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**KP-LAB**

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## Abstract

This deliverable has been produced in the context of the Knowledge-Practice Laboratory (KP-Lab) project. KP-Lab focuses on innovative practices of working with knowledge in higher education, teacher training, and professional networks. Participants of WP10 are University of Helsinki, University of Oslo and Pöyry Forest Industry representing both researchers and practitioners.

This is the second synthetic report from WP10 'Knowledge Practices in Professional Networks<sup>1</sup>'. WP10 explores knowledge practices in workplaces to understand more of the ways professionals create, use, communicate, and embed knowledge in their work. According to the goals of the KP-Lab, the cases chosen have a special emphasis on collective knowledge artefact creation and the implementation of ICT-based tools. The first submission reported work initiated by WP10 during months 7-12 of the KP-Lab project. This report is the second revision. In order to answer to the requests from the second project review, we need to draw on insights from later period (M13-24).

In the period covered by this deliverable, we investigated five empirical cases. We describe the networked dimensions, which means that the targeted work organizations are investigated in the context of their collaborative relationships and interactions across functional boundaries. The connecting feature across the cases is the introduction of a network-based tool as a part of knowledge management infrastructures: a web-based commenting tool in Project Way, Wikis and blogs in ChronICT, company specific web-portal integrated with a CRM tool in KIKK and in 'Design of Activity System Design Tool (ASDT)@Pöyry', and customizing a repository for standardized work descriptions (PPS) in Ahus Competency.

This allows exploring development, use of tools and transformation of the knowledge practices from different perspectives. In our presentation of the portfolio of case studies we will elaborate on their representativeness and validity for KP-Lab. We also point to the comparable outcomes across cases, and elaborate how they contribute to the co-design processes. In the appendix we provide more elaborate information about the two cases in the M12 portfolio that were closed down at M18.

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<sup>1</sup> WP10 is from M13 on titled 'Knowledge Practices in Workplaces'

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# 1 Introduction

This deliverable is a report on the work in the context of the Knowledge-Practice Laboratory (KP-Lab) project, WP10 *Knowledge Practices in Workplaces*<sup>2</sup> during months 7-12. Participants of WP10 are University of Helsinki, University of Oslo and Pöyry Forest Industry, and they represent both researchers and practitioners. This is the second revision, and in order to answer to the questions from the second project review, we need to draw on insights from later period (M13-24) also.

WP10 focuses on research of collaborative knowledge creation practices, interaction of tools and practices, and the elicitation, exploration and creation of knowledge in different representational modes. It further aims at providing insight into tool-mediated knowledge creation processes in authentic situations, combining individual and collaborative modes of working with knowledge in work places. As seen from a long-term perspective, the investigations are expected to provide analytic insights in professionals' knowledge advancement in different boundary-crossing activities, e.g., between workplaces, workplaces to education, and higher education to workplaces. All these interests represent the topics of knowledge practices and knowledge creation in workplaces that are considered to be important in the KP-Lab development work.

During the period M7-12, we negotiated two additional cases studies; ProjectWay and Ahus-Competency, and they broadened the assessment of knowledge practices in work places. The main criteria of selecting the cases to WP10 work is the opportunity for long term collaboration with the organizations focusing on co-design and/or customization of knowledge artefacts, tools, and practices. This criterion is important given time span of KP-Lab development work. The design principles by KP-Lab have been a central guideline in the selection process (see the summary table 1, p. 19-20, in the end of the case presentations) and evaluating the relevance of the case studies for KP-Lab R&D. The in-depth case study approach complement the design-based research designs in WP8/WP9, and findings from the case studies can inform requirements to KP-Lab tools, or serve as analytic benchmark.

In this deliverable, we point at the relevance of the cases when discussing first findings and observations. The five negotiated cases of knowledge practices in work places investigated by M12 represent following sites: A global company undergoing a change from an engineering services provider towards a knowledge broker in its industrial branch (forestry); a collaborative practice where activities of multiple stakeholders play out in a collaborative web-environment (sort of shared space); a large hospital organization working to transform their knowledge practice to a more patients-centred work flow; and a software company in rapid expansion. ProjectWay' (M11-M18) is now a closed studies and the summary of the outcomes is available in the Appendix. 'Ahus Competency' is a new longitudinal case study to explore the knowledge creation and production processes during a hospital organisation's transition to new facility and new social practice. The case study adds understanding of on-going knowledge creation and processes exploiting the potential of the ICT-based knowledge management infrastructure as shared, evolving and collectively produced knowledge artefact to deal with authentic real life, open-ended, ill-defined problems. In all case studies we explore

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<sup>2</sup> The name of WP10 was changed from "Knowledge Practices in Professional Networks" to "Knowledge Practices in Workplaces" following feedback from Y1 review

how they deal with open-ended problems. The cases provide windows to understudied, rich and complex working environments, and in their knowledge practices, innovative potential and a quest for change and development. We are also contributing to the development of the design and use of the tools in the context of these specific knowledge practices. As such, the case studies give a variety of perspectives to the on-going exploration of knowledge creation practices and technology-in-use.

In order to start cross-case comparisons, the dimensions of each case have to be explored first, as they are not obvious and given in the beginning of the research. The necessary next step of the research will involve comparative analyses across the cases of knowledge practices, as well as returning to the KP-Lab theoretical resources to discuss the findings in relation with the existing literature and the ongoing development of the dialogical learning concept. 'Knowledge' and 'knowledge practices' are the two central concepts informing the work of KP-Lab and WP10 (see definitions formulated in the *Technical Annex*, (KP-Lab, 2006)). Knowledge achieved by communities and knowledge practices are thought to be created through a variety of collaborative activities in organizations. This means that by investigating concrete activities we may achieve understanding of conceptually complex knowledge-related issues that are in the core of the KP-Lab. We emphasize 'knowing' in organizations, and emphasize actions and doing. It follows that 'knowledge practices' cannot be separated from the activity of the given community; rather this concept offers a special perspective to the collaborative work, which becomes ever more crucial for the sustainability and transformation of the communities (Gherardi, 2006). In Deliverable 10.1 we pointed to some of the challenges related to the knowledge practices we set out to investigate. Among them is the shift from mapping and managing individuals' knowledge and skills to knowledge practices where people organize, create, adopt, re-create and/or reject knowledge in common knowledge repositories, and further to knowledge-as-knowing perspectives (this is further elaborated in D10.3).

In this presentation of the empirical cases of knowledge practices we will report on activity around emerging, shared objects, contribution to tool development, and progress of how to investigate long term processes of knowledge advancement in work places. The summary table is found in the end of the case presentations. We approach the analysis of knowledge practices through exploring the activities in a workplace and the networked activities the participants take part in. To investigate the collaborative nature of knowledge creation, learning and development we draw on the ideas of KP-Lab proposed theoretical framework of three metaphors of learning (Hakkarainen, Palonen, Paavola, & Lehtinen, 2004; Paavola & Hakkarainen, 2005). In the changing multi-professional contexts, practitioners and their expert cultures need to develop dynamic capabilities or knowledge practices that are characterized as "learning to learn". (This discussion is further elaborated in D10.3.) The theoretical resources in the KP-Lab project complemented by concepts like "boundary objects" (Bowker & Star, 2002), "developmental transfer" (Engeström, 1999), and "boundary crossing" (Konkola, Tuomi-Gröhn, Lambert, & Ludvigsen, 2007; Tuomi-Gröhn & Engeström, 2003) will help identify the key features of the practice and the tools that can enhance knowledge creation. The review of the literature related to knowledge practices in professional networks and knowledge management in particular continues alongside with the empirical investigations in the case studies and is reported in D10.3.

- This document is organized as follows:
- Section 2 Case studies of knowledge practices

- Section 3 Methodological approaches
- Section 4 Technology development
- Section 5 Towards an integrative approach - cross case comparisons
- Section 6 Summary with lessons learned and challenges ahead

## 2 Empirical case studies of knowledge practices

We are reporting five case studies (operative by M12) of knowledge practices in workplaces and the networks these workplaces are part of. We are assessing the development of the knowledge practices in work places through two kinds of case studies: 1) exploring current knowledge practices, their tool-use and developmental challenges to contribute to analytic insight in how tools mediate everyday practice, and 2) evolving knowledge practices when co-designing and experimenting with KP-Lab tools. The selection of cases are informed by the design principle, and we have emphasized:

- -representativeness in terms of knowledge work in a technology intensive environment and access to network setting (see section 5.4)
- -ongoing change processes that challenge the existing knowledge practices and give rise to triological type learning processes; co-design and co-configuration of shared artefacts, knowledge creation and transformation processes
- -option for researcher interventions to integrate the KP-Lab tool development to the case or opportunity to investigate their evolving knowledge practice as "history does the intervention"
- -access to the organizations and possibility to carry out the field work in the frame of the KP-Lab schedule

The structure of the case presentation is; *introduction* to the case, *focus* of the case including the key ideas laid out by KP-Lab project (research strategy and plan) to highlight the representativeness of the cases for the overall project, *methodology, tool development and/or use* that contributes to the co-design processes and connect to the KP-Lab *design principles, challenges and possibilities for KP-Lab*, including contributions to the overall R&D agenda for KP-Lab and *status of the case* concerning the closed cases.

### Case A: KIKK

*Introduction.* KIKK (Knowledge Management for Internal Communication and Customer relations) is a collaborative project between InterMedia, University of Oslo and Safran Software Solutions AS, located in Oslo and Stavanger, Norway. The company is engaged in commercial software product development and develops and sells project planning and management tools and provides consultancy services in using these tools. The main market has been the Nordic oil and gas industry. To expand to new markets, in particular building and construction, the company has started to change and improve its knowledge management practices regarding customer relations.

*Focus.* The company is known for their customer initiated product development approach, i.e. close interaction with customers to develop tailor-made products (Nygård & Mørch, 2007). Customers are encouraged to report problems, innovative use, and local development to the company. This has been stimulated through long-term relationships (maintenance, support, and training contracts) and two kinds of user forum. One is an annual (F2F) showcase where customers are invited to interact with developers on site

o the basis of presentations. Another is communication and information sharing tools that developers have created for customer interaction. This started with the telephone, then supplemented by mail, later extending to a Helpdesk interface, then a Customer Relationship Management (CRM) system, and most recently a Web 2.0 prototype created by the research team (Nedic & Olsen, 2007).

One aim with this case study is to understand and explicate the company's experiences and existing models of knowledge management, and we engaged in collaborative interaction (participatory design and agile development) to design and introduce the Web 2.0 prototype. Another aim is to study the challenges encountered during the implementation process, which includes the tensions between different developmental practices that could not be solved by one type of solution. The problem calls for solutions at different levels, involving both organizational as well as technical components. In particular we explore the tension between two activities we have labelled adaptation and generalization (Mørch, Nygård, & Ludvigsen, in preparation). On one hand, the company is in transition to expand to new markets in order to increase revenue by new customers (generalization). On the other, they want to maintain good relations with existing customers and develop tailor-made solutions for individual customers (adaptation).

Summary of results (which has informed PCP, see section 3):

- *Mutual development*: Dynamics of expanding to new markets and adaptation to individual customers (Andersen, 2008; Mørch et al., in preparation);
- *Co-configuration*: Dynamics of developers, products, and customers (co-configuration) (Engeström, 2004; Victor & Boynton, 1998);
- *Boundary crossing*: Interaction between developer activity system and customer activity system (Konkola et al., 2007);
- *Evolving artefacts*: (Fischer & Ostwald, 2001; Mørch, 2003): Following the development of user tools as they are part of mutual development, co-configuration and boundary crossing;
- *Knowledge management*: Identify strengths and limitations of knowledge management systems. To what degree can and should experiences be formalized in to system representations, knowledge in different representational modes,

These findings are related to the dialogical approach of KP-Lab in that the focus is on collaborative development on shared artefacts (software products). It thus is consistent with to several of the design principles (e.g. "organizing activity around collaborative advancement of knowledge artefacts," and "knowledge advancement around authentic problems"). It differs from the paradigmatic examples of the dialogical approach (collaborative writing and open source software development) in that interaction in the KIKK case is "asymmetrical" in terms of knowledge of the shared artefact (re: knowledge advancement around authentic problems) and when it comes to the potential for contributing to innovation (professionals vs. amateurs/end-users/customers) rather than symmetrical (professionals only).

*Methodologically*. KIKK has been inspired by and contributed to Participatory Change Processes (PCP), a method that is developed based on cases in KP-Lab (see section 3). PCP as applied in KIKK is a combination of participatory design and extreme programming. It also addresses organisational redesign based on feedback from the company on the results of the design work. The organizational design involved change in practice. To accomplish this, the researchers collaborated with practitioners in the

company (developers, consultants and trainees) as well as with representatives of their customers. These insights allowed us to develop a Web 2.0 prototype that could be field-tested. The feedback from the company allowed us to put knowledge management and customer relations into a larger picture than what is commonly discussed in the literature on knowledge management and systems development, to also include customers as part of the product and knowledge development process (Andersen, 2008; Mørch et al., in preparation).

*Potential of tool development and/or use* The web-portal prototype was developed as a collaborative effort between the company and two InterMedia researchers (Nedic & Olsen, 2007). Its implementation during the summer of 2007 was partly a success, partly a failure. It succeeded to demonstrate as proof-of-concept of the ideas we set forth in our research objectives. It failed when we were not able to successfully integrate the portal with the CRM tool (a vendor product suggested by the company that was not open for integration with third party software without extensive debugging and work around). The lessons learned from this are that we were successful in our communication with the company regarding the usefulness of expanding the view on knowledge management to also include active customers as a capacity to count on for further development of commercial products. These findings were important for advancing our understating of mutual development, boundary crossing, co-configuration, evolving artefacts and knowledge management.

