Abstract

Purpose – The purpose of this paper is to provide new insights into the implementation of large-scale learning projects; thereby better understanding the difficulties, frustrations, and obstacles encountered when implementing enterprise-wide e-learning as a tool for training and organization transformation in a complex organization.

Design/methodology/approach – Information-sharing disturbances, one of five categories of disturbances that emerged from a grounded theory open coding procedure applied to empirical data collected through a longitudinal field research, are in focus. Third generation activity theory, specifically the notions network of activity systems, disturbances, tensions and contradictions, is used as an analytical lens through which to understand the role of information sharing in a large-scale implementation.

Findings – The study has identified how information sharing disturbances became a critical factor in the implementation of e-learning in a large company. A number of tensions that point to potential contradictions have been identified. Ways in which to deal with such tensions in future implementations of e-learning have been suggested.

Research limitations/implications – Activity-theoretical discussion of e-learning in a large organization, identifying underlying tensions, is of relevance to large organizations introducing new technologies for working and learning.

Practical implications – The study has identified the causes of an important type of problem that can slow down or hinder e-learning adoption in an organization, and thereby pointing out shortcomings of standardised e-learning applications.

Originality/value – Empirical studies of enterprise-wide implementations of e-learning have rarely been reported on in the research literature.

Keywords E-learning, Information sharing, Workplace learning

Paper type Case study
Introduction
When relocating more than six thousand employees to its new headquarters at Fornebu in Oslo, Telenor, the largest telecommunication company in Norway, decided to use e-learning to prepare its employees for a new working environment that included open-office solutions, extensive use of ICT solutions, advanced meeting rooms, advanced equipment and expectations to utilize new work practices. In addition, the organization was shifting from local competence development and a hierarchical organization, to new leader and employee roles and new work forms. This change process, that would affect the daily work practice of thousands of employees, had two goals. A short-term goal was to do “business as usual” a few days after relocation, and a long-term goal was to become a learning organization and an innovative workplace. A longitudinal field research has followed this process over a period of four years in order to uncover potential problems and opportunities (Netteland, n.d.).

In this article we look at the implementation of e-learning (the process of taking e-learning into use in the organization) through a third generation activity theory lens. The term “implementation” is used differently in different communities. In information systems (IS) research and practice the term denotes the process of introducing the technology in an organizational setting. Here it is used in the IS term of the concept (Munkvold, 2003). We use Engeström’s (1987) model of an activity system and his notions of disturbances, tensions and contradictions as analytical resources in order to understand the tension-riddled network of interacting activity systems that represents the complexity of introducing enterprise-wide e-learning in a modern company. Focusing on the e-learning activities from the perspective of a training administrator, whose role it was to execute a plan for e-learning in her unit, and on the problems, obstacles and frustrations that arose in regards to issues of information sharing within the network of activity systems, we hope to provide new insights into the accomplishment of large-scale e-learning projects.

The paper begins with a description of the research design where the site and participants, the data collection methods and the analytical tools are detailed and a category of disturbances, referred to as information sharing, is introduced. Then an activity theory analysis is presented first by identifying a network of interacting activity systems, followed by the presentation of a selection of tensions that were found within the network of activity systems. The paper concludes with a summary of the findings and a discussion of ways in which to deal with such tensions in future implementations of e-learning in an organization.

Research design
Site and participants
Telenor is a leading provider of telecommunication services and one of the largest mobile operators worldwide. The company survived as a state monopoly in the Norwegian market until 1994 when it was transformed to a public corporation, and in December 2000, the company was partly privatised and listed on the stock exchange. At this time Telenor decided to use e-learning as a strategic tool for internal competence development and organizational change (Telenor, 2000). The relocation, from the old locations spread around Oslo to the new headquarters at Fornebu in 2001, together with the focus on new work practices, represented an enormous educational challenge, and e-learning was seen as a means to aid in this transition. A project that
should address the technological and organizational aspects of implementing e-learning across Telenor, was launched by the top management. This project, referred to as the E-learning project was, however, also a cost-reduction and a symbolic project (Meyer, 1994). E-learning should contribute to make learning cheaper and more effective, at the same time as it was expected to transform Telenor from a hierarchic structure to a knowledge organization, and was meant to contribute to the view of Telenor as a modern and efficient organization.

At the time of moving, Telenor consisted of four large units or business areas (Unit 1-Unit 4). The span in production was large – from mass production of automatic message counting, via products related to data, telecom and mobile technology, to advanced integrated solutions and services directed to the most demanding customers in the Norwegian industrial market. In line with most enterprise-wide information systems implementations (Rosenberg, 2006), however, e-learning was implemented as a standardized approach; all employees should go through the same learning modules, irrespective of experience, competencies, type of business unit and so forth.

