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D1.1
Results of the Ethnographic Study and Conceptual Knowledge Maturing Model

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Editors	Andreas Kaschig, Ronald Maier, Alexander Sandow, Andreas Schmidt, Stefan Thalmann
Authors	Sally-Anne Barnes, Jenny Bimrose, Claire Bradley, Alan Brown, Daniela Feldkamp, Pablo Franzolini, Andreas Kaschig, Michael Kohlegger, Christine Kunzmann, Johannes Magenheim, Ronald Maier, Tobias Nelkner, Simon Nikles, Uwe Riss, Alexander Sandow, Andreas Schmidt, Michelle Shuttleworth, Stefan Thalmann

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List of Abbreviations

CoP	community of practice
KM	knowledge management
OLME	organizational learning and maturing environment
PLME	personal learning and maturing environment

1 Executive Summary

This document provides an overview of the results produced by WP1 during year 1. WP1's objective is to build a common ground for the consortium concerning the state of the art about concepts and theories required to understand knowledge maturing as well as about the state of practice on knowledge maturing from a human-oriented, an organisational and an ICT perspective.

Therefore, the three main foci of WP1's year one activities were on (1) the compilation of the scientific state-of-the-art of the literature on knowledge maturing and related concepts, (2) the planning, performing and analysis of a collaborative ethnographic study involving our application partners as well as a number of associate partners and (3) the reconciliation and revision of the knowledge maturing model. It has been targeted to investigate the state-of-practice at MATURE partner organizations from a knowledge maturing perspective in order to inform the design activities as early as possible. The main objective is an in-depth investigation of knowledge maturing within our application partners and selected associate partner organizations. Furthermore, aim is to identify maturity phases of knowledge in organisations and to explore situations, episodes, routines and processes in the scope of knowledge maturing. These are richly described including contextual factors, such as human-oriented, organisation-oriented, design-oriented and ICT-oriented factors. The results of the subsequent analysis have been taken on board of parallel activities performed in MATURE, most notably the design studies (WPs 2, 3, 4 and 6), the process of developing use cases and requirements (WPs 2, 3, 4 and 6), the definition of maturing services (WP 4), the elaboration of the semantic framework used in the technical infrastructure (WP 5) as well as the planning of the formative evaluation (WP 6).

WP1 took the lead in the project and already had a detailed plan as a suggestion for the procedure brought into the kick-off meeting last April in Karlsruhe. This plan was discussed and refined according to feedback from the consortium members and agreed in the meeting. This procedure with UIBK thoroughly preparing each subsequent meeting with a suggestion for the next phase, providing templates to be filled by consortium members engaged in WP1, coordinating the execution of the activities, collecting the results, transforming, refining and visualizing the results and moderating their joint analysis and reflection was followed throughout the year.

The compilation of the scientific state-of-the-art provided a basis for the diverse perspectives on knowledge maturing brought into the project by members of the consortium with their interdisciplinary background and can be found in the MATURE Wiki (http://wiki.mature-ip.eu/). This deliverable concentrates on the results of the ethnographic study, their implications for the project as well as the revised version of the knowledge maturing model. Specifically, the ethnographic study provided rich descriptions of knowledge maturing practices, so-called Personas, long-running maturing cases, frequently used knowledge routines and hot knowledge maturing areas, stories describing changes in knowledge maturity as well as knowledge maturing indicators. The results of the activities in this work package, most notably the empirical work, converged into the refined version of the knowledge maturing model which is seen as an instrument to convey our understanding about knowledge maturing and is intended as an analytic model to help structure the analysis of organisational and technical infrastructures. These have been taken up as valuable sources of input for the requirements engineering and design activities performed in parallel. Thus, it was important that WP1 provided its results early on and continuously during the first year.

The take up of the results was supported not only by frequent presentations of interim results, early release of work-in-progress within the consortium and discussions of their impact, but also by the fact that a number of designers and software developers participated in ethnographic activities in person.

2 Introduction

Year 1 of MATURE has been characterised by a number of parallel strands of activities the ultimate aim of which is to establish a profound knowledge base of concepts and theories as well as practices of knowledge maturing. The role of WP1 in this is (1) to collect and analyze empirical evidence about knowledge maturing in general for developing a common understanding and to revise the knowledge maturing model and (2) to contribute to the various requirements engineering and design activities, particularly the development of use cases as well as requirements for the planned MATURE software. This is in line with the participatory design process that MATURE takes towards software development. Building on the results of the ethnographic study which is the first in a series of empirical studies, the knowledge maturing model has been revised as empirical data has been taken as a first "reality check" for the initial knowledge maturing model. Implications for requirements have been collected as part of deliverables developed in WPs 2-6 for which the results have provided a rich source of experience for requirements engineering as well as direct contact of developers with potential application contexts to inspire and guide ideas. Lastly, steps towards preparing a representative study planned for Year 2 have been taken that will be used to test assumptions created in the ethnographic study. This deliverable reports on Year 1 achievements of MATURE towards the objectives of work package 1, particularly to

- establish a *common knowledge base* about the different domains, concepts and theories required to understand and support the knowledge maturing process,
- explore current *knowledge maturing practices*, e.g., routines, processes, knowledge types and semantics,
- develop a *reference model* for describing knowledge maturing.

These objectives are reflected in the following tasks that the consortium has worked on during the first year:

- *T1.1 Compilation of the scientific and technological state of the art and current trends*. This has been written up in the MATURE Wiki until M6 and will be briefly summarized in this deliverable,
- *T1.2 Explorative empirical studies*. Work on WP1 in the first year has been particularly intensive with respect to a collaborative ethnographic study that has been performed by MATURE partners and involves MATURE application partners as well as several MATURE associate partners,
- *T1.4 Development of the conceptual knowledge maturing model*. The results of T1.1 and T1.2 have been fed into a substantial and concise refinement of the initial knowledge maturing model as presented in the Description of Work taking on board particularly the results of the ethnographic study and the input by and feedback of application partners voiced in meetings, workshops, e.g., on design studies (see WP 2,3 and 4).

The overview given in Figure 1 shows the main activities of this phase and their primary use within this work package and concerning other work packages and the corresponding deliverables represented by arrows. The ethnographic study provides rich material about knowledge maturing practices, cases and personas which have impacted the parallel activities in WPs 2-6. The results of the empirical study, particularly long-running knowledge maturing cases, stories about changes in knowledge maturity, indicators for knowledge maturing and hot knowledge maturing areas, have been primary resources for the revision of the knowledge maturing model together with the description of the state-of-the-art concerning knowledge maturing brought to the project by the members of the consortium and an extensive review of the literature.

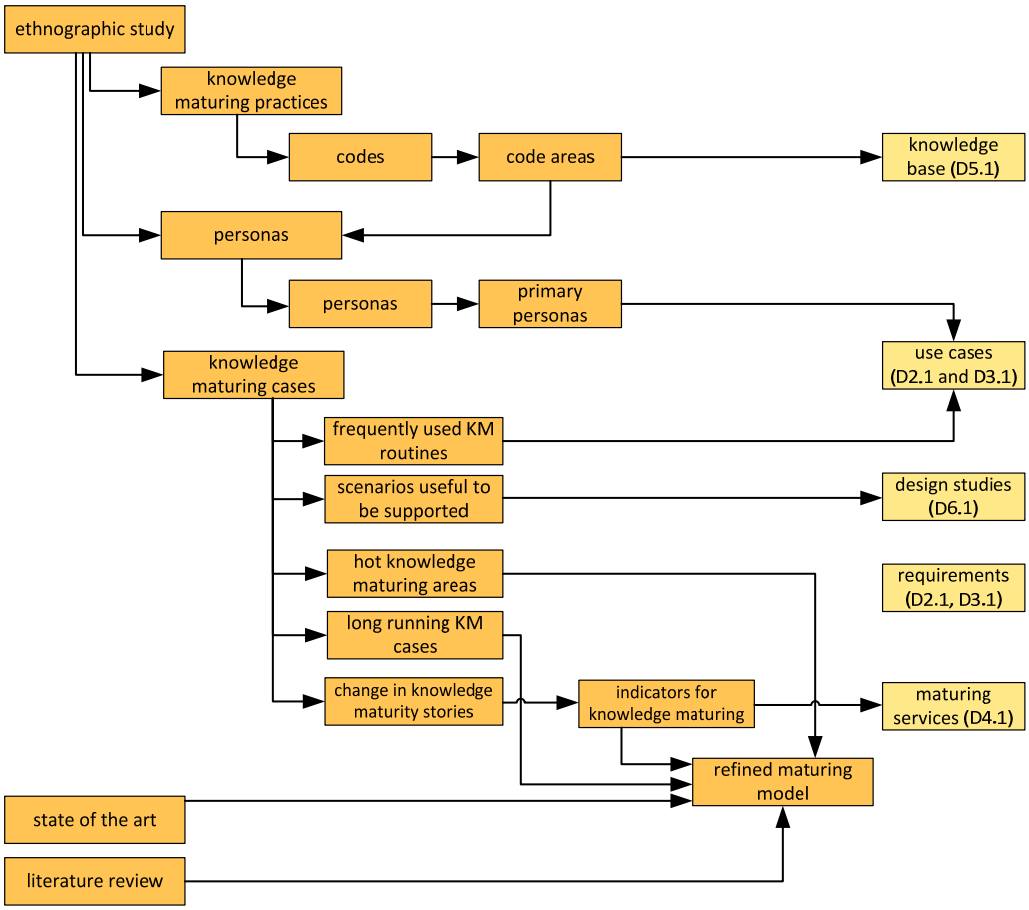

Figure 1: Overview of elements of WP1

Consequently, this deliverable is structured as follows. Section 3 reflects on the ethnographic study and presents the procedure, methods and timeline employed by MATURE. Section 4 then presents and discusses the results of the study (see figure 1), particularly with respect to knowledge maturing practices, Personas, and knowledge maturing cases. The knowledge maturing practices which were developed by coding the ethnographic study and the creation of code areas later on are described in section 4.1. Section 4.2 then describes the process of creating personas and the selection process of primary personas. Whereas the personas represent a personal or individual perspective, the rich ethnographic material has also been analyzed from a situational and a process-oriented perspective. Section 4.3 will describe the different approaches used for this analysis. Section 5 briefly reflects on the conceptual background that has been collected as part of T1.1, discusses implications of other maturity models that have been utilized for the development of the second version of the knowledge maturing model which is then presented. Section 6 discusses implications for the MATURE project in accordance with the main objective of WP 1, namely to build the foundation for the design of tool infrastructures developed in WPs 2-5. Section 7 concludes the deliverable. Finally, the appendix is of particular value because it not only contains analysed and refined data collected in the study, but also a plethora of conceptual models that are deemed useful for developing use cases and requirements (WPs 2, 3, 4 and 6), for defining maturing services (WP 4), for providing semantic material for the framework used in the technical infrastructure (WP 5) as well as for the formative evaluation (WP 6).

3 Ethnographic Study

The ethnographic study has been targeted to investigate the state-of-practice at MATURE partner organizations from a knowledge maturing perspective in order to inform the design activities as early as possible. Section 3.1 presents the objectives of the study. Section 3.2 reflects on the academic background of the ethnographic study. Section 3.3 reports on the procedure taken and the methods applied. Section 3.4 discusses limitations of the study. Appendix 8.1 gives an overview of the individual studies that have been performed, i.e. teams of ethnographers working with individual MATURE partner organizations, in the form of fact sheets about the studies.

3.1 Objectives

The main objective is an in-depth investigation of the processes, habits, cultures, social interactions, etc. of knowledge maturing within our application partners and selected associate partner organizations.

The investigation aims at identifying relationships between personal tasks at work, creation of personal knowledge, determination and fulfilment of learning demands, processes of learning and knowledge sharing within communities, institutionalisation of community knowledge on the organisational level as well as managerial instruments targeted at influencing these processes. The study also yields current barriers and problems. First hand experiences which could be useful for design activities should be gathered by involving developers into the ethnographic study

Furthermore, an aim is to identify maturity stages of knowledge in organisations and to explore current knowledge routines, processes and types in the scope of knowledge maturing.

3.2 Background

Ethnographical research established in anthropology and social science was developed to investigate new cultures and social settings. Fetterman describes ethnography as “the art and science of describing a group or culture” (Fetterman, 1999). In this sense, first ethnographers like (Malinowski, 1922) discovered exotic islands and cultures to describe them in monographs. Social scientists started to use ethnography to describe social hot spots, like cities with a large portion of unemployed people (Jahoda et al., 1933) or the growing suburbs (Park et al., 1925). In order to allow a detailed description of cultures and social settings, more than simple observation is necessary. The key characteristic of ethnography is active participation in social settings to understand why things happen (Lamnek, 2005, Jordan, 1996, Fetterman, 1999). In contrast to field observation which describes *what* happens, ethnography focuses also on the *why* and *how* things happen.

The researcher tries to become a member of the community by working with people in their natural environments, typically for long periods of time (Fetterman, 1999). In fact, researchers never become members in the same sense (Emmerson et al., 1995), but nevertheless motivations and intensions of observed actions can be described (Lamnek, 2005). Usually, the researcher performs activities that are central for the lives of those studied and as he/she participates he/she also influences the observed environment. The effects of the ethnographer’s participation, often called “consequential presence”, cannot be avoided, but the ethnographer should be aware of them (Emmerson et al., 1995).

Openness, especially for uninteresting-acting situations is one of the key success factors in ethnographic research (Fetterman, 1999, Lamnek, 2005). Theories should not be validated by ethnography. Rather, theories should be inductively derived from the gathered data. That does not imply any lack of rigor and the researcher is guided by hypotheses and ideas, but he should be aware of its estimations (Fetterman, 1999).

It is unusual to use formal questionnaires or predefined questions, instead, informal interviews (“conversations”) or questions asked on-the-fly, as they arise in actual situations are typically used (Jordan, 1996). That again does not imply unsystematic procedure. Furthermore, it has to be ensured that data is gathered systematically and not haphazardly (Jordan, 1996), (Harper, 2000). Due to the uniqueness of social settings, in our case organizations, and the situational character of ethnography, it is practically

infeasible to develop detailed guidelines for realizing a study. Typically, general guidelines describing general procedures in terms of do's and don'ts are used. (Lueger, 2000).

Observations and experiences should be noted in a regular and systematic way contemporary to observation. These records, called field notes, should describe the ethnographers' observations and experiences in an intensive and involved manner (Emmerson et al., 1995). Field notes are not simple observations, they are already arguments and interpretations (reflection in action) and the researcher considers these important to the research topic (Dicks et al., 2006). Video and audio records can be useful, but they can only record what is observable and in focus of the device (DuFon, 2002). The main idea of ethnography is to understand why and how things happen and that cannot completely be realized by recording observable things (Emmerson et al., 1995). Writing too intensively during observation can confuse people and deflect ethnographers from things happening. Creating short jottings during observation and developing detailed field notes later in a different place can be an effective solution for this issue (Emmerson et al., 1995).

Recently, ethnography has also become more popular in disciplines other than anthropology and sociology. For example in computer science, ethnography has been one of the key approaches for designing CSCW (computer supported cooperative work) systems (Harper, 2000). However, classic ethnographic studies are too time-intensive, costly, unfocused and mostly too inflexible for the fast changing world of information systems. For that reason, modified versions, like rapid ethnography (Millen, 2000), have been proposed to be more suitable in requirements analysis (Harper, 2000). The main idea of that modified ethnography is to save time by narrowing the focus, use several observation techniques, work collaboratively and use tools for the analysis (Millen, 2000). Usually, these studies are realized in cases with highly situated work practices and a need for specific support (Plowman et al., 1995). Especially in those highly situated work practices, workers often solve problems without being even aware that a problem has occurred (Jordan, 1996). Because of the ability to catch those situations and to describe them, ethnography seems to be a more comprehensive approach for investigating such situations.

Within MATURE, a group of researchers studied several organizations in a collaborative way. Collaborative ethnography can be defined "[...] as the collaboration of researchers and subjects in the production of ethnographic texts, both fieldwork and writing." (Lassiter, 2005). Every researcher has a personal perspective on happenings and describes and highlights different details that are influenced by the professional background, and discipline of the ethnographers, in our case from social sciences, psychology, education, and business as well as information systems. For that reason, collaborative ethnography can join these different perspectives and provide a broader view on the setting (Buford-May and Pattillo-McCoy, 2001). Furthermore, the MATURE ethnographic study involved different organizations in order to extend the variety of knowledge maturing characteristics. The ethnographic study thus was carried out by six teams of ethnographers from six MATURE partner organizations in total, i.e. CIMNE, FHNW, FZI, UIBK, UPB and UWAR and studied MATURE application partners, i.e. STRUCT, as well as MATURE associate partners, i.e. Career Scotland, GISA Halle, Connexions Kent, Swisscom Zurich, Synaxon Bielefeld and the Städtisches Klinikum (city hospital) Karlsruhe (see appendix 8.1 for details). Procedure, method and tools were coordinated with the help of prepared templates, joint usage of tools as well as frequent reflections of interim results and their joint interpretation.

3.3 Procedure and Methodology

The study was carried out in three phases – preparation, realization and analysis which are depicted in Figure 2 and described in the following sections.

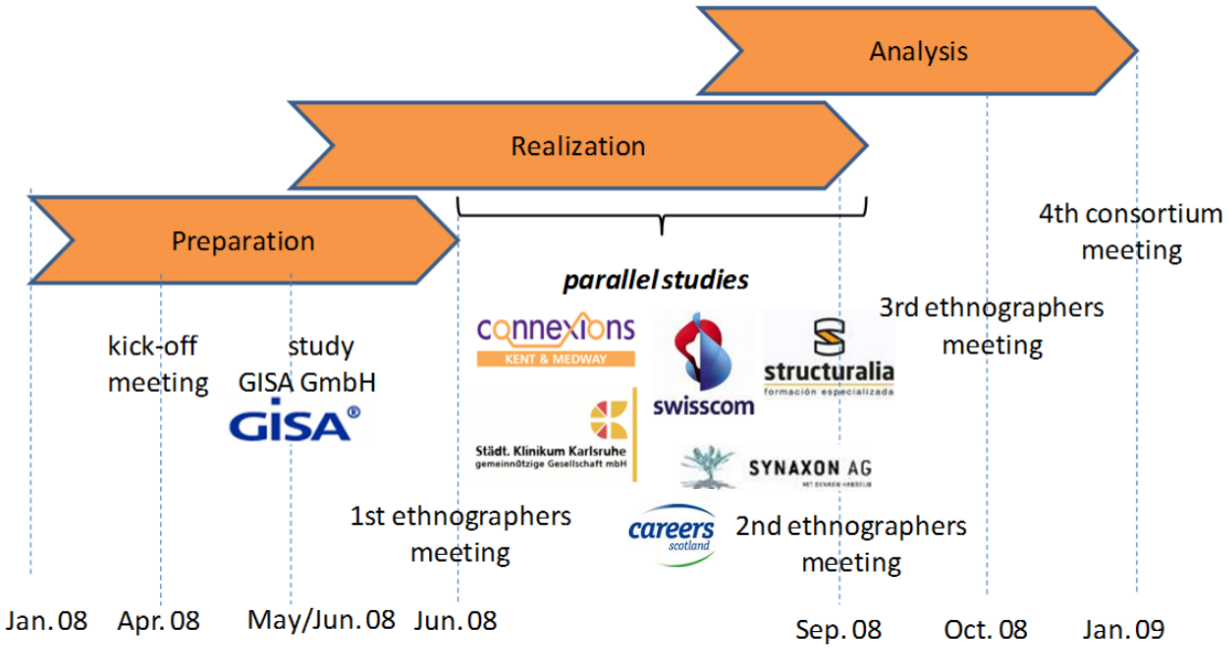

Figure 2: Timeline of collaborative ethnographic study

3.3.1 Phase 1: Preparation

In preparation of the study and before the official start of MATURE, LTRI hosted Stefan Thalmann from UIBK for two months. John Cook and Andrew Ravenscroft assisted him in collecting experiences with ethnography in similar cases, study their lessons learnt and take them on board for the organization and the guidelines for the MATURE ethnographic study.

During the project kick-off meeting in Karlsruhe, UIBK presented a first plan for the ethnographic study and the procedure. The consortium agreed on the general steps of the procedure as well as the pairs of researched organizations and ethnographers teams. The sample can be characterized as a convenience sample. Although not representative, the selection process made sure that we get a decent mixture of types of organizations that we can assume influence work contexts for knowledge maturing, i.e. small & medium versus large organizations (size), variety of industry sectors (sector), affinity to use (information and communication) technology (IT intensity) as well as culture and languages (country), (see Table 1).

Organization	Size (employees)	Sector	IT intensity	Country
Careers Scotland	large (>1,000 employees)	professional services	medium	United Kingdom
Connexions Kent	large (> 300 employees)	professional services	medium	United Kingdom
GISA GmbH Halle	large (400 employees, in group >10,000)	IT services (group: utilities)	high	Germany
Städtisches Klinikum Karlsruhe	large (4,000 employees)	health care	medium	Germany
Structuralia	small (30 employees)	professional services	medium	Spain
Swisscom	large (20,000 employees)	telecommunication	high	Switzerland
Synaxon AG	medium (130 employees)	IT	high	Germany

Table 1: Characterization of the sample

The sample includes first of all the application partners and associate partners who have a close relationship with the project, i.e. Careers Scotland, Connexions Kent and Structuralia. Studying the situation at the application partners is considered very important for driving the requirements process. Both, the design of the procedure and the definition of the focus of the study profited from prior empirical work that CIMNE brought to the project about STRUCT, that UWAR brought to the project about Connexions Kent and Careers Scotland that FZI brought to the project about Städtisches Klinikum Karlsruhe (SKK) and UIBK brought to the project about GISA GmbH. Due to the fact that the ethnographic study had to be kept within reasonable time limits, it was considered beneficial for the study instances if the researchers had been involved with the studied organizational units before.

In addition to the selection of organizations, also the processes and people to be studied had to be determined. Criterion for this selection process was that the persons to be worked with had to be primarily engaged in knowledge work, i.e. an ideal type of work, an abstraction comprising key characteristics of a wide array of activities in organizations across occupations that creates, translates or applies new knowledge (Maier et al., 2009). Knowledge work

- solves weakly structured problems with a high degree of variety and exceptions,
- is creative work and requires creation, acquisition, application and distribution of knowledge,
- uses intellectual abilities and specialized knowledge rather than physical abilities,
- requires a high level of education, training and experiences resulting in skills and expertise,
- is often organized decentrally using new organizational metaphors,
- bases inputs and outputs primarily on data and information,
- has strong communication needs and is highly mobile and distributed,
- and thus requires a strong yet flexible support by information and communication technologies.

In order to inform the MATURE study, one of the study instances was performed before the others by UIBK from May 19 to May 23 and June 16 to June 20 in Halle and Chemnitz (Germany). The UIBK team had strong relationships with GISA GmbH, established from former research projects. The trusted relationship, GISA´s openness for the topic (related to former projects involving members of the UIBK ethnographer team) and personal contacts were a good starting point for the first study.

One aim was to collect experience in the fieldwork in order to refine the study concept and guidelines. Only some minor changes in the study design were done and thus the GISA study is fully comparable with the other study instances. This study design allowed the participating researchers from UIBK to transfer the collected experiences early on to the other teams of ethnographers in a face-to-face ethnographers meeting that took place on June 30 as part of the MATURE consortium meeting in Innsbruck.

In this workshop-style meeting, UIBK presented a summary and the lessons learned of the GISA study. Every team of ethnographers presented the selected organisation and, more specifically, the knowledge-intensive processes which should be researched in the ethnographic study as well as a time plan for the intended study.

In order to ensure comparable data collection and analysis between different teams of ethnographers, guidelines for behaviour and focus areas of the ethnographic study and guidelines for writing field notes were prepared by UIBK and jointly refined in the meeting. The main points of the guidelines were formulated as recommendations for the behaviour in the field. Guidelines and study procedure for the ethnographic study were discussed within the meeting and all ethnographers agreed on the following study design and guidelines:

Study design:

Time for personal contacts within the study (MATURE partner and participated organisations) was set to two weeks. The phases of intensive ethnographical fieldwork were divided into 2 * 1 week in order to observe a longer temporal interval. Self descriptions and communication between ethnographers and

participating people from the studied organizations were used to bridge the time in between. The idealized study design can be seen below.

1st week: At least two researchers per site immerse in organisations for ethnographic fieldwork to do ethnographic work and to create awareness for knowledge maturing.

2nd-3rd week: Ethnographers are in contact, e.g., via e-Mail, instant messaging or telephone, with the participating knowledge workers. Self-reporting is used for gaining data about specific and well-defined topics over these two weeks.

4th week: The same researchers return to the organization for further ethnographic fieldwork. They discuss the topics of self-reporting, get a richer picture of the happenings and interview selected people in order to get input for designing PLME and OLME.

Guidelines used in the ethnographic study can be found in appendix 0.

3.3.2 Phase 2: Realisation

From July 2008 to October 2008, individual studies (study instances) were performed in the MATURE partner organizations and associate partners. Detailed information about the study instances can be found in the fact sheets presented in appendix 8.1.

The same study design as described above was applied for all study instances involving MATURE associate partner organisations.

- UPB performed a study with 2 researchers at SYNAXON AG in August.
- FZI performed a study with 3 researchers at Städtisches Klinikum Karlsruhe in August and September.
- FHNW performed a study with 2 researchers at Swisscom in September and October.

One researcher from UIBK attended at least the first day of each study instances in order to coach the participating researchers, to ensure comparability between the procedures and methods employed and to get impressions of the case. Moreover, background knowledge and personal impressions gained during the participation were very useful for data analysis.

An extended procedure was applied for STRUC by CIMNE as MATURE application partner and for Careers Scotland and Connexions Kent & Medway by UWAR and PONT as MATURE associate partner organisations, both of them already committed to the role of target end users of the MATURE developments according to the project plan. In addition to the study procedure applied at MATURE associate partner organizations, further design-related activities were conducted. Design studies were also developed in order to inform the design activities in WP 2 - 4. Therefore, directed interviews were also performed in addition to ethnographic study.

- UWAR and PONT performed a study at Connexions Kent & Medway between April and July.
- UWAR and PONT performed a study at Careers Scotland between June and October.
- CIMNE performed a study with one researcher at Structuralia in September.

A sum-up workshop for all researchers participating in the ethnographic study took place at Frankfurt (Main) airport on September 26. At that time, most study instances were finished (FHNW and CIMNE studies were still running) and the experiences were shared between the teams of ethnographers. UIBK presented first prepared results, which were also published (Maier and Thalmann, 2008). One aim of the workshop was to agree on the procedure for data analysis and how to develop, structure, describe and visualize the implications for the MATURE project.

3.3.3 Phase 3: Analysis

UIBK started with data analysis, i.e. with coding field notes and an investigation of initial implications in two directions: describing Personas and describing maturing practices and cases (for results see section

4). The procedure of data analysis was discussed in the Frankfurt meeting and agreed by all participating researchers. UIBK presented initial Personas, processes and examples for codes taken out of the GISA study. Furthermore, ATLAS TI was suggested as a tool for data analysis. Thus, the general procedure with UIBK driving the process was kept not only for the realization phase, but also for analysis – UIBK always being the first to perform a step of the study, collecting the results, presenting them to the other ethnographer teams, agreeing on the procedure, sending out templates, collecting the filled templates, transforming them into a presentable form, agreeing on the presentation of results and then conveying them to the MATURE consortium.

By October 15, all teams of ethnographers finished coding their field data and described Personas. In preparation for the second ethnographers meeting that took place on October 22 in Barcelona, these data sets were consolidated by UIBK. Furthermore, the role of the Personas for the ongoing design activities was defined. Within a clustering session for the codes, hot knowledge maturing areas were identified. Every team of ethnographers described hot knowledge maturing areas from the point of view of their study up to November 15.

In a modelling workshop on October 16 (UIBK & BOC), a concept was developed of how to turn results of the ethnographic study into conceptual models useful for conveying and further refining requirements between ethnographers, designers and developers. Process modelling was chosen as the main model type enriched by further model types and model elements specific to knowledge-maturing, e.g., Personas. This concept was presented in the Barcelona meeting. All teams of ethnographers agreed to describe instances of knowledge maturing processes, called knowledge maturing cases[1], from their study instances until November 15. All knowledge maturing cases were collected and consolidated by UIBK.

During the entire phase of data analysis, templates developed by UIBK were used in order to guide this process. It should also be noted that a series of physical meetings as well as a number of teleconferences took place in order to share results and insights gained from the study with designers, developers and application partners in order to jointly refine them into more mature concepts such as conceptual models, particularly process models and Personas, as well as requirements.

The results were written up and a first shared version of this deliverable was distributed in December 2008 which formed an important base for the development of use cases and requirements carried out and reported in WPs 2, 3 and 6. Particularly, the Personas developed in this deliverable were found useful to guide the process of harmonizing the use cases with each other performed in January (28th-30th) in the consortium meeting in Olten (Switzerland).

3.4 Limitations

The term ‘ethnographically informed study’ might fit better to the study conducted within the MATURE project. The study follows a different layout compared to classic ethnographic studies. The main limitation is the time spent for ethnographic field work. Compared to classic ethnographic studies that take several months and mostly years, time allocated to MATURE study had to be limited to four weeks each, two of which were intensive fieldwork. A longer time frame was not feasible, because of limited time within the project (design activities needed the input from the ethnographic study early on) and, most importantly, limited resources on the part of the researched organizations and partners that made it necessary to reduce the time for which organisations opened themselves to ethnographers. However, in most cases, the study instances built on long-term established relationships between ethnographers (both, individually and organizationally) and the knowledge workers that were studied so that the time required for establishing trustful relationships between the ethnographer and studied group could be shortened substantially. The MATURE consortium is convinced that the resources have been better used to collaboratively study several organizations rather than concentrate all efforts on one or a smaller number of studied units. Besides the basis from classic ethnography, influences from rapid ethnography and from collaborative ethnography have been considered in our study design. In the following, we will use the

[1] In process and workflow management, instances of workflows or processes are usually called cases.

term ethnographic study being well aware of the studies' limitations with respect to time spent at the organizations.

4 Results

This chapter presents the main findings of the ethnographic study. It should be noted that these findings are the results of a series of workshops of ethnographers that jointly interpreted the results of the individual studies. The findings are based on annotated and coded field notes, transcribed audio recorded interviews as well as original documents from the studied organizations (further details about the coding procedure can be found in section 4.1). These sources were analyzed along three lines: maturing practices (section 4.1), Personas (section 4.2) and concrete knowledge maturing cases (section 4.3).

4.1 Characterization of Knowledge Maturing Practices

One established procedure recommended for analyzing qualitative data is coding (Emmerson et al., 1995, Mayring, 2008a, Fetterman, 1999, Gläser and Laudel, 2006, Lamnek, 2005). Thereby, the aim is to extract new insights inductively which can be verified by occurrences (evidence) in field data. One common recommendation is to start data analysis without any hypotheses or expectations. From the point of view of critical rationalism (Popper, 1972, Popper, 1994), this aspect is often criticized as not realizable. The literature in the field of qualitative research methods identified this problem and recommends being aware of hypotheses and expectations and to ignore them during data analysis (Fetterman, 1999). But nevertheless an influence cannot be excluded. The content analysis approach proposed by (Gläser and Laudel, 2006) tries to integrate these hypotheses and theoretical deliberations into the coding procedure. Previous knowledge, e.g., theories or other studies, can be used to define a first set of codes. The researcher needs to be deliberately open for new concepts appearing during coding, though, and has to adapt initial codes according to their own material. The openness is ensured by allowing flexible adjustment which is realized by changing or creating new categories if necessary (Gläser and Laudel, 2006).

We used this latter content analysis approach for coding the field data gained in the MATURE ethnographic study. This way of analysis provides the possibility to integrate previous work in the field. In order to coordinate the distributed teams of ethnographers, UIBK selected initial codes for each dimension from the literature (see Table 2).

Dimension	Sources
knowledge elements	(Maier, 2007)
knowledge routines	(Hädrich, 2008, Eraut and Hirsch, 2007)
supporting tools	(Hädrich, 2008)
situations	(Maier and Sametinger, 2004)
motivational factors	(Fiske and Haslam, 2005, Fiske, 1991)
knowledge structures	(McGuinness, 2003)

Table 2: Dimensions and sources of initial codes

Figure 3 represents the coding procedure which was subject to three phases.

Orienting phase:

In the first orienting phase, descriptions of codes were revised by every new occurrence in the field data. Furthermore, it was necessary to describe the predefined codes, because no specific and suitable coding rules could be found in the literature. New codes were defined if a relevant description from the ethnographers' point of view could be found in the field data and this code did not fit perfectly to a single existing code. This code was formulated in a first step and described more precisely over time. This included in most cases an example to a code description in order to ease comprehensibility. After investigation of a substantial amount of field data, the first draft of criteria appeared to be reasonably

stable. Changes during development of the first draft of codes demanded a rescan and recoding of the considered data material. Preliminary codes were applied to the entire set of field data during recoding. Thus, it was necessary to change some assignments in order to achieve homogeneous assignment of all codes. During this phase, the number of codes increased over time.