*Challenges and possibilities for KP-Lab* In addition to the in-house developed web portal, the KIKK case will investigate to what extent the company will be able to use for shorter or longer time frame one or more of the KP-Lab developed tools. It is big challenge for a profit-driven company to benefit tools developed in a research project, and it requires close interaction between researchers and site. This dilemma has not been successfully resolved in our case, because we were not able to switch our hats to be consultants only (a reason for this is that the collaborating partner is not affiliated with KP-Lab). The benefits KP-Lab can draw from the case is as example of a knowledge practice in industry where end users play a key role, not only by providing input to requirements, but also as active contributors and innovators due to their expert knowledge of how software products can be used in different ways in domain specific work (in our case project planning in the oil, gas, and the building industry).

## **Case B: ChronICT**

*Introduction.* ChronICT is a case study in collaboration with Centre for rare diagnosis (SSD) at Rikshospitalet University Hospital, Oslo, Norway. Representatives of the chosen patient group and health care providers from different units in the hospital are involved in the study. SSD is a competency centre established to provide advice and consult to/with/about patients and their families with a rare diagnosis<sup>3</sup>. They consult with the patients and their families, health providers, schools and social services involved in a patient case. SSD is developing their knowledge practices, and wants to use more collaborative tools to collect, systematise and make easier available accumulated information and knowledge in new mediums. ChronICT is the acronym for "ICT based information and communication resources for patients, their families, and health care providers dealing with chronic disease". ChronICT case explores everyday challenges of "living well" with a congenital condition and support self-care and symptom

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<sup>3</sup> A rare diagnosis has by definition less than 500 diagnosed nation wide

management activities. For the users this is an open-ended problem, where opportunities to *collaboratively create knowledge* and systematize experiences across user-groups can be important. A basic assumption guiding us is that related to a chronic condition experiences, accumulated knowledge and solutions in daily living are distributed, ill-systematized and under-articulated.

*The focus* of the ChronICT case is to systematize, explore and actively attend to 1) the wide range of knowledge and experiences relevant when living with a rare malformation, emphasising self-care and symptom management in everyday activities, 2) approaches to information and knowledge sharing among the involved participants, and 3) potentialities in ICT-resources as infrastructure for access to and creation of relevant and timely information and knowledge. The significance of this case study to KP-lab is the unfolding opportunities to use tools to augment an increasingly complex but under-explored knowledge practice. In particular, interactions of knowledge types, e.g., professional, lay, experiential, or tacit play out to constitute interesting trajectories in this knowledge practice (Ludvigsen, Rasmussen, Krange, Moen, & Middleton, 2007) . Further, exploring processes to expand the repertoire of learning material for information sharing and knowledge creation in a network where the participants contribute special expertise and experiences adds to the relevance. The purpose is to create a space for exchange of experiences, questions or concerns related to more "factual" content. This may allow us to study development of individual and collective agency in an area with distributed and limited systematized, accumulated knowledge.

*Methodologically* ChronICT is set up as an exploratory and design-based case study. We held workshops with members of different target groups to elicit experiences, strategies and knowledge in use and of importance to them. Participants in these exchanges were recruited by SSD (resources persons, health experts) and InterMedia (technical and theoretical competence). The empirical material is from two cycles of workshops; 4 workshops in the first cycle and 6 workshops in the second cycle, to elaborate on content, design and areas of use for a shared tool. Participants were different stakeholders; patients in different ages, parents and providers. Altogether 50 persons have contributed in the workshops.

*Potentialities for tool development* The first cycle of workshops had contributed to articulate variety of and accumulate knowledge and experiences about 1) assessment of existing practice, 2) written learning material, and 3) every day experiences from future, intended user communities; patients and family members, as well as health providers. This first cycle of workshops contributed content about issues related to treatment follow-up, e.g. leakage, eating, surgery – stoma, and challenges in everyday life from patients and family point of view. This complemented accumulated knowledge and experiences about treatment, self-care, symptom management and living well with the condition, for example presented in the booklet "Å leve med anorektale misdannelse" (Senter for Sjeldne Diagnoser, 2006). The contributions in the workshop included how they have to re-think and challenge the "taken-for-granted" in every situation. Other participants refer to their operational routines and traditional modes of interaction and sharing knowledge, experiences and expertise related to the particular condition.

One of the challenges has been how to synthesize material to a format and style that not simply repeat already available resources, but give credit to and encourage to complement available resources. Material from the workshops and an available booklet was basis for creating ChronICTprototype ([www.intermedia.uio.no/ChronICT/](http://www.intermedia.uio.no/ChronICT/)), a mock-up that illustrate wiki-blog "bliki" environment. Here are examples of different

stakeholders' contribution modelled as wiki and blog features in a learning resource. Being aware of the digital possibilities and opportunities for multimodal communication and participation we gave examples of multiple modes of expression presented from left to right as keywords, short viewpoints and questions as blog-entries and longer texts providing explanations and everyday experiences as wiki entries.

The second cycle of workshops used ChronICTprototype as starting point for discussion, and collecting feedback and further ideas and suggestions for development. We demonstrated two types of user-participation/contribution 1) blog-related questions/responses and 2) wiki entries and collaborative content development. The presentation of blog and wiki entries (from left to right) suggests a certain direction and may imply notions of a process, exemplifying a metaphor of "collaboration"/"knowledge-creation" / "knowledge-sharing" that help convey the objectives and functionality of the site.

Initial feedback from the workshops points out challenges for tool development and interaction in this virtual environment. The professionals and the patients/families raise concerns about accountability, position/role and how do we know that the information we access is accurate and trustworthy. There was consensus in the workshops that a sufficiently secure and protected environment for privacy and confidentiality about sensitive, personal health matters were a prerequisite, if a shared, evolving resource should be used, useful and trustworthy. It still challenges how format and style in the bliki (wiki-blog) environment support collective knowledge creation and production processes.

*Challenges and possibilities for KP-lab* To start with, we modelled contribution of knowledge and experiences from all parties on equal footing, to systematize distributed and accumulated knowledge. Feedback from the cycles of workshops, points to challenges for tool development and how to support interaction and production processes in a sufficiently secure and protected environment to ensure contributions to and usefulness of a shared, evolving resource. This challenged us to rethink requirements of how to direct user-contribution to specific areas in virtual environments, and if it is necessary to differentiate types of contributions. The health care providers needed more time and experiences before they would feel comfortable contributing health-related and "facts"-oriented texts that could be freely edited by other community members. Although this would limit opportunities for collective knowledge creation, we modified ChronICTprototype to illustrate exchange of experiences, questions or concerns as blog entries, and restrict contributions to the "factual" content presented in the wiki. This challenges what is negotiable and governed by internal, self-organized codes of conduct prominent in wiki communities, and what is stable and not so negotiable.

For KP-lab this illustrates that tools could include functionalities to direct participation and collaboration to certain content areas. This is a trade-off and user input to ChronICTprototype require us to explore customization of wiki (and bliki) as platform for collaborative activity (Morrison, Smørdal, Lund, & Moen, 2007). As a first attempt, the content in the wiki was structured in three different types of texts or categories; 1) an informative introduction, 2) accumulated knowledge and experiences as descriptive information and 3) experiences. Currently, only "experiences" can be edited. This allows us to illustrate some activity around shared artefacts in a process of knowledge advancement and point to development of individual and collective agency. In ChronICTprototype some of the digital possibilities and opportunities for multimodal communication and participation are exemplified as exchange of experiences and

possibly expanding the "factual" content later. This is steps in the longer time knowledge creation processes.

An elaborate report on the case can be found in the appendix to this revised deliverable.

*Status of the case* This case was closed at M18 for several reasons. Creating a learning resource inviting collective knowledge creation in and between heterogeneous communities and adhered to national recommendations for maintained privacy and confidentiality of health related information represented major hurdles for design of the tool. This represented unexpected increase in resources necessary to develop to a fully functional pilot. In addition we expected that the complex, specialized and currently stricter security requirements in the health care compared to other work environment we are investigating would limit opportunities for tool-mediated, collaborative knowledge creation.

### **Case C: AHUS competency**

*Introduction* The collaboration with Akershus University Hospital HF (AHUS) was negotiated in this reporting period (M7-12). The longitudinal case study "Knowledge creation and production processes in transforming social practice" investigates evolving knowledge creation and production processes during a hospital organisation's transition to new social practice. The new social practice materializes in the interplay of an explicated patient centric best practice vision and re-designed work processes when moving to new buildings. An emerging ICT-based knowledge infrastructure including standardized work descriptions and web-based learning environments should support their transformation process.

For KP-Lab, the case study was selected to understand on-going knowledge creation and production processes, exploiting the ICT-based knowledge management infrastructure potentialities as shared, evolving and collectively produced knowledge artefact to deal with open-ended, ill-defined problems. The case contributes in-depth, analytic insight to knowledge production, and ongoing knowledge accumulation taking place in transformations enabled by the use and re-use of knowledge artefacts in hybrid spaces, and how the different initiatives in sum contributes to transformation of the knowledge practices. The case will add to the 'triological learning' metaphor because triologicality or the triadic structures requires historical analysis of evolving practices complementing design experiments pointing to seeds of triological learning.

*Research questions* we will explore in this longitudinal study

- What kinds of resources do professional mobilize and how do they position themselves as individuals and representatives of their local practice in knowledge creation processes when exploiting the consolidated work descriptions and reflect on their practice?
- What are the knowledge creation processes and production from consolidation, use, modification and re-use of standardized work descriptions – *the tool* – as
  - part of the larger ICT-based knowledge management infrastructure?
  - an integrated component in their Electronic patient record system?
  - a shared artefact mediating professional development, staff mobility (boundary crossing), and facilitating new practice in the institution?
- How do professionals reason and negotiate in processes to develop pedagogical design and content in a web-based learning environment to introduce the comprehensive ICT-based knowledge infrastructure and the transforming knowledge practice?.

- How are the affordances of the web-based learning environment articulated in the collaborative talk and subsequently utilized in the instructional design?

*The focus* is to explore supporting tool's role in collective knowledge development and transformation to the new practice; in particular the user-functions, how they are designed and used at different organizational level over time. How use, modification or further development of consolidated work descriptions in daily work, integrated in documentation templates to represent their knowledge practice in the electronic patient record, or how a web-based learning environment is customized and used to promote the new social practice, is the focus of exploring knowledge creation and production processes towards the new social practice.

The case started with their processes to re-organize, systematize and harmonize the nursing service's standardized work descriptions (and this was the focus till KP-Lab M22). These consolidated work descriptions are part of a larger knowledge infrastructure, EQS, the Extended Quality System. In the beginning, we focused specifically on the processes of integrating the pool of in-house, local procedures with a repository of standardized work descriptions called PPS (Praktiske Prosedyrer for Sykepleietjenesten/Practical Procedure for the nursing Service) to hospital specific, consolidated standardized work descriptions (AHUS-PPS). In the observed processes biomedical and nursing research, interpretations of standards and guidelines, local routines and tradition, as well as collective expertise and personal experiences are mobilized as knowledge resources to play out in the knowledge creation (Moen & Nes, in preparation). In addition to promote transparency in the organization and facilitate evidence-based practice, the goal is also to simplify representation of nursing practice in the integrated Electronic Patient Record (EPR).

*Methodologically.* To investigate the knowledge creation and production processes related to the evolving knowledge infrastructure and transforming practice, we are carrying out extensive participatory observation (field notes and video based data), formal and informal interviews, artefact analyses and survey questionnaire. The case study is designed with 3 phases, planned as follows: 1) consolidate, review and inform procedures in PPS with Ahus' existing clinical procedures, 2) implement and use the consolidated PPS in clinical practice and 3) PPS as part of new practice. We will follow PPS as a mediating artefact, and explore how knowledge practice transforms over time as tool(s) and practices co-evolve over time to become part of everyday knowledge practices. Experiences and findings from one phase give direction for the next phases, and complement the picture of evolving tools and practices.

*Potential of tool development and/or use* The case explores how 3<sup>rd</sup> party tools in a work setting plays out for knowledge creation over time, and how technology-mediated knowledge production processes leads to transformation and new social practice. The specific focus for the exploration of the web-based learning environment will be towards design and customization aimed to support on-going transformation. We focus towards affordances; how components of the particular design tool are perceived and utilised, and how content is represented in the learning environment for mastery of concrete skills and knowledge creation. The analytical work includes how participants negotiate and act, and the institutional context and history as framing the interaction data (Nygård & Moen, 2008).

*Findings about the evolving knowledge practice.* We followed the consolidation of PPS and the existing pool of clinical nursing procedures. Each procedure in PPS (currently 264) integrates research-based knowledge and new evidence, and adheres to legal

regulations and recommendations as well as professional guidelines and national standards if available. New releases and updates of PPS are distributed to the customers annually (Akribe, 2006).

PPS is a knowledge repository for documentation and quality assurance of clinical nursing procedures at a national level, and the procedures cannot be modified locally. However, additions and comments to complement the descriptions and include local procedures can be linked to the repository. The PPS repository is used in all nursing colleges in Norway as introduction to clinical skills training (Solli & Reiersen, 2006). AHUS also has an existing pool of clinical procedures, written in-house and classified according to institution-wide, department or unit specific applicability. This existing pool of clinical procedures has been reviewed and consolidated with the procedures in PPS to systematize and harmonize these two repositories to one hospital endorsed repository of standardized work descriptions.

During M7-M18 we followed how they systematized and consolidated these two repositories of clinical procedures, PPS and the existing pool of clinical procedures. The exploration reveals that the oldest in-house procedures were from 1992, and 3-8 versions of the same work process descriptions within the hospital were not unusual. The review-process lead to elimination of paper-based procedures if existing in PPS, amendments to a PPS-procedure if required, or if a new procedure is necessary for the institution, but not available in PPS yet. Procedures that are not approved can only be marked as inappropriate, but not taken out of customized Ahus-PPS. The first outcome of this consolidation is communicated in a "*red space*" (Moen & Nes, 2008). Summarizing the content in the "*red space*" shows:

- (a) approved work description (191 of 264 procedures),
- (b) conditioned approval with links to alternative or additional information in EOS (47 of 264 procedures),
- (c) disapproved work description (26 of 264 procedures).