In line with the vision of creating a learning organization and an innovative workplace, the slogan of the e-learning project became “to give the right training to the right people at the right time and in a right way” (Telenor, 2001). The E-learning project developed a plan that addressed explicit and implicit rules for the learning activity, specifying for example what and how many modules should be completed before and after moving, when the modules should be launched and completed, recommendations about how much training time was needed, different roles in the e-learning team, rules for production of completion reports and rules for control and follow up. Furthermore, the plan stressed that learning should be integrated with work and take place at the employee’s own desk. Training administrators, most of whom were part of the human resources staff, were appointed in each of the Business areas (TA1-TA4) as well in each of three smaller Telenor companies (T5-T7) and it was their responsibility to execute the plan in their unit. Each unit’s top manager, however, had the main responsibility for this activity. The e-learning project also produced the e-learning modules. A separate project, the LMS project, which had the responsibility for the implementation of a new learning management system (LMS) through which the e-learning modules were to be accessed, was launched in parallel.

Twelve web-based e-learning modules were developed to support training of specific skills and it was expected they be carried out individually without help of other colleagues or human tutors. There were eight compulsory modules; three modules were expected to be completed before moving, five afterwards. The modules were classified in three categories: “ICT-solutions”, “Physical workplace” and “New ways of working”. All modules were multimedia based, with channels for audio, video, animation and graphics. The content comprised both tasks and tests. Expected completion time for each module was from 20 to 45 minutes, with opportunities for redoing. Users were free to take a break any time, log off and log in later, without losing credits. Although eight of the modules were compulsory and the others optional, the modules were all marketed by the project as an opportunity for flexible and mobile learning, with respect to navigation, time as well as space (Netteland, 2003). The training, made available via a LMS interface, was organised according to a marketplace metaphor. This was symbolized with a shopping basket in “the learning catalogue”, where all the available modules were listed. When a module was ordered, it was moved to the “in
progress” view, and once it was accomplished and approved, it was moved into the “learning history” view (Guribye and Netteland, 2003). Employee data, combined with data about the completion rate, were available for the training administrators through predefined reports, one aggregated at Unit level, the others identifying employees and additional completion rates at Unit or Manager level. To be counted as completed in the LMS reports, a module had to be at least 80 percent finished, some of them even 100 percent. It should be noted that four weeks after moving, the completion rates of one and the same compulsory module could vary with more than 50 percentage points across the four main units. Unit 1 had the lowest rates; the completion rates of the eight compulsory modules ranged from 5 to 37 per cent.

Data collection
The analysis is based on data collected during the four years of Netteland’s doctoral research using, in accordance with the ethnographic research tradition and to provide validity and reliability, a variety of methods such as interviewing, participant observation, observation, field notes and textual analysis of archived historical documents. The more than 48 audio-taped interviews with sources such as managers, project leaders, project members, training administrators, support staff and employees, comprise the main body of data together with archive documents while quantitative data from sources such as the LMS and the enterprise resource system have also been accessed. The transcribed interviews formed the basis of the analysis; and excerpts from the interviews presented in this article have been translated from Norwegian to English by the first two authors. It should be re-emphasised that activity theory did not play an essential role during the process of data collection.

Data analysis
Analysing an enterprise-wide implementation of e-learning in a large complex organization such as Telenor, with different types of work, varying experiences and a large variety of competences, requires an analytic tool(s) that manages to handle this complexity and aid in analysing and making sense of the empirical data. By taking departure in the third generation activity theory, which views the activities as dynamic processes and non-isolated units, continuously influenced by other multi-organizational activities and changes, the aim is to understand the network of interacting activity systems and identify the underlying causes of the problems, obstacles, and frustrations that arose during the implementation.

To handle the complex and large data material and to gain a deeper understanding of the main obstacles in the process, interview and observation data were therefore first reviewed, manually coded, then questioned, compared and categorized using the grounded theory (Glaser and Strauss, 1967) procedure referred to as “open coding” (Strauss and Corbin, 1990). Six different categories comprising the main obstacles, frustrations, breakdowns, etc. encountered during the implementation, emerged.

From an activity theory perspective these categories represent types of disturbances. Characterized as “deviations from the normal flow of work” (Engeström, 1996; Helle, 2000), disturbances show up mainly as “errors, problems, breakdowns, ruptures of communication, obstacles, etc.” (Helle, 2000, p. 87). Engeström and Mazzocco define the concept as:
Deviations from the normal scripted course of events in the work process, normal being defined by plans, explicit rules and algorithms, or tacitly assumed traditions. ... A disturbance may occur between people and their instruments or between two or more people. They appear in the form of an obstacle, difficulty, failure, disagreement or conflict. Identification of types of disturbances and ways of managing or containing them opens up a new layer of work for analysis – layer of constant negotiation and problem solving from below (Engeström and Mazzocco, 1994, p. 2).

Table I presents these six categories of disturbances, giving excerpts from interviews to exemplify each category. It should be noted that the categories are identical with those that emerged from the grounded theory analysis (Netteland, n.d.).

During the implementation of e-learning in Unit 1, a plethora of complaints arose about the lack of collaboration and interaction around what we have called information sharing. Excerpt 1 below, from a group interview with the training administrator in Unit 1 (TA1) and her colleagues, illustrates this dissatisfaction.