Fluctuating phase:

Again, relevant codes were identified and revised. The number of codes increased significantly and there was relatively high fluctuation within the codes. The phase was also characterized by consolidation of codes and thus the number of codes decreased. At the end of this phase, approximately 2/3 of the material was scanned and again recoding was necessary.

Stabilization phase:

Finally, the remaining 1/3 of field data was investigated. Thereby, no significant changes in the codes occurred. Definitions of criteria turned out as suitable and applicable in this phase. Changes to the codes were mainly caused by merging codes or revising or refining code descriptions. A complete rescan was necessary in order to ensure consistent understanding of all code assignments throughout the entire set of field data. The stabilization phase was considered to be finished as soon as the final codes appeared to be stable and as soon as all identified characteristics could be represented by the final codes.

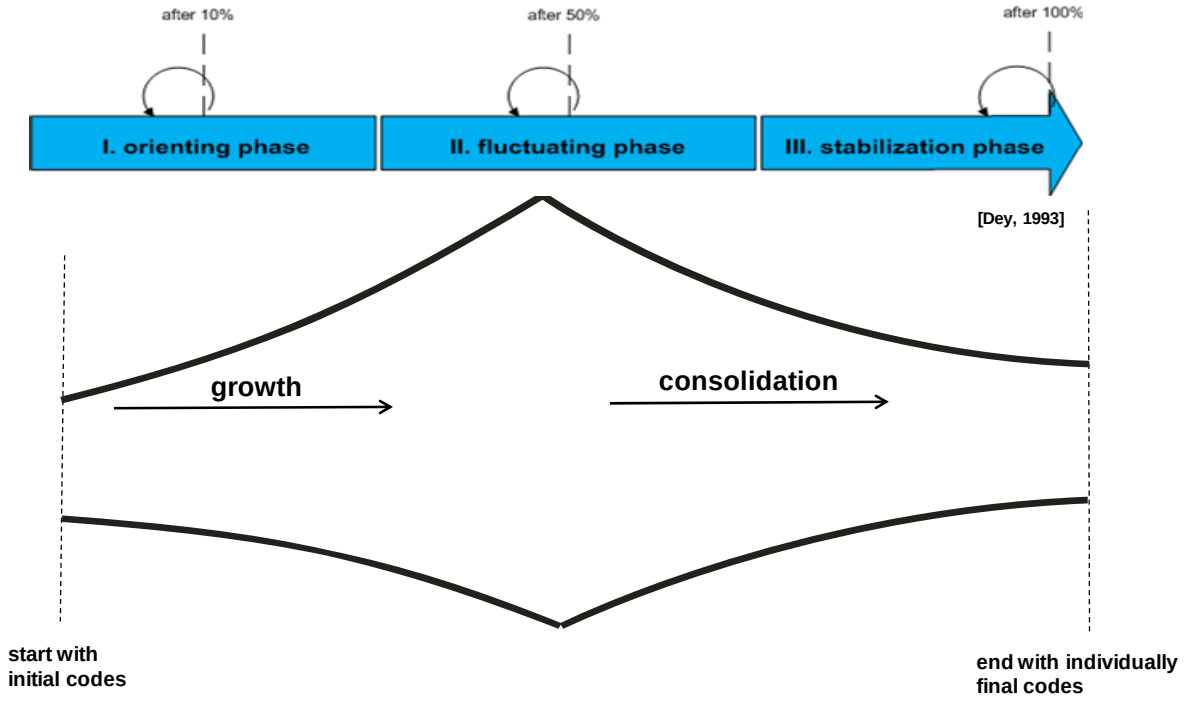

Figure 3: Coding procedure

162 final codes from UIBK were presented at the ethnographers meeting that took place in Frankfurt on September 26. All other ethnographers were welcomed to use the comprehensive list of codes as initial codes when starting their own coding procedure. Each team of ethnographers then went through a similar coding procedure in parallel. This means that some of the 162 initial codes were reused whereas others were added to the list of initial codes. The overlap with the initial codes and with other partners' codes is depictured in Figure 4.

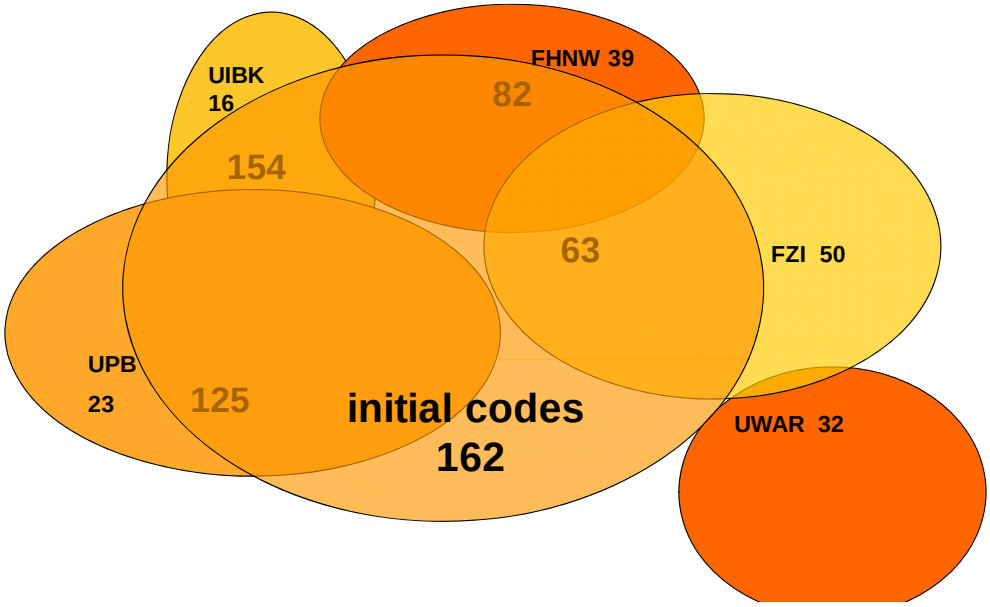

Figure 4: Overlappings of codes used by the distributed teams of ethnographers

Finally, as a result of all coded studies, 322 codes were identified (all codes with descriptions can be found in table 12, section 8.4). After individual coding, these codes were analyzed with respect to each individual dimension. In order to foster interpretation, code clouds were used in the ethnographers' meeting on October 22 in Barcelona. Figure 5 lists all codes for the dimension "knowledge routines" in alphabetical order. The size of the code descriptions reflects the number of code assignments to text fragments in the field data.

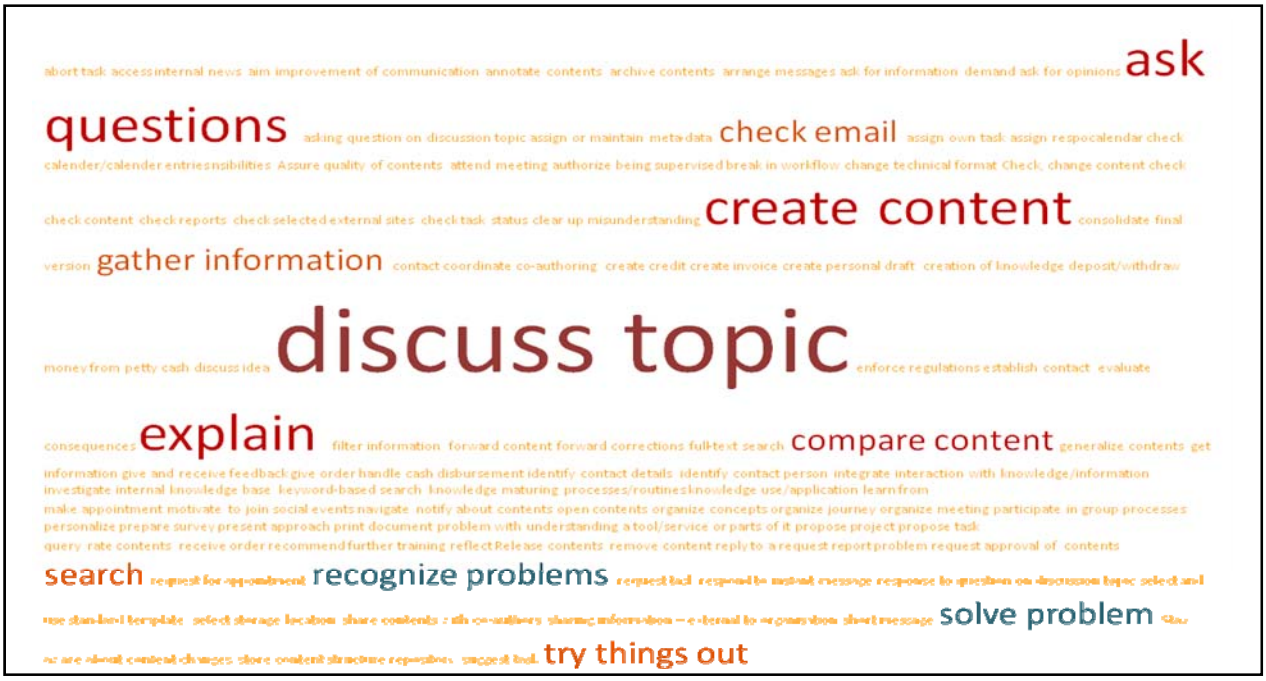

Figure 5: Code cloud for the dimension "knowledge routines"

Due to the fact that the coding procedures performed individually by each ethnographic team resulted in a large number of codes which were initially understood only by single ethnographic teams, we decided to jointly reflect on the codes during the ethnographers' workshop on October 22. Groups of ethnographers from different ethnographic teams discussed, reflected and finally clustered a portion of the codes into groups. For this exercise, we prepared print-outs of codes which could physically be moved on prepared tables in the workshop setting (see Figure 6).

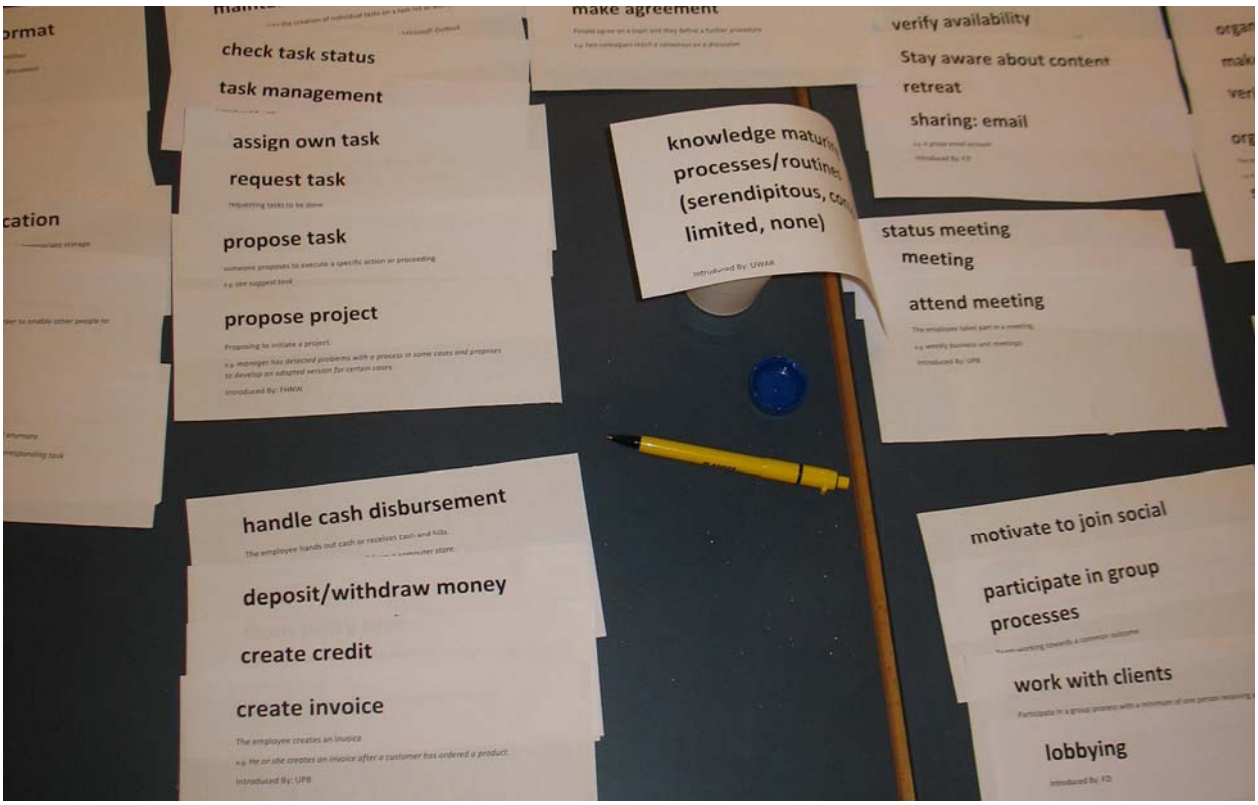

Figure 6: Table with clustered codes

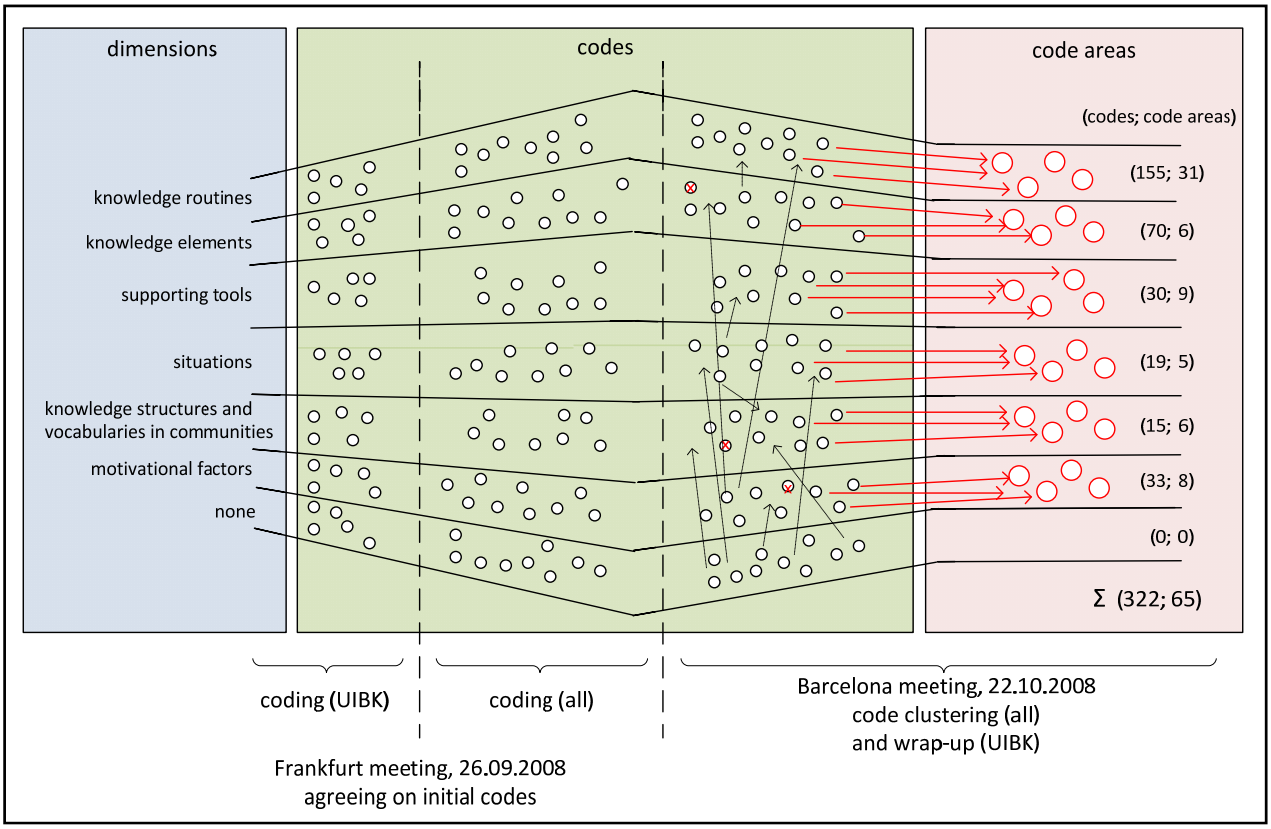

Figure 7: Progression of overall coding process

During the workshop, the assignment of codes to specific dimensions was checked and adjusted where necessary. After the groups had finished their exercise, their results and reasoning for the clustering was presented to all ethnographers who then reflected, commented and sometimes changed assignments if deemed necessary. This approach of clustering codes also aided the creation of code areas. A code area can be seen as generic term for a number of codes. As one result of the ethnographers' workshop in Barcelona, 65 code areas were identified. The number of codes per dimension and the number of code areas per dimension are displayed in Figure 7. This figure also summarizes the progression of the overall coding process.

For a more detailed view on identified code areas see Table 11 in appendix 8.4 which also shows the name of each code area and the number of codes that were put into that code area. As can be seen in Figure 7, most codes refer to knowledge routines (155 codes) as well as knowledge elements (70 codes) which is not surprising considering the fact that awareness of researchers was focused on how (maturing) knowledge was handled in the studied organizations. A comprehensive overview of all 322 identified codes is provided through a table in the appendix (see section 8.4). The table shows the assignment of each code to a dimension and to a code area and provides a short description as well as an example for each code. It also contains information about the source of code, i.e. whether it was part of the initial codes provided by UIBK or whether it was introduced by other ethnographer teams during their coding phase.

To sum up, the coding procedure was a quite complex undertaking. This is especially true due to the fact that coding had taken place not only locally, i.e. in the geographically distributed ethnographic teams reflecting their own field notes on the organization they studied, but also globally, i.e. jointly reflecting all the collected data material in order to make sense out of what we observed and collected as a global team. This process can be regarded as a knowledge maturing episode in itself, in which initial codes were used as seed, and the coding procedure can be regarded as an evolutionary growth phase and, after each iteration, codes were reseeded before entering the coding procedure again. Reflecting on this process, we feel that it was extremely valuable to MATURE to employ this iterative, incremental approach. What is more, we not only carefully selected the organizations as well as processes and people within these organizations to be studied, but also deliberately and consciously selected ethnographers with different backgrounds ranging from social sciences, economics and HRM to computer science) and with different research foci, e.g., informal learning practices, process modelling, knowledge management, community learning, social networking or motivational aspects, so that they could challenge and enhance each others' findings. This effect could be observed most clearly during the ethnographers' workshop on October 22 and is reflected on the rather small overlapping of added codes between ethnographer teams clearly visible in Figure 4.

The codes have provided a foundation for characterizing Personas (see section 4.2), but have also been important for discussing knowledge maturing cases and for identifying hot knowledge maturing areas (see section 4.3). Last, but not least it has also influenced the work on refining the knowledge maturing model (see section 5.2.2) as well as use case and requirements definition.

It would have been difficult, if not impossible to investigate these facets and provide a systematic foundation for the findings presented in the next sections by merely relying on questionnaires or interviews. We think that these facets are crucial for the understanding of informal learning scenarios and the development of technical support for them. Building on lessons learned from other EU-funded projects (particularly NEPOMUK, see Gudjónsdóttir and Lindquist, 2008), we are strongly convinced that it has been essential for MATURE that not a small and separate team of ethnographers has participated in the ethnographic study, but that a substantial number of MATURE people (i.e. 15 ethnographers) have been involved. This includes several MATURE consortium members who are engaged in software development, who as a result have gained first-hand impressions of actual knowledge maturing-related happenings in real-world work places and have participated in the numerous opportunities to share knowledge about their observations and reflections with their fellow ethnographers. This has eased the smooth transition of results from the ethnographic studies into requirements elicitation done in WPs 2, 3 and 4.

4.2 Personas

Modelling Personas is one promising approach to characterize user needs, work routines and learning styles as proposed by (Cooper, 1999). Personas are useful in order to understand potential users in terms of their needs, goals and characteristics regarding their future intended system usage. A Persona is a precise description of a user's characteristics and what he/she wants to accomplish (Cooper, 1999) and represents a class of target users that is described with rich information (Aoyama, 2007). Besides its usage for software designers, Personas can be used for communication with clients and stakeholders (Chang et al., 2008). We are well aware of the fact that there is a plethora of related work investigating person types from a psychological perspective (Bayne, 2004, Bayne, 2005, Bayne, 2006). However, these general person types have not been analysed from a learning perspective and thus do not give any details about how they handle knowledge (maturing).

According to Cooper, a Persona should be based on sound empirical fieldwork (Cooper, 1999). Furthermore, Cooper and Reimann argue that a Persona should be mainly based on qualitative data gathered through interviews or ethnographic fieldwork (Cooper and Reimann, 2003), however, it may also include imaginary information (Junior and Filgueiras, 2005). A Persona can be developed according to a single human being (Cooper, 1999) or as a mash-up of users with aggregated characteristics (Chang et al., 2008). In any case, descriptions should be consistent and one Persona should be understood as one individual. A big advantage is that the targeted audience of Personas develops its own picture of the Persona as a human being. There is evidence that the audience typically tries to consider the Personas' characteristics in communication and design activities (Chang et al., 2008). In order to reach its full potential, Personas must come to life in the designers' minds. Pictures or images of Personas can be used in order to make them more memorable and to add realism (Junior and Filgueiras, 2005). Designers can talk more easily about the needs and goals of a Persona than about abstract requirements (Blomquist and Arvola, 2002).

Personas are part of the user-centred design approach which primarily focuses on requirements of the potential user group. Randolph suggests that a system should be designed according to one primary Persona whose needs are considered predominantly (Randolph, 2004). Thereby, Personas form important communication media within the team of designers (Blomquist and Arvola, 2002). They are useful in helping to guide decisions about a product, such as features, interactions, and visual design. The following list shows a selection of benefits of using Personas identified by Cooper as well as by Pruitt and Adlin (Cooper, 1999, Pruitt and Adlin, 2006b):

- Personas help make user-centred design possible by putting users or more precisely information about targeted users at the centre of design.
- Personas help team members share a specific, consistent understanding and can be used to help guide decisions, e.g., about the product's navigation scheme and visual design.
- The development of solutions can be guided by how well they meet the needs, attitudes and behaviour patterns of Personas.
- Personas provide a human "face" so as to focus empathy on the people represented by the demographics.

Personas have also been introduced building on lessons learned from the EU-funded projects APOSDLE (see Dotan et al., 2009) and NEPOMUK (see Gudjónsdóttir and Lindquist, 2008).

In MATURE, Personas have been used in order to reap these benefits. Personas provide one possibility to generalize individual observations that have been made during the ethnographic study (see section 3). Furthermore, usage of Personas goes along with the aim of modelling users in a semi-formal manner and supporting the communication process during delivery or mediation, respectively, of outcomes of the ethnographic study to those developers who have not participated in the ethnographic study[2].

[2] As mentioned in section 3.1, some software developers have directly been involved in the ethnographic study so that they could directly take on board their first-hand experiences into the software design process, the design studies with application partners as well as the prototype development process.

With the help of the data that was collected during the ethnographic study (see section 3), the ethnographers identified 21 Personas. The consortium decided to apply a local approach to defining Personas instead of a global one. The reasoning for this is that at that time we could not be sure about all factors affecting knowledge maturing, so we felt we needed to stay close to the studied local situations and interpret them from the perspective of the local ethnographers. The intention was not to lose too much by generalizing too soon, which would have been the case if we took a global approach. Each of the Personas represents a varying number of observed target users. Table 3 provides an overview of identified Personas. The Persona's motto has been provided in order to summarize the general stance of the Persona and give a first impression of what the Persona is about.

Persona	Identified by	Motto of Persona[3]
Aisha	UIBK	There is nothing, but experiencing it by yourself, so try and make errors, however, if we should translate it into a (customer) product, it needs to go formal.
Andrew	UWAR	No idea how I learned that - it just happened!
Axel	UPB	Let me test it, then can I tell you what's good and what's bad.
Becky	UWAR	You just have to ask the right people!
Carolina	CIMNE	Use the network to find a solution, but don't lose your criteria.
Colin	UWAR	Everything is learned according to plan!
Deborah	UWAR	The world is my oyster - anything is possible!
Edward	UWAR	No idea how I learned that - it just happened!
Fiona	UWAR	Everything is learned according to plan!
Gina	UWAR	You just have to ask the right people!
Harry	UWAR	I learn for a particular purpose - not relevant to anyone else!
Heather	UPB	If you have a problem, talk about it and you may find an appropriate solution.
Igor	UIBK	There are no stupid questions, only stupid answers.
Kevin	UPB	Tell me what to do, and I'll do as you say.
Kurt	FHNW	Collect relevant information, use it at the right time and transfer it to the right person.
Otto	FZI	Why does nobody solve the problems? - I have proposed many solutions
Raquel	CIMNE	Transforming the usual flat text content into an interactive experience is more an art than a science.
Sally	UIBK	If I have not seen it working, I do not believe it anyways.
Silke	FZI	Always well organized.
Stella	UPB	I don't want to know everything; I only want to know where to find it.
Thomas	FHNW	A phone call is more efficient than 10 e-mails.

Table 3: Identified Personas

According to Pruitt and Adlin, a Persona could be characterized by descriptions about identifying details, roles and tasks, skills and knowledge, context and environment as well as goals and motivations (Pruitt and Adlin, 2006a). Godwin proposes to identify behavioural patterns and characteristics during

[3] Personas with the same motto were found to handle knowledge and the knowledge maturing processes in a similar manner.

ethnographic fieldwork. Most of these patterns have ranges with two ends in which the Persona should be positioned in one extreme (Goodwin, 2002). As a result of our empirical fieldwork, the ethnographic teams individually identified numerous characteristics and behavioural patterns which can be mapped to the dimensions from (Pruitt and Adlin, 2006a). The dimensions listed in Table 4 are the consolidated and agreed outcome of the joint interpretation of the results perceived by the local ethnographers. The fact that the ethnographers represented heterogeneous disciplinary backgrounds ensures that this list reflects an interdisciplinary perspective on knowledge maturing.

Dimensions (Pruitt and Adlin, 2006a)	**Characteristics**	**Description**
identifying details	name	name of Persona
	motto	an abstract statement that helps to quickly convey a central point that the Persona is about and thus can be used for explaining, referring to and visualizing the Persona
roles and tasks	role / degree of standardization	job description and some information about the degree of standardization of tasks the Persona has to handle or likes to handle, respectively
	workplace / colleagues	a description of the Persona's workplaces and information about relationships to colleagues the Persona is surrounded by
	task management	description of how the Persona organizes own activities and of how activities are triggered
skills and knowledge	education and professional background	information about school education or possible degrees the Persona holds and about coining experience it gained on the job
	learning	self-motivated learning of the Persona and (frequency of) occasions the Persona is confronted with the need for learning new things and description of how the Persona approaches it
	knowledge	description of knowledge that is relevant for the Persona, that is needed to perform tasks or knowledge the Persona puts a high value on
	formal training	description of subjects of formal training the Persona is interested in and of motivation behind participation in formal trainings
context and environment	reaction to requests from colleagues	description of Persona's reaction when asked for help by a colleague
	communication strategy / approach to knowledge sharing	explanation of how the Persona interacts with colleagues or other people within its environment, description of aims the Persona hopes to achieve when acting this way
	content types	types of meaningfully arranged (electronic) data the Persona uses as input for its tasks
	structures	description of how the Persona organizes own workspace and how it connects contents to one another
	important tools	a list of IT-tools that have a big effect on Persona's daily work or leisure time, respectively
goals and motivation	problem solving and other knowledge routines	description of how Persona deals with problems or other knowledge-oriented activities that can be partly routinized

	motivation / drives / interests	description of Persona's reasons for wanting to do something or achieve something as well as explanation of things the Persona pays attention to
	attitude towards technology	explanation of opinions and feelings the Persona has about information technology

Table 4: Dimensions for characterizing Personas

In our case, the Personas are identified by *name*. A *motto* provides a personal touch and helps to imagine the Persona as an individual.

Roles and tasks are represented by *role*, a description of the *workplace* of our Persona as well as its individual handling of tasks, called *task management*, which provides a rich picture of the Persona's daily business.

Skills and knowledge are represented by descriptions about the Persona's *education and professional background*. An important aspect for the design of learning technology is the Persona's *learning* strategy, handling of *knowledge* and *formal trainings*.

Context and environment show the Persona's interaction possibilities and are represented by descriptions about the community, e.g., the *reaction to requests* from colleagues and the Persona's *communication strategy*. Furthermore, descriptions about frequently used *content types,* what *structures* are used for organizing contents and *important tools* show the IT infrastructure available to the Persona.

Descriptions about goals and motivations can be found in the Persona's *motivation* and *problem solving* approach which is highly relevant for work-based learning scenarios. The *attitude towards technology* indicates how a Persona generally perceives usefulness of IT tools which we consider important for designing learning technology.

In some conceptual enterprise modelling approaches, there is a similar concept for capturing information about persons on the type level which is the person type (e.g., in ARIS). However, this model element is rarely used for the kind of rich information that is typically captured for Personas and which is described in Table 4. MATURE thus has substantially detailed the dimensions for describing Personas as suggested by (Pruitt and Adlin, 2006a) on the basis of the empirical data from the ethnographic study. This set of characteristics will be used by BOC as part of the PROMOTE meta-model (see section 4.3.1) in order to enhance modelling capabilities for depicting facets of knowledge maturing.

Figure 8 gives an example screenshot of the graphical representation of Personas Sally, Igor and Aisha using PROMOTE. As the figure shows, the Persona can be further specified using the aforementioned 17 attributes.

Appendix 8.6.1 lists all Personas characterized according to all 17 dimensions. Most of this detailed description of Personas was directly taken from field notes, the rest is based on joint reflections on the ethnographic data.

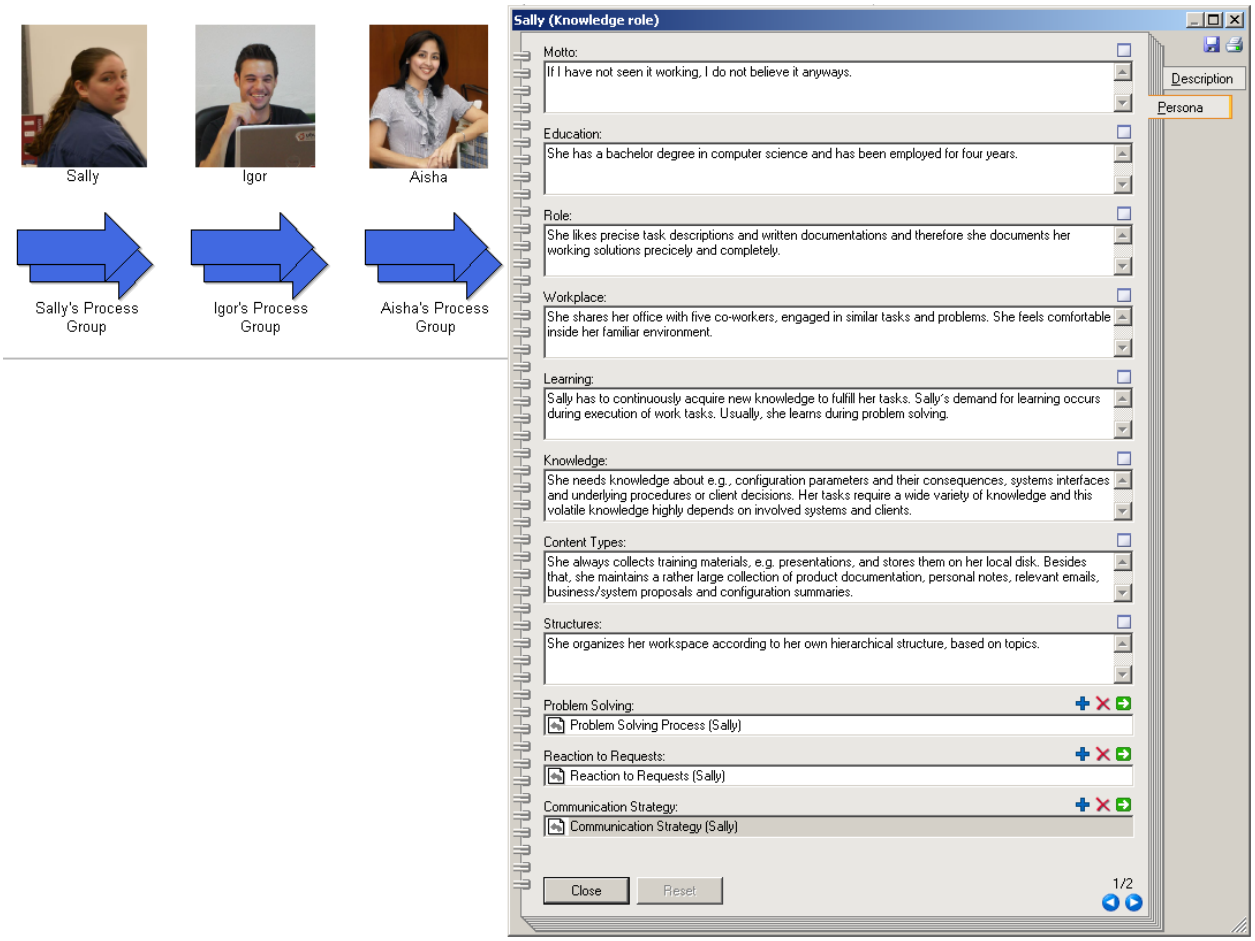

Figure 8: Graphical Representation of Personas in PROMOTE[5]

As mentioned before, Personas must come to life in designers' minds in order to exploit the potential of this approach. We felt that 21 Personas are too many to be kept in mind in detail when designing the system and also neglect the suggestion by (Randolph, 2004) that it is sensible to concentrate on one or a small number of primary Personas. An initial idea to reduce the number of Personas was discarded, because we figured that each of the Personas was a valuable means for discussion in the local context of co-working Personas in the studied organizations for selected design issues. For the purpose of remembering Personas' characteristics in consortium-wide discussions, however, it was deemed necessary to keep the number of Personas small. Pursuing this aim, FZI, UIBK and UPB worked on approaches to cluster the Personas in order to prepare an informed decision about selecting a (small) number of primary Personas. In preparation of the 4th consortium meeting from 28th to 30th January 2009 in Olten, each of those three consortium partners developed independently one possibility to cluster Personas with regard to their characteristics.