They produced additional or alternative work descriptions reflecting their understanding of best practice. Their production processed led to modification and local adaptations of the tool. To point out what led to the '*red space*' text, we also systematized the resources participants introduced and used as accounts when consolidating the repositories. Findings summarized in (Moen & Nes, in preparation) shows interaction and trading of the following resources:

- (a) *explicit knowledge*, as reference to legislation, standards, or published research papers and books
- (b) *collective expertise* reflecting systemic practical knowing and 'how to do' the work,
- (c) *personal knowing*, presented as extreme cases or accumulated experience related to the described work.

The repository of standardized work descriptions will be used for several purposes (Ahus, 2006); (a) to support the representation of nursing practice (as a reference), (b) to improve quality of nursing practice focusing on why a clinical procedure should be performed in a specific way (beyond what to do), and (c) to ease introduction and competency development for staff, students and interns to the local practice requirements. This allows us to further explore expansion or vertical and horizontal boundary crossing as part of knowledge creation and practice transformation (Engeström, 2001). We entered phase 2 of this longitudinal case study M22, exploring

how the professionals perceive the usefulness of the standardized work descriptions (Bøe, Standal, & Sundstrøm, 2008), experiences following pilot use of standardized work descriptions as templates in the clinical documentation (Horvati, 2008) and the pedagogical role of the web-based learning environment (Gauperaa, 2008). This will be included in more detail as part of Results of Empirical research.

*Challenges and possibilities for KP-Lab.* As an analytic contribution this case provides insights from iterative exploration (3 phases) of knowledge construction around an evolving artefact as reported above, as well as long-term analyses of knowledge creation and production processes in transforming social practice. How the new comprehensive ICT-based knowledge infrastructure, the repository of standardized work descriptions coupled with the new ways of working with knowledge in this technology rich social practice plays out will add understanding to collective knowledge creation or the triological metaphor. Herein are potentially important elements to understand practice transformation and allow for analytic benchmarking

### **Case D: Development of Activity Systems Design Tool (ASDT) at Pöyry**

*Background* This case combines the exploration of the Pöyry knowledge practices and the KP-Lab co-design of the Activity Systems Design Tool (ASDT)<sup>4</sup>. Even though these two lines of interest have partly proceeded separately from each other, the reason to keep them within one case is evident: Change Laboratory approach, as well as the development of a novel ASDT tool for it, is a contextual approach implemented in the face of specific learning challenges of concrete activities. The tools design by the KP-Lab needs work-related data, not only technical specifications, in order to carry out the design of ASDT. On the other hand, Pöyry is interested in developing its global learning environments and will be an important field of piloting the implementation of virtual tools for Change Laboratory-based work development. Therefore, Pöyry as KP-Lab partner has taken the coordination of the design work and invested resources to accomplish the ASDT component of KP-Lab technology.

Pöyry is a globally operating consulting and engineering firm. It has three core areas of expertise: energy, forest industry, and infrastructure and environment. This case concentrates on Pöyry's Forest Industry business area, which is ranked a market leader in its sector providing engineering and project implementation services for pulp and paper industry projects worldwide, maintenance engineering and other local services to the mills, consulting on forest industry strategies and operations and investment banking. Change Laboratory (CL) is presented in the methodology section.

*Focus:* Because of twofold research interest there are two foci. The first is retooling and instrumentation of the CL approach as a triological process of multi-disciplinary boundary-crossing among pedagogic researchers, software designers, and in-house developers (users). The data consists of discursive data on collaborative design meetings on different levels and at subsequent phases of the ASDT design work. Data includes not only series of design discourse, but also the versions of artefacts and objects of design at various phases. In sum, the ASDT design work as a triological-type of artefact creation is analyzed on several levels, such as: the level of KP-Lab multidisciplinary design, the level of end use activity being in this case work of the researchers and organizational developers applying the CL method, the level of the knowledge practices of the case company, Pöyry (and possibly others later on in the project). The second foci the change

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<sup>4</sup> earlier 'Change Laboratory Tools CLT'

of knowledge practices of a forest engineering company and the critical transition from the local learning activity to the global learning networks with a special emphasis on tools mediation. Both the Change Laboratory and the ideas of dialogical learning in KP-Lab emphasize strongly learning as local activity. At the same time, the contexts of learning are becoming increasingly scattered and global, as the case of Pöyry shows. There is a contradiction of local and global, manifesting itself, for instance, as a contradiction between the promise of global technology and the observed underutilization of new tools at the local level.

The developmental challenges for knowledge practices that we are addressing within the frame of the KP-Lab are of strategic nature for Pöyry. The practices of product development and knowledge creation have to support the expansion and innovation in the present market situation. On the operational level, the development and learning challenges of the knowledge practices of Pöyry were summarized in the Deliverable 10.1 report in questions like: How do we reach shared practices and ways of running projects even when operating in a network? How do we ensure in a systematic way learning from one project to another over time? Related to these questions, we have started to focus on the problems of the design, implementation and sustainable use of the knowledge tools and systems in the collaborative network of Pöyry.

The theoretical focus is on: shared practices and object of work in a global network; design, implementation and sustainable use of the knowledge tools and systems in the collaborative network; creating learning instrumentalities for concept-level changes of the core business activity. In the course of the historical shift from an initially nationwide to today's global company, Pöyry has developed and keeps on developing radically new product and business development processes. This includes wide range of challenges; from how to enhance innovation in global network to how to ensure successful roll-out and sustainable use of developed tools. Product and business development thus far has been head-office centric, which has meant an underutilization of the developmental potential of the global network as a whole.

*Potential of tool development and/or use* In order to enhance the KP-Lab tools development (here ASDT) we need to understand the challenges of the work in transformation as discussed above. Tools are always used in a specific cultural-historical context. As a piloting case for the first round of the Change Laboratory development, we have chosen the global CRM system and its implementation by different customer-servicing units. Beyond the operational-level questions such as addressing the usability, there are the strategic questions of creating a learning system to support the concept-level changes of the core business activity and their implementation throughout the network such as addressing the globalization. With CRM (Custom Relations Management) these questions become visible in transforming the customer processes from several parallel practices of different, previously independent, business units (with own historical backgrounds) to one unifying process defined on the level of the global forest industry business. The manifest problem is the present underutilization of the CRM system, referring to the fact that the entries by the users to the logs storing the information of customer contacts and final proposals are fewer than expected. Specifically, the CRM process and tools designed within the Forest Industry head office are poorly implemented by the network of local engineering offices.

In this case the awareness of CRM processes in different parts of the company and the needs for shared knowledge provides the first step in getting motivated to use the tools. This is the focus of the first pilot during spring 2007. The second step will be the

collaborative redesign of the CRM tools to better serve variety of needs. Equally important is to design simultaneously the practices of using the tools, which means developing the customer processes. The third step of the process workshops would lead to the agreement on the pilot use of the redesigned CRM tools and commitment by the participants to the usage during a given period of time.<sup>5</sup>

*Challenges and possibilities for KP-Lab* The CRM workshop was the first of the developmental sessions combining the development of the Pöyry activities with the ASDT development of KP-Lab (similar workshops has been carried out recently (M34) in the Virtual Mille case). The data on the transformation of knowledge practices consists of video and audio recorded interviews and observations of team meetings at Pöyry. The data on the ASDT/KP-Lab tools design consists of video and audio recorded documentation of the design process taking place across multiple activities, such as the designers of KP-Lab, the present users of the Change Laboratory method, and the developers of Pöyry. The main challenge on this line of research is to provide the link between the research of Pöyry's transforming practices and the development of the learning tool ASDT. To reach this goal, the experimenting pilots on the use of the ASDT at Pöyry are vital and challenging. Other pilots needed are the experimentations with the ASDT by the present users of Change Laboratory.

## **Case E: Project Way**

*Background* This case study was negotiated and started in the period M7-12. It was closed in Month 18 (see Appendix). In 'ProjectWay,' we explored collaborative process in which the company people aimed to create a generic model of design process for an engineering company (later referred as the Company). It produces application services and application tools for Pöyry and Pöyry's customers. The Company has been recently formed by combining five separate application development sites. The new company requires constructing a frame for organization and work, e.g., organizational structure, working models and practices, and clarifying the products and services.

*Focus.* The Company presents a situation, in which knowledge practices are transforming due to the changing needs and nature of heterogeneous stakeholder network. In the Company there exist several ways to carry design work, which are inherited from earlier companies. These are mostly individual practices, which are not documented or made visible on collective level. The need for constructing shared working practices, is an interesting aspect from the point of view of KP-Lab and its conceptual focus on the dialogical learning. In the development project, ProjectWay, the intention was to create a shared design process model. The existing working practices and the design tools were to be made visible for the whole community's use and further development. The initial model was formed by four representatives of the Company. The model included different phases of the process, project documents, and open questions. The model was released for other developers for commenting and modification.

The KP-Lab R&D challenges are emphasized in ProjectWay by considering learning as a collaborative practice, alongside with the co-design and use of collaborative tools.

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<sup>5</sup> Month 17 we carried out a workshop in which we dealt with CRM case with the participants at Pöyry. Its aim was, first, to produce diagnostic knowledge of the problems of CRM practices for the development unit, and, second, demonstrate the use of mirror material for the ASDT designers at Pöyry. Other steps with the CRM development did not realize. We are planning to continue a similar type of development in the piloting phase, where we combine the development of project activity of Pöyry (Virtual Mill Case) with testing the ASDT in a network setting involving engineering units in Finland and China.

ProjectWay represents challenges of transforming local working practices to a shared model. KP-Lab researchers collected data from designers' collaborative efforts and the use of collaborative tools. The data consists of the meetings when developing the collaborative tool and the process, interview data with workers, and the material to be produced with collaborative tools. In the audio taped meetings 1) participated KP-Lab researchers and the Company developers and workers, concerning the ProjectWay pilot, and 2) KP-Lab researchers, with Company developers and 3<sup>rd</sup> party development organization concerning the technical development of "Commenting tool for internet-pages/systems" and the shared space to reflect the project work model. Interviews were conducted with Company workers participating to ProjectWay. The KP-Lab design principles were used to connect the practices and technical development of the design process model "ProjectWay". The initial research focuses aimed to explore a) the process aimed at constructing a shared, triological work object (design process model "ProjectWay"); b) how the development of new project model took place in collaborative environment, and c) what kind of agency appeared on individual and collective levels.

*Potential of tool development and/or use* For the KP-Lab tools development ProjectWay serves in following ways. The workers use a combination of a shared web-platform and a "Commenting tool for internet-pages/systems" to construct a design process model. KP-Lab researchers have had an opportunity to participate to the tool development. ProjectWay will contribute to the requirements of KPE. This knowledge will be carried explicitly to the use of KP-Lab by participation to the work of Working knots (WKs) and by the work of planning and organizing further studies, extended pilots, and pilots using the KP-Lab technology and KP-Lab learning practices

*Challenges and possibilities for KP-Lab* The KP-Lab challenges and the future considerations concern leveraging the results to be used for requirements of KP-Lab tools and practices. The aim is to use the experiences of ProjectWay in similar collaborative efforts of implementation and development, which highlight the co-participation of developers and participants from professional organizations.

*Status of the case:* This case has been closed after the revision of cases included in DOW 2.1, according to Y1 project review. Outcomes are reported in D10.3, and the report is in Appendix.

The cases presented above are summarized in the table:

• Table 1. Summary of the cases of WP10

• Case	• Focus	<ul style="list-style-type: none"> <li>• Tools</li> <li>• KP-Lab- tools (KP) Case-based (C)</li> </ul>	<ul style="list-style-type: none"> <li>• KP-Lab design principles</li> </ul>	<ul style="list-style-type: none"> <li>• Contributions to KP-Lab</li> </ul>
<p>A) KIKK- Knowledge Management for Internal Communication and Customer support. <i>InterMedia, UiO and Safran Software Solutions AS in Oslo and Stavanger, Norway</i></p>	<ul style="list-style-type: none"> <li>- Explicate accumulated experiences, knowledge in different representational modes</li> <li>- Dynamics of adaptation and expansion (mutual development) and dynamics of developers, products, and customers. (co-configuration)</li> <li>- Collaboratively develop new artefacts, products, and ways of working collaboratively over long-term</li> </ul>	<p>Web-portal (C)  Customer Relationship Management (C)</p>	<ol style="list-style-type: none"> <li>1. Organize activity around shared artefacts</li> <li>2. Flexible tool mediation for triological activity</li> <li>5. Development through transformation and reflection</li> <li>6. Eliciting (individual and collective) agency</li> </ol>	<ul style="list-style-type: none"> <li>- Example of boundary crossing in a community of interest (multiple activity systems)</li> <li>- Identification of knowledge creation practices in an authentic setting</li> <li>- Challenges to working with a company that has business goals that are different from research agendas</li> </ul>
<p>B) ChronICT  <i>InterMedia, UiO and Rikshospitalet University Hospital, Oslo, Norway</i></p>	<ul style="list-style-type: none"> <li>- Explicate accumulated experiences, knowledge ranging formal, explicit knowledge, practical knowing and informal, under-articulated knowledge</li> <li>- Collective creation of relevant and timely information and knowledge, supporting "Living well" and handle everyday challenges</li> </ul>	<p>Wiki –blog (C) (Web 2.0)</p>	<ol style="list-style-type: none"> <li>1. Organize activity around shared artefacts</li> <li>4. Fostering process of long term knowledge advancement</li> <li>5. Development through transformation and reflection</li> <li>6. Eliciting (individual and collective) agency</li> </ol>	<ul style="list-style-type: none"> <li>- Challenges to collaboratively create and share knowledge in (too) heterogeneous user-groups</li> <li>- interplays of everyday and scientific knowledge</li> <li>- examples where participation and creation is directed to selected features and services in the tool-development</li> </ul>
<p>C) AHUS – Competency  <i>InterMedia, UiO and Akershus University Hospital HF, Norway</i></p>	<ul style="list-style-type: none"> <li>- unfolding new social practice as the institution relocates and reorganises workflow with an extensive introduction of new ICT-based tool including</li> <li>- Web-based tool's role in collective knowledge development – using tools as mediating artefact to collaboratively develop best practices, accumulating and reusing knowledge at different organizational levels</li> </ul>	<p>PPS (Practical Procedures for the nursing Service) as part of EQS (Extended Quality System)  EPR (Electronic Patient Record) (C)  Annotation tool (KP/SSp)</p>	<ol style="list-style-type: none"> <li>1. Organize activity around shared artefacts</li> <li>4. Fostering process of long term knowledge advancement</li> <li>5. Development through transformation and reflection</li> <li>6. Eliciting (individual and collective) agency</li> </ol>	<ul style="list-style-type: none"> <li>- analytic account of tool-mediated knowledge creation and production processes as transformations to new social practice unfold</li> <li>- individuals' and groups work with knowledge resource, and how they orient themselves with new tools</li> <li>- insight to tools operating in authentic work place settings</li> </ul>
<p>D) Development of Activity Systems Design Tool<sup>6</sup> (ASDT) at Pöyry  <i>University of Helsinki and Pöyry</i></p>	<ul style="list-style-type: none"> <li>- Retooling and instrumentation of CL approach as triological process of multi-disciplinary boundary-crossing among pedagogic researchers, software designers, and in-house developers (users)</li> <li>- Change of knowledge practices of forest engineering company and the critical transition from local learning activity to global learning networks, emphasis on tools</li> </ul>	<ul style="list-style-type: none"> <li>- ASDT (KP/SSp)</li> <li>- Multimedia annotation tools (KP)</li> <li>- CRM tool (C)</li> <li>- Map IT (KP)</li> </ul>	<ol style="list-style-type: none"> <li>2. Flexible tool mediation for triological activity</li> <li>5. Development through transformation and reflection</li> <li>6. Eliciting (individual and collective) agency</li> </ol>	<ul style="list-style-type: none"> <li>- Transformation of knowledge practices from local to global networks</li> <li>- Co-design of CLT in integration with KP-Lab Shared Space</li> <li>- Data gathering for CLT demonstrations (case CRM) and (future) pilots</li> </ul>