**Excerpt 1:**

TA1: We have made a link to Fornebu [the website of the new headquarter at Fornebu where also Unit 1 was located], but the site is not updated ... eRAF [the relocation project] does not update the site ... we have given up ... then we made our own site instead ...

A5: Yes, that is what I also do.

A1: We are fairly critical to eRAF [the relocation project] ...

TA6: And then we lose the overview.

TA2: We could have avoided this ... in a hectic relocation process we could have avoided this!

TA7: And then another thing ... there are too many e-mails and information floating around ... if we had had what we talk about here [a common e-learning web site], then we could have actively taken part in this [information exchange] ... we are after all Training Administrators and know what we ought to do; to log onto the site and link the site to our personal links instead of as it is now. There are seven, eight, ten people sending the same mail and we are bogged down with mail.

A5: One is bogged down with mail.

From the grounded theory coding (Strauss and Corbin, 1990) of the interview data from Unit 1, four situations related to information sharing were singled out as particularly problematic:

1. difficulties in reaching the entire staff with necessary information before the e-learning implementation started;
2. incomplete and shifting information from the E-learning and LMS projects;
3. the information to the employees from the project groups and the TA was neither coordinated nor consistent; and
4. obstacles to the e-learning activity because the information from the project groups was difficult to understand.

According to the given plan, the e-learning activity was expected to be transparent and the actions coordinated. These situations, which represent deviations from the
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<tr>
<th>Category</th>
<th>Description</th>
<th>Excerpt</th>
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<tr>
<td>Management control</td>
<td>Disruptions, breaks and problems that hampered the control activities. For instance problems related to the quality of user data, the report production in the LMS and the further transformation of these reports into readable control reports for the management</td>
<td>“The LMS reporting was impossible to carry out . . . You [the training administrator] had to know all the employees [about 1,200 people] to be able to [produce] and use the reports . . . That’s the reason why we have not produced control reports for the management”</td>
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<td>Technical infrastructure for E-learning</td>
<td>Obstacles and errors emerging during the e-learning activities related to the lack of access to the modules and the logging of the e-learning activities. It incorporates problems related to the local network, to the PCs, line capacity, LMS, the e-learning modules as well as missing technological assistance</td>
<td>“[Most of the employees] did not get access to the e-learning modules from their pre-location office due to too old PCs and missing network access. We [the coordinators] tried to arrange for a separate training PC, but [despite this] many did not have access to e-learning before moving”</td>
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<td>Execution of implementation tasks</td>
<td>Problems emerging as a result of lacking collaboration between key actors in the implementation activity, within the business area, and between the business areas, the project groups and help desk. The category also includes problems related to the lack of engagement, lacking follow-up, bothersome work flow and division of labour.</td>
<td>“I claim that the management of Unit A was totally absent [in the implementation activities] . . . [in this unit] there was an enormous focus on earnings, to make the new unit survive. In this situation e-learning was not emphasised”</td>
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<td>Information sharing</td>
<td>Complaints related to the information exchange between different actors, for instance: missing or lack of information about the e-learning activity at implementer level and employee level; negative experiences related to misinformation, information overload and difficulties in finding the desired information; as well as complaints about the written (or web-based) guidelines about the operation of the e-learning modules and access to the e-learning infrastructure</td>
<td>“. . . at first we [the training administrator] got to know that you were logged out of the LMS after three hours . . . Therefore we did not inform the employees. But then we got a message that people were thrown out after 45 minutes, that is something else . . . People go to lunch, take a break, and when they come back none of the e-learning activities has been saved and they have to start from the beginning”</td>
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<tr>
<td>Allocation of time</td>
<td>Complaints about lacking opportunities for e-learning and conflicts between daily work tasks and competing activities. Problems due to struggling with multiple roles, disruptions from customers, emergency work as well as problems related to the new working environment, are also incorporated</td>
<td>“I would have preferred to work with the e-learning modules from home – we are fully booked at work and have to give priority to customers”</td>
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<tr>
<td>Relevance to work and previous knowledge</td>
<td>Problems and complaints related to e-learning modules and the lack of relevance to ongoing and future work activity. It also includes missing or poor relevance to earlier experience and competence and discrepancies in relevance to current and future needs. The category is related both to entire modules and parts of modules</td>
<td>“[The module] eBygg (e-Building) is not relevant for me because I do not have to book meeting rooms in my work”</td>
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prescribed plan in the form of difficulties, obstacles, frustration and ruptures in communication etc. and manifested themselves as disturbances in the learning and work activities, illustrates that the activity was anything but transparent and the actions lacked coordination and precision.

To understand why the disruptive role of information-sharing disturbances was felt as a serious obstacle, it is necessary to grasp the complexity in the implementation process, the complexity in the e-learning environment, the complexity of the Telenor organization with its four rather different working environments, and the tight integration of work and learning activity. The activity theoretical discussion in the remainder of this paper aims first to tackle this complexity by sorting out the interacting activity systems and examining the underlying causes of information sharing disturbances and then to conclude with a discussion of the ways in which they could be managed or contained.