Although the 21 identified Personas vary in the way they perform tasks as well as in their behaviour, needs and objectives, it was possible to identify pools of Personas with similar characteristics. As one example of clustering, the approach adopted by UIBK is described in more detail in the following.

[4] *Sources for the pictures (creative commons):* *http://www.flickr.com/photos/valeriebb/399111745/*
http://www.flickr.com/photos/peterlozano/2831110288/
http://www.flickr.com/photos/george_reyes/2309222494/

[5] Please note that characteristics have been abbreviated with respect to the ones described in table 4.

As a starting point for clustering, the Personas were characterized by UIBK according to three dimensions taken from the knowledge maturing process (see section 5.2.2). Each dimension displays two phases of the knowledge maturing process as opposites. Each Persona then was classified with regard to these three dimensions using an ordinary scale. Each of the three possible values (left value, e.g., standardization – medium – right value, e.g., guidance/visionary) was represented by a specific colour (yellow, orange or red respectively). Table 13 (see appendix 8.6.2) shows the outcome of matching Personas' characteristics to these dimensions.

Table 13 can be used to create a graph as a visualisation of similarity of Personas' characteristics by following these two rules:

- if there is no difference between two or more Personas, then they are placed as a set within one ellipse
- if two (sets of) Personas are different with respect to only one colour-grade (red to orange or orange to yellow) in one of the dimensions, the (sets of) Personas are connected by a line

As the generated graph (see Figure 28, appendix 8.6.2) shows, Personas can be clustered into three groups that were named as follows:

- communication & serendipitous
- aggregation & combination
- routinized & isolationist

The only Persona that does not fit perfectly into one pool is Kevin. According to the conducted clustering, Kevin can be seen as a member of the aggregation & combination pool or as member of the routinized & isolationist pool, respectively. Because of his characterization as someone who learns in isolation (see Table 13, appendix 8.6.2), Kevin is seen as member of the latter pool.

The proposals from FZI, UIBK and UPB for Persona clusters are depicted by Figure 29, Figure 30 and Figure 31 in appendix 8.6.2. During a Flashmeeting videoconference that took place before the Olten meeting on 26th January 2009, FHNW, FZI, UIBK and UPB discussed the three proposals. We realized that the three proposals closely matched each other and, thus, the discussion concentrated on preparing a proposal for a sensible number of Persona pools which would predetermine the number of primary Personas. Factoring in the role the Personas should play in the process of identifying and reflecting use cases, we decided to limit the number of Persona pools to five. This further development led to the clustering depicted by Figure 32. The participants of the videoconference agreed on mapping the three proposals to each other and present them at the consortium meeting in Olten in order to spark discussion about the selection of primary Personas.

Furthermore, the five types of knowledge maturation investigated in the design studies and provided by UWAR were considered for the selection process of primary Personas:

- Serendipitous knowledge maturation – knowledge sharing and maturing is ad hoc and haphazard. Knowledge typically developed and shared as part of a development process for a product or service within the organisation or as part of training.
- Conscious knowledge maturation – communicating and sharing information both internal and external to the organisation accords with an explicit (organisational) strategy and is shared or disseminated in many different formats.
- Network knowledge maturation – a heavily reliance on information/ knowledge being shared within local networks. Individuals played a central role in this process of maturation as holders of the information and knowledge, determining what would be shared, when and with whom. Individuals often unaware of what they know, or how they acquired this knowledge
- Isolationist knowledge maturation – information and communication throughout the organisation is limited to an individual or team and not shared across the organisation.

- Visionary knowledge maturation – where an individual, or group of individuals understand the potential and possibilities for the use of ICT in the process of knowledge maturation both within the organisation and externally, but are currently constrained by policy, finances or organisational culture.

Figure 9 presents the result of these preliminary thoughts about the grouping of Personas. The clustering done by FZI is represented with orange rectangles. Yellow rectangles show the results of the approach of UPB, whereas red borders mark the three clusters found by UIBK. The names printed in bold mark the five primary personas which were selected in Olten.

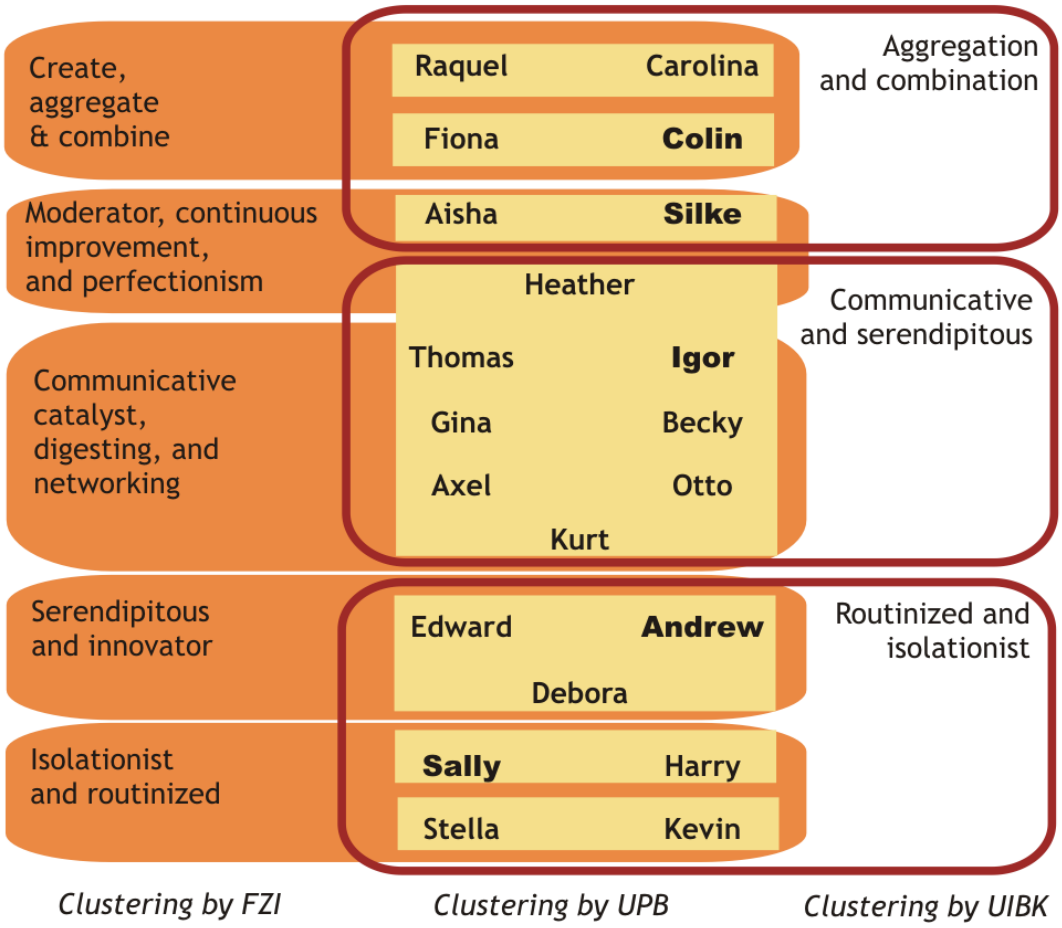

Figure 9: Mapping of approaches for clustering Personas

At the first day of the 4th consortium meeting, the mapping of proposals for Persona clustering (see Figure 9) was presented. The consortium discussed and agreed on these clusters and on identifying primary Personas. Nevertheless, it was decided to keep all identified Personas as they are considered to be useful for future decisions about design as well as functionality that are not fully covered by primary Personas. According to the mapping of Persona clusters (see Figure 9), the consortium was split into five groups. The groups were formed with the goal to contain at least one ethnographer, one representative from the application partners and one representative of the technical partners and each group aimed at selecting at least one primary Persona out of the pool it was assigned to. The resulting primary Personas are shown in Table 5 and were presented to the consortium. Appendix 8.6.3 shows the reasoning documented by the five groups for how and why they selected their primary Persona.

Group	Selected primary Persona
serendipitous & innovation	Andrew
isolationist & routinized	Sally
create, aggregate & combine	Colin
communicative catalyst, digesting & network	Igor
moderator, continuous improvement &perfectionism	Silke

Table 5: Selected primary Personas

The five groups that were formed in order to select a primary Persona then were kept throughout the 4th consortium meeting which was primarily dedicated to discussing candidate use cases, enriching the use case descriptions as well as adding new ones if deemed necessary. The five groups took on the perspective of their Persona and reflected on those use cases they thought most interesting for their Persona. They then turned their reflections into enhanced descriptions of the use cases which finally were discussed in a series of plenary sessions in the meeting. Members of the consortium agree that Personas have been a very useful instrument in order to render more concrete discussions about use cases. They have been especially useful as an anchor instrument in order to convey goals, needs and context of using the intended MATURE system from the perspective of concrete Personas with roots in the application environment of real-world organisations. The groups identified with their Personas, resulting in utterances like "Igor would never do that, he would rather ..." or "Sally would think this is great, because ..." or "Silke just would not find that useful in her way of organizing things due to ..." which greatly enriched the stories behind the use case descriptions and has helped to tease out the essence of the context – and motivation – needed so that the system can be used successfully.

4.3 Knowledge Maturing Cases

In addition to the personal or individual perspective applied with the help of the Persona concept, the rich ethnographic material has also been analyzed from a situational and a process-oriented perspective. This resulted in numerous concrete descriptions of both, short-term and long-term cases. The short-term cases are individual and thus situational, whereas the long-term cases involve many organisational members or even units and thus more process-oriented KM episodes, procedures, courses of knowledge maturing actions or sequences of actions. Especially on the long-term cases, the analysis has been done on the level of concrete instances of happenings rather than classes of happenings and thus we refrain from calling these processes. As these are instances of processes, often called cases in process management, we call the various strands of analysis done from these perspectives knowledge maturing cases. Table 6 gives an overview of the five types of cases that have been elicited from the ethnographic data by the ethnographic teams. Even though these results have found their way into virtually all year 1 MATURE activities successfully, there have been primary take-ups of individual types of cases shown in Table 6.

type of case	long running cases that span the entire knowledge maturing model	stories illustrating frequently used knowledge routines	stories describing change in knowledge maturity	hot knowledge maturing areas	knowledge handling and learning specific for individuals
primary use	refinement of knowledge maturing model (see section 5.2.2)	priorities of use cases (see D2.1 and D3.1)	indicators for knowledge maturing (see section 4.3.5)	refinement of knowledge maturing model (see section 5.2.2)	characterisation of personas (see section 4.2)

Table 6: Overview of knowledge maturing case types

These will be described in more detail in the following sections.

4.3.1 Long Running Knowledge Maturing Cases

Besides the short-term and mid-term observations in the ethnographic study, knowledge maturing cases were first introduced in order to analyze one particular instance of a long-term maturation of knowledge that came to a successful end within the regarded organizations. Obviously, this could not be directly observed in its entirety during the four weeks that we spent at the studied organisations, so this had to be described by one or more selected members of the studied organisations in personal interviews. The question posed towards members of the organisation was to report about an instance in which a new idea was successfully turned into a new product, service, competence or process. Contrary to the standardised process modelling approaches which describe classes of processes, these maturing cases are modelled on an instance level and represent one specific case and not a process class. This is due to our intention to capture as many specifics of an individual case as we could in a rich description of the individual case rather than the abstraction and generalisation that typically is conveyed by respondents when asked for the process on the type level. Also, we figured in the GISA study that each long-running maturing case carries a lot of specifics that cannot easily be generalised. The interviewees did not have hundreds, but rather several (up to a dozen or so) long-running maturing cases that came into their minds.

One exemplary knowledge maturing case which interviewees thought was a very successful case was selected to be analyzed further for each application partner. The BOC modelling suite, PROMOTE, and its corresponding method for modelling knowledge-intensive processes was used in order to structure and to document these cases in a semi-formal way. Using this approach, a smooth transition towards the MATURE system architecture in the sense of model-driven development will be possible. Although, the project members are well aware of the fact that there need to be many more steps necessary, particularly a representative study, that confirms the necessity and usefulness of steps to be supported by MATURE. Based on the graphical case representations to be modelled and the information needed for that, the following characteristic dimensions for process descriptions have been defined:

- *Task number (level).* The task number is used as a primary key for easy referencing single tasks.
- *Task name.* The task name consists of a short, characteristic name for the considered task.
- *Task description.* Besides the short name, the description gives a more detailed explanation of the considered task.
- *Participating organizational units.* For each task, organizational units such as work group or department and organizational roles were documented together with the type of participation, i.e. a distinction between the function of the respective organizational unit / role was made:
    - *responsible role(s).* The role(s) which is responsible for the fulfilment of the current task.
    - *performing role(s).* The role(s) which actually executes the current task.
    - *communicating role(s).* The role(s) which communicate in order to execute the current task, e.g. give information.
    - *informed role(s).* The role(s) which are either actively or passively informed about the current task.
- *Resources (input).* The name and a short description of all resources (documents, information, knowledge) which are needed in order to fulfil the current task.
- *Resources (output).* The name and a short description of all resources (documents, information, knowledge) which is created by/as a result of the current task.
- *Knowledge-intensive task (KIT).* A specialisation of task that defines if the current task requires a comparably high proportion of specific activities handling knowledge. Within BOC's PROMOTE meta-model a KIT is defined as task that requires or creates critical knowledge (Woitsch and Karagiannis, 2005).
- *Task number predecessor.* Number of task(s) which need to be executed before (as a prerequisite of) the current task.

- *Task number successor.* Number of task(s) which will be executed after the current task.
- *Remarks*. This is an unstructured field for further remarks e.g., reflections and potential requirements.

For the complete data, please refer to appendix 8.7. The data on these cases (see appendix 8.7.1) was analyzed regarding recurring patterns and similarities, as well as indicators like the number of people, roles or organisational units involved, the number of tasks currently not supported by IT, the number of tools used, the number of transitions between tools and content types, the number of tasks per knowledge maturing phase, the proportion of knowledge-intensive tasks, identified barriers, motivational effects. The number of tasks varies between 9 and 32 and described cases have between 0 and 3 sub processes. Another dimension depicting a great variety is the number of content types, which lies within a range of 1 and 11. In general the cases represented have different levels of granularity (for an overview see table 14).

In the following sections, one exemplary long running knowledge maturing case is described in detail, "New Solution development" from the study conducted at Gisa by UIBK.

New Solution development

The company hired a new employee for the application support team who just finished his Diploma. Based on his studies, the new employee became interested in the upcoming portal technology of the company's main software vendor. The employee acquired, encouraged by his line manager who thought that this would be an interesting technology, knowledge about portals in general and the SAP Enterprise Portal in particular (see sub process instance[6] no. 2). After doing so, he thought that this solution would represent a fit not only for his own interests, but he was also sure that the technology would carry high potential for being applied for the company's customers. He then discussed his ideas regarding the usage of this software with his colleagues and tried to convince them of its advantages. After having been promoted by the employee a bit, his team leader evaluated the proposition for the usage of the portal technology taking into account the team leader's existing knowledge about the company. The team leader decided that the idea fitted into the company's strategy. The team leader then discussed this with the head of the corresponding department and the CIO of the company. The idea was evaluated as a benefit for the company and it was decided that it fitted into the strategy.

After the employee's head of department was convinced of the proposal, the CIO of the company was involved in order to start an internal pilot project. The employee was sent for a training by the software vendor in order to gain additional product knowledge before starting the internal pilot project. In doing so, the employee gained knowledge about designing and implementing the portal solution. Based on the gained knowledge about portal technology and previous projects that implemented software of the vendor, the pilot project was planned in detail by the employee and his team leader. The internal project was conducted and the portal technology was implemented. With the help of this project, product and implementation knowledge was distributed by the employee and gained by other project members. After finishing the first release, the project was presented to the CIO and the results were evaluated.

After this evaluation, an organizational unit was dedicated by the division manager in order to support the internal portal and to gain more knowledge concerning this technology. It was then decided by the company to develop a proposal for a pre-commercial solution (see SPI 15). After implementing the first release, lessons learned were used to improve the initial release and to implement more functions previously nested in the old intranet homepage. In parallel, the company tried to acquire a customer for the recently used and experienced portal technology. After an interested customer was found, a project for a portal solution based on the knowledge gained with the internal portal was started. By implementing the project, product and implementation knowledge was distributed by the employee and gained by other project members. The technology was used in customer projects and therefore more employees needed to be instructed the use and impact of the implemented portal technology (e.g., helpdesk). As the first customer project comprised only a small part of the possible functionality of the technology, the remaining use cases needed to be implemented by a follow-up project. Therefore, a plan for an enterprise-

[6] Tasks could also be detailed further using sub-process instances (SPIs) which described tasks within a task.

wide roll-out was developed by the employee and the responsible division manager. After the project's completion, the first customer solution went live and was maintained by newly trained application managers. By maintaining this solution in a live environment, several support processes were identified which needed to be changed because of the new, integrated nature of the portal solution. After the enterprise-wide usage for the first customer was planned, the next release/project was conducted by a new project.

Sub Process Instance (task no 2)

First, the employee tries to find existing knowledge within the company and therefore investigates the company's knowledge base. After finding only a small amount of information, the employee talks to his colleagues in order to get some hints. After following these, the employee investigates the software provided by the company's main software vendor. After collecting a lot of information, the employee evaluates the benefits and the potential of the portal software.

Sub Process Instance (task no 15)

The employee uses the results of the internal project in order to derive a similar project for customers. He then develops a proposal and formalizes it. The proposal is then reviewed by his team leader regarding functional and technical requirements. After this, the proposal is reviewed with respect to formal criteria like layout and presentation by a sales representative of the company.

Figure 10 depicts as an example the graphical representation of the previously described knowledge maturing case "New Solution development". Knowledge intensive tasks (KIT) are highlighted.

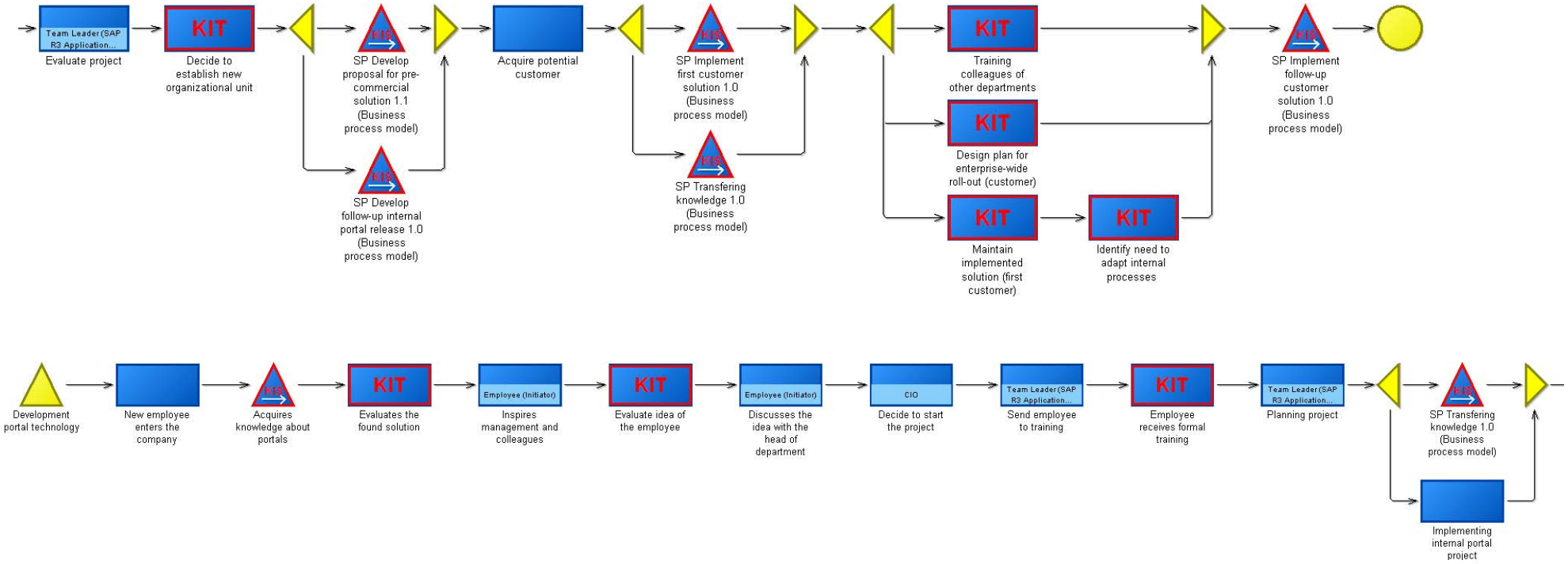

Figure 10: Graphical representation of the maturing case "new solution development"

Aggregated phase / Tasks comprised	GISA	Swisscom	STRUC	SKK	Synaxon
expressing ideas	5	8	1	1	3
appropriating ideas	9	2	4	2	3
distributing in communities	8	1		1	5
formalizing	7	5	4	3	5
ad-hoc training	1				1
standardizing				1	1

Table 7: Aggregation of phases of process instances

Based on the case descriptions created, we classified and aggregated each task comprised within the task to a maturing phase (see section 5.2.2). For doing so, we selected the most fitting phase for each task. Table 7 shows an overview of the number of occurrences of each phase within the maturing cases. It its noticeable, that the first four phases are much more prominent than the two last phases. Note that these process instances have been selected with respect to coverage: they needed to start at the idea phase and needed to last to at least until the 'formalizing' phase. However, a possible thesis would be that most ideas involve several refinement stages before they get standardized. This refinement of ideas would in turn initiate new phases like 'expressing ideas'. Another mentionable aspect is that two distinct groups of maturing cases can be distinguished: The cases of Gisa and Synaxon on the one side show an approach focused on decentralization where more networking and distribution of ideas within communities takes place. The cases of Swisscom, SKK and Structuralia lack of the distributing phase and build around a centralized approach typically focusing on a hierarchical model. This distinction fits to scenarios for knowledge management described in (Maier, 2007).

In addition to these long-term-oriented cases, ethnographers were asked to provide additional impressions about the organisational processes found at the application partners who will be reported in the following sections.

4.3.2 Frequently used Knowledge Routines

The ethnographic material was scanned for those knowledge routines which were deemed most important in the respective ethnographic context, including a prioritized list of used tools. Based on these descriptions, we derived an abstract presentation of tasks described. Besides the trigger, which presents the event that starts the routine, the considered task element could be one of the following activities:

Search. A task (or task element) that is conducted in order to identify and gather knowledge from various sources.

Transform. A task (element) that converts pieces of knowledge into other forms of appearance, e.g., adapts, changes, refines, extends or combines the collected knowledge.

Discuss. A task (element) in which the person carrying out the task jointly reflects e.g., a solution, with others

(Re)use. The task (element) the knowledge is/was created for in the first place is put to further use.

The sequence of routines identified within the rescan is depictured in Figure 11. The number of occurrence is labelled on the relationships between the triggering events and routines, routines and routines and routines and final state. The sum of all transitions for each category is depictured on the bottom of the figure.

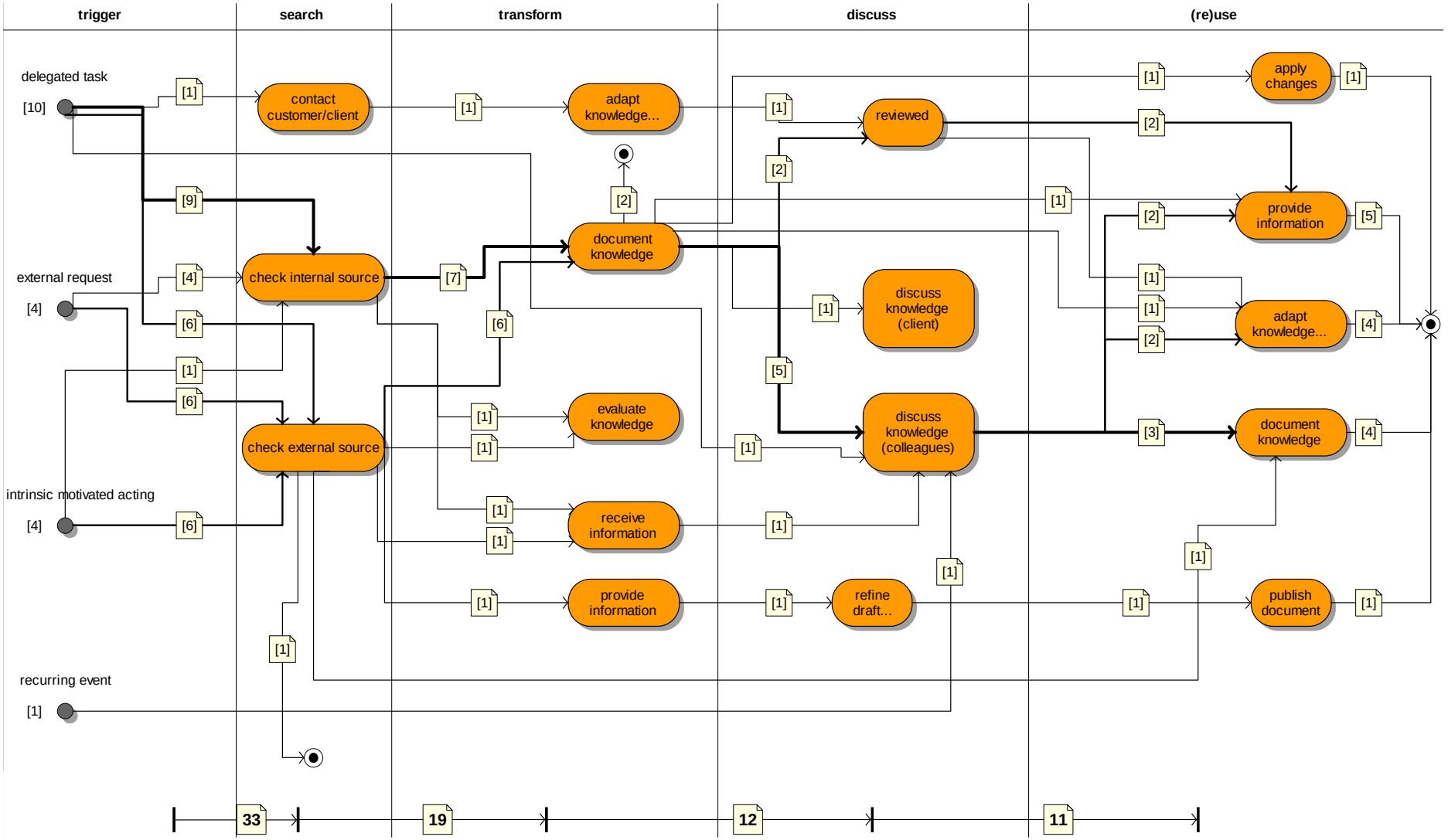

Figure 11: Sequence of knowledge routines

The identified routines are connected with relationships. The relationship between two categories is depictured as bold line for the relationship with the highest occurrence and the second raked relationship as medium line. By doing that critical paths or dominants ways are highlighted. These paths can be seen as frequently occurring sequences of routines, which should be primary supported by the MATURE software. This information was also used to facilitate the use case development for PLME and OLME. The frequency of occurrence seems to be one indicator for the relevance of activities or sequences of activities. Other indicators might exists which can probably identified within the representative study.

The dominant sequence is <delegate task>, <check internal source>, <document knowledge>, <discuss knowledge with colleague> and <document knowledge>. This sequence seems very common for knowledge work and is in line with the results from [Hädrich, 2008]. All activities can be supported by ICT. The support can be realized by existing tools or services or by mash ups of them. The results from both studies lead to the assumption that these sequences are depended from current tasks, job positions and application areas. These assumption could be tested within the representative study and facilitate the guidance processes.

It can be observed that the number of transitions decreases over the time. Thus, not all sequences fulfilling all stages or stages are jumped over. Some strands are merged, spitted or they reach a final state in early stage. Knowledge matures is not a continuous straightforward process. Furthermore, it can be seen as a kind of evolutionary growth process, which can stop at every stage and can have different final states. By knowing some typical sequences guidance of these maturing processes could be supported to a certain degree. Indicators describing these sequences are needed for automatically identifying and supporting these sequences by the MATURE software. The identification of such indicators is one aim of the representative study. Furthermore, the results should be verified within the in-depth case studies.

As one can see there are two activities that occur very often within the described routines: ‘document knowledge (system)’ and ‘check internal source (system)’, whereas many others occur only once. Therefore, these activities should be paid special attention to within the design phase of the MATURE software.

4.3.3 Hot Knowledge Maturing Areas

In addition to the elicitation of Personas as well as the in-depth description of long running knowledge maturing cases, the ethnographers also used the joint reflection of codes carried to in the 3rd consortium meeting in Barcelona on October 22nd for a joint brainstorming about so-called “hot knowledge maturing areas”. This term describes the identification of interesting questions which arose during qualitative analysis of collected data and which should be further pursued when revisiting data or possibly be discussed in separate interviews with representatives of studied organizations. Three teams reflected on codes given by ethnographers in the areas of:

- types of knowledge (contents) (FHNW, UWAR)
- routines (CIMNE, UIBK, BOC)
- tools, motivational factors, structures (FZI, UPB, TUG)

Each team identified 5-15 codes that were considered “important” and clustered them on tables in order to foster the process of brainstorming within the teams. As mentioned above, the task was to identify “hot knowledge maturing areas” that teams of ethnographers should look at when revisiting data.

Based on the identified areas, five questions were considered important in order to collect data from the respective associate partners. A first interview round was conducted at Gisa in November 2008 collecting initial data on newly defined topics. Following this, refined questions were surveyed by original teams of ethnographers with additional feedback from other application partners. For each question, i.e. for each hot knowledge maturing area, some facets were identified, based on the aggregated results over all cases and application partners. The detailed results can be found in appendix 8.7.3.

Area 1 (Valuation of knowledge and learning): Please describe the general valuation of knowledge or the handling of (core) organizational competencies in the organization you studied. How does this valuation materialize in, e.g., recruiting, project staffing, personnel development, formal and informal knowledge sharing events, management by objectives, dealing with errors etc.? What is the reasoning behind this?

- *Recruiting*. All application partners value knowledge as very important for their core business. Some application partners see recruitment as a way of gaining new knowledge.
- *Project staffing*. The application partners, at which project staffing is applicable define the skills of a project member as an important factor in their selection. However, preferences of the project leader, as well as personal interests of the project member and past projects are also taken into account.
- *Personnel development.* Two application partners support new employees by conducting formal training and defining a mentor for them.
- *Formal knowledge sharing events.* All application partners organize some form of knowledge sharing events, but the frequency as well as the specific embedding varies widely. Examples for those events include weekly team meetings or lessons learnt meetings at the end of projects.
- *Networking*. A number of different types of networks operating within the organisations were identified, including: local; specialist; professional development; and personal-professional. These networks represented a method of developing, managing, validating and disseminating knowledge. However, there was nearly no formal valuation of this networking.
- *Management by objectives* and *Dealing with errors*. There was insufficient data available in order to evaluate it properly.

Area 2 (formal levels of expertise): Which levels of expertise are distinguished within your organization, e.g., junior consultant, consultant, senior consultant? What are the changes with respect to learning and handling of knowledge once an employee is considered "fully qualified"? Please be as specific as possible. What are your own experiences?

- *Levels of expertise.* A level of expertise describes the subject-oriented maturity of an employee and has to be distinguished from the position he/she has within the organizational structure. Some organizations studied distinguished several levels of expertise, whereas others had no differentiation. Four out of six application partners are using levels of expertise within their organization.
- *Changes, when fully qualified*. The term "fully qualified" is defined by three dimensions: domain, organization and person. In general, a fully qualified employee should be able to identify his/her own learning needs, learn and act autonomously about needed topics and be able to teach less experienced colleagues.

Area 3 (continuous learning): How do you cope with the continuous need to learn, improve and keep up to date your knowledge and competencies?

- *Role*. The roles of the employees interviewed were either working self-guided and trying to find knowledge for specific application cases, or dealing with more general developments in certain business areas.
- *Content*. The content, the employees needed to cope with was usually about new developments, or policy changes in the specific business area and either were more technology/product-oriented, data (statistical) oriented or regarding new processes and methods.
- *Sources*. In general, colleagues were an important source for learning and staying ahead of the respective area. Also, different internet and print sources (magazines) were used for acquiring knowledge, although they varied greatly due to different business areas.
- *Available time*. There was insufficient data available in order to evaluate it properly.