<sup>6</sup> renamed 2008 from Change Laboratory Tool to ASDT

<ul style="list-style-type: none"> <li>Case</li> </ul>	<ul style="list-style-type: none"> <li>Focus</li> </ul>	<ul style="list-style-type: none"> <li>Tools</li> <li>KP-Lab- tools (KP) Case-based (C)</li> </ul>	<ul style="list-style-type: none"> <li>KP-Lab design principles</li> </ul>	<ul style="list-style-type: none"> <li>Contributions to KP-Lab</li> </ul>
E) Project Way <i>University of Helsinki and Application Services/Pöyry</i>	<ul style="list-style-type: none"> <li>- Explicate accumulated experiences, knowledge in different representational modes</li> <li>- Collaboratively develop new artefacts, products, and ways of working collaboratively over long-term</li> <li>- Transformation of an initial, given design process model to a shared generic model</li> <li>- Reflexive practices on collective level</li> </ul>	<ul style="list-style-type: none"> <li>- Project web portal (C)</li> <li>- "Commenting tool for internet-pages/systems" (C)</li> <li>- Annotation tool (KP) was optional, but the case was closed before the launch of SMAT</li> </ul>	<ol style="list-style-type: none"> <li>1. Organize activity around shared artefacts</li> <li>2. Interaction between personal and social level</li> <li>5. Development through transformation and reflection</li> <li>6. Eliciting (individual and collective) agency</li> </ol>	<ul style="list-style-type: none"> <li>- Transformation of knowledge practices with heterogeneous stakeholders</li> <li>- KP-Lab as co-designer of new practice (not realized)</li> <li>- Knowledge of Design Process Model as triological object of work</li> <li>- Reflection of design principles, requirements of KP-Lab shared space, and metadata and tagging features for KP-Lab tools</li> </ul>

### 3 Methodological approaches

In this section, we first discuss the methodological starting points and principles drawn from the tradition of Developmental Work Research and user-centred design process involving the users as designers from the very beginning. Then we present two approaches, Change Laboratory® method and Participatory Change Process approach that we use in our case studies. They were chosen to KP-Lab as fitted to facilitate the design and redesign activities by participants in multi-disciplinary networks of collaboration, the object of design ranging from a single tool or technology to complex models of work activity.

Our research approach is taking the socio-cultural theory as an analytic framework for exploring knowledge practices. An important aspect herein is End-User Development (EUD) and sustained participation in the case studies. The Change Laboratory® as well as Participatory Change Process (PCP) emphasize and take EUD as a prerequisite. The importance of end user participation will be underlined in further development of the co-design processes and exploration of KP-Lab tools and practices. The case studies are multidisciplinary and collaborative longitudinal analyses of evolving knowledge practices; combining with interventionist studies using experimental and evolutionary prototyping during ICT development, design experiments or time-limited and focused experimentations with specific tools in a chosen context. In the first synthetic report, the methodological principles were outlined:

- Based on collaborative approaches to joint problem solving of authentic problems
- The unit of analysis is the object-oriented collective activity, which applies to the analysis of both individuals and communities
- Collaboration with end-users to explore and understand user-perspectives, with emphasis on collectiveness and developmental aspects of the phenomena under study
- Activity-theory-based studies, knowledge creation and ethnography of work allowing us to use participatory approaches and following up longer trajectories of development of a given professional network.

We have continued to develop and explicate the methodological approach and research methods reported in this period, and emphasize the “methodological triangle” of 1) tools (existing and/or introduced to the setting), 2) practices, and 3) theory. By this we mean that of these should be not studied nor analyzed in isolation but as dynamic interaction.

The methodological approaches produce very rich collections of work-ethnographic data. In the case studies of knowledge practices, we collect information in interviews, negotiations with the case partners, conversations and observation, follow-up and feedback of the activities. Video and audio recordings are given preference whenever appropriate. In addition, field notes, review of organizational documents, surveys and material artefacts created and used in the work places complement data collection. We will specifically elaborate on Change Laboratory® (CL) approach and the Participatory Change Process (PCP).

### **Change Laboratory (CL) approach**

Change Laboratory® is a method for exploring and initiating the development of work practices by the practitioners together with the interventionist-researchers (Engeström, Virkkunen, Helle, Pihlaja, & Poikela, 1996). The method is Registered Trademark of the Center of Activity Theory and Developmental Work Research (<http://www.edu.helsinki.fi/activity/>) to be used in workplace development and learning by qualified developers, including an extensive training network that provides the qualification required.<sup>7</sup> The task to design the ICT-tool for CL was included in the Technical Annex, (KP-Lab, 2006). It was based on the notion of the theoretical foundations of the CL approach, e.g., collective learning, object-orientedness, actor-centeredness, co-design of activities, which were conceived as promising and in line with the preliminary ideas of the dialogical learning and knowledge building. To point out the connections, some theoretical outlines are next opened up.

The idea of the Change Laboratory is to bring work redesign closer to the daily shop floor practice while still keeping it analytical, which means dialectics of close embeddedness in and reflective distance from work. The method supports expansive learning (Engeström, 1987), which involves major transformations of the work activity within or across work units and organizations. There is the need for bringing together the tools of daily work and the tools of analysis and design. This kind of new dialectic of instrumentalities is based on the notions made on the present-day learning challenges of working life. CL approach is a co-design approach, which was the reason to include it in the development work of KP-Lab. The co-design efforts are directed to a wide range of objects, from single tools and technologies to complex models of activity. In this sense, the CL approach is essentially a dialogical approach.

Change Laboratory method was developed on the fundamental notion on the dual stimulation (Vygotsky, 1978). “The crucial idea here is that a task is never just the task the experimenter designed. It is always interpreted and reconstructed by the subject by means of his or her internalized ‘psychological instruments’ that cannot be strictly

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<sup>7</sup> It is important to note that the KP-Lab design activity is not addressing the methodology of Change Laboratory as registered approach, but focusing on developing tools for CL according to recent technological advancement. KP-Lab tools development takes place in a close collaboration with the developers of the CL approach, who have clearly articulated the need of novel instruments facilitating networking and distributed learning activity.

controlled from the outside" (Engeström et al., 1996). Besides as co-design, dual stimulation may also be characterized as *re-mediational* design.<sup>8</sup>

Applied to work development, the first stimulus is the data shown to the participating workers from their work. This data works as a mirror in which they can look at their work. The second stimulus is needed to start to solve the problems seen in the mirror. Here the suggested systemic model of activity is a central tool offered to the participants by which they may vision and design the future way of working. Between the mirror and the modelling tools the workers are offered a space for ideas and tools. Typically they may design intermediate tools such as schedules and flowcharts of processes, layout pictures and diagrams of organizational structures, categorizations of interview responses, formulas for calculating costs, or techniques for idea generation and problem solving, including simulations and role playing (Engeström et al., 1996).

The summary by the researchers illuminates the variety of the design tasks involved. Change Laboratory method has been characterized as a co-design of learning instrumentalities. The concept of instrumentality has three implications: (1) The instruments form a system that includes multiple cognitive artefacts and semiotic means used for analysis and design, but also straightforward primary tools used in the daily work and brought into the Laboratory for examination, reshaping and experimentation. (2) In such a dense mediational setting, a set of interconnected new sociocognitive processes are called for - a new mentality generated. (3) The very complexity of the setup means that the instrumentality is constantly evolving; old tools are modified and new tools are created (Engeström et al., 1996).

In the use of the Change Laboratory method in KP-Lab/WP10 case studies involves simultaneously the design of the Activity System Design Tool (ASDT) for transforming the CL applications from manual to digital use environment. Both pedagogical and technological design work is involved. This co-design process in KP-Lab is documented by researchers and analyzed in order to produce new theoretical understanding of the dialogical learning processes (Engeström & Toiviainen, in press; Toiviainen, Toikka, & Lallimo, in preparation). The analytical frameworks developed thus far aim at revealing the multivoicedness and multilayeredness of co-design and learning during the ASDT design work in KP-Lab (see Section 2 Case D).

### **Participatory Change Process (PCP)**

In Participatory Change Processes (PCP), the goal is to involve end users and other stakeholders in order to create a smooth introduction of one or more new (computer-based) tools in an organization and to complement this with work practice redesign to take advantage of the tools for improved work performance, learning support, and practice transformation. PCP is thus both an interventionist and an ICT method for workplaces. As an interventionist method it can be compared with Design-Based Research (DBR) and Change Laboratory<sup>®</sup> method as described in the previous section. As an ICT method it is inspired by Participatory Design (PD) and recent developments in software engineering, such as agile development and extreme programming (achieving tighter integration and shorter turnaround time due to rapid feedback cycles). In other words PCP aims to bring social (organization) science in general and workplace learning research in particular together with design of collaboration (CSCW and CSCL) software.

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<sup>8</sup> The way in which this differs from design experiments currently addressed in educational research, is discussed by Engeström (2007).

As an interventionist approach PCP makes use of existing methods like field observation, document analysis and interview data. It differs from DWR in that it involves end users (workplace employees) as co-developers and from DBR by applying a design principle referred to as “local ownership of problems,” so that end users have the means, when the principle has been successfully applied, to remain as co-developers after the researchers have left the site (a principle shared with DWR in the name of formative intervention). As a design method it uses well-known techniques from PD, e.g., role-playing, work and learning scenarios, design workshops, and mock-ups, and from software engineering evolutionary prototyping and agile programming. The techniques are not used in parallel, but at different stages, starting with informal design activities with broad participation and ending with formalized design work materialized in running prototypes with the ultimate goal to be systems integrated with or replacing existing workplace tools. The co-developers should be super users (regular users with an interest in knowing more about technology) and developers in the IT division of the company. PD techniques are used during the planning stages, software engineering techniques during systems development. Field observation and interview data record the initial planning and collaborative design sessions and “follows” the practice as it changes over time (to gather empirical evidence for practice change). During technology development we are particularly paying attention to how the tools evolve, and we use empirical methods to capture this transition (directed observation, following super users, strategic ethnography). Our experiences with PCP were first gained in a pre-KP-Lab case where we involved users at multiple levels in a large service organization in the planning and development of a new web-based learning portal that ended up as a system that was installed at 230 petrol stations (Mørch, Engen, & Åsand, 2004).

When refining PCP and using it in the current WP10 case studies (KIKK and to some extent AHUS) we have been particularly interested in exploring the connection between the two endpoints of current organization (starting point) and new technology (endpoint) in general, and in particular to what extent we can provide guidelines for how to “translate” ideas from one domain to the other in specific cases. Our answer at this point is tentative, since it is work in progress that needs further investigation with new carefully chosen cases. We claim that such a path indeed can be found if there are layers of intermediate abstractions to ease the transition between the two domains (i.e., technology substrates, pedagogical approaches and models, and organizational patterns and theories). Based on our experiences so far, it seems that the main challenge is on agreeing upon the abstractions of the source (organization) domain and the level concreteness of the target (systems development) domain. Regarding the former, “organizational abstractions” range from domain concepts (e.g. specific ontology, a field of application), previous research (established ideas in social science and educational research and corresponding empirical results), and new theoretical concepts (e.g., triological learning, KP-Lab reference model). On the other hand, the level of concreteness related to the part(s) in (design of) tools where organizational abstractions are manifest and can be evaluated for coherence and completeness with respect to the starting point.

The PCP method in practice seeks to capitalize on existing processes that stimulate artefacts to evolve and practices to transform. These processes can be triggered by the users (employees) themselves and (better) by researchers or consultants upon invitation. As such the PCP method is both an autonomous as well as an externally aided process for managing change at different levels at a workplace, from organization to technology, dealing with incremental and punctuated changes at both ends. Incremental

changes are common in everyday (routine) work when unexpected use situations interfere, provide feedback, and are allowed to inform further development in a reflexive way, such as a novel way of using an existing tool, recovering from a breakdown that can lead to new learning, or making a persistent modification to an existing tool to account for new needs or change in practice. Abrupt changes are rarer, but nonetheless exist and can be detected by the right methods in longer-term studies, and can have major impact on the workplace. It can be the result of an organized intervention by a research team, or the practice transformation “observed” through interviews and retrospective accounts (historically developed activity). We aim to develop PCP further into techniques for capturing both incremental and punctuated changes of both organization and technology, including a technique for studying evolutionary design (“following artefacts” as they evolve over time within and across organisations), “dissecting artefacts” (to identify hidden parts for historical analysis: predecessor artefacts and design rationale), future games (simulating future work situations with design alternatives), directed observation (means to seek out and analyse the workarounds, hacks, and clever improvisations super users and ordinary people create at work and at home to improve their tools).