Activity theoretical analysis

In order to address the underlying causes of information sharing disturbances, we need to look at their sources, or in Engeström’s words, their contradictions (Engeström, 1987). This can be done, as in this study, by applying the activity-theoretical triangle. By making an additional further analyse from a historical perspective, it is possible to identify the further deeper-lying contradictions (Engeström, 1987) of these disturbances defined as a set of “historically accumulating structural tensions within and between activity systems” (Engeström, 2001, p. 7). These exist at four levels (Engeström, 1987):

1. primary contradictions within each component of the activity system;
2. secondary contradictions, appearing between the elements of the activity system;
3. tertiary contradictions, appearing when representatives of a culture introduce the object /motive of a culturally more advanced form of central activity; and
4. quaternary contradictions, appearing between the central activity and its neighbouring activities

However, because a historical-genetic analysis has not been carried out, this study can only point to the potential contradictions emerging as tensions that have been identified.

This section begins with a presentation of the network of activity systems, which represents the activity systems involved in the implementation of e-learning in Telenor. Then we present an analysis of the tensions that underlie the information sharing disturbances.

The network of activity systems

The internal coordinator of the e-learning implementation in Unit 1, the Unit 1 Training Administrator (TA1), was also part of the human resource staff. This human resources activity system (HRAS) is presented in Figure 1 from her point of view.

The object of this human resources activity system is to implement e-learning. To contribute to this, the TA motivates and stimulates the employees to access and use the e-learning modules, the outcome of which is educated employees prepared for the new
workplace, new ways of working, business as usual and, in the long run, a competitive unit. A number of tools are at the disposal of this activity system, including the e-learning project mandate, the learning platform (LMS), the e-learning modules (content), information meetings, locally produced oral and digital information about e-learning (e.g. e-mails, instructions) and managerial information from the e-learning and LMS projects. The community is made up of the project leaders of the E-learning and LMS-projects, the TAs in the other three small companies (TA5, TA6, TA7), technical super users and the unit managers, all of whom should be working towards the implementation of e-learning so the employees learning what they need in order to be efficient as fast as possible in their new working environment. The division of labour specifies how the necessary tasks should be divided both within the local e-learning team, which is between the TA and the Unit manager (TA1 and Unit 1 manager here) and between the TA and the E-learning and LMS-project groups. The rules, which define the norms and conventions that constrain actions and interactions within the activity system, comprise meeting conventions and the e-learning plan (when, what, how, where and who).

The human resources activity system (HRAS) exists within a network of activity systems, see Figure 2. When viewed within a network, it can be seen as a subject producing activity system (Engeström, 1987, p. 88) in that it produces e-learning activities for the subjects of the Working Activity System (Unit 1), referred to as WAS. The WAS is an object activity system as it is the object of the HRAS, the focused activity system. The HRAS receives rules and tools from one external activity system, the Management Activity System (MAS), which comprises the activities involved both in the E-learning and the LMS projects. The three neighbouring activity systems are depicted in Figure 2.
Figure 2.
The network of activity systems involved in e-learning
As illustrated in Figure 2, the MAS produces the plan for e-learning and the implicit and explicit rules and regulations that constrain this activity (e.g. how many compulsory modules shall be completed, when the modules shall be launched) for the HRAS (dotted line 1), and the e-learning modules and the LMS for both the HRAS (dotted line 2) and the WAS (dotted line 3). Finally, the HRAS produces information about new tools and work forms, which becomes a new tool for the WAS (dotted line 4). This network of activity systems forms the basis for the analysis of the tensions and the potential contradictions underlying the information sharing disturbances that arose during the implementation of e-learning in Unit 1.

*Tensions and contradictions underlying information-sharing disturbances*

As identified earlier, difficulties in reaching the employees with necessary information, missing, incomplete and duplicated information, as well as poor instructions and disruptions in information sharing between the TA1 and the employees and the TA1 and the project groups, are typical manifestations of information sharing disturbances. These disturbances, not only arose internally in the HRAS (Human Resources Activity System), but also in the relations between the HRAS and the WAS (Work Activity System) and the MAS (Management Activity System). To address these disturbances the training administrator, taking the following initiatives:

- tried to influence how and when information about the new e-learning initiative was communicated;
- contacted the E-learning and LMS-projects and asked for more precise and predictable information;
- was a driving force behind the proposal of a classroom course (to help those who did not manage to translate the web based e-learning instructions into practical learning activity); and
- developed a dynamic e-learning web site to offer the employees in Unit 1 one common e-learning information channel.