Instances were identified in which time was allocated for formal training and learning. However, in contexts where it was necessary for individuals to maintain their knowledge and competencies for their day to day tasks, through informal learning, there was inadequate time available.

- *Influence on personal development*. Nearly all cases analyzed showed, that continuous learning was needed in order to execute their tasks. In some cases, advancing on the career path would greatly be influenced by acquiring new knowledge.
- *Formal training* . Formal learning in the form of INSET training, continuing professional development opportunities and formal education courses played a significant role for maintaining and developing the knowledge of those in contexts responding to rapid change.
- *Informal learning and development.* Within most of the organizations, the continuous need to learn and maintain knowledge was an essential element of their job role. Informal learning was an essential method of maintaining knowledge. For instance, individuals were required to have up-to-date knowledge and information on local education, training and employment opportunities. However, there were few formal processes for recording, storing and sharing this knowledge.
- *Occasion*. Nearly all of the cases had in common, that a lot of learning had to be done parallel to work.

Area 4 (artefacts): Which forms of representation for knowledge or artefacts are important in the company's daily operations, e.g., formalized training material, contributions in community platforms, emails? Why?

- *Artefact.* Most content types were either documents related to the daily business like project presentations or meeting protocols or they were knowledge oriented like FAQ-lists, product documentations or stored answers from colleagues to a certain problem.
- *Formalization*. Artefacts with all levels of formalization were found.
- *Location.* There were different specific locations used like file servers or PIM (see Area 5 below). However, artefacts could be stored in more than one location, especially, if the regarding content would exist in different stages of formalization.
- *Organizational vocabulary. Often the v*ocabulary used is organisationally prescribed and policy driven relating to professional identify. Language and vocabularies are shared across, and embedded within, the organization and comprise part of the knowledge structures.

Area 5: How are individual and group work spaces structured, e.g., own file system, file servers, email archive? Which concepts are used? Why?

- *Type of workspace*. All employees personal and one or more group workspaces relevant for their work.
- *Location*. The primary location for storing documents and information were file servers and the PIM. Other, less common locations were wikis, document management systems, portals or specific application systems.
- *Contents*. Most content types were either documents related for the daily business like project presentations or meeting protocols or they were knowledge-oriented like FAQ-lists, product documentations or stored answers from colleagues to a certain problem (see Area 4).
- *Concept*. The primary concept for structuring the personal and group workspace was that of a hierarchy which was, in many cases, sorted by task or time dimension.
- *Changeable*. Although all personal workspaces were changeable by the employees, a lot of group workspaces had a fixed structure, whether due to administrative issues or standardization efforts of the application partner.
- *Formats*. The workspace of most employees contained typical office formats like MS Word, Excel, PowerPoint and stored email messages.
- *Responsibilities for updating*. Depending on the system used for storing information, either everybody could update specific contents (wiki), or specific roles were defined being responsible for keeping information and knowledge up-to-date. In addition, there were some examples of not

defined responsibilities for updating due to the unstructured approach of the respective workspace.

- *Access rights*. There were two different approaches: either the workspace would be open for everyone in order to provide a broad knowledge basis for all employees or a rights management would be in place to protect business critical information.

The five areas provide rich information about the nature of knowledge maturing, both on a personal and organizational level. The most interesting aspects could be identified and were considered for design activities. Furthermore, these five hot knowledge maturing areas identify some open issues on knowledge maturing which should be answered in the representative study.

4.3.4 Stories describing changes in knowledge maturity

Besides the more general knowledge maturing cases (see section 4.3.1), several typical stories were collected, in which a change in the level of knowledge maturity could be observed. These stories were structured according to the dimensions also used for the codes (see chapter 4.1, (Maier and Sametinger, 2004)):

Who. This dimension describes the stakeholders. As these processes are less detailed than the knowledge maturing cases above, a distinction is only made between actively and passively involved stakeholders. Active stakeholders comprise responsible and performing roles, whereas roles involved in only communicating without taking an active part or only being informed are summarized as passive roles.

What. The subject of maturing is divided into the three concepts artefact, cognifact and sociofact (see see D2.1).

How. This dimension contains the order of task elements which represent the process described. Furthermore, relevant tools, which are necessary for executing the process described, are named.

Why. The motivation, why a certain process or task respectively is started is covered within the why dimension.

When. How quickly does knowledge mature in these stories.

The *where* dimension was neglected due to the fact that we aim at an electronic solution that can be accessed from anywhere.

A change in maturity can be seen as discernible step of development within or between phases of the knowledge maturing model (for a more detailed description refer to section 5.1)

In sum eleven stories were reported by the ethnographers. Three of them report on an increasing maturity of the observed subject within one phase of the knowledge maturing model (*intra-phase-maturing*). Seven studied stories describe a change in knowledge maturity that spans two phases of the knowledge maturing model and one spans three phases (*inter-phase-maturing*). Figure 12 provides an overview of the observed changes in knowledge maturity. Note that the figure only shows in which starting phases and ending phases the stories are mapped. The position of the arrows and alignment within the phase do not carry any meaning.

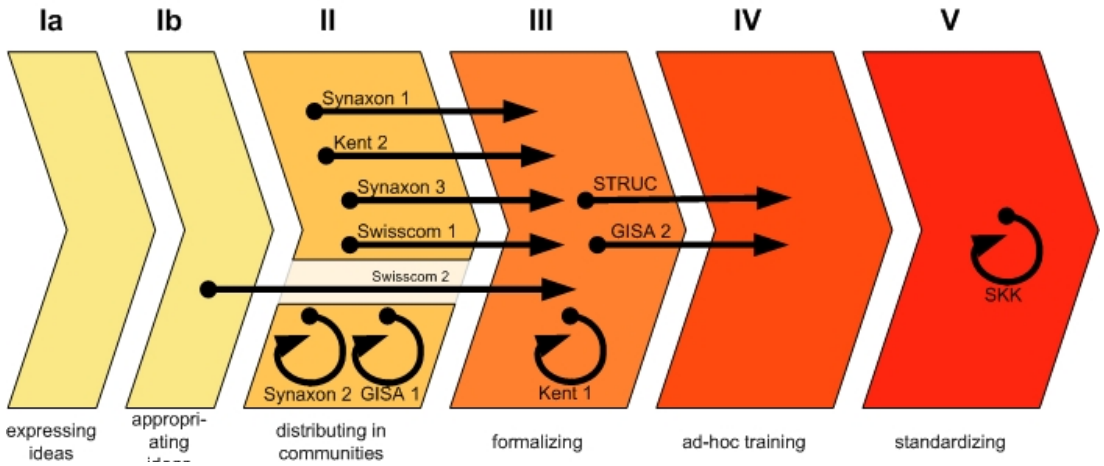

Figure 12: Observed changes in knowledge maturity

In the following all maturing stories will be described with respect to their mapping to the knowledge maturing process. Especially commonalities of stories describing similar changes in knowledge maturity are focussed. More detailed information can be found in table 28 up to table 31 (see section 8.7.4).

Intra-phase-maturing

Two stories (Gisa 1 and Synaxon 2) describe maturing within phase II (distributing in communities). In both cases a subject is discussed within a community. A clarified and common understanding of the discussed topic represents the outcome of in either case. The outcome of the discussion was not documented and hence not formalized in any way.

One story (Kent 1) depicts maturing within phase III (formalizing). An identified risk going along with an already existing and formalized process is reduced through the creation of additional guidelines that were also formalized. This led to an improved and more mature process.

Another story (SKK) reports on maturing within phase V (standardization). The starting point of this story is an already standardized process. This process was enhanced through the introduction of one additional task. As a result of the enhancement, the process was standardized again and increased in its maturity.

Inter-phase-maturing

Kent 2, Swisscom 1, Synaxon 1 and Synaxon 3 are stories that describe changes spanning the phases II (distributing in communities) and III (formalizing). All four cases include a subject that is discussed in a group. Additionally the result of the group discussion is formalized, e.g., as meeting minutes or presentation slides.

The stories Gisa 2 and STRUC report on changes that span the phases III (formalizing) and IV (ad-hoc training). Both describe the improvement of existing formalized contents, which results in didactically refined training material.

In story Swisscom 2 a recognized change in knowledge maturity is described that spans phases Ib (appropriating ideas) and III (formalizing). The first observed step of this story is the idea posted by a project manager. The project manager directly assigned the task to implement the idea to an employee. As no discussion within a community was observed, this story directly results in formalized knowledge represented by intranet contents.

Summary

Phase Ia was not covered be any reported stories. One reason of this is that this phase mostly takes place on a personal level and hence is not directly observable. Due to these difficulties in observing changes in maturity related to phase I, an investigation on an individual level within the representative study is needed. This data should be used to enrich the development of the PLME. Phase V was only observed in one single story. Most changes in knowledge maturity were observed in phases II, III and IV. Four stories

report on a recognised change in knowledge maturity that spans phases II and III and two report on a change that spans phases III and IV. Six cases end in the step 'formalizing'. Thus, it can be assumed that there is a need for technical support in standardizing knowledge within organizations. Therefore, this point was considered during the development of use cases (see D2.1 and D3.1).

One observed change in knowledge maturity leaps over phase II (distributing in communities). This shows that the phases of the knowledge maturing model are not processed in a sequential way. Section 5 elaborates more on the argument against misinterpretation of the knowledge maturing model as a linear model. The focus was on changes that increase the level of maturity of a subject. A change in the opposite direction was not observed.

4.3.5 Knowledge Maturing Indicators

All ethnographic teams were also asked to specifically review their empirical data in order to look for indicators that allow us to conclude that knowledge maturing has happened. This is particularly interesting for those maturing services that aim at creating awareness for the state of maturity of knowledge areas or domains which might help OLME users in order to decide about which guiding activities they should choose. Knowledge maturing indicators are important means for determining in which knowledge maturing phase a certain unit of analysis currently is, e.g., a knowledge domain, an area of competence, a project, a process or an organisational unit. On this basis, decisions about (re-)seeding activities to be applied can be taken.

Medium	Knowledge maturing indicators	CIMNE	FZI	UIBK	UPB	UWAR	Sum
artefacts	acceptance into filtered domains	x		x			2
artefacts	agglomeration of similar information according to one topic	x			x	x	3
artefacts	being part of guidelines/standards	x	x			x	3
artefacts	choice of an artefact presented by search	x			x		2
artefacts	created/refined during a meeting	x		x	x	x	4
artefacts	documents prepared for meetings	x			x	x	3
artefacts	generic change of document	x			x	x	3
artefacts	level of integration (e.g., all functions in one system, many systems under one GUI, one main system which invokes other systems, many systems exchanging data, many systems with no data exchange)			x			1
artefacts	reduced user group			x			1
artefacts	sent to customer			x		x	2
artefacts	type of document or type of portion of document (extracted from content or manually annotated)	x		x		x	3
artefacts and people	documents changed after process executions (by themselves, by others)	x		x			2
artefacts and people	documents changed after the person has learned something in this context	x			x	x	3

artefacts and people	enlarged user group			x		x	2
artefacts and people	rating by users			x			1
artefacts and people	reputation of role (of person or group) handling document, e.g., creator, sender, signer	x	x	x		x	4
artefacts and process	change in a predefined workflow			x	x	x	3
artefacts and process	change of todo-lists	x			x	x	3
artefacts and process	used in presentation (customer, team meeting, executive meeting, conference)			x		x	2
artefacts and process	used in training course	x	x	x		x	4
people	change in social network, e.g., mentor relationships			x			1
people	change of roles or responsibilities			x			1
people	participation in discussion, e.g., with expert, novice (via mail or in person, …)	x		x	x	x	4
people	participation in project (long term)			x		x	2
people	qualification, e.g., training, certificate		x	x			2
people	time with the current organisation			x			1
people	total time of professional experience	x		x		x	3
process	certified (standardised) process	x		x			2
process	create, check, use of information in process	x		x		x	3
process	documented process	x		x	x	x	4
process	elapsed time since last change			x		x	2
process	improvement of process (execution time, costs, quality, flexibility)	x		x			2
process	number of cycles within the process	x		x			2
process	number of decision within process	x		x			2
process	number of participants	x		x			2
process	number of successful repetitions		x	x			2
process	time to create	x			x		2
Sum		23	5	29	11	24	

Table 8: Knowledge maturing indicators

The collected knowledge maturing indicators were mapped to three different mediums (Maier, 2007) in which knowledge can reside or be related to. If the related knowledge is embedded within an object, the

artefact dimension was mapped. This is usually the case for documented knowledge like, e.g. lessons learnt or product knowledge. Knowledge which resides within individuals is mapped to the people dimension, whereas knowledge on a collective level is mapped to the process dimension.

The list of indicators provides a first overview of relevant aspects which may give a hint on knowledge maturing. These indicators are highly relevant for maturing services (see D4.1) which should detect and support such situations. In the first step, these indicators are useful for design activities but for implementation, more detailed information is needed. The research on maturing indicators will be one main aspect of the representative study and the in-depth-study later on.

4.4 Conclusion

This chapter provided a detailed overview of the main findings from the ethnographic study. Within the study, a profound overview of existing knowledge routines, knowledge artefacts and tools for knowledge handling was achieved. This foundation was important for creating a common understanding within the MATURE consortium and forms the basis for the design activities in general and the design studies in particular. Furthermore, a human-oriented perspective, e.g., personas, which fit to the user-centred design approach (see D6.1) were introduced. From 21 identified personas, five primary personas have been selected and have been used to facilitate and coordinate the design activities in the other work packages (WPs 2 to 4). By linking use cases directly to personas, they play the role of a central coordination instrument of the design activities.

The long running maturing cases present a holistic picture of comprehensive real-world maturing examples. They provide valuable input for the development of the knowledge maturing model. Frequently used knowledge routines present idealistic sequences of knowledge routines which can be performed during knowledge maturing. These sequences flow into the further development of the knowledge maturing model and provide input for the design of knowledge services (see D4.1). Nevertheless, both aspects need more investigation and are considered within the representative study.

Rich descriptions about knowledge maturing and changes in the level of maturity were given by hot knowledge maturing areas and stories describing change in knowledge maturing. Both are important for building a common understanding within the MATURE consortium and the design of services which should guide knowledge maturing. The indicators for knowledge maturing are a first step to operationalise characteristics of knowledge maturing which should be used to automatically detect changes in the maturing of knowledge in the MATURE software. The data from the ethnographic study was used extensively for the further development of the knowledge maturing model which is presented in the following section.

5 Knowledge Maturing Model

This chapter reports on the results of the activities in this work package that converge into the refined version of the knowledge maturing model (version 2). These activities are based on a thorough review of the literature and related work, a structured content analysis of other maturity models that has informed the reflection of our knowledge maturity model with the help of an interrogative framework, the results of the ethnographic study presented in section 4 and numerous discussions in the consortium. Section 5.1 introduces the concept of knowledge maturing and briefly reports on the distributed activities to clarify the state of the art on which the knowledge maturing model can be built. Section 5.2 gives an overview of maturity models found in the literature and derives a list of questions that are then used to guide the extended description of the knowledge maturing model. Finally, section 5.3 reflects on important aspects of the motivational sub-model used in MATURE.

5.1 What is "knowledge maturing"?

The notion of "knowledge maturing" is the central concept of the MATURE project. It is placed in an interdisciplinary ground which is reflected in the composition of the MATURE consortium, and so the first year of the project has also focused on evolving the initial understanding and model.

5.1.1 Procedure

The consortium has been engaged in a distributed task of **literature review** resulting in **Wiki pages** on concepts considered important with respect to knowledge maturing. These **concepts** include among others knowledge maturing as distributed cognition, ontology maturing, maturing of competencies, process maturing, task management, (business) process management (BPM), BPM lifecycle, process maturity (e.g., CMMI), intellectual capital, agile process management, business rules, process repository, formal and informal learning, mobile learning, learning in context, didactic concepts of e-learning, personal or individual knowledge management, relationship between culture and informal learning, scaffolding informal learning, representation and recognition of informal learning, significance of identities, personal learning environments, communities of practice, organisational Learning, theories of action, SECI model, SER Model, types, processes, methods of organisational learning, innovation management, knowledge design, knowledge operationalisation, knowledge identification, knowledge access, knowledge creation, knowledge storage, knowledge distribution, knowledge monitoring, knowledge performance definition, knowledge goal specification, knowledge measurement, knowledge evaluation, motivation and incentives for sharing, communicating, learning, fostering intrinsic motivation, barriers, economic views on incentive systems, knowledge and maturing services, user profile services, associative networks, cognitive architectures, Web 2.0, service-oriented architectures as well as the state-of practice with respect to tools available within the consortium and on the market. The detailed results can be found on the **MATURE Wiki** (http://wiki.mature-ip.eu/).

In addition to this activity investigating a wide range of theories, approaches, and findings from different disciplines, the following activities contributed to our understanding of knowledge maturing:

- A structured **collection** (as part of the evaluation in WP6, see D6.1) of the initial understandings **of knowledge maturing** of the project participants and an analysis of their overlap and differences.
- Reflection on the **results of the ethnographic studies** (as part of the coding process, see section 4.1, the rich descriptions of Personas in section 4.2 and knowledge maturing cases in section 4.3, particularly the stories describing a change in knowledge maturity and the long-running knowledge maturing cases).
- Reflection on the **design studies** and use case development, yielding user needs from a solution- and intervention-oriented point of view.

Informally, knowledge maturing refers to a form of development or evolution of knowledge. **Mature** as an adjective carries numerous connotations. Examples are complete, elaborated, fully aged, fully developed, having attained definite form, having reached a limit, perfected, ripe or saturated. **Maturing** then denotes the process of development or of becoming mature. The metaphor "maturing" has been chosen in analogy to other disciplines like

- *biology*: maturing refers to a growth process that leads to a capacity to survive on an individual and species level,
- *economy*: mature markets are saturated markets, i.e. markets that are no longer expanding; maturity also refers, e.g., to industries where it denotes a stage in the industry life cycle between growth and decline or to bonds that are due, i.e. ready to be paid,
- *geology*: maturity refers to the development of streams of landscapes until the stage of maximum topographical diversity,
- *medicine*: mature means that a process has attained a definite form or function as the end stage of biological development,
- *sociology*: maturity denotes the socialization process towards fulfilling requirements of an effectively running social system, and
- *psychology*: maturing refers to the progress of (childhood) development of human beings, particularly of personality.

All of these forms of usage share that it is a development process and it can be associated with a direction (towards a higher degree of maturity). Moreover, numerous theoretical models have been suggested that distinguish a number of **phases of maturing processes**. The discipline of developmental psychology has a long tradition of phase-oriented characterizations of development or maturing processes with an early emphasis on infants and children and later additions to adolescents, adults and aging people. Examples are the phase models describing childhood development by (Bühler, 1918) or (Piaget, 1926), Freud's maturing model of psycho-sexual development (Freud, 1991) or Kohlberg's model of the development of morale(Kohlberg, 2008).

What we need to clarify is (a) the subject of the evolutionary process, (b) the direction, and – somewhat connected (c) the criteria for maturity as well as (d) the characteristics of the knowledge maturing model as compared to other maturity models including the well-known capability maturity model (CMM or CMMI).

In the following sections, we explain our approach to a refined definition of knowledge maturing and other related processes, primarily address the subject (a), before moving on to describing direction and criteria for distinguishing different phases of maturity (b+c) as well as reflecting on the key characteristics of the knowledge maturing model (d, section 5.2).

5.1.2 Distinguishing knowledge maturing from other forms of knowledge evolution

The collection of statements from consortium members about their understanding of knowledge maturing has revealed that we tend to mix up the definition of knowledge maturing with our understanding of what is related and what we thus need to influence in order to improve knowledge maturing. Based on the discussions within the project, and particularly from results of user studies with the SOBOLEO tool (e.g., at the EA-TEL Summer School 2008, (Braun et al., 2008) and the studies conducted with students at the University of Innsbruck), we came to identify the following dimensions that are related to the phenomenon of knowledge maturing:

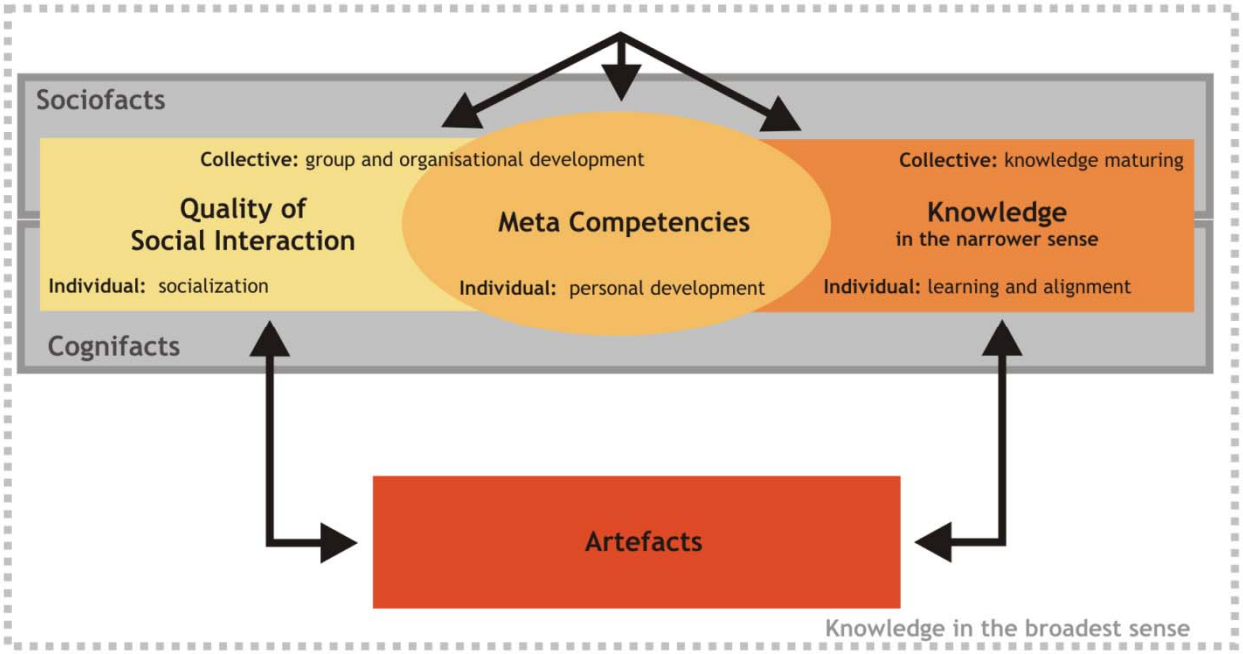

Figure 13: Dimensions of knowledge maturing

- The **knowledge** dimension refers to knowledge in a narrow sense, i.e., domain knowledge in a non-tangible form, including "know-what" and "know-how". Knowledge in this understanding is always bound to people's minds – everything beyond that is an *abstraction*. This dimension represents the main domain described with the first maturing model where knowledge was understood differently on the individual and the collective level:
    - **Individual** level. On an individual level, we follow the assumption that knowledge is bound to individuals' minds and their structures. The process of augmenting and changing that knowledge is what is usually called (individual) **learning** processes. There are manifold forms of learning and their adequacy depends on the type of knowledge, the individual, and the situation at hand. One special form of learning (which is often not explicitly considered as learning) here is also the alignment to the understanding of others of the same real-world phenomenon.
    - **Collective** level. The collective knowledge level is an abstraction if we "zoom out" from an individual to a (larger) group of people. From this meso and macro perspectives[7], we can speak of collective knowledge as an aggregation of individual pieces of knowledge. From this meso- or macro-level, we can (despite the fuzziness of aggregation) see if an individual learning process contributes to an advancement of the collective knowledge level, which is what we call **knowledge maturing**. While learning at an individual level is always the prerequisite for any advancement on the collective level, there is a fundamental difference if an individual just learns what others have learnt before (e.g., like a pupil at school) or if this learning is an active construction process that advances knowledge on a higher level. We call this "higher level" the collective level. This has a quality of its own while still acknowledging that it is an abstraction from the sum of individual knowledge. This also corresponds to the notion of a shared understanding of a collective. Such a collective does not necessarily refer to a global level, but can also refer to smaller collectives like an organisation (macro level) or a team (meso level). Development on this collective is what knowledge maturing in its narrower sense is referring to.

[7] Depending on the size of the organisational unit (macro stands for the entire organisation, e.g., a company, whereas meso denotes any organisational level within, e.g., a work group, a project or a department.

- **Artefacts** are manifestations, touchable or visible items, either in physical or electronic form (e.g., models, documents, videos, notes). The relationship to the knowledge dimension is important, but complex and can be described as the following: while those artefacts do not "contain knowledge" in the proper sense, they are instruments to communicate about knowledge, form part of learning processes and thus reflect maturity of knowledge. However, the maturing of artefacts is not always synchronous with the maturing of knowledge. As the example of Wikipedia shows (Braun and Schmidt, 2007). Wikipedia is by definition of the community[8] concerned with mature knowledge. However, the artefacts (i.e., the articles) often start from a very immature level and follow their own maturing process. As a consequence, the maturity of artefacts is dependent on the maturity of the underlying knowledge, but not vice versa. Very mature knowledge does not need to be embodied in mature artefacts. We then have a **maturing process for artefacts**, which needs to be clearly distinguished from knowledge maturing, but which is dependent on the knowledge maturing process and might even influence the latter. This maturing process for artefacts is different for different types of artefacts, such as ontology maturing, process maturing, and content maturing.
- Not only artefacts facilitate learning and knowledge maturing, but also **"meta-competencies"** of the individual or the organisation.
    - **Individual level.** As knowledge maturing rarely is an individual activity, but rather a collaborative activity where individual activities become interconnected, the individuals in that process need collaboration competencies that enable them to participate in knowledge maturing. This comprises a general willingness and competencies to interact with others, communicate, negotiate, compromise and accept rules. But it also affects the competency with respect to learning and coping strategies. These determine the capability and affect the motivation to engage in maturing activities. Individuals can only build a shared understanding, shared artefacts and methods to create these if they learn to collaborate on the individual as well as on the collective level. The process of evolution of these competencies is what we call **personal development**.
    - On the **collective level**, we have to take into account that there is also a capability of organisations to make knowledge maturing happen within its social system. This refers to organisational competencies like innovation and change to external stimuli, communicative culture, dealing with errors, work organisation etc. The evolution of these organisational competencies is part of what we call **team** and **organisational development**.
- Other aspects of **quality of social interaction** refer to more stable areas like the value system, non-explicit rules and norms. On the **collective level**, an evolution of this is part **of team and organisation development** processes, while on the **individual level** we call this process **socialization**.

As knowledge maturing is an inherently social phenomenon, it has turned out to be useful to describe it from a social interactionism point of view. The result is a categorization of knowledge (in its broadest sense) into artefacts, cognifacts, and sociofacts; the theoretical background is described in detail in D2.1. Artefacts refer to codified representations of knowledge, cognifacts refer to the individual knowledge, expertise, and competencies, and sociofacts describe collective knowledge phenomena (including collective rules, norms, but particularly also collective knowledge in the narrower sense). This categorization.

[8] Notability Guideline ("A topic is presumed to be notable if it has received significant coverage in reliable sources that are independent of the subject."), http://en.wikipedia.org/wiki/Wikipedia:Notability

5.1.3 Defining Knowledge Maturing

According to the distinctions and considerations laid out in section 5.1.2, knowledge maturing refers to knowledge (in the narrower sense) on a collective level, but the notion of "maturity" additionally requires a direction. Therefore **we define knowledge maturing** as the goal-oriented development of collective knowledge, or better **as goal-oriented learning on a collective level** where

- *goal-oriented* describes knowledge maturing as a process with a direction. The goal can be an individual goal (e.g., deepening the understanding in certain areas out of curiosity), a team goal (e.g., developing a full grasp of known errors with respect to a product that the team works on), or an organisational goal (e.g., refining a certain core competency of an organisation). The goal can be fuzzy (like interest), or concrete. Goals typically change over time and get aligned in social processes, resulting in a direction as a (mostly a posterior) interpretation.

- *collective level* can refer to a team, an organisation, a community etc., i.e. a "collective" can refer to different levels of granularity. This encompasses that usually knowledge maturing is not the result of an activity of an individual, but of an interconnected series of activities of interacting individuals, frequently also within different collectives.

- *knowledge* is understood as both cognitive structures bound to individuals' minds (becoming manifest in their behavior) and as an *abstraction* of the knowledge of individuals in a collective.

This model allows for describing more clearly the focus of the project: **MATURE focuses on improving the knowledge maturing process as a goal-oriented learning process on a collective level.** This is the **primary goal of the project**. However, there are hardly any means to influence this directly (in a repeatable way) so that we need to intervene on the other dimensions as **secondary goals** by:

- Improving individual learning processes (knowledge dimension) as the foundation for (collective) knowledge maturing processes
- Improving artefact creation and usage processes (artefact dimension) as the visible and measurable product of knowledge – both on the individual and collective level
- Developing personal meta-competencies as a personal prerequisite to be able to engage in knowledge maturing activities
- Developing the quality of social interaction by applying team and organisational development interventions.

In different contexts and because of the importance for knowledge maturing proper, we also speak of **artefact or cognifact maturing** as metaphors to describe similar processes with a different object. While these phenomena have to be distinguished from "knowledge maturing", the presented model also clearly shows that these are interconnected and have to be considered if we want to improve knowledge maturing. We do not include them in the definition of *knowledge* maturing, however. Particularly, we emphasize that knowledge maturing is not the same as individual learning: (Individual) **Learning** activities are activities in which the knowledge *of the individual changes*. They can take place on their own, but also in social contexts.

The relationships between knowledge maturing and those other development processes is complex and important to investigate. Efforts in that direction are already represented in the knowledge maturing presented below and its specializations.

5.1.4 Relating knowledge maturing to other fields

As part of the state of the art activities, we have identified some approaches that will play a key role in the further course of the project.

The concept of **communities of practice** was first introduced by Lave and Wenger (Lave and Wenger, 1991). Communities of practice are "groups of people informally bound together by shared expertise and

passion for a joint enterprise" (Wenger and Snyder, 2000). In communities of practice, individual experiences are shared, new knowledge is created, and problems are solved through interactions between community members (Brown and Duguid, 1991, Wenger, 1998, Brown and Duguid, 2001, Brown and Duguid, 1998).

The power communities of practice have in handling knowledge can be understood through the evolution of practice and identity in themselves that can be seen as a result from a "shared history of learning" (Wenger, 1998). Through learning, community members negotiate new practices based on past and present practices and on their identities. Current practice is pushed to new levels by the members while they gain new identities during the process: competent members are identified; incompetent members are labelled; newcomers become experienced members; and old-timers who are no longer involved lose significance. Hence, communities of practice provide an effective environment for knowledge sharing as well as knowledge creation (Brown and Duguid, 1998, Lave and Wenger, 1991, Brown and Duguid, 2001).

Wenger, McDermott and Snyder (Wenger et al., 2002) postulate that CoPs move through five different stages of development whereby in this context the middle one seems to be interesting since it is about maturing of practice, including knowledge base, tools, methods and language. In order to prevent a community from abandoning coordination and mutual understanding a process, called reification, has to occur. With the aid of artefacts, like shared symbols, documents and stories, something that is abstract becomes associated with a concrete form and as a consequence implicit parts of knowledge are translated into explicit ones that can be internalized and spread throughout an organisation. By projecting meaning to the external world (forms), reification enables communication if the emergence of artefacts is accompanied by the growth of consensus about the form-meaning-pairs among the members of a community.

In terms of the knowledge maturing model, this reification produces artefacts that reflect and summarize the intangible knowledge of the community on the collective level. As a consequence, MATURE can leverage on the body of research on CoPs to understand community processes in a better way, particularly the relationship between social environment, knowledge, and artefact.

An important aspect of knowledge maturing is its distributed character, i.e., the interconnected individual learning processes that contribute to the collective process, both in terms of distribution between agents (persons or communities) and distribution between internal (knowledge dimension) and external knowledge representations (artefacts). This characteristic lends itself for viewing knowledge maturing as a process of **distributed cognition** where several interdependent agents exchange knowledge amongst each other using direct means of communication as well as external knowledge representations.

This strand of research has already been explored as part of WP4 activities (see D4.1 for details) and appears to yield an appropriate theoretical framework (see also (see also Schmidt et al., 2009)) for conceptualizing maturing services.

5.2 Describing Knowledge Maturing

This section first analyses maturity models (section 5.2.1) in order to inform the characterization of our knowledge maturing model. Section 5.2.2 then presents the revised knowledge maturing model, version 2. Section 5.2.3 details this model concerning the three types of artefacts process, ontology and competence models. Finally, section 5.2.4 briefly touches on interventions into improving activities of knowledge maturing in organisations.

5.2.1 Background on Maturing Models

There is a large number of **maturity models** that can be found in the literature (see table 10, section 8.3, which covers 52 maturity models together with their sources of literature). One of the earliest maturity models with respect to development of organisation (developing software) has been proposed by (Nolan, 1973). His stage theory of management of information systems or, as he called it back then, of computer resources, influenced many future similar models in which the stages have been adapted to the

contemporary management challenges. Compared to Nolan's model, **stages, transitions and recommendations** have often been described in more detail.