## **4 Technology development**

The experiences from the empirical cases studies help identify requirements to tools supporting advancement and creation of knowledge. WP10-members participate in exploration of existing tools and in design of KP-Lab tools. This includes in particular requirements to Change Laboratory tools (ASDT as redefined from Month 36 on), annotation tools and Shared Space but also the semantic wiki. Our case studies include pilots and iterative design processes that contribute to requirements to development and modifications of tools.

In the development of tools, we draw from the design principles of the KP-Lab, as formulated by WP3 in collaboration with both technological and pedagogical work packages. WP10 has two main roles in tools development. The first one is a direct participation in the co-design of tools that is carried out by means of fast iterations of mock-ups and demos. The second one is as longitudinal studies with data-gathering that provides insights to the rationale of the development work.

The empirical cases help us identify the specific practices where new tools are useful. Exploring first the tool-related challenges in general and later on using and experimenting with KP-Lab tools in the cases of knowledge practices are steps to observe, elaborate and articulate knowledge in different representational modes. The analyses may inform research on work place learning, development of terminologies, e.g., vocabularies, glossaries or ontologies, flexible tools that opens new opportunities for change, transformation and innovation, and point to implications for higher education.

### **Activity System design Tool, ASDT**

The main design requirements of the Change Laboratory tools (renamed ASDT) were reported in Deliverable 10.1. The primary tool to be developed will support prototypical setting of the Change Laboratory session. During months 7–12, the ASDT design concentrated on the collaboration between WP10 and WP6 (KP-Lab partner EVTEK) with the aim of coordinating the design with the design of the KP-Lab Shared Space.

Technological collaboration, coordinated by Pöyry, to develop ASDT will continue with WPs 6 and 10, while at the same time we will more and more focus on planning the first ASDT pilots at Pöyry. Results of the ASDT pilots will be also used, along with results from other pilots, to define annotation tools for a more general context of professional organizations. ASDT pilot at Pöyry will serve as a test bed for the developed prototype as well as provide empirical data that helps the developers to identify new functionalities for the next versions. Following and evaluating the experiences of the first pilot we wish to expand the implementation of the ASDT also to other case studies of WP10.<sup>9</sup>

In the phases to come, we will gather researchers, designers as well as practitioners (participants from the partnering professional organizations) to design and experiment with “virtual” ASDT. The focus of interest will be in following and analyzing how the participants take the tools into use and develop them, and how the new tools will change collaboration and learning.

Co-design is organized by the Working Knot ‘Change Laboratory’, (renamed Working Knot ASDT), the outcomes of which may be read in the following two documents, which already include the integration of ASDT to Shared Space as the starting point of the design:

- 1) Link to the working copy of the ASDT functional specification in EVTEK's KP-Lab wiki:  
<http://kplab.evtek.fi:8080/wiki/Wiki.jsp?page=ChangeLaboratoryToolSpecification>
- 2) Specification of ASDT integration with Semantic Multimedia Annotation Tool:  
[http://www.kp-lab.org/intranet/design-teams/wk-change-laboratory/M29\\_CLT-SMAT\\_spec.doc/view](http://www.kp-lab.org/intranet/design-teams/wk-change-laboratory/M29_CLT-SMAT_spec.doc/view)

### **Use and modification of existing tools**

In addition to case studies where the plan is to use KP-Lab tools, we are also focusing on unfolding knowledge production and practice transformations in work places with 3<sup>rd</sup> party tools (understood as non-KP-lab developed). This allows us to gain insight to how tools play out in transformation processes in knowledge intensive workplaces. Such insights can serve for analytic benchmarking, and comparisons to processes where the KP-Lab developed tools are introduced. We are observing practitioners using and appropriating a variety of tools, including a web-based commenting tool in Project Way, making mock-ups illustrating Wikis and blogs in ChronICT, company specific web-portal integrated with a CRM tool in ASDT@Pöyry and in KIKK, and a commercially available repository for standardized work descriptions (PPS) in Ahus Competency.

In areas like peer communication and knowledge creation the cases open up new possibilities for tool evolution based on use and user-experiences. For example, the web portal integrated with CRM, and Wiki are examples of tools where the usefulness largely depends on what people contribute to these systems in terms of content. PPS at Ahus offers to its users a comprehensive knowledge repository, but they can add and create new knowledge to this repository as their practice transforms. Understanding how these 3<sup>rd</sup> party tools are customized, tailored and adapted to the particular context provides valuable insight to the knowledge creation and production processes that may lead to transformations of knowledge practices in workplaces.

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<sup>9</sup> After the reported period, CLT has been introduced to the present CL user community. The usability tests were carried out summer 2008, and pilots are planned to be carried out with trained CL developers in their organizational environments. Pöyry pilots will be carried out in the second piloting phase, see Case D in case section.

These tools support communication and knowledge creation in a knowledge infrastructure that allows access, use, modification, and creation of relevant resources. They may be considered 'shared spaces' for accumulating experiences and strategies, representing opportunities for multiple voices to maintain heterogeneity and multiplicity, e.g., in ChronICT different perspectives of health provider insight and cumulative experiences, experiences of the persons' to live well the condition, or parents' need for communication with parents in similar situation exemplifies this (Morrison et al., 2007). Opportunities to cultivate, but also make available different 'views', is important in settings such as this health related one, but also in education.

By exploring the use of existing tools' potentialities, like wikis and blogs in ChronICT, commenting tools in Project Way or tools like PPS and CRM-portal, we can add understanding to knowledge creation towards meeting KP-Lab aims. This can, for example, generate requirements for new or modified KP-Lab tools, and it may be important for benchmarking the tools. As an input to KP-Lab design of tools and ongoing examination of practices, the exploration of existing tools in workplaces adds the following to KP-Lab: Firstly, the findings may contribute to the KP-Lab tools' requirements regarding the Shared Space, Activity System Design Tool and Annotation tools. The contribution in this case is to provide knowledge of the challenges of the tool use based on novel technologies. Secondly, by identifying the efforts to implement and modify the given tools by the members of organizations the findings may contribute to the modelling of the KP-Lab dialogical practices, that is, modelling work as a reflexive, collaborative practice, and modelling work as object-oriented activity. Thirdly, the analyses and results gained from design processes that involve the users as designers from the very beginning, accompanied by developmental interventions, may add knowledge to the strategies of carrying out design processes. Using and experimenting with tools in general, and later on with the KP-Lab tools, in the cases of knowledge practices is a step to observe, elaborate and articulate knowledge in different representational modes as different aspects of knowing plays out. All of these possibilities that were envisioned after the first year are continuously relevant in the KP-Lab work, and partly realized, as is the case regarding the co-design of Shared Space, ASDT and annotation tool, and knowledge about the design processes.

## **5 Cross case comparisons**

In this section, we bring together the first set of findings from the case studies that we have described in this report. First we point to representativeness and validity of the selected cases, and then outcomes and comparisons across cases, contribution to KP-Lab co-design and identification of case studies that inform about knowledge practices in networks. As starting point for our comparisons we refer to table 1 summarizing the cases (p.19-20). This is the first steps towards an integrative approach, and this will also be further elaborated in deliverables to come.

### **Representativeness and validity of cases**

Mindful of contribution to the KP-Lab R&D agenda, we emphasized cases potential to further operationalize and shed light to certain KP-Lab criteria tailored to workplace-related studies, as listed in Section 2. This included:

- representativeness in terms of knowledge work in a technology intensive environment and access to network setting (see section 5.4)

- ongoing change processes that challenge the existing knowledge practices and give rise to dialogical type learning processes; co-design and co-configuration of shared artefacts, knowledge creation and transformation processes
- possibilities for researcher interventions to integrate the KP-Lab tool development in the case, or opportunity to investigate their evolving transformation processes as knowledge practice and tool use unfold
- access to the organizations and possibility to carry out the field work in the frame of the KP-Lab schedule

The cases meet these criteria and in terms of representativeness and validity for KP-Lab, each case contributes to outcomes for comparisons across cases, and insights to the KP-Lab co-design. Also, based on the Y1 review, we decided to close two relevant cases in which we could not indicate progress in a given time due to the external reasons.

## **Outcomes and comparisons across cases**

The main focus of the cases may be summarized as

- (a) explication of accumulated experiences gained in observing and analysing the efforts to elicit knowledge in different representational modes, ranging from formal, explicit knowledge to practical knowing, and tacit knowledge of informal, under-articulated practices.
- (b) explore collaborative processes defined in terms of: mutual development and co-configuration seen as adaptation, expansion and instrumentation embedded in dynamics of multi-disciplinary boundary-crossing among developers, products and customers/users (communities and networks of interest)
- (c) exploration of collaborative tools where we have focused on experiences and user activity to understand the processes of collective creation of artefacts
- (d) developing shared objects of activity that transform knowledge practices in the processes like transitions from local learning activity to global learning networks, from multiple, individual design process to a shared generic model, or moving from one location to another

Pointing out specifics from our cases, KIKK, ChronICT and Project Way have started to explore knowledge in different representational modes. So far we found complexity and heterogeneity because of the multiple stakeholders' perspectives on what counts as knowledge in the interplays of, for example, informal, everyday knowledge, and formal, or scientific knowledge. In addition, we have observed how the requirements for tool use both constrain and stimulate participation in terms of creating purposeful selection of functionalities and services in prototyping/tool-development.

In particular, development of Activity Systems Design Tool (ASDT) at Pöyry explores collaborative process carried out to clarify the coexistent requirements of engineering and co-design of ASDT, new knowledge practices, and features for KP-Lab Shared Space. ProjectWay shed light to iterative commenting on the project management software, and processes carried out to merge and streamline different software applications. KIKK focuses on mutual development among the designers and customers, and processes of adaptation of the 3<sup>rd</sup> party tools for knowledge creation and boundary crossing. These cases give insights in the collaborative development of best practices and reuse of the knowledge at different organizational levels. In addition, they give insight in the identification of knowledge creation practices, tools operating in work place settings, and transformation of knowledge practices with heterogeneous stakeholders.

We may briefly summarize common themes across cases<sup>10</sup> by first asking, what knowledge creation means and involves in each case, and later deepen this by focusing on knowledge creation and production processes leading to practice transformations. In KIKK knowledge production processes are associated with their tools or products, e.g., project planning software tools, services, e.g. consultation, and user experiences from using these tools and services. Knowledge creation is therefore related to innovations in products and services, and involves both design and use. Hence, we can distinguish internal and external processes. Internal knowledge creation is initiated by professional developers associated with the creation of new products and services. External knowledge creation is initiated by the customers when they develop a new way of using a tool. For example, they may discover a failure of an existing tool or service and create a work around for it. Super users may make local adaptations to existing products for which there was no predefined solution. Knowledge creation is especially interesting when the internal and external processes interact, impact each other, and drive development forward as co-configuration between developers and customers.

ChronICT aimed to identify, systematize and actively incorporate different types of knowledge, that is professional, lay, experiential, embodied or embedded related to 1) living with a rare malformation, everyday living, self-care and symptom management 2) information and knowledge sharing, and 3) exploring ICT-resources as an infrastructure for the access to and creation of relevant and timely information and knowledge. These are resources for the work in which these multiple stakeholders are involved assisting them in the face of the challenges of "living well", and supporting self-care and symptom management activities for learning and coping with a congenital condition with life-long challenges. To them this is an open-ended problem that requires them to *collaboratively create knowledge* for sharing experiences, skills and knowledge across the different user-groups. A basic assumption guiding our work in this particular production-based research collaboration was that knowledge and the contribution of knowledge, experiences and practicalities are negotiable and symmetric. In particular so related to a chronic condition, since experiences, accumulated knowledge and solutions in daily living might be distributed and ill-systematized.

In Ahus Competency case the negotiations of the hospital's standardized work description can be seen as a knowledge creation process. Observations, interviews and documentation shows how the negotiations in the groups also play a part in the further development and design of the tool - the repository of standardized work descriptions. The participants' opportunities to feed suggested changes into the development cycle were considered valuable for supporting the creation and implementation of the customized, or re-designed, standardized work descriptions. The created knowledge is fed into the annual process of content updating of the centralized resource on a national level, and such global changes in the standardized work descriptions lead to further development of the repository. For the hospital this is seen as a continual process, necessary for sustainable changes in the knowledge practice, and for securing seamless operability, relevance and invisibility of the knowledge infrastructure.

In ASDT development at Pöyry, the co-design process is analysed as the process of a multi-perspective knowledge creation embracing technological, learning-theoretical, and pedagogic-practical knowledge. There is a need to develop a method to bring these different strands of knowledge creation together in the course of the design. Another

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<sup>10</sup> To do so we are also drawing on analysis that took place past M12.

level of knowledge creation we are going to focus on, are the knowledge practices in Pöyry's business activity, the forest industry engineering. Two activities have been selected for an investigation. In the CRM activity, knowledge creation is found in design and implement new globally shared knowledge systems and infrastructures for Pöyry's activities in transition from the local practice to global networks.

In ProjectWay the knowledge creation is geared to the shared design model to be constructed by the workers. The knowledge creation manifests itself in the transformation of individual and implicit process models towards a collective and shared model. Knowledge creation for a new, shared model seeks balance between the prestructured, strategy-driven design model and the technologically open design setting encouraging participation.