As Hasu (2001) suggests, these initiatives to deal with the disturbances associated with information sharing will be used as a starting point for the identification of underlying tensions. While the main focus is on information sharing disturbances, they are often intertwined with other types of disturbances, thus some of the excerpts presented here contain evidence of other types of disturbances (dealt with in Netteland, n.d.). The tensions, embedded in the network of activity systems, are articulated from the point of view of the TA1 and the employees in Unit 1. This section presents these tensions as potential representatives of the underlying contradictions, illustrated in Figure 3.

1. **Global versus local perspectives.** The e-learning project group had both the short-term goal of using e-learning to educate the employees about the new work environment (so there was business as usual, a few days after moving), and the long-term goal of having Telenor develop into a learning organization. A general plan for e-learning that did not take into consideration local conditions that were unique to each of the four business areas was created. Despite the effort of TA1 to influence this plan (initiative 1), as evidenced by Excerpt 2, aspects of importance for the local implementation were ignored.
Figure 3. Tensions underlying information-sharing disturbances.

MANAGEMENT ACTIVITY SYSTEM

SUBJECT
E-learning PL * or LMS PL *

OBJECT
Select/install the LMS
Develop e-learning modules
Plan e-learning activity

OUTCOME
LMS
E-learning plan
E-learning modules

* Project Leader

TOOLS
E-learning modules
LMS

1

HUMAN RESOURCES ACTIVITY SYSTEM

SUBJECT
TA1

OBJECTION
Implement E-learning

2

RULES
E-learning plan

COMMUNITY
Workers, Managers, Other TAs, Project leaders, Technical Super Users

DIVISION OF LABOUR

3

DIVISION OF LABOUR

COMMUNITY
TA1, Managers, Fellow workers, Super Users

WORK ACTIVITY SYSTEM (Unit 1)

SUBJECT
Employee

OBJECT
Engage in e-learning while working

4

OBJECT
Educated employees prepared for the new workplace
New ways of working
Business as Usual
A competitive Unit

5

RULES
Learning integrated with work
Profitable production

6

7

8
Excerpt 2:

TA1: I have said [to the E-learning Project Group] that maybe only four modules [and not eight] should be compulsory [in Unit 1], but that was not accepted.

TA1’s main task was to implement e-learning under the constraints and regulations of this global plan (rules in the HRAS) while dealing with the realities of practical problems such as no computers on which the e-learning modules could run, late e-learning modules, and lack of timely information, miscommunication, etc. This led to a lot of frustration for TA1, see excerpt 3, and to actions on her part that attempted to remedy some of the weaknesses in the e-learning plan by producing a dynamic e-learning web site (initiative 4) that offered the employees in Unit 1 one common e-learning information channel.

Excerpt 3:

TA1: When so much money at first has been used here [at the new headquarters at Fornebu where Unit 1 was located], then we would have expected that they [the E-learning Project Group] had prepared a dedicated site on the Fornebu intranet.

The TA1’s site presented a valuable assortment of the e-learning information given by the project groups, e-learning relevant information published by TA1 (especially targeted to the needs in Unit 1), links to the LMS and different types of digital e-learning resources such as lists of frequent asked questions and a help desk, as well as to e-learning relevant articles published on Unit 1’s intranet-site.

A number of crucial problems with executing the given plan can be explained by the tension between a global focus on e-learning at management level, where one-size fits all and the assumption that all implementation actions can be described in detail in advance, and a local focus on the actual introduction of e-learning, given local constraints. This tension may represent a quaternary contradiction between the MAS and the HRAS (arrow 1, Figure 3), and as TA1 explained, “we make complaints to them and they badger us”. TA1 was truly frustrated when her initiatives were not received with interest and engagement. In fact, in one of the interviews she asked us to pass on a request to the e-learning project group to deliver more updated and coordinated information (one venue for initiative 2).

2. Important information meeting. An information meeting, arranged by the e-learning project, was the primary location for the employees to get information about the e-learning in which they were to engage. According to the e-learning plan, this was held one week before their scheduled move. The meeting would share information about the overall aim of the e-learning activity, when and how to access the e-learning modules, how to handle different types of problems and when the modules should be completed. Missing the information meeting had both short term and long-term effects; the later explained by TA1 in excerpt 4.

Excerpt 4:

TA1: At some places the attendance was high, other places only a few [people] showed up, and the leaders were almost without exception totally absent . . . Some of them had secretaries that got the job of attending [the information meeting] . . . The result was that [nearly nine months after the arrival at Fornebu] some of the managers asked for the telefax [which no longer existed because it was integrated in a multifunction machine; they would have known this if they had taken the e-learning modules] . . .
The planned timing of the information meeting was problematic for Unit 1 because of the upcoming moving one week later. The meeting went as planned (in time and content) despite TA1 having contacted the e-learning project group and requesting that the meeting date be moved up and that more information be given at the meeting. The result was a poor attendance, which made it difficult to create a shared understanding of why e-learning was important for Unit 1, and made the later work for TA1 extremely difficult as neither employees nor managers were prepared for the new activity. This tension between the when and the what of the information meeting specified in the e-learning plan (rules) and the practical needs that arose when TA1 tried to put e-learning into use (object) shows the nature of a potential secondary contradiction between the rules and the object of the HRAS (arrow 2, Figure 3) which underlies the disturbances related to the preparation of employees for the upcoming e-learning in which they would be engaged.