A list of maturity models collected in the literature can be found in appendix 8.3. These models differ with respect to the following dimensions which are illustrated with the help of a number of questions. These questions have been developed based on the results of a **structured content analysis**[9] applied to a selection of 16 models marked by "x" in appendix 8.3. The questions show similarities and differences between the models

- What is the understanding of the term maturing? change in quality – change in capability – change in risk
- What is the character of change of the maturing object? – change in quantity vs. change in nature of maturing object
- In which direction does the maturing object change? – increasing or decreasing direction
- Which object is maturing? competence – infrastructure – product – service – process – structure
- Does the maturity model aim to complement another maturity model? yes (mostly CMM) – no
- How is the model designed? linear – iterative – cyclical
- How many stages does a maturity model have? 3 – 4 – 5 (most) – 6 – 7 – more
- Does the stage description include a "not existing" stage? yes – no
- What does the stage description of a maturity model contain? conceptual stage description – trigger description – activity description
- How does the maturing element proceed from one stage to another? discernible events / triggers / goals achieved vs. stages fading into each other
- Does the maturity model allow or recommend level skipping? yes – no (mostly)
- Does the maturity model allow parallel maturing processes for the maturing object? yes (mostly) – no
- How many triggers does the stage description of a maturity model include? mostly >1 trigger
- How many trigger levels does a stage description contain? main trigger level – sublevel
- Which kind of trigger benchmarks does a maturity model use? quantitative – qualitative
- What is a maturity model used for? conceptual – practical; descriptive – explicative – normative
- Who uses the maturity model? internal vs. external assessment teams
- Which sources is a maturity model based on? practical experiences – standards – literature reviews – already established maturity models
- Where does the data needed to assess maturity stages come from? interviews (mostly) – documents – questionnaires – data bases
- Does the maturity model offer tool support? assessment model (mostly) – software tool

[9] We decided to rely on textual descriptions of maturity models as sources for our investigation in order to be able to cover a number of models and compare them. A suitable method focusing on the analysis of contents and the identification of criteria is the structured content analysis (Mayring, 2008b)[Mayring 2008]. The general procedure of a structured content analysis covers (1) definition of the analysis items (here: textual descriptions of selected maturity models), (2) definition of structuring dimensions, (3) definition of its underlying category system (3) (here: structure and category system have been determined by the analysis question "Which characteristic patterns can be observed by comparing maturity models?"), (4) a verbal definition of the derived categories, (5) work through of the material and (6) extraction of findings into the structure and, finally, (7) an iteration of the steps 2-6 to rework the category system. The result of this process is amalgamated into the questions presented in this step.

- Does a maturity model offer certification? yes (mostly) – no

Our knowledge maturing model has then been rated against these questions. The purpose of this analysis is to characterize our knowledge maturing model and show in what respects it is similar, but, even more importantly, different from established maturity models, like the capability maturity model (CMM). Also, there are several maturity models which can influence our thinking about, e.g., what maturity means, what is the subject of maturity etc. The results are as follows:

What is the nature of maturing?

- How do elements change in time?
  Knowledge elements (artefacts, cognifacts, sociofacts) change in nature while they advance through the knowledge maturing process.
- What does maturing mean?
  Maturing means a change in several dimensions including formality, distribution, commitment, legitimation, understandability and teachability of the maturing subject, i.e. of socially constructed knowledge in an organisation.
- What is the direction of change?
  Maturing means an increase with respect to the dimensions formality, distribution, commitment, legitimation, understandability and teachability of the maturing subject.
- What is the maturing subject?
  The maturing subject is a knowledge area in the sense of a chunk of knowledge in a socially distributed activity system.

How is the model designed?

- Has the model a conceptual mother model?
  The knowledge maturing model is not related to any other maturity model.
- Does the model complement other models?
  The knowledge maturing model is not intended to complement another model.
- What is the model used for?
  The knowledge maturing model can be used as an analytic model to help structure the analysis of existing organisational and technical infrastructures in support of goal-directed learning on a collective level and can be further enhanced to help design such infrastructures with respect to their ability to guide knowledge maturing.
- Who uses the model?
  The knowledge maturing model can be used by members of organisations taking on the role of guides helping to foster and reduce barriers for knowledge maturing.
- How is the model designed?
  The knowledge maturing model is designed as a sequence of phases which do not necessarily build on each other in strict way. Each phase can use outputs provided by all other phases as inputs for knowledge maturing activities in this phase.
- How does the subject proceed from one level to the next?
  The maturing element matures implicitly between the stages. However, there can be explicit decisions to take a knowledge area from one phase to the next one.
- What is the number of stages?
  The knowledge maturing model has six stages.
- Is there a "not-existing" stage?
  The knowledge maturing model has no "not existing"-stage.
- What do the level descriptions include?
  The level descriptions of the knowledge maturing model include conceptual descriptions of the stages.
- What is the degree of detail of the trigger description?
  The knowledge maturing model has no triggers between its stages.

- Is level-skipping possible?
  The knowledge maturing model allows for level skipping.
- Are there parallel maturing processes possible for one unit?
  Within one organisational unit, there might be different knowledge areas which are in different knowledge maturing stages.
- What is the number of goal levels?
  The knowledge maturing model has no goals assigned to its stages.
- What is the method of goal benchmarking?
  The knowledge maturing model uses a non-metric way of goal benchmarking.
- Where do assessment data come from?
  The knowledge maturing model is not practically used yet, so assessment has not been specified yet.

How is the model used and supported?

- What is the model used as?
  The knowledge maturing model is used as a conceptual (analytical) model.
- Is tool support available?
  The knowledge maturing model as a whole is not yet supported by a tool.
- What is the model description based on?
  The knowledge maturing model is based on practical experience.
- Is there a certification available?
  There is no certification available for the knowledge maturing model.

This analysis has been carried out in order to inform the refinement of our knowledge maturing model. The results have substantially raised the awareness of the consortium about design decisions that needed to be taken when revising our knowledge maturity model. The results of this revision will be presented in the following sections.

5.2.2 Extended description of knowledge maturing phases

For describing in more detail how maturing takes place or what maturing is, **related maturity concepts** from, e.g., biology, economy, psychology or sociology, (see section 5.1) have frequently relied on identifying characteristic phases with well identifiable transitions in between. In this spirit, the **process of development of this model** has focused on identifying maturing phases. It started years ago by the joint interpretation of empirical evidence gained in several practical cases in applied research projects (Schmidt, 2005), and in a large empirical study conducted in 2000 (Maier, 2007) which has first been published in (based on Maier and Schmidt, 2007) in order to gain valuable feedback from the scientific community in the fields of technology-enhanced learning and knowledge management. This initial version was then subjected to interpretation by the community that was formed to prepare the research proposal for MATURE and refined in a series of iterations which resulted in the formalised version which is now part of the Description of Work for MATURE. Thus, the process of developing the knowledge maturing model is also a knowledge maturing process in itself. For reasons of traceability we will call the version of the MATURE model that was given in the DoW the knowledge maturing model, version 1.

Based on a much more detailed literature review, the analysis of knowledge maturing statements brought into the project by the members of the consortium, the results of the ethnographic study, the views created and feedback collected in the design studies and a number of face-to-face, Flashmeeting and telephone discussions in the consortium, we will present a revised version in the following which we call the **knowledge maturing model, version 2**. Figure 14 shows the six phases that have been identified so far.

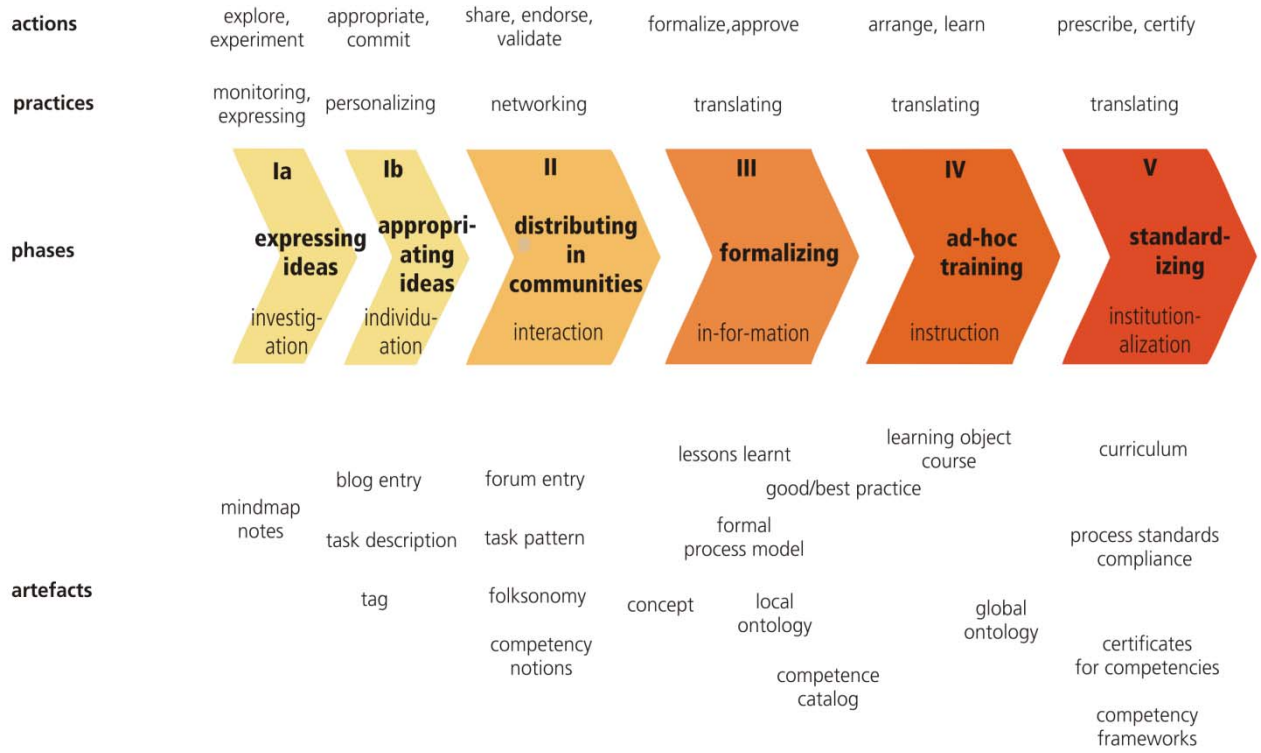

Figure 14: Knowledge maturing model v2 (based on Maier and Schmidt, 2007)

Figure 14 lists a number of key concepts that explain the individual phases of the knowledge maturing model. The phases are further differentiated with the help of the following.

- **Actions**: The phases typically involve many (knowledge) actions, e.g., access, collect, converge, coordinate, create, discuss, distribute, evaluate, identify, inquire, network, prepare, request and review (Hädrich, 2008). However, there is a set of distinguished actions which describe the core of the phase, i.e. the main or characteristic activities that persons engage in when going through or working in a certain phase.
- **Informing practices**: Finally, the phases can be characterized with the help of the primarily targeted informing practice: expressing, monitoring, translating, networking (Schultze, 2000) and personalization, i.e. marking a knowledge element as one's own so that one can trace back future developments towards an individual's creation in order to have the individual benefit from it.
- **Artefacts**: Organisations typically handle large numbers of (digital or non-digital) artefacts that are related to knowledge for a variety of reasons. Some of them can be classified into types that are typical for individual phases of the knowledge maturing process.

With the help of these key concepts, the individual phases can be described as follows.

- **Ia. Expressing ideas (investigation):** New ideas are developed by individuals either in highly informal discussions or by browsing the knowledge spaces available inside the organisation and beyond, e.g., in the Web. In an organisational world and society in which there is abundant data, expressing ideas is often based on more or less extensive search and retrieval activities which result in loads of material that has been scanned and navigated and which influence the idea generation directly or indirectly. This step is driven by curiosity and creativity. The knowledge is subjective and deeply embedded in the context of the originator. The vocabulary used for communication maybe is vague and is often restricted to the person expressing the idea.
- **Ib. Appropriating ideas (individuation):** The concept of individuation is widely used in a number of scientific disciplines, most notably philosophy and psychology. Its origin can be traced back to the Latin adjective "individuus" which means indivisible, inseparable or undivided. It

describes processes in which the undifferentiated becomes individual, or processes in which separable components become an indivisible whole. New ideas or results found in the investigation phase that have been enriched, refined or otherwise contextualized with respect to their use are now appropriated by the individual. This means that the individual marks its contributions so that it can benefit from its future (re-)use. The experience made is thus personalized. This step has been neglected in academic discussions as well as in many practical implementations of infrastructures for handling knowledge. Many efforts have focused on transparency of knowledge and on supporting knowledge workers in sharing knowledge or even detaching knowledge from humans as "media" of knowledge. However, at least in a more individualistic culture stressing diversity, the individual knowledge worker requires also support for her activities concerning the appropriation of knowledge towards the individual subject. Consequently, the knowledge maturing model version 1 has been extended by this phase.

- **II. Distributing in communities (community interaction):** This step is driven by social motives and the benefits that individuals typically attribute to sharing knowledge. These are, among others, belonging to a preferred social group, thus increasing the probability of getting back knowledge from the community when one needs it. From the perspective of semantics, this accomplishes an important maturing step, i.e. the development of common terminology shared among community members, e.g., in discussion forum entries or Blog postings.
- **III. Formalising (in-form-ation):** Artefacts created in the preceding two phases are often inherently unstructured and still highly subjective and embedded in the context of the community. In this phase, purpose-driven structured documents are created, e.g., project reports or design documents or, with a stronger knowledge connotation, rich case descriptions, lessons learnt or good practices, in which knowledge is de-subjectified and the context is made explicit.
- **IV. Ad-hoc training (instruction):** Documents produced in the preceding phase are typically not well suited as learning materials because no didactical considerations were taken into account. Now the topic is refined to improve comprehensibility in order to ease its consumption or re-use. The material is ideally prepared in a pedagogically sound way, enabling broader dissemination. Individual learning objects are arranged to cover a broader subject area and thus are composed into courses. Tests allow participants or adaptable learning infrastructures to determine the knowledge level and to select learning objects or learning paths.
- **V. Standardising (institutionalisation):** Finally, formalized documents that have been learned by knowledge workers are solidified and implemented into the organisational infrastructure in the form of processes (described e.g., by business process models), business rules and/or standard operating procedures (possibly implemented into enterprise systems such as workflow management systems). From a learning perspective, the ultimate maturity phase puts together individual learning objects to cover a broader subject area. Thus, the subject area becomes teachable to novices. Certificates confirm that participants of formal training achieved a certain degree of proficiency. On an organisational level, certificates allow organisations to prove compliance with a set of rules that they have agreed to fulfil, e.g., with service level agreements or with respect to regulations such as Basel II or SOX.

This model describes characteristic phases of knowledge maturing, but does not imply a linear development that is the same in each and every case. Rather, those phases are used as an analytical tool to distill commonalities from context-specific knowledge maturing. Therefore, this model should not be misunderstood as a process model in the business process modelling sense. Within the ethnographic studies and their analysis, it has turned out that apart from the level of those maturing phases, we also need to consider a finer level of granularity. For those, we introduce the following terms:

- **Knowledge maturing activities** are activities of individuals or groups of individuals that contribute to the development of knowledge on a collective level. This usually includes learning of the individuals that are involved, but goes beyond that in its effects: Its outcome is an advancement of collective knowledge. Such activities usually make use of and frequently produce artefacts, where artefacts can have the function of facilitating communication, of mediation, or of cognitive support.

- **Knowledge maturing episode** is an interconnected, but not necessarily sequentially ordered set of knowledge maturing activities. The connection is constituted on the collective knowledge level, but usually traceable through artefacts. The long-running knowledge maturing cases found in the ethnographic study and described in section 4.3.1 and the stories describing a change in knowledge maturity in section 4.3.4 are examples for knowledge maturing episodes found in the organisational practice.

- While both activities and episodes are instance-level descriptions of knowledge maturing (i.e., not repeatable), we aim at descriptions of successful patterns of knowledge maturing episodes (like business processes represent efficient patterns of organizing work). We call these abstractions **knowledge maturing pathways.**

Research in the second year of the project (with the help of the representative study) will investigate the identification of such maturing pathways.

5.2.3 Specializations of the knowledge maturing model

Describing knowledge maturing must remain abstract to a certain degree which is what the knowledge maturing model is about. This has various reasons: (1) it abstracts from different types of knowledge and their artefact-level representation, (2) it abstracts from contextual factors (see section 5.1.2). However, as already indicated in Figure 14 and its description in section Extended description of knowledge maturing phases 5.2.2, there is a large variety of types of artefacts and corresponding knowledge.

In MATURE, we categorize the types of knowledge into three categories: content (factual knowledge, mainly represented by documents in various media), process (knowledge how to do things), and semantic structures (knowledge how to describe, and structure). While the maturing of content can be easily described using the same vocabulary as in the general knowledge maturing model, it has turned out that for the other strands we need specializations, which mainly focus on the artefacts. The initial submodels which were developed based on the experiences within the design studies and additional conceptual research. The main purpose of these submodels is to identify concrete measures to support the maturing process of these types of knowledge.

5.2.3.1 Process Maturing

The maturing of processes as coordinated sets of activities performed by a number of agents is an extension to standard concepts of business process management which have an inclination towards documentation and prescription of rather strict processes in the sense of standard operating procedures. However relevant these strict process models are, activities in organisations only partially follow these strict prescriptions. Rather, there are abundant variants and undocumented activities taking place in organisations. Moreover, existing documented processes are continuously improved and changed according to changes in the business ecosystem surrounding these processes. These have been studied with the help of concepts such as ad-hoc workflows, agile or flexible business processes. The process maturing model takes these flexible processes into account which might follow a maturing pattern into strict process models as depicted in Figure 15.

Figure 15: Process maturity model

Table 9 briefly summarises the main characteristics of the four phases identified here from the perspectives of users and organisations and to what extent deviations are allowed and how they are guided.

	Flexible direct enactment	Descriptive pattern-support	Prescriptive pattern-support	Strict process models
User perspective	Pros: **Flexible performance in new situations** Cons: **No user support**	Pros: **Benefit from existing experiences** Cons: **Challenge to locate patterns matching needs**	Pros: **Clear guidance on relevant deviation options** Cons: **Fewer deviation options**	Pros: **Strict guidance for core processes** Cons: **No deviation for new situations**
Organisation perspective	Pros: **Support performance in new situations;** *opportunities for user support* Cons: **No standardisation or control**	Pros: **Evolve org knowledge;** *opportunities for user support* Cons: **Lack control over deviations**	Pros: **Standardise org knowledge for relatively stable processes; control deviation options** Cons: **Some modelling / approval**	Pros: **Standardise core org processes** Cons: **Expensive, upfront modelling**
Deviation support	**Everything is ad hoc and user-driven**	**Support direct enactment with patterns**	**Deviations restricted to approved options**	**No deviation**
Open issues	**Can some user support be provided?**	**Are deviations from selected pattern controlled?** **Any guidance or constraints on pattern options?**	**Are deviations within restricted patterns controlled?** **Do we need a fallback strategy for new situations?**	

Table 9: Description of phases of process maturity

5.2.3.2 Ontology Maturing

The maturing of structures used in order to systematise knowledge domains, also called taxonomies, knowledge maps or ontologies, also follow a general pattern that is depicted in Figure 16 and described in the following.

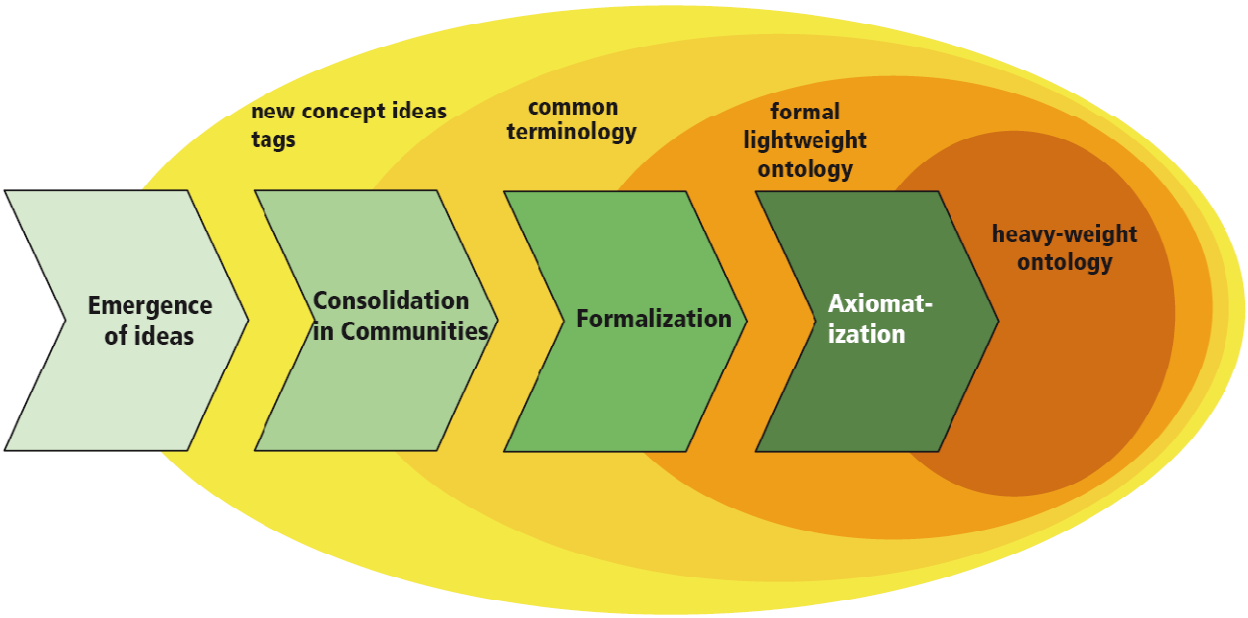

Figure 16: Ontology maturity model

1. **Emergence of ideas.** New ideas emerge and are introduced by individuals as new concept ideas or informal tags. These are ad-hoc and not well-defined, do not follow a so-called "controlled vocabulary", and are rather descriptive, e.g. with a text label. For instance while annotating or searching a pasta recipe, the user becomes aware of the missing tag "spaghetti" and adds it to the ontology. These tags are individually used and informally communicated.

2. **Consolidation in Communities.** Through the collaborative (re-)usage of the concept symbols (tags) within a community, a common vocabulary (or folksonomy) develops. The concept ideas are refined, useless or incorrect ones are rejected. When comparing currently envisioned tags with previously used ones or with tags from other people assigned to the same resource, the users discover similarities and differences. For instance the users realize that they can improve their search by using a synonymous term; e.g., "spaghettoni" instead of "vermicellini" or "pasta" instead of "noodles". The emerging vocabulary, which is shared among the community members, is still without formal semantics.

3. **Formalization.** Within the third phase, the community organises the concepts into relations. These can be taxonomical (hierarchical) ones as well as arbitrary ad-hoc relations, for instance in the course of becoming aware of different abstraction levels (e.g. of "pasta" as hypernym of "spaghetti" and "spaghettini" as hyponym of "spaghetti"). This results in lightweight ontologies that rely primarily on inferencing, based on subconcept relations.

4. **Axiomatization.** In the last phase the adding of axioms, e.g. "pasta di semola di grano duro consists of semolina, water and salt and not of eggs", allows and improves for inferencing processes (i.e. "pasta di semola di grano duro is suitable for people who are allergic to egg white"). This step requires a high level of competence in logical formalism so that this phase is usually done with the aid of knowledge engineers.

As for the general maturing models, this model must not be misunderstood as a strictly linear process; rather ontology development processes in practice will consist of various iterations between the four different phases. This also means that concepts do not proceed in the same process at the same time. Usually, individually used tags, common but not yet formal terminologies as well as formally defined concepts coexist at any moment.

5.2.3.3 Competence Model Maturing

As part of the design study (DS8) on people tagging (see D3.1), we have concretized this model for the challenge of competence maturing, i.e. the maturing of competence models/catalogs as means to describe and manage competencies of individuals and collectives.

1. Emergence of ideas. By employees annotating each other with any topic tag, new topic ideas emerge. For instance, they describe a recent or very specialized topic. These topic tags are individually used and informally communicated.

2. Consolidation in Communities. A common topic terminology (folksonomy) evolves through the collaborative (re-)usage of the topic tags within the community of employees. The topic tags are defined and refined, useless or incorrect ones are rejected.

3. Formalization. Within the third phase, the special members of the community (usually legitimated by the organisation by assigning "gardening" tasks) begin to organise the topic terminology into well-defined competencies by introducing relations between the topic tags. These relations can be taxonomical (hierarchical) ones (e.g., object-oriented programming <is broader then> Java programming) as well as arbitrary ad-hoc relations, expressing similarity (e.g., Java programming <is related to> C# programming). That results in new or updated competency notions, i.e. lightweight ontologies, which allow primarily for inferencing based on subconcept relations.

4. Axiomatization. In the next step, abstract competencies, also named as competence types, are differentiated into competencies with different levels, i.e. instances of competence types (e.g. Java programming beginner/intermediate/expert <is instance of> Java programming). Adding axioms with the help of modelling experts allows and improves complex inferencing processes. This includes especially precise generalisation and composition relationships (e.g. Java programming <is a> object-oriented programming or {Java programming expert, AJAX programming beginner} <is part of> GWT programming intermediate). This allows, e.g., subsuming competencies for the purpose of competency gap analysis, or competency-based selection of learning opportunities.

5.2.4 Describing guidance for knowledge maturing

One important assumption of the MATURE project is that knowledge maturing, i.e., a goal-oriented learning process on a collective level, can be improved by appropriate guidance. Like knowledge maturing, such guidance can be very context-specific. In particular, guidance can take the form of personal guidance (by other individuals), structural guidance (by established processes and organizational structures), or tool guidance (by the tool design). Naturally, the main focus of the project will be on tool guidance, and D2.1 and D3.1 lay the foundations for such guidance.

However, like describing phases for knowledge maturing, it has already proven useful to describe a macro model as a reference. To that end, apply Fischer's **seeding, evolutionary growth, and reseeding (SER) model** (Fischer et al., 2001) has already proven very useful. The SER model was originally developed to describe and help to understand the evolution of complex software environments. Instead of viewing a software environment as the final product of the software development process which led to its existence, the SER model views the software system as the starting point (**seed**) for a complex, socially driven, evolutionary further "development" process. In this process, users interact with the environment, its units, its structures and its tools – and thus develop them further. New units are built during these interactions, new tools are developed (by adaptation or end-user programming capabilities), and a variety of relationships or structures are discovered and expressed. The better the provided tools afford the creation of new and the combination of existing units, structures, and tools, the more the users have the opportunity to express their creativity and to satisfy their needs. Community activity leads to evolutionary, undirected (and often confusing) growth of the original software system. Fischer observed that typically such an **evolutionary growth** phase is followed by what he calls a reseeding phase: at some point in time, the environment becomes too complex to be managed. Many new units and tools have evolved and structures have become frizzled. Restructuring and redesign of the environment is initiated by some triggering event (e.g., design breakdown). This **reseeding** can happen in a form of consolidation and negotiation processes in which the variety of units, structures, and tools are pruned. In traditional software systems, this reseeding has to be accomplished by programmers, since the end-users will not be able to do it themselves.

Fischer argues that in order to build and maintain useful software systems, we need to provide end-users not only with tools which support evolutionary growth activities (e.g., combine, specialize), but also with tools which enable them to participate in the reseeding phase (e.g., visualization of structures, negotiation). In order to reflect on applying the SER model to the knowledge maturing process consider for example the maturity phase II "distributing in communities". First, a community "space" is seeded with an initial idea or topic that individual members of the community have appropriated to themselves (phases Ia and Ib of the knowledge maturing model). This involves creating an initial knowledge structure together with its knowledge units and their capabilities and characteristics. This community environment needs to be equipped with tools for combination, analysis, and change of the structures and the units themselves in order to enable evolutionary growth. Such tools enable the users to combine knowledge units to build (increasingly complex) knowledge structures and to change the knowledge units themselves according to their needs. Analysis tools enable the community to monitor and guide its activities. If the development of the topic reaches a certain level, the decision whether to take the topic further to the maturity phase III "formalizing" has to be made. If the development of the topic stagnates, reseeding might be an option. This includes pruning the current knowledge base, introducing new ideas, knowledge elements or people into the community or changing the topic. The relationship between the SER model and the knowledge maturing model is depicted in Figure 17.

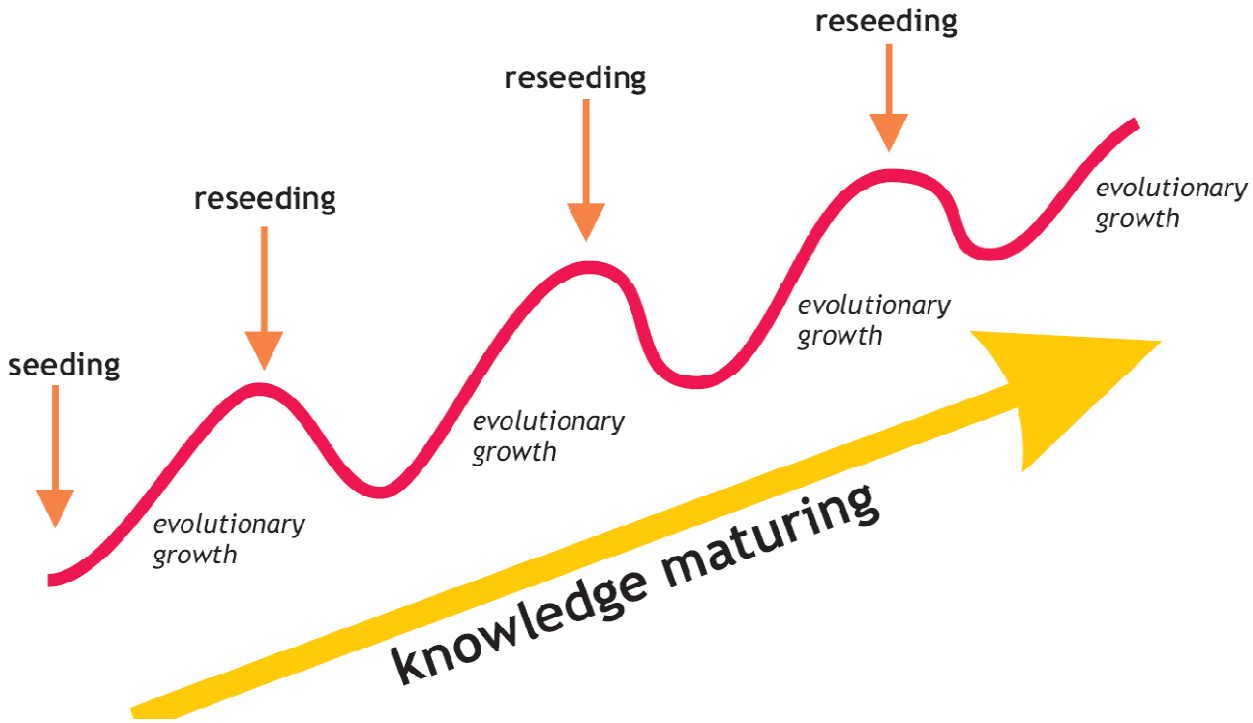

Figure 17: The SER model and knowledge maturing

It is tempting to equate one **SER cycle** with a knowledge maturing phase. However, this conceptualization of knowledge maturing evokes the false impression that maturing is a collection of discrete phases which will happen in strict order. By applying the SER model, we not only stress that evolutionary growth and reseeding are important recurring phases of the maturing process, but that they are really inseparably interlinked and interwoven. That is, a user might engage in growth activities at one moment involving one knowledge asset type (content, semantics, process) while the same user might engage in reseeding activities in parallel. This interplay of growth and reseeding activities invokes the association to the interplay of assimilation and accommodation processes during knowledge construction in informal learning (Riss et al., 2006). Here, persons integrate new knowledge into their own mental models of the topic. The knowledge is either added into existing knowledge structures or this new piece of knowledge causes them to restructure their mental models in order to accommodate it.

Within the first year's project activities, we could apply guidance according to the same template, e.g.,

- the coding procedure of the ethnographic study data (see section 3.3)
- the use case and requirements definition process (see D6.1)

which has shown that the SER model provide a framework of reference for guiding bottom-up processes where we want to leverage the individual experiences and creativity as much as possible to promote knowledge maturing.

5.3 Motivational factors for engaging in a knowledge maturing activity

For understanding knowledge maturing, we do not only need to analyze the nature of knowledge and how knowledge gets transformed and enriched, or how it is applied. We also need to understand the actors in such a maturing process:

- Why do individuals engage in knowledge maturing?
- How can we understand what prevents them from engaging?
- How can we intervene in order to stimulate them?

This involves investigating the motivational structures of individuals underlying their behaviour. The notion of motivation is multifaceted as it touches an interdisciplinary ground, which includes, e.g.:

- psychological theories of motivation (e.g. Alderfer, 1972, Ryan and Deci, 2000, Herzberg et al., 1959) explain the fundamental drivers and potential inhibitors of human behaviour as such,
- game theory, power theory, and competition theory allow for understanding cooperative and non-cooperative behaviour within an organisational context from an economic point of view, and
- activity theory (Engeström, 1987) allows for structuring individual activities according to its influencing factors.