In summary, our first findings demonstrate the variability of the work life knowledge practices we are addressing in KP-Lab. Some themes across the cases can already be seen:

- Developmental co-design interventions and developmental transfer of learning, which are at the core of the KP-Lab dissemination efforts to encourage dialogical learning. Thus even though KP-Lab is not primarily developing interventions and transfer these themes facilitate the dissemination of the KP-Lab results. (Cases involving PCP and ASDT, and multiple activity systems)
- Customization and use of 3<sup>rd</sup> party tools, emerging as boundary knowledge objects in heterogeneous professional practices, adds analytic insights in tool-mediated knowledge creation and production processes, as transformations in individuals' and groups' working with knowledge artefacts (Ahus, Pöyry)
- Design of tools to deal with knowledge in different modes and in boundary-crossing across different knowledge communities (ChronICT, ProjectWay)
- CRM- tools, one of the topical issues in the workplaces may be used as window to the challenges of development and implementation of tools, also in KP-Lab. Even though KP-Lab is not producing tools for the CRM systems in particular, the CRM theme will provide a concrete case by means of which the tools development may be carried out and experimented. (KIKK, Pöyry)

In all of the WP10 cases, the change of the knowledge practices involves design and implementation of new tools, which is bound to the developments of ICT. Due to the generally observed state of flux of work organizations, it is no coincidence that the field of organizational studies is nowadays often seen as design studies (Jelinek, Romme, & Boland, 2008). This implies a pragmatic approach to design embracing both process and outcome, an approach in which "...boundaries between designers and users become blurred, heterogeneous user preferences emerge in use, tasks remain partially partitioned and the goals of the design emerge through interaction" (Garud, Jain, & Tuertscher, 2008:367) These findings by other researchers validate criteria applied to selection and exploration of the cases of WP10: organizational development, particularly focusing on the tool development, is seen as co-design marked by boundary-crossing, multi-voicedness, heterogeneity of perspectives, and incremental, iterative interaction.

### **Contribution to KP-Lab co-design approach**

Related to KP-Lab co-design approach, WP10 cases represent basically two types of contributions, those involving the design and piloting of KP-Lab tools and those adding analytic accounts of collective knowledge creation and production processes supported

by organizations' own operating tools. Without the analytic insight of existing tools in participating organizations, the KP-Lab tools' design would be disconnected from existing, everyday work practices. The case of ASDT at Pöyry Forest Industry exemplifies KP-Lab tool design, involving co-design by technical and pedagogical partners. The cases like Project Way, KIKK and Ahus-Competency contribute to KP-Lab co-design through the analytic insights from processes mediated by 3<sup>rd</sup> party tools. We see both categories as necessary contributions to the KP-Lab co-design approach. We want to emphasize here that the co-design work in WP10 concerns the KP-Lab internal action between technical and pedagogical partners, but also co-evolutionary external actions between KP-Lab representatives and several companies.

Each of the cases has contributed to the design process of KP-Lab directly and as benchmarking in terms of insights to the working practices. The meaning of the mediating tools and artefacts, and the object of work has been defined through a design and negotiation process involving stakeholders from outside organizations and from KP-Lab partners. Besides the fields of developing and testing the KP-Lab tools, we need representative cases in which we may explore the potential for triological learning by means of analyzing the evolving, tool-mediated knowledge creation processes and practice transformations.

During the period of Del 10.2, KP-Lab approached design through design teams and a set of design principles (further elaborated as in Deliverable D3.1). In our work, we identified the case studies representing and informing the following design principles.

#### 1. Organize activity around shared artefacts

KIKK, ChronICT, AHUS Competency and ProjectWay represent cases where the activity was organized around shared artefacts that intended to be the main object of work and realized as products or models. This could be found in KIKK as the development of customer relation management web-portal; in ChronICT as the creation and sharing of knowledge and experiences in a web-based ICT prototype for "living well" with a chronic condition; in Ahus competency as the appropriation of standardized tools to facilitate knowledge creation and practice transformations; and in ProjectWay as the ICT supported construction of a new design process model towards transforming work.

#### 2. Flexible tool mediation for triological activity

The tool mediation was a focal element in cases KIKK, ASDT and ProjectWay. The CRM system analysed was typically a tool for mediating the negotiation of the implementation of shared CRM practices across several customer-servicing units. The KP-Lab researchers contributed to bring problems of mediation from different user and designer perspectives to the forefront. In ProjectWay, the design of "Commenting tool for internet-pages/systems" involved Pöyry designers, the technical supplier of the tool and KP-Lab researchers. The intended use of tool was co-designed between Pöyry workers and KP-Lab researchers.

#### 4. Fostering process of long term knowledge advancement

Knowledge creation typically requires a long-term process, which has particularly been the case in ChronICT and Ahus Competency. ChronICT represents a tool and environment for transforming a practice when patients, their families and medical experts collaborative in long term processes to share experiences and externalize their knowledge and experiences. Ahus Competency explores an ongoing, long-term effort to

transform practices, as the standardized work descriptions are customized, evolving and changing over the course of hospital's ongoing change processes. The cases of Pöyry/ASDT and ProjectWay demonstrate the importance of extending the perspective to the history of the company's knowledge practices in order to understand the heterogeneity and the long time line needed to transform the tools and practices.

#### 5. Development through transformation and reflection

Knowledge creation and development of the practices requires reflection. KIKK offers insight to the reflective process between the company and KP-Lab researchers, and how the prevailing practices and use of CRM tool should be transformed in order to better meet the customers' needs. ChronICT opens a development process in which the insight of patients and medical experts led to a system for collaborative reflection. Ahus Competency, ASDT and ProjectWay offer insight of collective efforts to make the prevailing, and often under-articulated, practices visible by collaborative reflection and by means of externalized standards, concepts and models.

#### 6. Eliciting (individual and collective) agency

The analytical approaches in all the cases are build on the interplay between individual and collective activity studying how the individual and collective agency are designed and can be nurtured in relation with each other. The possibility to participate in the design and to follow the implementation of the tools paves way to individuals' contribution helping them realise how features in the tools and collective perspectives of the community play out. We will return to elaborate this when the experiences from the cases are incorporated in the use of KP-Lab tools and pedagogical models.

### **Contributions to understand knowledge practices in networks**

The starting point of exploring knowledge practices in workplaces is that new and emerging technologies support new patterns of interactions such as collaboration in networks, which offers new opportunities for knowledge production. This also leads to highly networked learning environments. Also previous research has pointed out that networks, or networking, are the major societal trends in organizing activities (Beeby & Booth, 2000; Castells, 1996; Powell, 1990) – as production, communication or education and knowledge development. Therefore, one of the criteria for selection of cases to be analyzed in WP10 research is that they will inform about knowledge practices in networks; either intra- or inter-organizational settings. We are approaching the challenge of networks by concepts such as co-configuration, boundary crossing and multi-voicedness.

Case A, KIKK, displays a multi-organizational environment where the production of given software solutions is coordinated between the producer and the customer and even the university research and development. Case B, ChronICT elicits and incorporates knowledge from variety of sources – professional, lay, experiential as well as tacit – derived from a network of living experiences, health-care information and ICT-based resources. As such these sources point to stakeholders that are interacting in a new network. Case C, Ahus Competency, represents a multiprofessional hospital network (intra-organizational network) where all providers contribute to the transformation involving new tools that are customized and implemented. Case D, ASDT design at Pöyry Forest Industry brings in the multi-disciplinary and multi-level design network of KP-Lab, and Pöyry's global and distributed engineering network. Case E, Project Way is an

intra-organizational network where the internal heterogeneity stems from merging several previously separately operated engineering units.

In addition, the tools explored are above all designed for enabling networked activities thus participating in the transformation of the knowledge practices: (A) new web-portal in the interface of service-provider and customer that is expanding to new market segments, (B) blog - wiki-based ChronICT for collective knowledge production, (C) web-based standardized work descriptions as part of the EQS (knowledge management infrastructure) simulate knowledge creation and transformation, (D) ASDT for learning in networks and company's own networking tools such as the CRM system, and (E) web-platform for commenting and constructing a design process model. The focus during months 7-12 was, however, on the customization and transformation of these new tools, and on the challenges of co-design, not on the viability of the solutions adopted by companies and organizations.

## **6 Summary – answering the critical review comments**

This deliverable, D10.2, reports on the on-going exploration of knowledge practices in five workplace cases. By providing insights from each case, we elaborate on our methodological approaches and contributions to tool design, and summarise the findings of the use and adaptation of existing tools made thus far. KP-Lab design principles are used for reflecting and further elaborating the approaches adopted. This is the second revision of D10.2 answering the Year 2 project review. Particularly, chapter 5 has been developed to describe the outcomes of the cases and the comparisons across the cases, to discuss the representativeness and validity of the cases for KP-Lab, and pointing out how the cases offer insight in co- design process of KP-Lab, and how the cases inform about the knowledge practices in networks.

The negotiation phase including the identification of the cases, getting access to company collaboration and starting the case studies and data collection, has been time consuming. In addition, planning the research in a way that makes it possible to explore development and change of the knowledge practices in question has taken more time than anticipated. The operating logic of business and the R&D endeavour of research have to be balanced. Analysis of the current practices in the case studies has enabled us to work collaboratively with end users, and provided a window to study and systematize experiences as new practices develop. We will continue to explore this by focusing on structures of participation in new ways of working, division of labour, altered communication patterns. They will be analyzed as relationship between two levels of activities, i.e., knowledge practices and innovative technology development. This opens up research questions of knowledge creation and practice transformation for further analyses, informed by the KP-Lab theoretical resources with a special interest in the interaction of practices and knowledge tools. The focus of this deliverable has been in practices; in Deliverable 10.3. we are further elaborating our theoretical understanding creating connection between the cases and the concepts of dialogical learning.

We are planning Participatory Change Process Workshops as well as Change Laboratory Workshops in which the exploration of evolving practices will be analyzed collaboratively with a special emphasis on tool-use and how tools mediate collaboration across the involved units. The case studies allow us to explore technology in use, under development and the potential of using the KP-Lab tools to scaffold practice transformation. Thus there is a) the level of tools designed by the company as the object of our research and b) the level of tools designed by the KP-Lab to be tested and

developed. The contributions to co-design work will start with Activity System Design Tool (Shared Space optimized for Change Laboratory® methodology) and Annotation tools. Our contributions to co-design of tools will take place in close collaboration with the companies in a co-configurational manner (Victor & Boynton, 1998). Findings from studies of use, adaptation and modification of 3<sup>rd</sup> party tools in workplaces (KIKK, Ahus, ProjectWay, and Pöyry/CRM) can also inform the co-design processes and contribute to analytic benchmarking of KP-Lab tools. We will participate in co-design, and, when possible in the collaborating organizations, we may explore the use of KP-Lab tools in work places. These experiences will be important to understand knowledge creation processes, co-design of tools and exploration of practice transformations over time to inform application of KP-Lab theoretical resources and technologies.

In the longitudinal analyses of evolving knowledge practices, we are analysing combinations of existing and new tools (e.g., Ahus Competency, KIKK and ASDT@Pöyry); focusing on design experiments to explore practice configurations and introduce new tools into existing settings and/or customize/adapt existing tools in the same settings (e.g., ProjectWay and ASDT@Pöyry); and carrying out time-limited and focused experimentations with specific tools in a chosen context to explore usability and refine functional requirements (e.g., KIKK and ASDT@Pöyry). We will use KP-Lab theoretical resources to further explore issues emerging in case studies of knowledge practices in work places, including methodological approaches, co-design and implementation of new tools in work places for knowledge creation, and transformation of practices.

The exploration of the knowledge practices reported here sets three major challenges to the work of WP10. This is working towards integration and collaboration based on 1) the follow-up of the case studies, which will continue by focusing increasingly on the tools mediation and the developmental potential of the knowledge practices through collaborative design, 2) collaboration with technology partners, where we will contribute to specification of the requirements of the KP-Lab tools; this makes demands on the intensified participation in the KP-Lab co-design work, and 3) use of KP-Lab theoretical resources in collaboration with WP3 to draw from the insight gained from the case analyses, and use the findings to explore the concepts of knowledge creation and Dialogical learning in the dialogue across the work packages.

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## APPENDIX: Report on closed cases

In this appendix we present a more elaborate report on two cases reported here; 'ProjectWay' and ChronICT. These two cases were closed during Y2 of the project, to restructure the work according to the recommendations from Y1 review.

### ProjectWay – Collaborative development of a design process-model

Partner organization, reporter's name: University of Helsinki / Jiri Lallimo, Centre for Research on Networked Learning and Knowledge Building

Duration of the case: M11-M18 (01.11.2006 – 31.07.2007)

#### Introduction

In the case study called 'ProjectWay,' the intention was to create a generic model of design process (or customer project process) for an engineering Company (hereafter referred as Company) and study its development. The Company produces application services and application tools for its customers. The Company has been recently formed by combining five separate application development sites under the same company. ProjectWay case was one of the explorations at Pöyry demonstrating the knowledge creation efforts in a newly founded Application Services unit. We studied engineers' efforts of developing a shared design process model. Their aim was to make visible the existing design engineering practices and to envision a new generic model for a knowledge tool in a situation in which they had started up new application service activity for Pöyry. The development team of the unit put in the intranet environment a suggestion for the new design process model on which the workers were asked to build their comments. They started to construct ideas on the presented model, and also commented other colleagues' ideas. The commenting was built as a discussion in collaborative environment and was visible to all. Construction of the ideas took place by producing text as free form. On the side of free text, it was also possible to connect the ideas to the overall task as short descriptions as 'tags' of the ideas. The environment had a specifically designed 'Commenting tool for internet pages', which included these functionalities. The figure 'commenting tool for internet pages' presents a part of the main view for tagging and commenting the generic Process model for the company. In the upper section are the choices to comment each page.