The introduction meeting was likewise the main arena to introduce Telenor’s ambition of integrating learning and work, but already here, it was evident that the new learning initiative led to conflicts. Instead of participating at the information meeting, most employees and managers gave priority to their regular work tasks and the moving activities. There were several reasons for this, including: the introduction meeting was not viewed as compulsory (this indicates a failure to share information that it was compulsory); the information meeting was not formally integrated in a new description of work and accepted by the managers and employees as a de facto rule; and the meeting took place only one week before moving when the employees were balancing working, packing and e-learning. The rules to integrate e-learning and work and to get through the e-learning modules, were in conflict with the rule to increase the business area’s earnings, see excerpt 5. This conflict can be understood as related to a potential primary contradiction within the rule node of the work activity system (WAS, see arrow 3). Furthermore can the tension between the rule of integrating work and learning and the object of engaging in e-learning indicate a secondary contradiction between the rules and object in the WAS (arrow 4).

Excerpt 5:

TA1: ... we tried to get the leaders in the different sub-units to focus on e-learning. I will say that the leaders were nearly totally absent. In fact only one or two leaders engaged themselves in this ... There was a heavy focus on earnings and to make this new business area [Unit 1] functioning, and therefore this [e-learning] activity not emphasised.

3. Information brokerage. Confusion about what, who, when and how information should be shared is evidence of a number of underlying tensions and contradictions in the working activity system that were manifested in a number of disturbances related to rules and division of labour around information sharing tasks and to inconsistent and redundant or wrong information being given to the TAs and employees.

For example, introducing e-learning in Unit 1 with over 1,000 employees was a challenge. According to the given plan, each unit manager was expected to follow up and control the employees’ e-learning activity based on completion rate reports extracted from the LMS by the TA. As the Unit 1 manager failed to engage himself despite being contacted by TA1 and being informed that completion rates (of the e-learning modules) were extremely low, the TA tried to engage lower level managers to encourage e-learning activity among the employees, see excerpts 6 and 7.
Excerpt 6:

TA1: . . . On my own I had to try to identify the staff coordinators at different level, to find out who we could ask to encourage the employees to use time for e-learning or to allow them to use time for training . . . I was the one who tried to get a dialogue here . . . [Despite of this] there were many sub-units, to which I did not get access.

Excerpt 7:

TA1: We in my unit [Unit 1] have not received requests from any of the leaders . . . What I have done is to publish who and how many have participated in each sub-unit – to much annoyance of course . . . and tried to summarize. This I am going to send to someone in that sub-unit, whether that is the nearest leader or not, I have not found out yet . . . now I have counted those who have completed and tried to make visible completion rates in the different sub-units. But I have only published aggregated statistics from the business area on the intranet, I do not want to denounce somebody.

Bedlam in Unit 1 around how information sharing tasks should be, and were, divided between TA1 and Unit 1’s top manager can be evidence of a potential secondary contradiction between the division of labour component and the rules component of the HRAS (arrow 5). Fuzziness around this division of labour with respect to information sharing can be attributed to problems in both the horizontal division of tasks between TA1 and the Unit 1 manager and in the vertical division of power and status. When the Unit manager failed to engage in his task of motivating the employees to participate in the e-learning, TA1 did not have the authority to take over the task herself – she could not get access to the necessary sub-units – and, as illustrated in excerpt 6, she consulted with the staff coordinators to identify who could. This situation is tightly related to the rules, embedded in the e-learning plan, that constrain actions and interactions within the activity system. This plan was inadequate with respect to information sharing in that it underrated the complexity of the TA role and illustrated a lack of understanding about the authority needed to carry out the information sharing duties; the manager should have been aware of the impact of his withdrawal on the e-learning and TA’s role. TA1 pointed to this lack of understanding of the TA role by the unit manager several times, referring to it as a “lack of anchoring”, see excerpt 8.

Excerpt 8:

TA1: The unit manager did not anchor the TA-role in the unit as I meant it should have been.

4. The planning of the e-learning introduction. Most of the planning of the e-learning introduction took place in two project groups, the E-learning and the LMS projects, in Figure 2 indirectly visible through the MAS (Management Activity System). This silo-organization of work, with little communication across the borders and little coordination of necessary information, led to a plethora of complaints from the TA and the employees in Unit 1. TA1 complained about not being able to trust information that was coming out of the E-learning and LMS projects about, for example, delays in launching of e-learning modules or changes in LMS functionality and thus created mistrust about the information that was given to the employees. As pointed out in excerpt 9, for example, changes in effects of inactivity while carrying out an e-learning module were conflicting and imprecise and could have extreme consequences.
Excerpt 9:

TA5: It is the arrangements by eRAF [the main project dealing with the moving to the new headquarter – the E-learning and LMS project were both part of this project] that, what shall we say ...