For the project, we see "**motivation**" as referring to psychological processes that initiate, steer, and sustain individual activities (i.e., behaviour) which are usually influenced by personal factors as well as external factors.

The basic conceptual approach for an analysis of the motivational dimension (based on results from literature and our experience in the ethnographic studies) is that we:

- look at knowledge activities as the smallest unit and individual motivation to engage in it,
- decompose this motivation into aspects and factors,
- identify barriers (negative influences) and motivators (positive influences),
- and interventions to overcome barriers and foster motivators.

5.3.1 Intrinsic vs. extrinsic motivation

Traditionally, intrinsic motivation and extrinsic motivation are contrasted as two forms of motivation. In the first case, the driver lies within the person, while in the second it lies outside the individual. As in practice, it is difficult to tell both forms of motivation apart, which particularly occurs when individuals start identifying themselves with external rules, (Ryan and Deci, 2000) have proposed a continuum of motivation where amotivation on the one side, and intrinsic motivation on the other side represent the extremes. In between, there are different grades, distinguishable by the degree of regulation[10]:

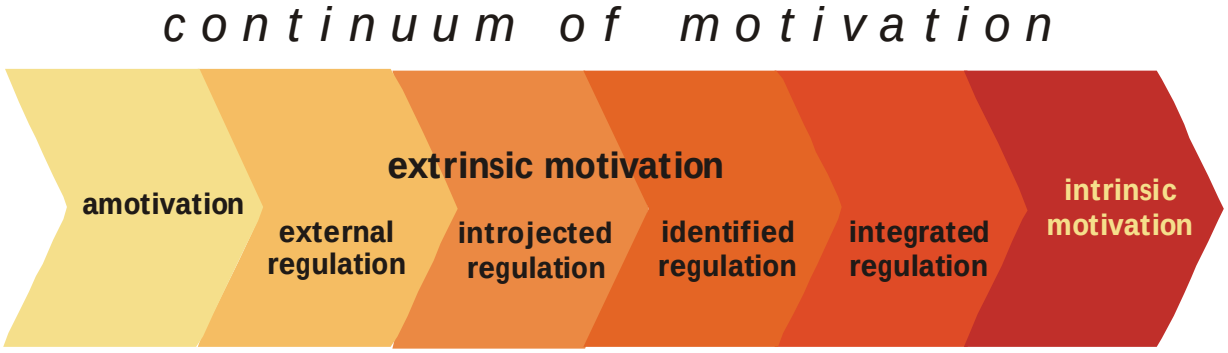

Figure 18: Continuum of motivation (Ryan and Deci, 2000)

- **Amotivation.** When people are amotivated they lack an intention to act, and either they do not act at all or they act passively. This happens when they are not valuing the activity or the outcomes it would yield, or when they are not feeling competent to do it.
- **External regulation** describes behaviours which "are performed to satisfy an external demand or reward contingency." Such behaviour typically follows rules and avoids punishments which are not connected to the activity. This could refer to tangible rewards and other incentives.

[10] The direct cites in the following descriptions are all taken from (Ryan and Deci, 2000).

- **Introjected regulation** "involves taking in a regulation but not fully accepting it as one's own. It is a relatively controlled form of regulation in which behaviours are performed to avoid guilt or anxiety or attain ego enhancement such as pride." Here, certain behaviour is shown because of wanting to feel worthy in a social context or other external pressure.
- **Identified regulation** "reflects a conscious valuing of a behavioural goal or regulation, such that the action is accepted or owned as personally important." Behaviour is shown because it is important for the attainment of a goal the person identifies with. This reasoning can be conscious or unconscious (e.g., because it is routinized), but is not connected to an apparent external reward.
- **Integrated regulation** "occurs when identified regulations are fully assimilated to the self, which means they have been evaluated and brought into congruence with one's other values and needs." Here, the behaviour is perceived as coherent with one's beliefs, goals, and values and considered important.
- **Intrinsic motivation** represents "the inherent tendency to seek out novelty and challenges, to extend and exercise one's capacities, to explore, and to learn." Reasons for intrinsically motivated behaviour are interest and enjoyment and the inherent satisfaction in the specific behaviour.

This model allows for a differentiated look at influencing motivation and clarifying the different notions of motivation.

5.3.2 Model for influencing factors

We now want to analyze how motivation influences knowledge maturing activities (as defined above). This influence can be on all phases of an activity:

- **Awareness** of the need or opportunity. This refers to the attention needed particularly in collaborative settings, but also the need or opportunity for abstraction from individual practices to more general patterns.
- **Initiation** of the activity by deciding to engage. This initiation can coincide with a certain work task at hand, but can also mean for the actor to accept extra effort. It can be the result of an individual decision, but also a reaction to an external stimulus.
- **Sustaining** and completing the activity.

Based on an extension of the model for workplace behaviour by (Comelli and von Rosenstiel, 2003), the influencing factors on the engagement in a concrete knowledge maturing activity can be decomposed into three main aspects (figure 19):

- **Individual**. This aspect refers to factors that originate directly in the personality and personal characteristics of the individual. Two basic families of factors can be identified:
    - **Capability** describes factors that affect whether an individual can engage in knowledge maturing activities. This comprises cognitive abilities to understand the issues at hand, and meta competencies, e.g., to cooperate, or to explain to others.
    - **Interests, values and needs** affect whether an individual wants to engage in knowledge maturing activities. These interests can be rational goals, e.g., for one's own career, but also comprise personal values, e.g., personal quality standards, and needs, e.g., for appreciation.
- The **work context** consists of organisational prerequisites for engagement in knowledge maturing activities:
    - **Organisational** factors affect whether the individual is allowed to or is even supposed to engage in concrete maturing activities, i.e., it comprises authorization, legitimation, commitment, rewarding, among others.

- **Enabling** factors refer to the technical and non-technical facilities offered or tolerated by the organisation to engage in knowledge maturing activities. This comprises technical systems like document and knowledge management systems, email, instant messaging, but also coffee machines and water coolers as possibilities for social interaction. Frequently, not only the facilities as such, but also the implicit and explicit regulations for their usage form an important part.

- The **interpersonal context** is equally important as most knowledge maturing activities involve interpersonal communication and cooperation.
  - **Cooperative** factors refer to cooperation as such and its inherent conflicts of interest from a more rational point of view. As cooperation in a single activity is frequently asymmetric, mismatches of interest occur so that win-win situations do not form.
  - **Affective** factors refer to the emotional side of social relationships and how the involved individual views the quality of these relationships. This includes factors like trust, or "personal chemistry".

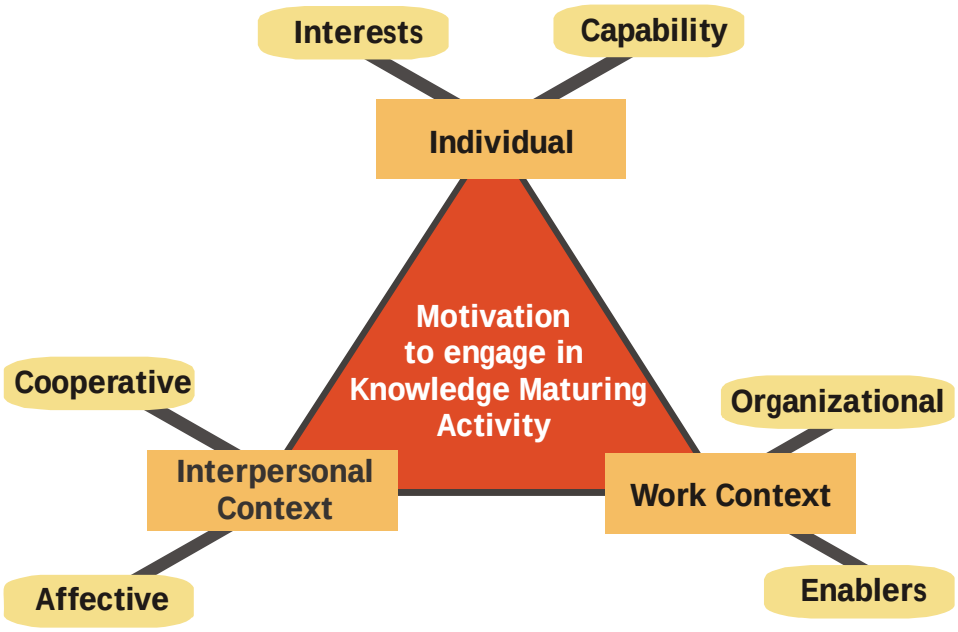

Figure 19: Determinants of motivation to engage in knowledge maturing activities

These factors cannot be clearly separated and also have at least long-term interdependencies:

- Capabilities of the individual can be improved by organisational measures (giving more responsibilities). This in turn can result in a shift of interest as self-esteem has risen. A change in interest changes the fundamentals of cooperation.
- The organisation can also introduce technologies that promote transparency and participation. This can conflict with or transform the corporate culture which in turn influences the foundations of cooperation, e.g., changes the value of competition vs. cooperation.

In the next sections, we investigate each of these aspects in more detail with respect to:

- identifying the set of individual factors (non-exhaustive) and ways to understand them,
- identifying the barriers related to those factors,
- and potential interventions to overcome these barriers.

5.3.3 Factors and Barriers on the Individual Level

Psychology has brought forth plenty of different models trying to conceptualize behavioural structures of **interests, values, and needs** of individuals:

- Maslow (1954) structures the needs into different layers and introduces dependencies between them in the form of a hierarchy: physiological, safety, love/belonging, esteem, and self-actualization.
- Herzberg et al. (1959) distinguish between different motivational factors: motivators and hygiene factors. While the latter form prerequisites for satisfaction (and can only have a negative effect if not fulfilled), the first ones cause positive effects on intrinsic motivation.
- Deci & Ryan (2000) identify three basic needs for intrinsic motivation:
  - experiencing autonomy,
  - experiencing competence,
  - experiencing relatedness.
- Values are the result of socialization processes which are developed in a life-long process. Value systems can be influenced through the social context (including the organisational context).

As the knowledge maturing model suggests with the level of meta-competencies, individuals need certain **capabilities** to engage in knowledge maturing activities. If these capabilities are missing, barriers arise. Some of these barriers are specific to the situation; others arise in most cases that could lead to knowledge maturing. In the latter cases, this can practically prevent individuals from participating in knowledge maturing in general.

- The individuals cannot express their ideas or understanding. This could be traced back to the fact that it is already sufficiently developed, but the individuals lack the competency to express themselves. Another reason could be that the expression as such still needs a learning process (i.e., the knowledge is not mature enough). This particularly applies to procedural knowledge, in contrast to declarative knowledge.
- Communication processes as such have inherent difficulties, which could hamper efficient exchange. The gap between communicating partners could lack a common ground.

5.3.4 Factors and Barriers on the Interpersonal Level

Cooperation within organisations is a sensitive topic. While on a global scale, cooperation is essential and beneficial, on the individual level these immediate benefits are not equally distributed within a single activity, sometimes not even on a longer time scale. Such asymmetries are analyzed within various contexts:
Game theory explores cooperation behaviour of actors under uncertainty about the behaviour of the other. The prisoners' dilemma provides a classical example that on a global scale, cooperative behaviour is preferable, but for each individual with a local perspective, non-cooperation seems to be the better choice. In Figure 20, if both players 1 and 2 share their knowledge, each of them will have a benefit of 7. But if player 1 cooperates, but player 2 does not, player 1 will only have a benefit of 3 and player 2 will have 9. In purely rational behaviour, this will mean that player 1 and 2 will decide not to share.

	player 2		
	strategy	share knowledge	defection
player 1	share knowledge	A (7/7)	B (3/9)
	Defection	C (9/3)	D (5/5)

Figure 20: Prisoners' dilemma

As a consequence, we can already identify that

- expectancy of reciprocity
- immediate benefits for the individual

are important factors.

Furthermore, we need to consider the issue of power which has been a major barrier when implementing knowledge management instruments in companies. The power-dependency theory of Emerson[11] helps to understand an activity of knowledge sharing in terms of power. The theory explains that in exchange relationships where partner A needs the good partner B possesses, B can exercise power over A. In terms of knowledge: if B has the knowledge A needs, B can exercise power on A. Sharing the knowledge with B would result in a **loss of power**.

Beyond one-to-one relationships, the issue of the social dilemma has been analyzed for collaboration systems like wikis, forums or similar. Here, the decision situation whether to engage by contributing or whether to just make use of the available information ("free riding") is more complex. Experimental findings[12] suggest that

- lowering contribution costs
- making transparent the benefits to others
- and the identifiability of one's own contributions

significantly enhance the sharing behaviour.

Rather than emphasizing the "natural barriers" to cooperation, the research strand on "cooperative intelligence" views this as a competence development topic of individuals and collectives (e.g., organizations).[13]

Affective factors are frequently ignored as they represent unwanted human behaviour within organisations. Also, emotions between individuals (as their origin is highly contextual) can hardly be addressed on a general level. Still the ethnographic studies have shown that they constitute very frequent barriers in organizations.

5.3.5 Factors and Barriers on the Work Context Level

Burke & Litwin (1992) have systematized causal relationships for change processes in **organisations** which can also serve for identifying the influencing factors.

For the engagement in knowledge maturing activities, the most important factors are:

- **Organisational culture** is a pattern of shared assumptions which have been learnt and have proven useful while coping with internal and external conflicts and is thus binding (Schein, 1995). It represents the social framework for acceptable and desired behaviour in a company. Such a culture is constituted by unwritten rules, shared values, and a feeling of identity. Important aspects of such a corporate culture for the engagement in knowledge maturing activities are:
    - **Communication culture.** Communication lies at the heart of many cultural issues in organisations. Communication is the vehicle for leadership, it can implement transparency and enable participation.

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[11] Emerson, R.: Power-Dependence Relations. American Sociological Review, Vol. 27, No. 1. (1962), pp. 31-41.

[12] Riss, U., Cress, U., Kimmerle, J., & Martin, S. (2006). Knowledge transfer by sharing task patterns: From experiment to application. In J. S. Edwards (Ed.), Proceedings of KMAC2006, The Third Knowledge Management Aston Conference (pp. 121-133). Birmingham: Operational Research Society

[13] Kauke, M.: Kooperative Intelligenz: Sozialpsychologische und spielexperimentelle Grundlagen der Interaktivität zwischen Partnern.Spektrum, Akad. Verl., 1998

- **Culture of trust.** As we have seen on the cooperative level, trust can overcome barriers introduced by short-term advantages for non-cooperation and can lower the uncertainty about the behaviour of others which has an impact on the social dilemma. A corporate culture which is based on a positive mindset about the nature of employees will rely on openness and transparency instead of control. As a result, individuals within such an organisation will tend to assume reciprocity, and the importance of power diminishes for the attainment of personal goals.
- **Culture of innovation.** This covers the valuing of new ideas, the challenging of dominant opinions and established procedures.

For influencing the corporate culture towards overcoming barriers to knowledge maturing, (Mayeroff and Gaylin, cited from von Krogh, 1998) recommend to reinforce the following five dimensions (which have an impact on the interpersonal level as well):

- *mutual trust*: Trust compensates for lack of knowledge about other people and is necessary in order to ensure that people can help each other – to give and to accept help.
- *active empathy*: Empathy means that a person can understand another person's situation, interests, skill level, history, opportunities and problems, "active" describes the situation when a person proactively seeks to understand another person.
- *access to help*: Having access to help means that a person needing help is able to find it directly.
- *leniency in judgment*: This dimension of care is especially needed when members of the organisation experiment with new solutions and produce errors; leniency means that these errors are not judged harshly which would possibly prevent future experimentation.
- *courage*: Courage means that members of the organisation voice their opinions and give (real) feedback as part of a process to help each other.

- **Organisational structure** can promote or prevent knowledge flow to happen. Next to informal organisational structures, deep hierarchies and fine-grained organisational divisions affect the maturing activities (Seidel 2003; Rosenstiel 2003):[14]
  - *Compulsory coordination* with superior institution increases the costs of non-standard activities and cooperation across structural entities.
  - *Centralisation and restricted information* channels allow for efficient coordination of a large organisation in the short run, but discourage self-initiated activities and thus also reduce the freedom of action.
- **Corporate rules and regulations** limit the freedom of action for the actors in the organisation, thus reducing the experience of autonomy.
- **Management practices** are important, for informal feedback on behaviour. Appreciation of maturing-relevant behaviour can foster the motivation of the individual.

[14] Seidel, M.: Die Bereitschaft zur Wissensteilung; Wiesbaden 2003; Rosenstiel, L.: Führung durch Motivation, Wiesbaden 2003

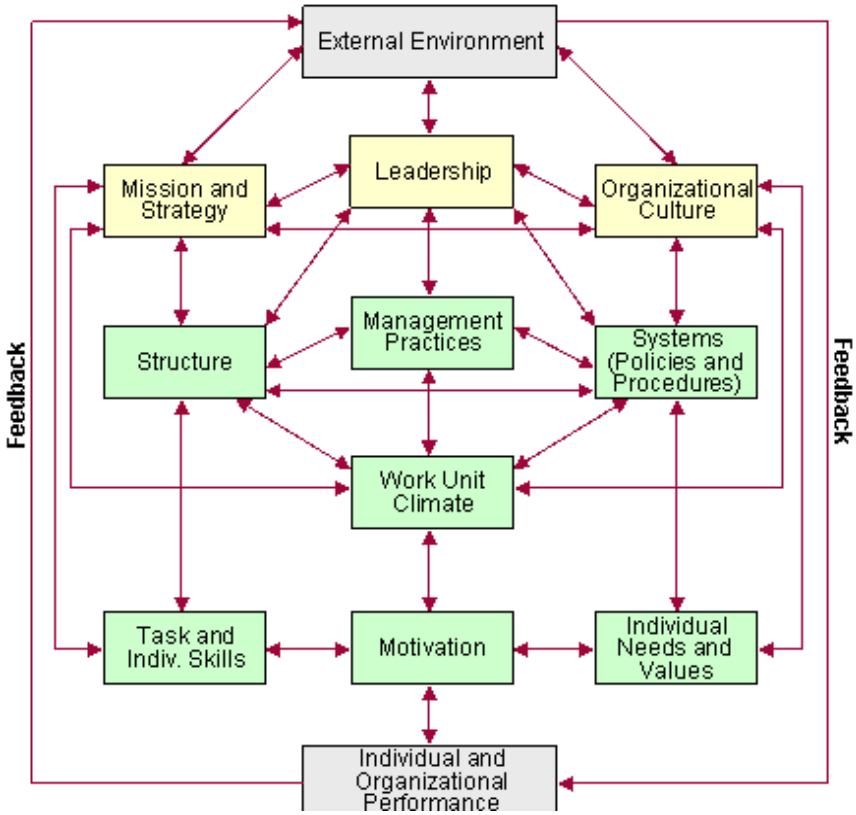

Figure 21: Model of Burke & Litwin (1992)

Knowledge maturing activities in many cases can only occur if appropriate technical infrastructure **enables** them, i.e. allows for performing knowledge maturing activities. Based on Riege (2005) and the observations within the ethnographic studies, barriers in this area include

- low usability,
- mismatch between individuals' requirements and integrated IT systems and processes,
- low integration of IT systems,
- lack of compatibility between diverse IT systems and processes,
- lack of training regarding employee familiarisation with new IT systems and processes,
- lack of communication and demonstration of all advantages of any new system over existing ones,
- lack of technical support (internal and external) and immediate maintenance of integrated IT systems,
- lack of transparency and control.

Consequently, this analysis poses some important requirements for any software to be produced in MATURE and has been taken on board in the process of defining use cases and developing requirements for MATURE.

We have applied the motivational framework to the knowledge maturing model based on the analysis of the ethnographic studies, assigned the motivational aspects to phases (where they are most relevant), and have come to the following table:

Phase	Context	Issues to consider (e.g., motives or barriers to overcome)
Ia+b	*Individual*	• need for experiencing autonomy • personal interest, curiosity • openness to learn and try out new things • satisfaction from achievments • resistance to change
	Cooperative	-
	Work	• culture, valuing of creativity and new ideas • workload • lack of tools promoting reflection, creativity support, appropriation support and their usability
II	*Individual*	• need for experiencing relatedness • lack of collaboration competencies • fear of openness • resistance to change
	Cooperative	• economies of cooperation • social dynamics (reputation etc.) • team culture • tools promoting sharing, communication and their usability • reliability of shared spaces
	Work	• complex regulations, e.g., for communicating with externals • tools for collaboration support • lack of cooperation infrastructure across boundaries • organizational fear of uncontrolled bottom-up activities • competitive situation => exchange with externals not wanted
III	*Individual*	• experiencing competence • attribution of contributions and willingness to disseminate • personal sense of perfectionism
	Cooperative	• affective barriers to accepting new approaches because of disliking the promoter • resistance to change
	Work	• workload • lack of participation in decision processes • tools for searching and accessing existing artefacts • superiors not open to putting new knowledge to practice • reliability of shared spaces • frustration because of not relevant results when using shared spaces • lack of influence on shared spaces • media disruptions requiring additional efforts

IV	*Individual*	• personal sense of perfectionism • resistance to change
	Cooperative	• affective barriers to accepting new approaches because of disliking the promoter
	Work	• superiors not open to putting new knowledge to practice
V	*Individual*	• conflict with experiencing autonomy • reluctance to towards change (late adopters) • resistance to change
	Cooperative	
	Work	• lack of commitment to roll-out from executives • lack of resources • managerial practice

These initially collected issues will be further detailed and systematized in year 2 as part of the empirical studies. They have informally been already considered in the use case definition. When non-functional requirements are concerned, they will be fed into the requirements process after M12.

Furthermore, as part of WP2 and WP3 work, concrete technical and non-technical measures will be identified how barriers can be lowered or even eliminated.

5.4 Conclusion

In this chapter, we have presented our knowledge maturing model, version 2 together with a profound analysis and definition of the main concepts, i.e. maturing and knowledge maturing, as well as an in-depth study of process, ontology and competence model maturity as well as factors of motivation, barriers and incentives affecting knowledge maturing.

The activities involved in the reconciliation and revision of the knowledge maturing model provided numerous opportunities for the consortium to refine the MATURE vision and our joint, interdisciplinary understanding of knowledge maturing. The analysis of the initial statements on knowledge maturing by consortium members, the results of the ethnographic study, the feedback of application and associate partners on MATURE concepts and the design studies as well as feedback on our academic papers and presentations from the scientific community have provided us with rich material that we have taken on board in the revision. As it stands, the knowledge maturing model, version 2, is an instrument to convey our understanding about knowledge maturing and is intended as an analytic model to help structure the analysis of organizational and technical infrastructures in support of goal-directed learning on a collective level. The model has already been an excellent vehicle for structuring discussions in the use case process and selecting those use cases that are of primary interest for the MATURE vision. The next revision cycle in Year 2 will (a) substantially extend the empirical basis on which the model is built, (b) further enhance the model to help design such infrastructures with respect to their ability to guide knowledge maturing and (c) include the results of the learning process that will be performed in parallel with the application of the model to guide our own maturing activities with respect to, e.g., requirements, use cases, framework and analysis of results of the formative evaluation as well as prototype solutions.

6 Implications for the Project

Implications for the MATURE project work in year 2 can be subdivided into implications for the definition of requirements (section 6.1), revised design studies (section 6.2), representative study (section 6.3) and the revised knowledge maturity model (section 6.4). Whereas the former two are performed as part of other work packages, the representative study as well as the further revision of the knowledge maturing model, version 3, are tasks to be carried out in this work package. Therefore, the development of requirements and the preparation of the representative study started in January 2009. The revision of the knowledge maturity model is an ongoing process that continuously takes up impulses from the various parallel activities in the project (see figure 22).

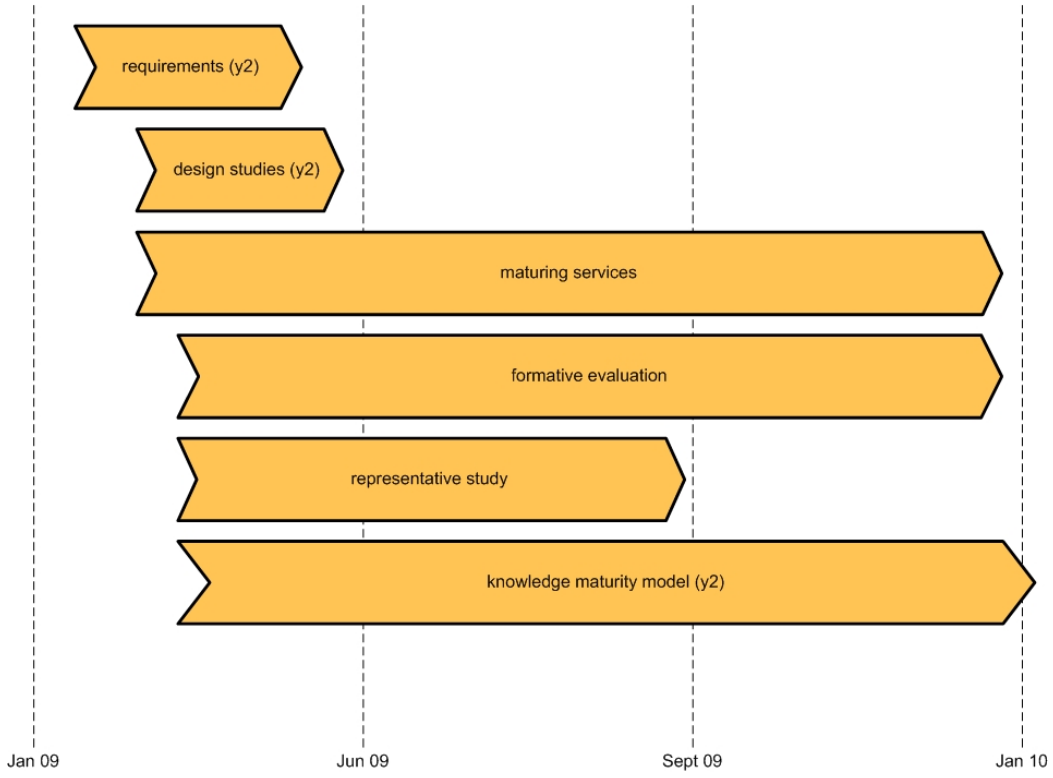

Figure 22: Overview of year two activities

6.1 Requirements

One of the main goals of the ethnographic study was to identify real-world phenomena which can inform the MATURE design processes. These identified phenomena should be used to develop requirements for WPs 2 – 5 (plus their reporting in WP 6). One of MATURE's main goals concerns the integration of existing tools and services which were identified in the course of Year 1 activities. Therefore, it has been considered useful that the affected work package leaders and members evaluate the findings of the ethnographic study and draw their own implications for their portion of the MATURE software (e.g., PLME, OLME, maturing services, infrastructure). The latter process will be guided by the evaluation work package which has already taken a strong role in the Y1 design studies and their systematic evaluation. In the following sections, some hints for this are given.

6.1.1 Personas

The identified Personas can be seen as idealized user types for the design of the MATURE software. That is the main purpose of Personas with the origin in design science. This concept was successfully applied in the design phase of the NEPOMUK and APOSDLE projects. Personas were important instruments to influence and structure the process of developing use cases. They are intended to continue playing the

role of communication vehicles between MATURE consortium members and partners, particularly between application and associate partners, ethnographers and technical partners.

6.1.2 Cases

The identified long-running knowledge maturing cases, frequently used knowledge routines, hot knowledge maturing areas, stories about knowledge maturing as well as knowledge maturing indicators were used as starting points to develop use cases for the design phase. The most important function of the cases is that they describe end-to-end knowledge maturing activities and thus are used for identifying relevant relationships between use cases, e.g., sequences, alternatives, parallel strands. Application areas for PLME and OLME within these cases will be identified and described as requirements for services. Thereby, for every part of the cases, some tool support will be provided. The main emphasis again is on the relationships between the various stages of maturity and thus for the relationships between the tools supporting individual stages or activities within stages. The cases drive an integrated understanding of the maturing process and a tightly or loosely coupled connection, e.g., integration, orchestration or mashup, of all recommended services. Thus, the cases provide valuable instruments for aligning (parts of) the formative evaluation with the actual conditions found in the studied organisations.

6.1.3 Codes

The identified codes represent a broad spectrum and a rich and dense description of many knowledge maturing-related facets of the researched organizations. The codes from the dimension knowledge elements show the spectrum of knowledge artefacts observed in our participating organizations. At least one supporting service should be associated to every identified knowledge element in order to ensure overall assistance.

The identified knowledge routines represent human-oriented interactions with knowledge, system-oriented interactions with knowledge and hybrid forms as well. All system-oriented routines should be covered by services which offer at least the described functionality. For hybrid forms and for human-oriented routines possible support functionalities should be identified. The identified routines offer a rich description of activities that handle knowledge. The identified tools can be seen as recommendation for services which can be integrated or the functionalities of which can be represented by newly built services.

The identified situations can be used to refine the use cases or evaluate the developed prototypes. Furthermore, a differentiation of cases with their own characteristics can be realized. Motivational factors should be considered in the development of all services. Possible system functionalities should be developed in order to overcome barriers or to support people's motivation. The spectrum of identified knowledge structures was comparably small. The tools and services should at least support the interaction with these structures. Furthermore, concepts for the use of more advanced knowledge structures should be developed.

All identified codes represent the state of practice evaluated in the ethnographic study. In addition to supporting the current situation, advanced functionalities should be developed as well for which the results of the interviews conducted with knowledge workers in the studied organisations provide some interesting ideas.

6.1.4 Model-based approach

All model elements and model types mentioned in this section will be used for concrete conceptual modelling activities using the Web-based PROMOTE work bench. Model-based approaches have become a base technology in recent years, as they proved to simplify complex situations as found in the "real world" to make them understandable for humans and enable a formalisation to be interpreted by machines. Three different modelling scenarios can be observed in knowledge modelling:

Firstly, the knowledge is modelled for documentation purpose. This means that knowledge is modelled to communicate between workers, find an agreement, as well as to elaborate details. The goal of this scenario is to make knowledge explicit.

Secondly, the knowledge is modelled for management purposes. This means that knowledge is modelled to ensure quality, efficiency as well as to reduce cost and time. The management scenario has the goal to identify knowledge as an object that has to be managed.

Thirdly, the knowledge is modelled for configuration purposes. This means that knowledge enables a tool- and technology-independent approach. The models are exported into the infrastructure where the models are seen as tool configuration. The configuration scenario has the goal to configure a technical infrastructure via models.

The above mentioned modelling scenarios are often combined. A typical approach is to start with the documentation scenario and improve the models in the second step for a management or configuration scenario. In MATURE, knowledge maturing will be modelled for documentation and configuration purpose, but also for the purpose of management. Before the models can be specified in detail for configuration of the MATURE system in WP5, a documentation approach was applied to find a common understanding between the MATURE partners on the available models. Here, WP1 activities not only contributed to the contents of the models, but also to improve the PROMOTE meta-model in order to capture the rich details available as part of the Persona descriptions.

Examples of results from the ethnographic study that have already been turned into PROMOTE models are codes (section 4.1) that have found their way into the ontology used in the MATURE PROMOTE models, process models (section 4.3.1) and Persona models (Figure 8) that have been modelled with PROMOTE. Details on the PROMOTE modelling language for the configuration of the MATURE system are provided in D5.2.

Last, but not least, the ethnographic studies and the subsequent developments of personas and knowledge maturing cases have provided rich representations which include motivational factors. This ensures that these aspects are fed into the development. The conceptualization of the motivational aspects of knowledge maturing will particularly facilitate the requirements definition for non-functional requirements and will inspire the development of solutions.

6.2 Design Studies

In preparation for the design activities in WPs 2, 3 and 4, first design studies were realized in parallel with the ethnographic study. Interim results were fed back and forth between ethnographic study and design studies. This cross-fertilization of the parallel activities was backed by the fact that several ethnographers also participated in the design studies. The design studies should be extended considerably based on the findings from the ethnographic study. The results and the developed requirements (section 6.1) form the basis for the development of mock-ups that show selected services that are considered crucial for knowledge maturing.

Furthermore, it is intended to keep in contact with the people that took part in the ethnographic study at the associate and application partner organizations. Involving these people in the design studies will be very useful. Some participants of the ethnographic study have shown commitment to the project and plan to participate in the associate partner meeting as well as ongoing knowledge sharing activities. A significant number of requirements are based on observations of these people and their needs. Thus, it seems useful to evaluate the suitability of the new design studies with these involved people.

6.3 Representative and In-Depth Study

In year 2 of the project, the multi-stage empirical investigation that was started with the ethnographic study will be continued with a representative and an in-depth study. Together with a refined knowledge maturing model, the version 3, the results of the representative study will be presented in D1.2. However, we plan to continue the successful model of exchanging interim results as soon as they are available with the other parallel activities in the project. The final knowledge maturing model and the results of the in-

depth study will be part of D1.3. An outline of the aims and the expected impact of both studies will be given in the following.