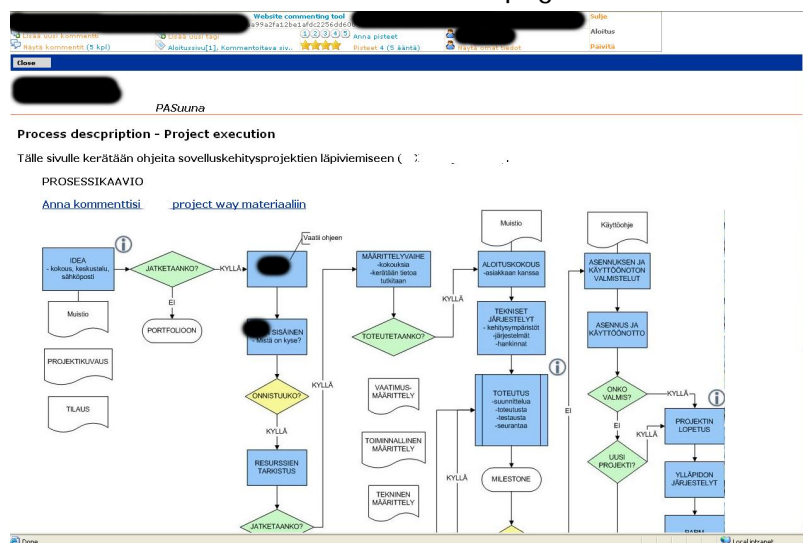


Figure: Commenting tool for internet pages

We analyzed how the members of the unit contributed to the modelling of the core process of their work, namely the design process model, by using a shared design environment. The results show how in designing and implementing collaborative tools and collaborative practices the following perspective become focal: the individual-collective agency in collaborative efforts, combining the knowing from historical elements of the work for future-oriented solutions, and understanding the limitations and strengths of stable and dynamic work objects (such as the work model as both stable and dynamic presentation of work).

### Significance of the case study

The case represented a situation where working practices are to be transformed to better meet the needs of multiple stakeholders. There exist several parallel design processes, which are inherited from earlier engineering practices. These are mostly individual practices, which are not documented or made visible on collective level. The demands have emerged for constructing shared working practices inside Company, and between Company and its customers. In ProjectWay, the intention was to create a shared, generic design process model. The initial model was formed by four representatives of Company, including different phases of the process, interdependencies between process elements, and project documents. The existing working practices and the supporting tools were to be made visible for the whole community's use. The model was released for other developers' for commenting and modification and the workers were expected to bring forward the tools they use, contradictions and potential elements in design project, e.g., to make visible the best existing practices, the 'bad and worst' practices, the potential practices, and questions without specific solutions.

### Methodological frame

In ProjectWay the analytical focus stemmed from the principles of triological learning (Paavola & Hakkarainen 2005). Looking at the *transformation of knowledge* and the *developmental tensions*, we used the perspectives of *individual – collective, ahistorical – historical, and static – dynamic view of knowledge and knowledge development* to analyze the data. This framework is put forward in the work of Ahonen, Engeström, & Virkkunen, (2000) as the transformation from first to second generation of knowledge management. The first generation KM initiatives adopt a technical approach as “management of information”, to distribute, disseminate and leverage knowledge to enhance organization's performance. The second generation, instead, emphasizes the creation of new knowledge, which is explored as part of collaborative and dynamic practices.

The developmental challenges representing the KP-Lab design principles consisted of exploring the participatory design efforts of the tools and practices, implementation of collaborative tools, and steps of implementation of new collaborative working practices. The focus was on how the reflexive work on collective level and the efforts of creating shared models take place. In this sense, ProjectWay represented challenges of transforming individual, local and invisible working practices to an explicated and shared model. The KP-Lab participants were involved in ProjectWay as a co-designer with Company and with the supplier of technical environment.

### Analyzing collaborative work and triological learning

KP-Lab researchers collected data from development meetings, interview sessions with workers, and the use of collaboration tool. The audio taped meetings took place 1)

between the KP-Lab researchers and the Company developers and workers concerning the objects of development to be addressed in ProjectWay, and 2) between the KP-Lab researchers and the Company workers concerning the technical development of "Commenting tool for internet-pages/systems" and shared space to reflect and transform project work model. The data of work practices consisted of interviews with Company workers participating to ProjectWay. Interviews concerned the ways of using communication system and emerging working practices around ProjectWay, and outcomes of the ProjectWay as transformative practice: database content and structure. The knowledge from the research was negotiated with the participants to support the further reflection and development of work.

### Results from the case

We explored the following three aspects that we found particularly interesting as transformative efforts from the first to the second generation knowledge management: Individual – collective perspective, Ahistorical – historical perspective, and Static – dynamic view of knowledge and knowledge development.

*Individual and collective efforts.* In ProjectWay one of the grounding elements was how to take into use the extensive pool of individuals' knowing and experiences of the design process by exhibiting individual knowing for collective knowing. The collective objective of the project was stated as the outcome itself; the collectively constructed model. The results showed the recurring problems at individual level and highlighted that the individual agency has to be carefully initiated when connected to collective object. For example, the introduction and kick-off of ProjectWay took place in a lengthy meeting, which included also other points on the agenda. The sufficient social infrastructure was not created for collaborative work. While the collaborative practices were new for many workers, the manager was expecting people to grow into the new order in a self-directed manner. It may be stated that new practices, such as in this case, demand careful fitting of individual and collective efforts; clear understanding and structure what is expected/required from individuals and how this activity constitutes an collective act.

The birth of a collective agency is aroused with a careful planning of the overall project by rooting it in the development of the entire activity, providing support for individual efforts, and emphasizing the interconnectedness of these two. The transformation from individual to collective construction of knowledge takes place in parallel and intermittent junctures as different perspectives are opened up and fabricated together. This requires not only an established dialogue in the community but a dialogical approach addressing simultaneously the individual knowledge, the emerging collective practices and the knowledge artefacts in the middle of activity to be developed.

*Ahistorical vs. historical elements concerning the evolution of knowledge* are often left unspoken in the development projects. This concerns taking into consideration the past, from where the existing solutions and questions derive from, and the future-oriented suggestions, which are meant to solve the existing problems. One deliberate focus in ProjectWay was to make visible the design work by revealing the historical roots behind the existing practices, stemming from a number of previously scattered application service activities of Pöyry. Approaching the knowledge repositories historically may even be interpreted as an effort belonging to the second generation knowledge practices. However, the results indicated that the pieces from the previous practices can be exhibited but not, as such, combined into a general model. This local-global shift was problematic in a sense that when the local and situated practices were put into the

global generic model, there was a risk of losing their initial vigour. We conclude that the idea of combining knowledge from different sources of expertise proves to be naive until the historical roots are collectively addressed and the new activity envisioned. Historicity is one of the basic principles of the Change Laboratory approach, which therefore has to be addressed and elaborated in the design of ASDT.

*Stable and standardized vs. dynamic knowledge* and processes are important for engineering work. When standardized, the knowledge is uniform across projects and even across different stakeholders, which helps identify and reuse knowledge. This relates mainly to knowledge of technical components and formal technical notations adequately handled even by the first generation knowledge tools. When the object of work is ill-defined and no existing solutions exist – following the second generation KM developments – standardized and stabilized knowledge has to be opened up. The starting point for making the new process model was a model framed by four representative designers, the ‘four wise men’, as they put it in the Company. The object of defining ‘a generic design model’ was twofold and contradictory for workers. On one hand, it was to represent a stable and structured model; on the other hand a new activity required an open model that would support and encourage new model solutions. This caused difficulties in defining the nature of the model. It seemed that the prevailing practices had emphasized construction of models, which are unquestionable stable. The collaborative construction of work would have required a new mode of working; exposing one’s unclear and unfinished ideas, which did not take place to full extent. It can be seen that the second generation knowledge management and the knowledge creation for a new activity goes through questioning, reopening and redefining the stabilized knowledge and knowledge artefacts. This is very crucial in the design of the KP-Lab tools, namely, that the tools should allow the on-going construction, reconstruction and evaluative reflection of collective knowledge created.

## Conclusions

In sum, the ProjectWay gives us insight in how the existing knowledge practices, which are oftentimes on individual and hidden levels, were to be exhibited for collective use. First, the results show that the collective agency has to be carefully nurtured. A way for this is to make the object of work visible and constructible for workers. This means that beyond the construction of the knowledge object (i.e. producing a new design process model for the Company with an orientation as a stable outcome), a shift should be taken for the construction of the object of knowledge work more generally, seeing the current work as part of larger historical continuum in which the practices are to be revisited and reshaped constantly. We found that negotiating and making visible the object of work can help the workers and the organization to map their current status and to envision the path in the zone of proximal development. At the same time, the results showed the meaning of planning and negotiating the social infrastructure of knowledge creation. Secondly, the technology for the distributed knowledge management is inseparable from exploration of knowledge practices.

ProjectWay case demonstrated how modelling of activity by means of technology has to seek balance between the excessive prestructuring of the knowledge object reducing the workers motivation to collaborate, and leaving the design setting technologically open, which may make the workers feel powerless to continue. The study relates to KP-Lab future considerations by leveraging the results to be used for requirements of KP-Lab tools and practices (e.g. ASDT, annotation). We have, and will, use the experiences in

similar collaborative implementation and development efforts, which highlight the co-participation of developers and participants from professional organizations.

Status of the case: Closed.

According to KP-Lab Y1 project review, this case has been closed after the revision of cases to be included in DOW 2.1. The rationale was to reorganize the resources of WP10 work in favour of increasing other cases' resources. The case as such did not lose its relevance, and some follow-up has been carried out with the same Company partners besides the KP-Lab work. Thus, the ProjectWay interventions did not realize as planned during M19-24. Closing the case was negotiated with the Company representatives. Outcomes of ProjectWay are reported in D10.3, and the final report is in DEL 10.2 Appendix.

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## **ChronICT – learning resource for patients and relatives with Chronic Condition.**

Partner organization, reporter's name: University of Oslo / Anne Moen, InterMedia,

Duration of the case: M1-M18 (01.02.2006 – 31.07.2007)

### Introduction

As health care migrates from professional practices and organized care settings, e.g., hospitals, outpatient clinics, care-centres or doctor's offices to the home dwelling, new practices emerge, and create demands for timely access to health related knowledge in different representational modes arise. Traditionally, patients and their family's contributions and responsibilities for self-care activities have been largely *under-articulated*, and invisible work (Strauss, Fagerhaugh, Suczek, & Weiner, 1985).

Tools and practices that support access to different modes of knowledge and information in feasible ways become increasingly important. ChronICT set out to assist patients, their family, and health care providers dealing with chronic disease in the challenges of "living well" with a condition and support activities related to self-care and coping with a chronic condition. Examples from the exploration of different stakeholders' practices have been integrated and presented as knowledge in different representational modes, and put forward in a mock-up; ChronICTprototype ([www.intermedia.uio.no/ChronICT/](http://www.intermedia.uio.no/ChronICT/)). In this mock-up, two types of user-participation/contribution are demonstrated: 1) blog for short questions/responses and 2) wiki entries and content managing simulated in terms of an informal and formal section - presented from left to right. This suggest a certain direction and imply notions of metaphor of "collaboration" "knowledge-creation", "knowledge-sharing" that could help convey the objectives and functionality of the site.

The case is described in Del 10.1 and Del 10.2., and material is available at <http://www.kp-lab.org/intranet/work-packages/wp10/empirical-cases/presentations-of-the-cases/> and as ChronICTprototype: [www.intermedia.uio.no/ChronICT/](http://www.intermedia.uio.no/ChronICT/)

### *Research focus – questions*

The focus of ChronICT case was to identify, systematize and actively incorporate modes of knowledge, e.g., professional, lay, experiential, embodied and embedded, related to 1) living with a rare malformation, self-care and symptom management 2) information and knowledge sharing, and 3) exploring ICT-resources as infrastructure for access to and creation of relevant and timely information and knowledge.

### *Significance of the case study*

The clinical case for ChronICT is to explore and gain insight into living with a rare physical, congenital malformation; anorectal anomaly. To the individual, the malformation(s) represent different degree(s) of severity and challenges to daily living, and there are different treatment options available. However, all of them face lifelong challenges to physical functioning, and psychosocial and emotional wellbeing of the individual with the condition as well as their family (Diseth, Egeland, & Emblem, 1998). Understanding challenges of living with a rare condition is ill-systematized, and to a large extent a trial-error exercise for the individual and their family. The targeted users groups are challenged to either live with or provide care to people with a rare health

condition. The providers they interact with may not provide much guidance either due to the rareness of the condition.

Therefore, the ChronICT case aims to explore and assist in the challenges of “living well” and support self-care and symptom management activities for learning and coping with a congenital condition with life-long challenges. To them this is an open-ended problem, and requires them to *collaboratively create knowledge* for sharing across user-groups. A basic assumption guiding our work and also this particular production-based research collaboration is that knowledge and the contribution of knowledge, experiences and practicalities are negotiable, particularly related to a chronic condition since experiences, accumulated knowledge and solutions in daily living might be distributed and ill-systematized.

### The case relatedness to KP-Lab project

The *conceptual focus* of ChronICT case was to identify, systematize and actively incorporate types of knowledge and experiences related to

- 1) living with a rare malformation, self-care and symptom management
- 2) information and knowledge sharing,
- 3) exploring ICT-resources as infrastructure for access to and creation of relevant and timely information and knowledge.

The idea is to encourage exchange of experiences, questions or concerns related to more "factual" content, without allowing everyone to update or contribute to the content, and allow us to study development of individual and collective agency. This is contrary to the common notions much present in wiki-related communities that everything is negotiable, editable and governed by internal, self-organized codes of conduct. The trade-off in this experiment is directing participation and collaboration to certain content areas. This makes ChronICT a case that explores, challenges and comments the symmetric notions in wiki and blog as information- and communication-technology, and asks if professional practices related to health issues require special modifications.

This case study targeted the following KP-Lab design principles:

1. Organize activity around shared artefacts
4. Fostering process of long term knowledge advancement
5. Development through transformation and reflection
6. Eliciting (individual and collective) agency

In the ChronICT case the participants explain how they have to re-think and come up with problem solving strategies given the particular situation, and challenge the “taken-for-granted”. Other participants refer to their operational routines and traditional modes of interaction and sharing knowledge, experiences and expertise related to the particular condition.