TA6: It can be a little better.

TA5: It could have been something quite different – [at first they say that] they come with new software releases at a specific date, and then some days later: they [the releases] are delayed for one week, and then we have to inform the employees once more, and then, next, it is even more delayed, and then we have to inform once more ... People are so tired, all the information that comes up and which you can’t trust. “That you told us last time too [employees say] – and despite this they [the releases] don’t come.”

TA6: It’s too bad ...

TA5: There are continually changes ...

TA6: This is critical.

TA1: And people do not start [the e-learning module from the beginning] once more.

As described above, both the TA1 and the employees experienced misinformation from the E-learning and LMS project groups throughout the entire introduction phase. Incorrect information was communicated, either in e-mails or published on the web, about when an e-learning module was going to be launched, how technological problems should be handled, etc. Equally embarrassing and damaging as miscommunication were the many conflicting messages that were distributed to employees and managers, either by e-mail or as a response to a telephone request. They came from the LMS project and the E-learning project and led to an experience of information overload and/or information inconsistency.

These situations, which negatively influenced the e-learning implementation for the TA as well as the e-learning activities for the employees, indicate tension between the complexity of developing tools (LMS and e-learning modules) and the need of the users (TA1 and employees) for clear and concise information and points to potential quarternary contradictions between the MAS and the tool component of both the HRAS (arrow 6) and the WAS (arrow 7).

5. Technological understanding and abilities. A number of difficulties arose also with employees who did not understand the technical instructions they were given via the intranet. This problem was first of all related to the instructions that led them to the LMS, but also to the operation of the LMS as such, see excerpts 10-12. Some of the employees were even not acquainted with the term “password”.

Excerpt 10:

TA1: ... in the mail, I mean, was written something about these classroom courses, but [it was underlined] that you had to have done something [some training] in advance ... And that is bad, because in the roadshows we have said ... that if you have ten thumbs and never has
used a PC, then you are expected to read the Infotorg [the internal information site] . . . you can’t expect that they go to the Infotorg and try to find out where to find Saba [the LMS].

**Excerpt 11:**

TA1: This introduction, how to come to Saba [the LMS], we had published it [the instruction] on the web and we had made short instructions, push this do that, there is the password and then you come in . . . Saba [the LMS] was not so easy that everyone managed to understand how they should operate it, how you should do . . . [this resulted in problems] . . .

**Excerpt 12:**

TA1: But for those who did not manage to start the modules, who did not understand so much of the PC that they managed to find the modules [navigate to the modules and follow the instructions], for those were arranged classroom courses . . . so that they could find out, which button to press, how to log in, what is a password and all this . . .

These disturbances pointed to tensions between the expected technological abilities of the employees and their actual abilities and were associated with a potential quatermary contradiction between the tools-producing system, the MAS (Management Activity System), and the WAS (Work Activity System) (arrow 8).

**Discussion of findings**

This section gives a summary of the study and presents the key findings before discussing the findings in the context of research on information sharing in the workplace e-learning literature.

**Summary**

This article has focused on information-sharing disturbances that were found from an activity theory analysis of the empirical data collected during field work that followed the implementation of enterprise wide e-learning in a large, complex organization. These information-sharing problems were observed through a grounded theory open coding of the empirical data, as presented in Table I.

In the activity theoretical analysis we identified a set of tensions and potential contradictions, see Figure 3, which underlie the problems that were manifested as disturbances in the network of activity systems. The sources of these tensions and contradictions related to information sharing disturbances point to the following weaknesses in the implementation activity:

- A standardized information and communication strategy that did not take local conditions and contextual factors into account.
- A missing understanding at company level for information sharing as a critical factor in local e-learning activity.
- A local need for a shared digital access point to updated information.
- A poor division of labour between the project groups and the units in the introduction phase.
- A lack of attention towards existent work practices and work rules and the need to prepare for integration of learning and work.
- A lack of understanding of the TA-role both in the projects and at management level.
Discussion

The weaknesses of the e-learning implementation that we have uncovered can in part be explained by Telenor’s reliance on a “peer-to-peer” strategy for communication among its employees rather than a “common information space” strategy (e.g. Bannon and Bødker, 1997). It can also be a relic from the late 1980s. From that time the emphasis in large Norwegian companies was placed on general organizational and managerial knowledge, and the training was mainly targeted to the single employee. This trend towards individual learning continued also in Telenor and was further reinforced in the 1990s. The aim was to develop individual attitudes and empower the single employee to take responsibility of the company’s development and growth (Røvik, 1998). Another explanation is that the e-learning strategy, with respect to the issue of information sharing, is influenced by Telenor’s history as a state monopolist and a hierarchical and centralized organization, and, the company did not take into account the large span in production, experiences, ICT literacy and challenges within the four Business areas and across them. Also, within Unit 1, which was a result of a recent merge and reorganization of two very different companies, there was a large span in type of production. While researchers seldom argue for differentiation of the information specifically directed towards different user groups, Victor and Boynton (1998) claim, from their standpoint in theories of work development, that information sharing (both content and delivery) should be tailored to the particular production system of the unit. Only in this way can different types of work (e.g. craft, mass-production, process enhancement, mass customization and co-customization) can take full advantage of information and learning. Dependent on the type of production, how the workers and managers in a unit are used to cooperating, whether the work flow is specialized or it opens for independent working, how training and knowledge building traditionally have taken place, etc., the sharing of information should be more or less flexible, more or less centralized, more or less standardized, all depending on what type of work it is expected to support.