The representative study aims at ensuring the soundness and representativeness of the results obtained through the ethnographic study. Therefore, it will involve a representational sample of different types of companies. Altogether, it is planned to investigate approximately 200 organisations. The results from the ethnographic study (section 4) will be used to formulate hypotheses which will be tested (trial of falsification) in the representative study. The primary Personas (section 4.2), the long running knowledge maturing cases (section 4.3.1), the frequently used knowledge maturing routines (section 4.3.2), the hot knowledge maturity areas (section 4.3.3) and the knowledge maturing indicators (section 4.3.5) are the most promising starting bases. Within the study, semi-structured telephone interviews will be realized. Moreover, open questions will be used to evaluate more aspects of knowledge maturing and to deepen the shared understanding. The following objectives are pursued by the representative study:

- The representative study should amplify the empirical foundation of the revised knowledge maturing model. During the ethnographic study, a new knowledge maturing phase has been identified and the original phases have been detailed. Together with some other aspects, e.g., maturing practices and actions, this needs to be verified to ensure representativeness.

- The knowledge maturing indicators that have been identified through the ethnographic study should be examined in further detail. Knowledge maturing indicators are needed as the basis of those maturing services that evaluate maturity of varying types of artefacts, their relationships and interactions with people in order to help knowledge workers or specific roles responsible for guidance of knowledge maturing, e.g., gardeners, take decisions with respect to seeding or reseeding activities (WP 4).

- The results of the representative study are intended to build the primary basis for the reconciliation of the knowledge maturing model (version 2) in order to develop a design-oriented component of the model, which in turn provides the main basis for developing the knowledge maturing model (version 3). In other words, the descriptive knowledge maturing model (version 2) is planned to be enhanced into an explicative or normative model.

- The examination of aspects of guidance, motivational factors and barriers will be an additional focus of the study. The knowledge maturing model is intended to support the development of recommendations regarding interventions stimulating participating knowledge workers. Therefore, from an organizational point of view, it is important to have a deeper understanding of influencing factors when performing recommended courses of actions.

- Finally, the representative study builds the basis for the in-depth study. Organisations participating in the representative study will be clustered with respect to contextual aspects of knowledge maturing. This should yield organisations that are particularly aware of knowledge maturing processes, that have initiated interventions into improving knowledge maturing or that are already successfully fostering knowledge maturing.

6.4 Evaluation

The rich material available and analysed in this WP has already played an important role as basis for some of the instruments that have been used for evaluation purposes. The results of the study as well as the revised knowledge maturing model will be fed into the process of planning the formative evaluation. More specifically, results such as personas, cases as well as phases have been used in order to evaluate completeness of coverage of knowledge maturing when analysing the use cases, for setting priorities for which use cases should be developed first as well as for evaluation of usability and fitness-for-use of prototype solutions.

6.5 Knowledge Maturing Model

Based on the results of the ethnographic study, a (revised) version of the knowledge maturity model was developed (see section 5). Considering the results of the representative study and of the various parallel activities in the project, particularly the requirements definition, design studies and development of use cases, the knowledge maturity model will be further enhanced and revised. In particular, the advancement of the support processes for knowledge maturing and the aspect of guidance need to be considered. Additionally, in accordance with the notions of maturity found in other fields and disciplines, our knowledge maturing model will have to undergo another round of serious reconciliation, e.g., with respect to the notions of

- "natural", i.e. unintentional, unsupervised maturing processes, versus "induced" maturing, i.e. intentional, guided maturing processes,
- stages after achievement of the level of mature knowledge, i.e. decline or deterioration of knowledge maturity, e.g., due to changed environments or new insights,
- the connotation of maturity with an end-point of development, e.g., readiness of knowledge to be deployed, to be "sold" or to be transferred to customers or business partners,

Furthermore, normative questions concerning implementation of an organizational infrastructure accompanying the introduction of PLMEs and OLMEs in organizations need to be developed here.

7 Conclusion

This deliverable has laid out the goals, procedure taken, the results as well as the impact of WP1's year one activities on parallel and future activities in other WPs. Specifically, the deliverable presented the results of the ethnographic study, discussed implications for the project as well as presented a revised version of the knowledge maturing model which is used as an analytic model to help structure the analysis of organisational and technical infrastructures for fostering and guiding knowledge maturing. Summing up, the activities in WP1 were a primary driver for the project to follow a participative design and development approach which necessarily needs to continue to stay in touch with what happens in the "real world" of "real users". Being well aware of the fact that many initiatives that aim at improving the handling of knowledge and learning in organisations fail (Bishop et al., 2008, Davenport, 2002), it is not sufficient to merely provide PLME and OLME software solutions, but the deployment of these requires instruments to drive organisational change and stimulate knowledge workers in order to really make a difference in the way organisations handle knowledge maturing. That is why we plan to continuously keep close ties with application partners, associate partners, a representative sample of organisations and a carefully selected group of organisations studied in more detail as a "reality check", as testbeds for the evaluation and as partners for reflecting our ideas and conceptualisations.

WP1 took the lead in the MATURE project and has influenced many of the parallel activities during year 1 by frequent presentations of interim results, early release of work-in-progress within the consortium and discussions of their impact and by a number of members of technical partners participating in ethnographic activities in person. WP 1 is intended to continue playing this role with feeding the results of the consecutive representative and in-depth studies and the second revision of the knowledge maturing model continuously into ongoing activities in other WPs.

8 Appendix

8.1 Fact Sheets of the Studies

8.1.1 GISA Study

Organization: GISA GmbH Halle (Germany)

Time frame: 19.05-23.05.2008 and 16.06-20.06.2008

Ethnographers: Andreas Kaschig, Ronald Maier & Stefan Thalmann from UIBK

Number of studied persons: 8 persons

Number of interviews: 6

Received self-descriptions: 13

Organization:

GISA GmbH is an IT service provider and specialized on SAP projects for utility companies with approximately 400 employees. GISA operates a computing centre and is an outsourcing provider, especially for the utility sector and has consultancy, development and application support teams. The headquarters is in Halle, branches are in Chemnitz, Düsseldorf, Berlin, Hamburg, Frankfurt and Hanoi. GISA is a subsidiary of the large German utility group RWE and thus qualifies as a large company.

Background:

UIBK have strong relationships with GISA since 2003 with a number of small scale research projects realized between 2005-2007 with Ronald Maier and Stefan Thalmann. Several MIS alumni from the University of Halle-Wittenberg (former position of Ronald Maier) are working for GISA. Overall there is a highly trusted relationship, at all management levels.

researched case “portal development”

The GISA portal group is responsible for development, operation and maintenance of the GISA portal and portals at clients’ sites. Portal development is innovative SW development, non-routine work and involves and produces a lot of meta-knowledge about the sources to be integrated and the people behind the sources that are responsible for them. It involves close cooperation with all GISA and many client functional departments. Development and administration of such portals promises information about knowledge acquisition, sharing, integration and application.

researched case “DWH consultancy at the client”

Consultancy in general is one of the samples considered most knowledge-intensive work. The requirements analysis for a data warehouse requires a lot of communicative elements, documents from existing systems and experiences from former projects. Intermediate results have to be adapted with clients in workshops and discussions. Result of the process is a document (business blue print) which merges results of all discussions, learned facts about the client and used documents.

researched case “software development”

The development of software is a non-routine task which requires a lot of knowledge about existing systems, interfaces, requirements from clients, technologies and experiences. The result is an operative program which can be seen as a knowledge-intensive product as well. The software is very complex and several people work together. Because of the interdependencies in the software, coordination (especially with the development team in Vietnam) between all engaged people in the software development is necessary on a regular basis. Besides, pure program documentations and help-functionalities have to be created.

8.1.2 Connexions Kent Study

Organization: Connexions Kent (UK)

Time frame: 21 April, 28 July and 14-18 August 2008

Ethnographers: Sally-Anne Barnes, Jenny Bimrose from UWAR, Graham Attwell from PONT

Number of interviews: 16 (plus 17 undertaken in 2007)

In-depth cases of practice: 5 (2007) involving 21 participants

Organization:

Connexions Kent is a service providing free impartial and confidential advice, guidance, support and personal development services to all 13-19 year olds and to those up to 25 who have learning difficulties and disabilities, throughout the county of Kent. The Connexions Kent service is delivered by specially trained Personal Advisers (P.A.s) who are based in schools, colleges, at Connexions Access Points, and in a range of community settings. Personal Advisers can help young people with all sorts of issues such as jobs, training, housing, money, relationships and health. The service offered is not restricted to careers and learning. Personal Advisers can help young people with all sorts of issues such as jobs, training, housing, money, relationships and health.

Background:

UWAR and PONT have had a continuing working relationship with Connexions Kent since 2006 in which they have undertaken a CEIG scoping exercise, building capacity in LMI and developing/piloting an e-portfolio to support CEG in the region. Through this relationship a greater understanding has been gained of how: the organisation operates; communicates internally and externally, creates, shares and disseminates information; and the language/vocabulary used. Overall, there are well-established relationships between UWAR and PONT, and those working across all levels Connexions Kent, from management level to Personal Advisers.

researched case "LMI development"

With increasing emphasis on the role of labour market information (LMI) in guidance, Connexions Kent has been involved in a process of knowledge development and maturing as part of the professional development of its workforce. LMI is being developed, aggregated, analysed, assessed, presented and represented, shared and disseminated not only across the organisation, but to clients and external agencies. Currently, LMI is not fully understood, but is used as part of everyday practice.

researched case "Recording and sharing LMI"

Individuals have a high level of professional knowledge and awareness regarding local area and the education and employment opportunities available to young people. A great deal of information and knowledge is held by each individual, but it is rarely shared. Personal strategies for recording information dominate. Limited information (i.e. on housing, health) is maintained, stored and shared within local teams, but this is usually paper-based. Currently there is a lack of organisationally shared knowledge, as there are limited IT systems in place to facilitate the recording and sharing of information within this geographically dispersed organization.

researched case "Management Information Systems"

Connexions Kent operates in a rapidly changing environment where there is a high dependency on policy and a need to adapt and collect various data on young people. As a consequence, there is significant emphasis and resources put into the Management Information System. This system contains all the records of every young person (aged 14–19 years) in the region. Information is held on each young person's course options, educational attainments, contact with Connexions and related agencies, plus agreed action. P.A.s are responsible for maintaining the records. Accessing this system can be complex particularly for those who are mobile and working across several schools.

8.1.3 Careers Scotland

Organization: Careers Scotland

Time frame: 26 June, 10 July and 13-14 October 2008

Ethnographers: Alan Brown, Sally-Anne Barnes, Jenny Bimrose from UWAR, Graham Attwell from PONT

Number of interviews: 12 interviews

Observations: 3 workplaces

Organization:

Careers Scotland has a clear and simple purpose – 'to help the people of Scotland secure the jobs of tomorrow'. As a national organisation operating throughout Scotland, Careers Scotland delivers career guidance and employability services which support the people of Scotland to: be better informed, prepared and ready for work in a changing and dynamic labour market; have the self confidence and motivation to constantly develop their skills and take part in lifelong learning; make well informed, effective career choices throughout life, beginning with the first step into the world for work; and be equipped with employability skills that meet the needs of employers in order to succeed and progress in the workplace. These career guidance and employability services are available to people of all ages. They are impartial, confidential and based on individual need. Personalised services are delivered in conjunction and in consultation with a range of partners.

Background:

UWAR have had a continuing working relationship with Careers Scotland for several years. There are well-established relationships between UWAR and those working at management level in Careers Scotland. The purpose of the Careers Scotland visit was to explore the knowledge development needs of the organisation, investigate the delivery of services and test out the typology of knowledge maturation emerging from an analysis of the Connexions Kent data.

researched case "flow of LMI"

Within the organization there currently exist blockages in the flow of labour market information (LMI) from sources to the individual career guidance practitioners. Labour market information is generally aggregated data collected at a regional, sectoral or national level. A continuing challenge is the need to enhance such data and integrate it with local labour market intelligence. Practitioners need to mediate and interpret labour market information for their customers routinely, as part of their practice – though many lack confidence and the skills. For many customers, labour market information relating to the local area in which they live is often seen as the most relevant (that is, job vacancies and opportunities). However, this local LMI often needs to be understood within a broader context of regional (and sometimes national) LMI. A good deal of relevant labour market information currently exists in disparate sources and at different levels (i.e. regional, national, and international). The challenge, therefore, is to aggregate these sources, making them more accessible to practitioners and in a timely way. Making labour market information more accessible and more understandable for practitioners is likely to involve visualisation to aid its interpretation for customers.

researched case "developing competence and reflective practice"

Careers Scotland has different categories of operational staff, including: careers advisers; Enterprise in Education Advisers (responsible for supporting career-related curriculum work in schools; Employability Advisers (responsible for helping individuals to find and apply for jobs); and Key Workers (responsible for working intensively with 'at risk' young people). ICT systems need to be developed to support the use of labour market information. Practitioners routinely engage in 'reflective practice' to develop their competence – though in relation to their use of labour market information, this is not yet highly developed.

Career decision-making is complex and involves a number of variables. For example, individual factors like qualifications and abilities, personal finances, relationships, interests, values and attitudes play an important part. Other social and contextual variables also have an impact on the way career pathways unfold (for example, gender, ethnicity, age, disability, etc.). A key challenge is, therefore, to assist practitioners to interpret the significance of LMI for particular customers in the specific context in which they are making their transitions. Supporting careers advisers in developing the skills necessary to interpret and utilise LMI effectively is likely to include the use of on-line synchronous and asynchronous learning materials, together with the facilitation of peer group learning within an organisational learning environment. ICT support is required to: support reflective practice in the particular area of LMI on an individual basis; share ideas and understandings with groups of peers; create a facility to ask an 'expert' – someone in the organisation who has specialist knowledge; and store knowledge, so that past experience can be drawn upon for use in the present, in a modified and adapted form.

researched case "organizational learning"

It would also seem that a need exists for ICT to support the development of an organisational learning culture around the effective use of LMI in practice. Because of the geographical distances involved across Careers Scotland and the dispersed nature of the learning communities that comprise varied practitioner groups, this would need to be conceptualised as a requirement to support learning at a distance that was community based. Two key challenges will be to develop ICT systems that facilitate: the collection, storage and dissemination of good practice throughout the organisation at various levels. (This raises the wider question of the criteria to be used to identify good practice and perhaps more crucially, who decides); and motivating and supporting staff to engage with ICT systems for these particular purposes.

researched case "networking"

Careers Scotland operates as part of Skills Development Scotland, which comprises a network of organisations. Specifically, Skills Development Scotland brings together four partner organisations, with a shared vision, to drive forward real, positive and sustained change in Scotland's skills performance. These partner organisations need to be able to communicate and collaborate more effectively, to ensure effective use of LMI to support, information, advice and career guidance practice. ICT support is required to facilitate this communication and collaboration.

8.1.4 Synaxon Study

Organization: Synaxon AG Bielefeld (Germany)

Time frame: 4.08 – 8.08. 2008 and 25.08-29.08. 2008

Ethnographers: Tobias Nelkner and Michelle Shuttleworth from UPB

Number of studied persons: 5 persons

Number of interviews: 4

Organization:

Synaxon is a big franchisor and IT company (e.g. PC Spezialist, microTrend) with 8 departments and about 130 employees. Synaxon has an organization culture in which wikis a central element. Purchase, marketing and administration are centralized at Synaxon.

researched case "Accountancy"

The department is responsible for all accounting activities with partner organizations. Main work is accounting of the provision of all partners and securing the correctness of accounting. There are clear and simple tasks within partially complicated processes, which is an effect of missing process optimization.

researched case "e-Business Team"

The e-Business Team is responsible for external representation in the internet, conceptional supervision of an e-business platform and internal development of the Web 2.0 based knowledge management strategy. The department is especially responsible for the web based shopping platform and the organization's representation. Main task is communication, networking and extending the community by blogging. Furthermore the use of the wiki-based internal knowledge has to be supported, mainly by reducing barriers

researched case "Event management"

The event management team is responsible for the organization of all meetings and exposition within Synaxon. Especially the organisation of a large company exhibition demands much communication, organisation and delegation. The adjustment with another company increased the requirements. Furthermore, physical and online meetings have to be appointed.

8.1.5 Swisscom Study

Organization: Swisscom Bern (Switzerland)

Time frame: 10.09.-12.09.2008 and 07.-08.10.2008

Ethnographers: Daniela Feldkamp, Simon Nikles from FHNW

Number of studied persons: 2 persons

Number of interviews: 1

Organization:

Swisscom is Switzerland's leading telecoms provider, 5.3 million mobile customers, around 5.4 million fixed lines included 1.7 million broadband connections. Swisscom has a presence throughout Switzerland and offers a full range of products and services for mobile, landline and IP-based voice and data communication. Swisscom also offers services for IT infrastructure outsourcing as well as the management of communications infrastructures.

Background:

FHNW has realized various student projects with former department on E-Learning and Knowledge Management and former co-operation in MoKEx project series.

researched case "Project Management"

The 4 departments generate new product ideas and ask the project manager if they can get a project leader. Project management comprises checking the projects status and getting new project leader for new projects.

researched case "Customer Experience Design"

Each product manager is responsible for a running product (life-cycle management) and products development in the sense of new customer experience. Aim is to promote the Swisscom Brand in the view of customers and to improve customer experience.

8.1.6 Städtisches Klinikum Karlsruhe study

Organization: Städtisches Klinikum Karlsruhe (Germany)

Time frame: 11.08-15.08.2008 and 08.09-16.09.2008

Ethnographers: Christine Kunzmann, Tina Hansmann and Aileen Hofer from FZI

Number of studied persons: 4 persons

Number of interviews: 1

Received self-descriptions: 7

Organization:

Hospital for „maximum care“ with 4.000 employees (among them 1.600 in nursery) . In focus of the study was the training and consulting center (BBz). It provides vocational training for healthcare professions, a healthcare manager academy, further education, like ward management or specialized nurses and continuing training, like conversation training or kinaesthetics.

Background:

Christine Kunzmann has strong relationships with SKK since several years. She was working for the training and development center for a certain time and knows all people and main processes very well.

researched case “Advanced vocational training for nursery”

The BBZ is responsible for organizing and conducting the advanced vocational training for the various disciplines in the nursery domain. Each team member is specialized in certain fields of expertise and designs, conducts, and organizes trainings in those areas based on customer request and their own initiative.

8.1.7 Structuralia Study

Organization: Structuralia, Madrid, Barcelona (Spain)

Time frame: 18.09-23.09.2008 and 27.09.-28.09.2008

Ethnographers: Pablo Franzolini from CIMNE

Number of studied persons: 2 persons

Number of interviews: 4

Organization:

Structuralia is a SME providing e-learning solutions and consultancy services for the construction sector from 2001. They have developed a technology platform that is provided via a Service Application Provider model to its clients, allowing them to implement training and courses and knowledge management capabilities. Their objective is to empower companies to exploit their knowledge assets so they can enhance the creation, transformation and distribution of it throughout the organization.

Background:

Structuralia and CIMNE have a close relationship since Structuralia's creation 7 years ago based on the co-founders laboral relationship with CIMNE before starting the company. Also CIMNE contributed in the past with a joint development of their training platform.

researched case "on-line course definition, development and teaching"

This is a recursive type of project in Structuralia, they have several of them every year thus have a well established processes in which many people is involved. They deliver this course through Structuralia's LMS in a ASP mode typically for a large company client.

8.2 Guidelines used in collaborative ethnographic studies

- Become familiar with the organization and get a general overview.
- Try to meet as many people as possible and to attend as many meetings as possible.
- Map out key processes and knowledge practices of the organization.
- Understand the diversities of work within the organization and understand how different sets of persons depend upon each another.
- Determine what events were viewed as the salient junctures in the (information) life cycle.
- Create awareness for the topic by explaining the study's aim and the nature of ethnography.
- Explore a general overview of the context of knowledge.
- Identify key persons and situations (like meetings) important for knowledge maturing and try to investigate them in more detail.
- Try to identify situations in which knowledge is generated and matures.
- Try to build relationships to people in the company and foster them during the time of self reporting by using communication tools.
- Try to describe everything related to the following points, even if it might be not essential from your point of view.

  A. Knowledge Elements

  B. Knowledge routines and supporting tools

  C. Situations knowledge is used

  D. Motivational factors

  E. Knowledge structures and vocabularies in communities

Recording data

- Do not interrupt people during executing tasks (ask after finishing the process).
- You will influence people by asking questions – be aware of it.
- Try to ignore predefined hypotheses as much as possible. Use a priori views to limit what you gather very carefully. Sometimes you will gather data that seems irrelevant. Try to be open for everything new.
- Write field notes neutral, analyze data later. Write a fieldwork journal of emerging ideas/interpretations separately and reflect it later.
- Record data as "purely" and in as much detail as possible. Avoid short-hand terms and avoid the replacement of primary observation with secondary elaborations.

Specific recording regards

- Write down all your observations, experiences and findings in field notes. Consider that people analyzing data have no experience with the researched organization.
- Only textual field notes, possibly enriched by pictures will be analyzed.
- If it is allowed and possible, use video or audio records. For the analysis, it is necessary to summarize the essentials into field notes.

- Try to make jottings during the phase of investigation and write them down into detailed field notes later. Enrich your observations by own opinions, especially why people do something and try to explain relationships.
- Allocate enough time for writing detailed field notes and ideally find a quiet place for writing.
- Find a good trade-off between observing and writing. Recommended is max. 3-4 hours of observation without a writing break. The longer the time of observing, the higher is the danger of simplifying and only shortly summarizing the jottings.
- Try to give recommendations for the analysis by marking your field notes with the letters of the focus areas. For which focus area are your observations of primary interest?

8.3 Overview of maturity models

The following table presents a list of maturity models collected from the literature that is the basis for the characterization of our maturity model.

Diversity*	Acronym	Title	Author
13600	CMM**	Capability Maturity Model	(Paulk et al., 1993a, Paulk et al., 1993b)
2120	PSP**	Personal Software Process	(Humphrey, 1999, Humphrey et al., 2005)
971	SPICE**	Software Process Improvement and Capability Determination	(ISO, 1998, Coletta, 1995)
830	CObIT**	Control Objectives for Information and related Technology	(ITGI, 2007)
602	SM**	Nolan's Stage Model	(Nolan, 1973, Nolan, 1979)
561	PCMM**	People Capability maturity model	(Curtis et al., 1995)
184	TMM**	Testing maturity Model	(Burnstein et al., 1996, Burnstein et al., 1998)
138	UMM**	Usability Maturity Model	(Earthy, 1998)
84	CM3**	Corrective Maintenance Maturity Model	(Kajko-Mattsson, 2002, Kajko-Mattsson, 2001)
77	ELMM**	E-Learning Maturity Model	(Marshall and Mitchell, 2003, Marshall and Mitchell, 2004)
70	SFIA**	Skills framework for the information age	(Grant, 2006)
40	SMMM**	Software Maintenance Maturity Model	(April et al., 2005, April and Desharnais, 2005)
37	OIMM**	Organisational Interoperability Maturity Model	(Clark and Jones, 1999, Clark and Moon, 2001)
31	SAM**	Dreyfus model of Skill acquisition model	(Dreyfus, 2002, Dreyfus and Dreyfus, 1988)
24	SIMM	Service Integration Maturity Model	(Arsanjani and Holley, 2006)
22	DMMM	Data Management Maturity Model	(Schnider and Schwinn, 2002)
19	biMM**	Business Intelligence Maturity Model	(Chamoni and Gluchowski, 2004, Chamoni et al., 2004)
17	EGMM	E-Government maturity Model	(Andersen and Henriksen, 2006)

17	IM3	Information Management Maturity Model	(Black et al., 2007)
16	ISM3	Information Security Management Maturity Model	(ISM3-Consortium, 2007)
15	EBMM	E-business Maturity Model	(Loos and Deelmann, 2001)
14	CPMM	Change Proficiency Maturity Model	(Ashour et al., 2004)
14	OPM3	Organisational Project Management Maturity Model	(PMI, 2004)
13	SWTMM	Software Testing Maturity Model	(Staab, 2004)
11	REPMM	Requirements Engineering Process Maturity Model	(Awan, 2005)
11	SCMMM	Supply Chain Management Maturity Model	(McCormack and Lockamy III, 2004)
10	OMMM	Outsourcing Management maturity Model	(Fairchild, 2004)
7	PPfMMM	Project Portfolio Management Maturity Model	(Bondi, 2006)
4	RCMM	Reuse Capability Maturity Model	(Promberger et al., 2000)
3	DITAMM	DITA Maturity Model	(Priestley, 2008)
2	HRSMM	Human Resource Service Delivery Maturity Model	(PSMPC, 2001)
2	ITCMM	IT Controls Maturity Model	(Hou et al., 2003)
2	SSECMM	System Security Engineering Maturity Model	(Hopkins, 1996)
1	SCOPEMM	SCOPE Maturity Model	(Jakobsen et al., 1999)
1	WSMM	Web Service Maturity Model	(Sprott, 2009)
1	TMMM	Training Management Maturity Model	(Leslie, 2008)
0	ERPSMM	ERP System Maturity Model	(Holland and Light, 2001)
0	KMM	Knowledge Maturity Model after Markov	(Markov, 2004)
0	SOA@FZIMM	Service Oriented Architecture Maturity Model FZI	(Mevius and Rathfelder, 2007)
0	SAASSMM	Software as a Service Simple Maturity Model	(Ried, 2008)
0	OMM	Ontology Maturing Model	(Braun and Schmidt, 2008)

0	CLM**	Cross model of learning	(Cross, 2007)
0	CRM	Customer Relationship Management Maturity Model	(Close et al., 2001)
0	DCIMM	Data Center Maturity Model	(Aperture, 2009)
0	ECMM	E-Mail Communication Maturity Model	(Gottschalk, 2007)
0	ILCMMM	Information Life Cycle Management Maturity Model	(SUN, 2005)
0	ISMM	Innovationssystem Maturity Model	(Bürgin, 2007)
0	ITBMMM	IT Business Management Maturity Model	(Touchpaper, 2007)
0	PEMM	Produktentwicklung Maturity Modell	(Preiss, 2006)
0	PMMM	Program Management Maturity model	(Martinelli and Waddel, 2007)
0	SOMM	Service Organisation Maturity Model	(FIR, 2006)
0	SSCMMM	Sicherheitsmanagement Maturity Modell	(Müller, 2008)

Table 10: Overview of maturity models

* Diversity is approximated by the number of search results returned in Google Scholar

** Model was used for the structured content analysis

8.4 Codes

dimension / code area	# of codes
knowledge element	**70**
documented knowledge	28
functional characteristics of knowledge	10
human communication message	3
knowledge about	9
media types	18
system generated communication message	2
knowledge routine	**155**
administrate users/groups	3
assess	5
balance	3
be guided	6
collaborate	4
communicate informal	2
create knowledge	7
establish opportunity to collaborate	6
examine	7
explain	1
explore	10
facilitate changes	5
give and receive feedback	3
handle problem	3
initiate interaction	2
instruct	5
interrupt	1
knowledge use/application	5
learn	7
maintain metadata	2
manage task	8
manipulation	9
meaningfully organize	7
meta-maturing processes	1
network	7
operational BP	5
promote	2
provide information	7
request information	9
share information	5
store	8

dimension / code area	# of codes
knowledge structures and vocabularies in communities	**15**
dictionary	2
hierarchy	3
human-based network	4
organization	2
thesaurus	1
vocabulary	3
motivational factor	**33**
affective	2
human	8
information technology	5
instruction	2
knowledge	1
organizational	6
personal (extrinsic)	6
personal (intrinsic)	3
situations	**19**
what	2
when	3
where	5
who	7
why	2
supporting tools	**30**
(mobile) Telephone	2
computer-based communication support	3
e-Learning	3
knowledge base	2
PIM	3
QM	1
software (organizational scope)	5
software (personal usage)	7
strategy	4
total # of codes	**322**

Table 11: Codes according to code areas and dimensions

The following Table describes the above mentioned codes in detail.

Dimension	Code Area	Code	Description	Example	Introduced by
knowledge element	documented knowledge	agenda	a list or program of things to be done or considered	a schedule	initial code
knowledge element	documented knowledge	contact information	one or more facts that describe one or more options to initialize a communication with a person	vcard element	initial code
knowledge element	documented knowledge	contract	a (legally) binding agreement	legal agreement of two parties that one buys a specified product from the other	UIBK
knowledge element	documented knowledge	curriculum	formal, often legal frameworks for instruction and assessment, e.g., at school, in vocational training	curriculum for a vocational training	FZI
knowledge element	documented knowledge	directory of communities	list of communities that are established within or accessible through the organization and a short description of themes, members and contact data	hiking community deals with all problems related to our hike products	initial code
knowledge element	documented knowledge	documented knowledge	information or data that is consciously recorded, stored or disseminated	local labour market information that is collected, stored and maintained in hard copy for use with customers	UWAR
knowledge element	documented knowledge	employee communication	equivalent to public relations and describes the part of corporate communication that is targeted to the organization's employees	corporate newsletters	initial code
knowledge element	documented knowledge	employee yellow pages	skill directories relate skills to individuals	Mr. Maier speaks Italian	initial code

knowledge element	documented knowledge	external knowledge	knowledge gained from a source which is not part of the organizational knowledge base	a description of a solution procedure found in a developer forum in the Internet	initial code
knowledge element	documented knowledge	fact database	structured data storage holding facts relevant for business	database with customer information	FHNW
knowledge element	documented knowledge	fact knowledge in internal/ external studies and analyses	reports document the results of an organization-internal study or analysis related to a specific topic or a study or analysis performed by an organization-external institution	scientific paper	initial code
knowledge element	documented knowledge	guidelines	recommended practice that allows some discretion or leeway in its interpretation, implementation, or use	first aid instructions how to give a rescue breath	initial code
knowledge element	documented knowledge	help entries	content which is created to provide a person help targeting a specific problem	a description how to save a file	initial code
knowledge element	documented knowledge	idea/proposal	informal or formal documents submitted to an established proposal system	microarticles describing a new idea	initial code
knowledge element	documented knowledge	internal and external patents	a set of exclusive rights is granted by a state to a patentee for a fixed period of time in exchange for a disclosure of an invention.	patent of a needle bearing used for wind engines	initial code
knowledge element	documented knowledge	issue list	list of issues/tasks that came up and need to be (or that are) handled by one or more assigned persons.	list of pending project issues	UIBK

knowledge element	documented knowledge	knowledge map	returns different knowledge-oriented visualizations in order to enable users to locate experts within an organisation	skill matrix in form of a spread sheet	initial code
knowledge element	documented knowledge	newsletter	desired newsletter with information which is relevant for the tasks or topics of the person.	a person gets a newsletter which he/her subscribed on a relevant topic	FHNW
knowledge element	documented knowledge	presentation	a set of visual symbols and/or pictures which are demonstrating something for the attention of the mind of other persons	a Microsoft PowerPoint Presentation	initial code
knowledge element	documented knowledge	project plan	a statement of how and when a project's objectives have to be achieved, by showing the major products, milestones, activities and resources required on the project	MS Project plan	initial code
knowledge element	documented knowledge	project proposal	a plan about the objectives, outcome, realization, effort and the timeline on a project	description of a research project	initial code
knowledge element	documented knowledge	protocol	a record of real-world activities	agreed notes of a meeting	initial code
knowledge element	documented knowledge	questions, answers	stored questions that might be of interest to many participants together with answers, mostly given by experts	FAQ lists	initial code
knowledge element	documented knowledge	schedule	an individual or shared plan for performing tasks or achieving an objective including the allotted time	MS Outlook calendar	initial code
knowledge element	documented knowledge	survey (internal)	a survey which only involves people working in the same company.	management sends an e-mail request for feedback on a process	FHNW

knowledge element	documented knowledge	task description	detailed statement of work that accompanies a task order in construction contracts within a certain deadline	MS Outlook task which describes the output and the deadline	initial code
knowledge element	documented knowledge	training material	contents, which are created for usage in formal or informal learning	a tutorial which explains the usage of specific software	initial code
knowledge element	documented knowledge	wishlist	utterance about wishes for improved support for knowledge exchange and usability in general	user requirements for an (improved) software solution	FZI
knowledge element	functional characteristics of knowledge	appointment	an arrangement to do something or meet someone at a particular time and place	MS Outlook appointment for a scheduled meeting in the own office	initial code
knowledge element	functional characteristics of knowledge	best practices	tasks or workflows that have proven to be valuable or effective within one organization or organizational unit and may have applicability to other organizations	SAP reference process	initial code
knowledge element	functional characteristics of knowledge	contact	establish a communication with someone/something or an observing or receiving of a significant signal from a person or object	talk to a person	initial code
knowledge element	functional characteristics of knowledge	decision	the result of deciding, sometimes based on an analysis of information gathered about alternatives	decision what product to buy out of a list of alternatives	UIBK
knowledge element	functional characteristics of knowledge	example	a similar case that constitutes a model or precedent a unique episode and can serve as a pattern for other cases	an employee reports from a former project and explains an solution by referencing on the former project	initial code

knowledge element	functional characteristics of knowledge	experience	familiarity with a skill or field of knowledge acquired over months or years of actual practice and which, presumably, has resulted in superior understanding or mastery	Mrs. Allen is responsible for the annual financial report for 10 years and she knows how to proceed during creation of such a report	initial code
knowledge element	functional characteristics of knowledge	lessons learned	systematically documented essence of experiences made by members of the organization	documented experience made in a former project	initial code
knowledge element	functional characteristics of knowledge	non-document knowledge	data or information that is gathered through various methods but not formally or systematically recorded as part of organizational knowledge structure	information on local education, training and employment opportunities that are retained/learnt by adviser	UWAR
knowledge element	functional characteristics of knowledge	rumour	gossip heard through the grapevine	rumour about a future product that might be available on the market	UIBK
knowledge element	functional characteristics of knowledge	source of information	indicating a certain source of information	files, journals, colleagues	FZI
knowledge element	human communication message	external request	the act of asking performed by a person which do not belong to the organization of the requested person.	a client reports a problem and asks our employee for help.	initial code
knowledge element	human communication message	internal answer	reply to a request to a member of the organisation	message: "apply for a journey is approved"	initial code
knowledge element	human communication message	internal request	message from a member of the organisation describing certain circumstances which demands actions of the receiver	a person asks for the approval of a journey	initial code