### Tool development

We had several design workshops to explore experiences, concerns and challenges in the everyday living. These workshops were sessions with persons having the malformation – youth and adults – and family members, health providers and researchers/developers in role homogeneous focus group style. Findings from these sessions and information already available in a booklet are included in a web 2.0 environment as a material artefact to be focus of further exploration, development and change. Also, we had workshops focusing specifically on the available prototype as discussions to improve and further develop the tool.

With the available material and collected experiences from the workshops we set out to make the ChronICT prototype. Informed by the KP-Lab ideas of creating and experimenting with environments supporting and requiring collaboration (KP-Lab, 2006), several infrastructure alternatives were considered. Our choice was a wiki-environment (O'Reilly, 2005) to create the prototype. Specifically we started with the Confluence platform since the technology was used and available to us as part of InterMedia's infrastructure. Integration of data from the workshop and text from the booklet was challenging. Although overlapping somewhat it also had different role and status. Therefore, it became a challenge to integrate the information from the workshop with the already existing text in the booklet. Restructuring the thematic structure of printed material, five main chapters were chosen as categories or nodes to organize the information; 1) peer-support, 2) when a child is born with ARM, 3) what is ARM, 4) living with ARM, 5) social support, welfare, aid, and information resources.

### *ChronICT prototype I*

With the goal of ChronICT to facilitate and encourage *collaboratively create content* for knowledge sharing across user-groups, we created a solution where the content was *not filtered* in its presentation but filtering of content was applied as a supplementary way of navigating the site, provided by feeds, e.g. last updates, last updates by your group. Further, emerging as an important issue throughout the work with prototype I on the wiki-platform Confluence, and hence a technical necessity to accommodate in the succeeding work with ChronICT, was the need for several comment-sections on each node or topic area. Confluence allowed for only one. This, in our view *limited user-participation, collaborative content creation and knowledge building*. To further advance the work, we searched for a platform /infrastructure with *comment-* functionality for multiple comments on each node topic area.

It also became clear that potential user-participation/contribution could be of two different types; 1) editing text-sections and 2) contribute and participate in form of questions. This led to consideration of wiki-environments as platform for ChronICT prototype that could accommodate more flexible forms of participation and contributions to knowledge building.

### *ChronICT prototype II*

Our difficulties translating and adapting the material at hand brought forward a number of questions before creating prototype II. Shall we equalize this text with the other one, should we re-evaluate already existing structure and find another, more appropriate way for our purposes, should the workshop contributions have different status than text from the booklet?

Still grappling with the challenge of how to present different types of information and facilitate collaborative knowledge building, we started making ChronICTprototypeII. The starting concern was to find ways to 1) convey the intended collaborative knowledge building/-sharing through an interface that invites both instrumental and explorative use, 2) design for open as well as filtered reception of content, and 3) create and provide for a networks of peers and across target-groups, together with multimodal reading and multiple modes participation. "Modes" are not only understood as text-types such as verbal contra visual communication, but as genres of oral - written, dialogic - commentary, narrative-instructive-descriptive.

In turn, these challenges and their suggested solutions brought more technical challenges and requirements to the surface. This led us to consider a "bliki" – combination of wiki and blog - in the following version of ChronICT prototype. A suggested solutions using "bliki" functionality were modelled in a html-mock-up [www.intermedia.uio.no/ChronICT/](http://www.intermedia.uio.no/ChronICT/). The mock-up simulated interaction and semantic relationships between the information entries .

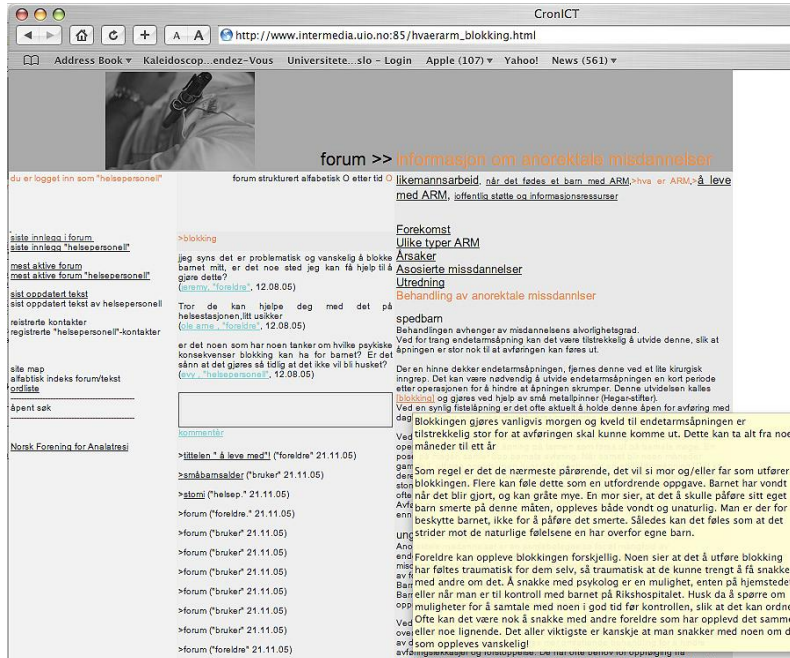


Figure 1: Screenshot from ChronICT prototype

Compared to the initial ideas explored in ChronICTprototypen, the html-mock-up became a helpful reference-tool. The interface conveyed affiliation e.g., the site as an user driven site + group identity, three different "text-types" or types of information and use as feeds, blog, wiki, and system and/or user-generated relations between them. Two types of user-participation/contribution were encouraged;

- 1) blog for shorter questions/responses and
- 2) wiki entries and content managing

This is simulated in a more informal and formal section presented from left to right. This implies a process or direction, and was part of our search for a metaphor on "collaboration", "knowledge sharing" or "knowledge creation" that convey the objectives and functionality of the site. Aware of the digital possibilities and opportunities for multimodal communication and participation, and the potentially fruitful outcome of this when inviting for knowledge sharing and peer activity across age/culture groups, we tried to employ other modes than only formal, verbal text and genres like images and short expressed viewpoints.

### Methodological approach

ChronICT uses the PCP approach, and focuses on long-term knowledge advancement. The first iterations towards a future web-resource to support collective knowledge advancement and augment current practices focused on

- 1) assessment of existing practice,
- 2) written information and learning material,

3) elicitation of every day experiences from real, future users; patients and family members, as well as health providers.

Grounded in ideas of user-participation (Schuler & Namioka, 1993), we held two cycles of workshops; the first cycle with the purpose to articulate and accumulate knowledge and experiences related to treatment and follow-up, e.g. leakage, eating, surgery – stoma, self-care, symptom management and living well with the condition. The second cycle of workshops elaborated on content and suggested functionality using the mock-up of bliki environment. One of the remaining challenges are to explore format and style in the material that give credit to, encourage and empower the end-user, and complement, not repeat already available information.

#### Findings from and implications of the case

ChronICT aimed to identify, systematize and actively incorporate different types of knowledge, e.g., professional, lay, experiential, embodied and embedded, as examples of experiences related to 1) living with a rare malformation, everyday living, self-care and symptom management 2) information and knowledge sharing, and 3) exploring ICT-resources as infrastructure for access to and creation of relevant and timely information and knowledge.

As a step in the process to create an interactive ICT resource we prototyped wiki, blog and feed functionality to exemplify functionalities for exchange of experiences, access to relevant condition specific information and to encourage collaborative sharing of knowledge and experiences. The first iterations towards a future web-resource aimed to support collective knowledge advancement and augment current practices focusing on 1) assessment of existing practice, 2) written learning material, and 3) elicitation of every day experiences from real, future users of ChronICT.

Initial feedback from the workshops points to challenges for tool development and interaction in a sufficiently secure and protected environment (for privacy and confidentiality of personal health matters), although there are enthusiasm and perceived usefulness of a shared, evolving resource. However, recommendations from collaborating health providers led us to direct participation and collaboration to content areas like exchange of experiences, questions or concerns related to “factual” content, but restricting permissions to edit the factual content. Actually this challenge that everything is negotiable, editable and governed by an internal, self-organized code of conduct (Morrison, Smørdal, Lund, & Moen, 2007). This way ChronICT asks if health care as content and context of collaborative knowledge creation require special or transitional modifications.

The challenge that surfaced over and over again in discussions ChronICTprototype was how to adapt, structure and edit the extensive accumulated knowledge, structured and prepared as written material from the booklet and from the workshop. As a solution, information from the workshops that could be integrated in the already existing categories was supposed to be integrated in the forum. As an approach, the content is structured in three different types of texts or categories; 1) an informative introduction, 2) accumulated knowledge and experiences as descriptive information and 3) experiences. Currently, “experiences” can be edited. Workshop-material was used under the category “experiences”, and instances where experiences can be added, this section is open underlining the invitation to add and suggest entries. The professionals and the patients/families continues to raise issues and concerns in the direction of

accountability, position/role and how do we know that the information we access is accurate and trustworthy.

### **Lessons learned** towards transformation in knowledge practices and tool use

Findings from the exploration of different stakeholders' practices have been presented as knowledge and experiences and presented in ChronICTprototype; [www.intermedia.uio.no/ChronICT/](http://www.intermedia.uio.no/ChronICT/). In this mock-up, two types of user-participation / contribution are demonstrated: 1) blog-related questions/responses and 2) wiki entries and content managing, which were simulated in terms of an informal and formal section - presented from left to right. This suggests a certain direction and may imply notions of a process, and exemplifies "collaboration", "knowledge-creation", "knowledge-sharing" that could help convey the objectives and functionality of the site. Illustrating possibilities and opportunities for multimodal communication and participation we illustrated multiple modes of expression; formal, verbal text, images and short expressed viewpoints or blog-entries.

Initial feedback from the workshops included enthusiasm and statements about usefulness of a shared, evolving resource. The participants also points to challenges for tool development in their request for a sufficiently secure and protected environment (for privacy and confidentiality of personal health matters). This experience also lead to questions for further elaborations, including how may we balance consequent "user-enactment", e.g. similar ways of responding in both blog and wiki, with different types of "participation-enactment", e.g. dialogue in blog contra description or instruction in wiki, and how may to optimize the collaborative design with the current prototype. Lastly, how to include system-generated and user-made relations between content entities, develop and use ontology or "folksonomies" supporting the system-generated relations, and how visual design facilitate intended dynamic between the blog/fora and wiki as multimodal user-participation.

#### *Dissemination efforts where the case was reported:*

Ludvigsen, S.R., Rasmussen, I., Krangle, I., Moen, A., Middleton, D. (2007): Multiplicity and intersecting trajectories of participation; temporality and learning. Ludvigsen, S.R, Lund, A., & Säljö, R (eds) Learning in social practices. ICT and new artefacts – transformation of social and cultural practices. EARLI Series: advances in Learning. Pergamon

Morrison A, Smørðal O, Lund A, Moen A. (2007) Multiple activity - multiple mediation: conceptualising and furthering the use of wikis. In: Morrison A, editor. Inside Multimodal Composition. Creshill NJ.: Hampton Press.

Aminoff, A., Toiviainen, H., Moen, A., Höynälänmaa, M., Lallimo, J., Smørðal, O., Mørch, A., Toikka, S., (2006) Synthetic report of research and development of professional knowledge practices. KP-Lab report, D10.1, September

Moen, A., Toiviainen, H., Lallimo, L., Nygård, KA., Mørch, A., Toikka, S. (2007) Synthetic report of knowledge practices in piloting professional organizations. KP-Lab report, D10.2, June

Moen, A., Sem, I., Smørðal, O (2007) ChronICT – learning resources for patient, relatives and health providers dealing with chronic condition. Poster, CMC conference "Coming to terms with 21<sup>st</sup> century practices", Oslo, November 2007.

Moen, A. (2006) "ChronICT, Case for Knowledge Practices in Professional Networks". KP-Lab Network, Oslo, 28. September 2006

Moen, A. (2007) "ChronICT. Presentasjon av prototype" [ChronICT, presentation of prototype]. Seminar, Senter for Sjeldne Diagnoser, Rikshospitalet – Radiumhospitalet HF, 4. Januar 2007

Moen, A., (2007) "Pasientinformasjon. IKT-baserte læringsressurser til pasientar og pårørende. Eksempla REPARERE og ChronICT". [Patient information. ICT-based learning resources for patients and relatives; examples REPARERE and ChronICT] Seminar, NSEP, NTNU, Trondheim 15. Mars 2007

Moen, A. et.al. (2007) Case studies, knowledge practices in workplaces, KP-Lab WP10, Utrecht May 21<sup>st</sup>, 2007

Moen, A. (2007) "Smart patients". Invited talk at 6<sup>th</sup> annual nursing management symposium, Johannesburg, South Africa, August 28<sup>th</sup>, 2007

Moen, A. (2007) Sjølvhjelp. IKT-støtta informasjons- og nettverkstenester til pasientar og familie. Forskningsnettverket "Trådløs Pasient", [Self help, ICT-supported information – and community resources for patients and families, Research network "Wireless Patient"] Oslo, Norway 12. December, 2007

In addition, a comprehensive overview of workshops with different stakeholders is reported in deliverables by WP11 Dissemination.

## 6. The reason for closing the case

Following Y1 review, this case was closed because complexity and unexpected increase in the necessary resources to move forward from the mock-up. Creating resources that adhered to national recommendations for maintained privacy and confidentiality when inviting lay people to share personal, health related information and experiencing in relatively open networks represented major hurdles for design of the tool using a web 2.0 platform. Security requirements in the health domain as a work environment are more complex, specialized and currently stricter than other environment we are investigating.

## Selected references

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Morrison, A., Smørdal, O., Lund, A., & Moen, A. (2007). Multiple activity - multiple mediation: conceptualising and furthering the use of wikis. In A. Morrison (Ed.), *Inside Multimodal Composition*. Cresskill NJ.: Hampton Press

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Strauss, A., Fagerhaugh, S., Suczek, B., & Weiner, C. (1985). *Social organization of medical work* Chicago: University of Chicago Press.