During the next three relocations (Units 2-4), changes were made both in the e-learning teams at the unit level and in the project groups at management level. First, the E-learning and LMS projects were merged. Then, members of the project groups were given a particular responsibility for assisting the next-moving Units, one project member responsible for each of the business areas. Also the training administrators made local adaptations, by more or less deliberately changing the e-learning plan and adapting it to the Business area’s internal needs. For instance, Unit 4 created a three-level detailed communication strategy, Unit 3 and 4 appointed extra local TAs at sub-unit level, Unit 3 introduced workshops as a new tool for the e-learning activity, and Unit 2 took active advantage of collegial support and created an internal local help desk. It should be noted that some of these initiatives elicited different types of conflicts with the E-learning project. Netteland (n.d.) describes how some of the local adaptations actually were in alignment with the unit’s specific type of work, as described by Victor and Boynton (1998). However, the changes and adaptations cannot fully explain why some of the disturbances in Unit 1, such as those related to technical understanding, were not experienced as disturbances in some of the other units. In order to understand this, it seems that additional factors have to be taken into account (for instance the ICT or technological competence in the staff).
Information-sharing disturbances, however, are only the “tip of the iceberg” when dealing with the implementation of e-learning in Telenor, as there are at least five other categories of disturbances that have impact on this process. Three of these, namely, technical infrastructure for e-learning, execution of implementation tasks and relevance to work and previous knowledge are addressed in Netteland (n.d.).

Conclusions
Despite large parts of the corporate e-learning literature recommending the application of information tools, models and language from consumer marketing and promotion when e-learning is put into use (Cross and Dublin, 2002; Moshinskie, 2002), ways of communicating these tools and models are more seldom addressed. Only a few authors specify how and when such artefacts should be applied (Reed and Oelze, 2001; Van Dam, 2004). For example, Cross and Dublin (2002) and Rosenberg (2001) both focus on credible communicators, timely and truthful information and consistency between messages, actions and company initiatives. Some authors focus broadly on information as a general context-independent resource, not merely as a means to communicate, but also to develop understanding for change, establish a shared vision, and enable two-way communication and dialogue (Cross and Dublin, 2002; Hodgins, 2002; Van Dam, 2004; Rosenberg, 2001). One example is Hasu (2001), who in her study of the adoption of technological innovations, argues for using workshops where meta-reflection, communication and collaboration facilitate “the emergence of a shared object” among the involved parties. Rather seldom, however, is information sharing referred to as a success factor. One exception is Rosenberg (2001), who counts it (although he uses the term communication) as one of the four Cs (Culture, Champions, Communication and Change) critical for an implementation’s success in the introduction phase. Another focused barrier, pointed to by Simmons (2002) and of relevance here, was the ability of the employee to find time for learning. In this case TA1 was constantly dealing with information sharing issues all the time while having to carry out her other duties as well; this is also related to the category of allocation of time disturbances.

This article has pointed to information sharing as an underestimated and critical factor in the implementation of large-scale e-learning at the workplace, at least in those situations where learning is expected to be integrated with work. To succeed in this kind of enterprise-wide process, the analysis has pointed to the following aspects of information sharing that should be taken into account:

- The information, as well as the ways of sharing this information, should be targeted towards specific user groups, local conditions for learning and other contextual factors (see for example Victor and Boynston, 1998).
- The company should put an increased focus on information sharing as a critical factor in the local introduction and not underestimate a persistent need for a shared understanding of the information and the object of the process, as well as a need for updated, coordinated and consistent information.
- The division of information tasks between the local and central levels is critical in the introduction.
• The large span in work practices and work rules in the different parts of the company must be given attention when integrating learning and work (see Victor and Boynton, 1998).

• A new division of labour allocating enough time for learning should be prepared, as well as new work tasks that integrate learning and working.

• The role(s) responsible for coordinating and pushing the e-learning activity is critical.

We suggest that the use of these points as a checklist for enterprise-wide implementations of e-learning in large organizations will contribute to a smoother and more transparent introduction and management of the disturbances related to information sharing.

Attwell (2005) claims that the restricted empirical research in the e-learning field has mainly focused on the development of technology or product evaluation, and not on “what works and what does not [work in a workplace environment]” (Attwell, 2005, p. 54). Effort has been made on our part to contribute to the restricted empirical research, by focusing on what works and what does not work when implementing e-learning in the workplace, and putting technology development (the focus of the majority of previous work) in the background.

References