knowledge element	knowledge about	fact knowledge about system characteristics	knowledge about characteristics and operational sequences of systems	adjustment settings of a printing machine for cotton prints	initial code
knowledge element	knowledge about	knowledge about business partners	knowledge about the characteristics of business partners	company X produces product Z with machine A	initial code
knowledge element	knowledge about	knowledge about chained tasks	knowledge about the order of tasks, their execution and their pre- and post conditions	agriculture: seeding - growth - harvesting	initial code
knowledge element	knowledge about	knowledge about customers	documented or experience based knowledge about customers, their behaviour or general market characteristics	customer profiles and market segments to lance products	FHNW
knowledge element	knowledge about	knowledge about employees	knowledge about peoples knowledge their roles and responsibilities within the organization	Mr. Miller is the chief engineer of the printing department and knows everything about the large printing machine	initial code
knowledge element	knowledge about	knowledge about organization and processes	descriptions of the organization's structures and processes	organizational charts	initial code
knowledge element	knowledge about	knowledge about projects	knowledge on goals, status or things carried out within a specific project	employee sends a status report to the boss	FHNW
knowledge element	knowledge about	knowledge about responsibilities	description of assigned tasks to a person or a role	Dragmore is responsible for all appeals concerning your employee portal	initial code
knowledge element	knowledge about	product knowledge	represents descriptions related to the organizations' products and/or services	marketing presentations	initial code
knowledge element	media types	blog entry	an article or notes in a Weblog	he writes a blog entry	UPB

knowledge element	media types	book	a book is a set or collection of written, printed, illustrated, or blank sheets, made of paper, parchment, or other material, usually fastened together to hinge at one side	Maier, R.: Knowledge Management Systems - Information and Communication Technologies for Knowledge Management. 3rd ed., Springer, Berlin 2007.	UIBK
knowledge element	media types	collaborative jottings	informal notes quickly written down for shared purposes within a community	jottings created by one or more persons summarize information from a group discussion	initial code
knowledge element	media types	documents paper based	documents in a physical form, printed out or copied	letters, physical folders, brochures	FZI
knowledge element	media types	email	a message, sent or received electronically by a email system over a computer network, as between two personal computers	email newsletter received over Microsoft Outlook	initial code
knowledge element	media types	figure	a two-dimensional pictorial abstract representation of an object or a fact which can have one of the following (digital) file extensions: "jpeg", "tiff", "raw", "pgn", "gif", "bmp", "ppm", "pgm", "pbm" and "pnm"	a diagram	initial code
knowledge element	media types	journal/newspaper	electronic or paper-based periodical, both for the general public and special purpose (scientific, professional etc.)	local daily newspaper, professional journal	FZI

knowledge element	media types	PDF-File	computer document that uses the PostScript page description language to represent two-dimensional documents in a manner independent of the application, hardware and operating system it has been build in and has the extension "pdf"	Adobe Acrobat Reader document	initial code
knowledge element	media types	personal jottings	informal notes quickly written down for personal purposes	handwritten notes of a meeting	initial code
knowledge element	media types	picture	a two-dimensional pictorial exact representation of an object which can have one of the following (digital) file extensions: "jpeg", "tiff", "raw", "pgn", "gif", "bmp", "ppm", "pgm", "pbm" and "pnm"	a photograph	initial code
knowledge element	media types	representations of knowledge	how information and data are presented and represented in different formats	statistical data presented in different tables and charts for different audiences	UWAR
knowledge element	media types	screen shot	a picture of what is displayed on screen	picture which shows an input form of an application	initial code
knowledge element	media types	source code	in computer science, source code (commonly just source or code) is any sequence of statements or declarations written in some human-readable computer programming language	source code of an .html, .xml or .java file	UIBK

knowledge element	media types	spread-sheet	a document that consists of multiple cells that makes up a grid, consisting of rows and columns. Each cell contains either alphanumeric text or numeric values	Microsoft Excel Sheet	initial code
knowledge element	media types	text	representation of language by means of a writing system, that can either be represented by a computer document that is structured as a sequence of lines and can have one of the following (digital) file extensions: "txt", "log", "html", "htm", "doc", "asc" or by a physical text	a Microsoft Word document	initial code
knowledge element	media types	video	motion picture, either electronic (as .avi, .mpg, .wmv or similar) or on tape	short instructional videos for a certain practice	FZI
knowledge element	media types	Wiki entry	a brief note, article, or group of figures in a wiki	the article on WP1 in the MATURE-IP wiki	initial code
knowledge element	media types	Word-File	special type of a text document which is produced through the word processing software Microsoft Word and has the extension "doc"	Microsoft Word document	initial code
knowledge element	system generated communication message	error message	messages created by a system to highlight erratic behaviour, which can include first hints on the error description	message: format of the inputted data is not correct	initial code
knowledge element	system generated communication message	system request	message created by certain system which demands certain actions of the receiver	message that the employee has to change his password within the next 5 days	initial code

knowledge routine	administrate users/groups	maintain access privileges	determination of one or more persons that are allowed to read and change contents	ask a project manager for getting access to a folder on a fileserver	initial code
knowledge routine	administrate users/groups	maintain groups	the employee maintains his or her groups in an online application	He or she creates a snippr groups or adds/deletes members.	UPB
knowledge routine	administrate users/groups	personalize	changing the view, available functionality or displayed information of an application in the way, the user wants it	setting a bookmark in the browser	FHNW
knowledge routine	assess	assure quality of contents	this routine is concerned with evaluating and enhancing predominantly the formal quality of contents with regard to, e.g., consistent formatting, correct page numbering, an up□to□date table of contents and the appropriate use of language	reformat a scientific paper regarding to publisher's guidelines	initial code
knowledge routine	assess	forward corrections	when errors are identified or extensions are recognized to be necessary then contents are either changed directly and the author is notified or a request for changes or comments is sent to him or her; this routine is executed without any explicit demand for feedback	someone recognizes a spelling mistake on an Intranet page and informs the author	initial code
knowledge routine	assess	rate contents	evaluate contents according to a scale	evaluate the usability of content using a scale from one to five	initial code

knowledge routine	assess	request approval of contents	in contrast to the request of feedback, this step targets the formal acceptance of contents by internal or external clients or by supervisors	present project results such as requirements specifications in order to get acceptance	initial code
knowledge routine	assess	request feedback about content	this routine is concerned with the enhancement and extension of contents, e.g., by ensuring their completeness, correcting errors or acquiring opinions in order to align perspectives and to make things plausible	contact a colleague in order to get his opinion about a presentation	initial code
knowledge routine	balance	evaluate consequences	thinking about the implications of some decisions	a person estimates which offer from a vendor to choose	initial code
knowledge routine	balance	make agreement	people agree on a topic and they define a further procedure	two colleagues reach a consensus on a discussion	initial code
knowledge routine	balance	solve problem	work out, how to overcome a certain challenge	figuring out, why a software tool does not work	initial code
knowledge routine	be guided	being supervised	the process of being helped or coached by a mentor	an expert guiding a trainee	initial code
knowledge routine	be guided	mentoring	experienced employee accompanies a new employee for a certain period of time to introduce him to the work practices and give advice	as part of apprenticeship	FZI
knowledge routine	be guided	recommend further training	someone recommends a specific event to one or more colleagues or staff members	one recommends a colleague to join a workshop by explaining advantages	FHNW

knowledge routine	be guided	training	an employee is taught skills coached by another employee in a planned, rather long-running session (e.g., one day)	an employee new to a domain is introduced with specific tools, training material and a test case while being able to ask questions and get coaching from an experienced employee	UIBK
knowledge routine	be guided	training/professional development activities	informal and formal training and development activities aimed at developing knowledge and competencies	INSET training course introducing new sources of local labour market information	UWAR
knowledge routine	be guided	use training materials	find information within contents created for educational purposes that are (electronically) accessible either only for course participants or even freely for all members of an organization	rework contents of a course in order to prepare for examinations	initial code
knowledge routine	collaborate	coordinate co-authoring	organize collaborative steps of an authoring process	coordinate the joint creation of presentation slides	initial code
knowledge routine	collaborate	motivate to join social events	someone motivates a colleague to join a social event to foster social networks	manager complains that a colleague didn't join an event	FHNW
knowledge routine	collaborate	participate in group processes	team-working towards a common outcome	taking part in a collaborative creation of a product	initial code
knowledge routine	collaborate	share contents with co-authors	this routine describes the exchange of contents between two or more authors of the same content	invite others to contribute in a Google-Docs document	initial code
knowledge routine	communicate informal	informal exchange	exchange of information during a face-to-face encounter, private or business related	coffee break talk	FZI

knowledge routine	communicate informal	short message	sending an sms	Igor sends an SMS to a colleague	FHNW
knowledge routine	create knowledge	create or change content	this routine comprises the creation and change of contents by means of software tools, in most cases office applications such as text processors, spreadsheet applications and presentation software	edit Microsoft Word document	initial code
knowledge routine	create knowledge	create personal draft	this routine describes the creation of a first working draft that is not yet finished and not considered to be distributed to other people	store an initial version of a presentation on the local hard disk or in a private workspace	initial code
knowledge routine	create knowledge	creation of knowledge	knowledge is created, extended and/or transformed for a different purpose or audience	Employee carries out a piece of research in response to query to extend knowledge of local labour markets	UWAR
knowledge routine	create knowledge	prepare survey	preparation work regarding a survey.	gather appropriate addresses to conduct a survey	FHNW
knowledge routine	create knowledge	recording information/knowledge	how information and knowledge is documented by the individual and organisation	local training opportunities are shared by email to local networks	UWAR
knowledge routine	create knowledge	select and use standard template	pre□defined templates that determine the structure and layout of contents are often identified and applied as a starting point for the creation of contents	use a given EU-FP7 template for creating a project proposal	initial code

knowledge routine	create knowledge	use similar content as starting point	as an alternative to the identification and use of standardized templates, suitable contents created in the past such as text documents or presentation slides are selected and changed	select an existing Microsoft PowerPoint presentation in order to reuse and enhance it	initial code
knowledge routine	establish opportunity to collaborate	make appointment	schedule an appointment that may involve other individuals	send out a meeting request using Microsoft Outlook	initial code
knowledge routine	establish opportunity to collaborate	organize journey	this routine includes all administrative tasks required in order to organize a trip as well as the absence from the workplace for the respective time	book a flight in order to attend a meeting in Frankfurt	initial code
knowledge routine	establish opportunity to collaborate	organize meeting	the employee organizes a meeting for his or her colleagues.	a start-up meeting for an event	UPB
knowledge routine	establish opportunity to collaborate	request for appointment	someone tries to make an appointment	employee calls a colleague and asks if they can met each other to discuss a topic	FHNW
knowledge routine	establish opportunity to collaborate	sharing: calendar	calendar items are shared among a group of people	group calendar	FZI
knowledge routine	establish opportunity to collaborate	verify appointment	action to ensure or request whether an appointment is fix	a person phones a colleague to ask, whether a meeting takes place, because an outlook request was not answered	FHNW
knowledge routine	examine	check	the act of testing or verifying something or someone	check an email for mistakes before sending	initial code
knowledge routine	examine	check calendar	have a look into scheduled appointments	monitor appointments in calendar of Microsoft Outlook	UIBK

knowledge routine	examine	check calendar/calendar entries	the employee checks his or her calendar for free time slots or entries	he or she wishes to participate a meeting and wants to know whether this is possible	UPB
knowledge routine	examine	check content	the employee reads and/or verifies content.	he or she reads a website that could be changed by him or her	UPB
knowledge routine	examine	check email	have a look into received or sent emails.	monitor email inbox of Microsoft Outlook	initial code
knowledge routine	examine	check reports	reports are either created manually in order to periodically inform everyone involved in a business process or project about past activities or they are created automatically	check a log file generated by an operational system in order to find a reason for a failure	initial code
knowledge routine	examine	check selected external sites	selected public external Web sites with news and information are visited for specific types of information and depending on the user's roles and preferences	visit www.wikipedia.org in order to get information about a certain topic	initial code
knowledge routine	explain	explain	to make a cause understandable to others (and show the logical development and context)	show a colleague how a new service operation works	initial code
knowledge routine	explore	full-text search	a search based on defined keywords that considers the whole text of the document.	conduct a search within all received emails using Microsoft Outlook	initial code
knowledge routine	explore	identify contact details	before colleagues or externals can be contacted, their contact details need to be identified	use individual contact list in Microsoft Outlook	initial code
knowledge routine	explore	identify contact person	try to find an internal or external person that has specific skills	determine an expert in knowledge management	initial code

knowledge routine	explore	investigate internal knowledge base	scan the internal knowledge base in order to get relevant knowledge about a certain topic	try to get information by scanning a project workspace	initial code
knowledge routine	explore	keyword-based search	trying to find something by providing words classifying the needed object	searching for a product by providing industry and needed criteria	initial code
knowledge routine	explore	knowledge acquisition	methods of how knowledge is sort, extended and developed by individuals	use of the internet to extend knowledge and understanding of a particular sector	UWAR
knowledge routine	explore	locate resource or people	determine the position of a needed resource or a colleague	finding a colleague using the enterprise portal	initial code
knowledge routine	explore	navigate	navigate through structures or systems menus to reach a certain goal	browsing through the structure of the company's intranet	initial code
knowledge routine	explore	search	to look for something	a person trying to find a handbook for the copier	initial code
knowledge routine	explore	web request	this routine returns a Web page identified by a unified resource locator (URL) that can be rendered with a Web browser	type in an URL into a Web browser to get to an Intranet or Internet Web page and obtain information for solving a problem	initial code
knowledge routine	facilitate changes	aim improvement of communication	a person tries to achieve changes that improves or facilitates communication	a manager wants to have all staff members working at the same place.	FHNW
knowledge routine	facilitate changes	communicate organizational changes	communication of changes in organization or responsibilities	manager informs his staff, that a new labour grading will be introduced	FHNW

knowledge routine	facilitate changes	communication lines (internal and external to organisation)	both formal and informal communication (electronic and hard copy) to those within and external to the organization	individual communicating information about local employment opportunities to local network of colleagues	UWAR
knowledge routine	facilitate changes	enforce regulations	someone enforces compliance or follow a guidance	a manager tells a staff member to reduce overtime	FHNW
knowledge routine	facilitate changes	knowledge management (reporting structure)	how knowledge, important to organizational operation, is created, stored, organized, maintained and disseminated within and through the organization	organizational statistics are shared with all organizational members	UWAR
knowledge routine	give and receive feedback	discuss idea	discussion on any ideas relevant to business	a product manager explains an idea for a new service which then is discussed	FHNW
knowledge routine	give and receive feedback	discuss topic	discuss a topic with one person or multiple people in direct interaction	conduct an online meeting in order to discuss or present a software product	initial code
knowledge routine	give and receive feedback	give and receive feedback	providing or getting a response, comments or opinion in order to evaluate a statement	evaluating the proposal of a colleague about an improvement	initial code
knowledge routine	handle problem	recognize problems	the employee recognizes a problem which activates a new workflow or changes the current	He starts the instant message client and gets an error message.	UPB
knowledge routine	handle problem	report problem	the employee organizes reports a problem to another staff member	an error message occurs and he or she tells another colleague about it	UPB
knowledge routine	handle problem	scaffolding	guidance through preparation of the problem space for a task to be carried out in a self-organized way by the learner	instructor gives a bigger task to be solved in a real-world setting, is available for advice, but does not tell how to do it	FZI

knowledge routine	initiate interaction	establish contact	this routine is targeted at the creation of links to other people	try to get in contact with someone one has met during a training course	initial code
knowledge routine	initiate interaction	request contact	try to establish contact	manager writes an e-mail to an unknown person (found as potential expert) to ask for contact	FHNW
knowledge routine	instruct	assign responsibilities	this routine is concerned with the definition and assignment of responsibilities, roles and tasks to one or more persons	assign a task to a group of employees during a meeting	initial code
knowledge routine	instruct	authorize	to give someone permission for something	granting access rights for a system to a colleague	initial code
knowledge routine	instruct	give order	to give someone a specific rule, regulation, or authoritative direction	delegate a task to a member of staff	initial code
knowledge routine	instruct	receive order	to get a specific rule, regulation, or authoritative direction from a senior	get a task assignment	initial code
knowledge routine	instruct	suggest task	someone who is not in the position to give an order proposes the execution of a specific activity	an employee proposes in a meeting, to evaluate some figures to make a decision possible	FHNW
knowledge routine	interrupt	break in workflow	employee has stopped his workflow caused by an event	while he is writing something, a colleague comes in the office and asks him something so he has started searching the answer for him	UPB
knowledge routine	knowledge use/application	access internal news	in contrast to the routine check selected external sites, this routine is conducted more routinely on a daily basis and not triggered by a concrete problem	monitoring company□related topics based on press releases or email newsletters	initial code

knowledge routine	knowledge use/application	knowledge use/application	how information is applied and transformed in everyday organizational operations	local labour market information is interpreted and represented for use with different audiences	UWAR
knowledge routine	knowledge use/application	open contents	person enters an existing principal substance of an electronic source	employee opens an intranet page	initial code
knowledge routine	knowledge use/application	use of mediating artefacts	using objects that help to make informed decisions and choices in order to undertake specific (learning) activities	using a clean sheet of paper and sketch up a graphic in order to explain an idea to a colleague	initial code
knowledge routine	knowledge use/application	use paper folder	the employee uses information taken from a paper folder	he or she uses information taken from a contract	UPB
knowledge routine	learn	gather information	getting facts in order to catch up on something	a person reads a project description in order to be up to date	initial code
knowledge routine	learn	learn from mistakes	gaining knowledge through something that has been done in a wrong way previously	rewriting a request which previously used the wrong template	initial code
knowledge routine	learn	learning by doing	learning process is integrated into a working practice without separating learning phase and practice phase	practicing how to carry a patient from a bed to his wheelchair	FZI
knowledge routine	learn	listen and observe	trying to grasp and /or to comprehend a situation	listening to a discussion, two colleagues are having in one's room	initial code
knowledge routine	learn	observation	trainer observes participants in their practice	trainer visits workplace to see how they put their knowledge to practice	FZI
knowledge routine	learn	try things out	put something into test	conduct a test of steps described in a manual	initial code

knowledge routine	learn	work alongside others	observing and listening to others at work and to participating in activities	listening to a discussion, two colleagues are having in one's room	initial code
knowledge routine	maintain metadata	annotate contents	annotation is the complementation of contents with comments in order to give feedback, ask questions for comprehension, correct errors or include additional aspects	use the Microsoft Word track changes functionality that automatically highlights changes within a document	initial code
knowledge routine	maintain metadata	assign or maintain meta-data	assign or maintain meta□data that is used in order to further characterize additional data about contents	add a keyword to a document	initial code
knowledge routine	manage task	abort task	the employee starts a task then cancels it without finishing	he or she starts to write an email and then decides to phone the person instead	UPB
knowledge routine	manage task	assign own task	someone defines a task which he/she will execute oneself	manager tells to send further information on a discussed topic	FHNW
knowledge routine	manage task	check task status	Ensure that a task is in process or is being bear in mind	manager asks whether a meeting with another department has been conducted	FHNW
knowledge routine	manage task	maintain task list	this step comprises the creation of individual tasks on a task list as well as their management	maintain individual tasks using paper-based notes or Microsoft Outlook	initial code
knowledge routine	manage task	propose project	proposing to initiate a project	manager has detected problems with a process in some cases and proposes to develop an adapted version for certain cases	FHNW

knowledge routine	manage task	propose task	someone proposes to execute a specific action or proceeding	see suggest task	FHNW
knowledge routine	manage task	request task	requesting tasks to be done	a person asks a colleague whether something should be prepared for the next meeting	FHNW
knowledge routine	manage task	task management	individual and self-determined work organization, covering both professional and private domain	planning event preparation, daily work planning	FZI
knowledge routine	manipulation	clear up misunderstanding	action in order to clear a (potential) misunderstanding	a person makes a phone call to explain information flows which seem to be gone wrong	FHNW
knowledge routine	manipulation	compare content	try to identify differences or similarities between two or more contents	try to find differences between an as-is and a to-be process description	UIBK
knowledge routine	manipulation	consolidate final version	merge parts of content created separately by one or more authors	writing each chapter of a book independently and merge them in an additional step	initial code
knowledge routine	manipulation	integrate	to incorporate information into a different set of information	insert information from a web-source like a wiki into a document	initial code
knowledge routine	manipulation	interaction with knowledge/information	individuals' use of knowledge and information	individual uses information with customer	UWAR
knowledge routine	manipulation	refine idea	an initial idea is refined in iteration cycles	refinement based on experiences gathered through applying the idea	FZI
knowledge routine	manipulation	reflect	self-observation and reporting; contemplation on one-self	thinking about a meeting in which the knowledge worker participated	initial code

knowledge routine	manipulation	summarize verbal	someone summarises discussed topics orally	moderator summarises the arguments made until a specific moment	FHNW
knowledge routine	manipulation	transformation of knowledge	how knowledge is changed and manipulated for different purposes and audiences	transformation of labour market information into intelligence	UWAR
knowledge routine	meaningfully organize	arrange messages	structure messages	move e-mails into folders	FHNW
knowledge routine	meaningfully organize	filter information	filtering information involves the selection, annotation and highlighting of information before it is distributed	an executive receiving a lot of information that he filters and distributes to subordinates	initial code
knowledge routine	meaningfully organize	generalize contents	generalization prepares the application of knowledge in different contexts or scenarios	removing or marking specifics of a Microsoft PowerPoint presentation created for a developers meeting in order to present it to a supervisor	initial code
knowledge routine	meaningfully organize	organize concepts	discuss about a topic in order to arrange some relevant points	structuring pros and cons of different proposals	initial code
knowledge routine	meaningfully organize	sort emails/files	the employee sorts emails or files into a folder	he or she has received an email and sorts this into a specific email folder	UPB
knowledge routine	meaningfully organize	structure repository	structuring the repository is the search for and the creation of a structure that supports the easy storage and retrieval of contents	create a sub□directory on a fileserver or within a DMS (document management system	initial code
knowledge routine	meaningfully organize	use shortcut functions	the employee sorts emails or files into a folder	he or she has received an email and sorts this into a specific email folder	UPB

knowledge routine	meta-maturing processes	knowledge maturing processes/routines (serendipitous, conscious, limited, none)	the processes and routines used by individuals to collate, store, manipulate, shared and reflect upon knowledge	individual consciously or unconsciously manages knowledge and information	UWAR
knowledge routine	network	attend meeting	the employee takes part in a meeting	weekly business unit meetings	UPB
knowledge routine	network	meeting	meeting without specific characteristics	meeting for discussing the event organization	FZI
knowledge routine	network	retreat	longer meeting of a group of people (at least one or two days), mostly in a remote location, for enabling in-depth discussions	group retreat	FZI
knowledge routine	network	sharing: email	collaborative access to emails	a group email account	FZI
knowledge routine	network	status meeting	regular short meeting	open space meetings	FZI
knowledge routine	network	Stay aware about content changes	this routine is concerned with monitoring changes on contents by other people and hence can be seen as a counterpart to the routines share contents with co-authors and annotate contents	check a change history of a project's deliverable	initial code
knowledge routine	network	verify availability	find out whether colleagues are accessible at a specific moment	consulting the Microsoft Outlook calendar in order to estimate whether he or she is typically available at a specific time	initial code
knowledge routine	operational BP	create credit	the employee creates a credit	after a wrong invoice, he or she creates a credit for the customer	UPB

knowledge routine	operational BP	create invoice	the employee creates an invoice	he or she creates an invoice after a customer has ordered a product	UPB
knowledge routine	operational BP	deposit/withdraw money from petty cash	the employee deposits or withdraws money from the petty cash	he or she had a request for cash by a colleague	UPB
knowledge routine	operational BP	handle cash disbursement	the employee hands out cash or receives cash and bills	a colleague needs to buy stuff from a computer store	UPB
knowledge routine	operational BP	hospitation	employee is working in a new department/field for a limited period of time to gain knowledge and experience with a new area	hospitation as part of advanced vocational training	FZI
knowledge routine	promote	lobbying	political influence on decision processes for legal frameworks and government budgets	influencing the definition of apprenticeship curricula	FZI
knowledge routine	promote	work with clients	participate in a group process with a minimum of one person receiving a service	working together with a user of a client-company in order to find a bug	initial code
knowledge routine	provide information	forward content	forwarding is the transfer of contents to a single person or a group of people, frequently as an attachment to or within the body of an email	send an email to a colleague	initial code
knowledge routine	provide information	notify about contents	inform colleagues about new or changed contents	inform a colleague about interesting content orally or via email that may contain a link and comments	initial code
knowledge routine	provide information	present approach	presentation or explanation of an approach to solve a problem	manager explains how he would solve a problem	FHNW

knowledge routine	provide information	reply to a request	to respond in words or writing to someone or something who/that is asking for something	send an answer email to a customer	initial code
knowledge routine	provide information	respond to instant message	the employee writes or answers to an instant message	he has become feedback and writes an instant message to a colleague.	UPB
knowledge routine	provide information	response to question on discussion topic	someone gives an answer or reacts somehow to a question within a discussion on a topic	a person explains the conceivable impact of a service change	FHNW
knowledge routine	provide information	verbal transfer of information	a person proactively tells about experiences or facts the person heard about and thinks it could be interesting in context of the work or projects	manager informs his team on new technologies	FHNW
knowledge routine	request information	ask for help	employee approaches colleagues, friends etc. in order to make progress on problem solving	ask for help with a problem	FZI
knowledge routine	request information	ask for information demand	someone asks others which information or knowledge they would like to get from a specific source, e.g. an event or conference	manager asks his team whether they have specific questions which he should ask at an event / meeting	FHNW
knowledge routine	request information	ask for opinions	someone wants to know, what other people think about a topic or question	vote for or against a discussed/proposed solution/action	FHNW
knowledge routine	request information	ask questions	interact with someone in order to get advice	asking a colleague, how a certain product works	initial code
knowledge routine	request information	asking question on discussion topic	someone needs more background or technical information concerning the currently discussed topic	one asks for figures when discussing on impacts of changes	FHNW

knowledge routine	request information	get information	the process of receiving information	getting an email	initial code
knowledge routine	request information	interview	inquiring an employee for gaining a targeted insight into opinions, experiences, fact knowledge etc.	instructor interviews participant about conclusions from an internship	FZI
knowledge routine	request information	query	a query returns dynamic views on electronic contents based on structured metadata; just as the full-text search service it returns dynamic views based on specified search criteria but in contrast is mainly based on structured meta□data.	try to find a document by using a creation date as search criterion	initial code
knowledge routine	request information	tool/service request	an employee has clear demands on a tool, service or parts of it	I need a tool for creating jottings that is small, fast and ubiquitous available	UPB
knowledge routine	share information	sharing information – external to organisation	information is disseminated external to the organization	one day conference is organized to informed key stakeholders of the organization's activities	UWAR
knowledge routine	share information	sharing information – internal to organisation	information is disseminated within the organisation	individuals are notified of new initiatives through team meetings	UWAR
knowledge routine	share information	sharing information – paper based	information is shared and organized in hard copy	information is stored at a local office within a folder	UWAR
knowledge routine	share information	sharing information – using IT tools (i.e. email, blogging, intranet)	information is disseminated using email, organizational intranet	individual learns of local employment opportunities and shared with colleagues by email	UWAR

knowledge routine	share information	sharing information: external to organisation	sharing information with people external to the organization, usually within one's own social network and without explicit approval of the organization	sharing calendar, sending documents to external partner	FZI
knowledge routine	store	archive contents	when contents are regarded as to be not relevant anymore, they are moved into an archive	move working drafts into a special folder after creating the final version of a presentation	initial code
knowledge routine	store	change technical format	the act of converting content from on file type to another	create a PDF document out of a Microsoft Word document	initial code
knowledge routine	store	fax	the employee sends or receives a fax	he or she needs to send information to another organization	UPB
knowledge routine	store	print document	the employee prints a document	an email, document or website	UPB
knowledge routine	store	release contents	this routine is about the release of contents in order to enable other people to access and use them	publish a web page that has been changed	initial code
knowledge routine	store	remove content	deletion of contents which are not seen as needed anymore	a person deletes e-mails after performing the corresponding task	FHNW
knowledge routine	store	select storage location	in order to make contents accessible for others, an appropriate storage location needs to be selected	decide where to store a Microsoft Excel spreadsheet	initial code
knowledge routine	store	store content	storing is the filing of electronic contents in a suitable format labelled with an informative name within a repository	store a Microsoft Word document on a fileserver	initial code

knowledge structures and vocabularies in communities	dictionary	catalog/ID	finite list of terms with an unambiguous interpretation	a list of project members	initial code
knowledge structures and vocabularies in communities	dictionary	glossary	a list of terms and meanings, specified typically as natural language statements	a list of abbreviations	initial code
knowledge structures and vocabularies in communities	hierarchy	formal is-a relationship	strict subclass hierarchies, using formal language	RDF class definition	initial code
knowledge structures and vocabularies in communities	hierarchy	hierarchy	a hierarchy is an arrangement of objects in a ranked or graduated series	a ranked list of preferred vendors	initial code
knowledge structures and vocabularies in communities	hierarchy	informal is-a relationship	relationship, where an instance of a more specific class is also an instance of the more general class but that is not enforced 100% of the time	folder structure on a hard disk	initial code
knowledge structures and vocabularies in communities	human-based network	extended networks (i.e. inter-agency)	relationships and communications go beyond the organization	individual works across two organizations offering services	UWAR
knowledge structures and vocabularies in communities	human-based network	internal extended networks	relationships and communications go beyond the locality	individual with particular specialty communicates with those organizational members operating in a different locality	UWAR

knowledge structures and vocabularies in communities	human-based network	social network	personal relationships with others (private and professional and mixed context)	phone a fried to get some piece of information	FZI
knowledge structures and vocabularies in communities	human-based network	social networks	the formation of personal relationships and communications	individual communicates informal with others about organizational issues	UWAR
knowledge structures and vocabularies in communities	organization	organisational/management structure	the structure and hierarchy of organization – how issues are reported and decisions made	performance of locality reported to senior management	UWAR
knowledge structures and vocabularies in communities	organization	professional role	individual organizational assigned role and responsibilities	individual assigned specializing in professional development	UWAR
knowledge structures and vocabularies in communities	thesaurus	thesaurus	additional semantics in relationships such as synonyms, antonyms and homonyms	a dictionary providing synonym words	initial code
knowledge structures and vocabularies in communities	vocabulary	vocabulary – individual/professional	words, terms and acronyms used by individual as part of their profession	how services are defined and used	UWAR
knowledge structures and vocabularies in communities	vocabulary	vocabulary – organisational	words, terms and acronyms used by individual as part of their profession	how initiatives and IT systems are defined	UWAR

knowledge structures and vocabularies in communities	vocabulary	vocabulary – policy driven	words, terms and acronyms used by individual as part of their profession	adoption and use of new policy terms in organization	UWAR
motivational factor	affective	barrier: affective	emotional barrier (anxiety, uncertainty) that hinders knowledge sharing and maturing engagement	uneasiness with the use of shared calendars because of transparency	FZI
motivational factor	affective	motivation: affective	emotional factor that promotes engagement in knowledge maturing activities	Igor has a strong interest in a topic and	FZI
motivational factor	human	barrier: attitude	personal trait or group culture that hinders knowledge sharing and maturing engagement	professional group does not want to go to training events with other professional groups because they think they are superior to the others	FZI
motivational factor	human	barrier: competition	in a competitive situation, knowledge is not shared as not to reveal something that could be an advantage to others	cooperation partner decide to go it alone in order to have an advantage instead of coordinated actions	FZI
motivational factor	human	barrier: lack of help	work has to be interrupted because there is no immediate possibility for help	software problems cannot be solved because the responsible department is not reachable	FZI
motivational factor	human	barrier: regulation	organizational or legal rules and regulations hinder knowledge sharing and maturing engagement	banned freemail addresses because of spam policy make communication with externals difficult	FZI
motivational factor	human	barriers to knowledge sharing – team culture	how knowledge sharing is hindered by a particular team culture	locality manager fails to share particular information to those working with him/her	UWAR

motivational factor	human	motivation: attitude	personal characteristic that promotes knowledge maturing engagement	openness towards new things, curiosity	FZI
motivational factor	human	motivation: competition	in a competitive situation, the desire to be better promotes engagement	new opportunities are sought in order to be ahead of competitors	FZI
motivational factor	human	motivation: personal standard	expectation of the individual toward him/herself	perfectionism leads to extra effort to make things continuously better	FZI
motivational factor	information technology	barrier: (semantic structure) individual data organization	inadequate individual data organization and incompatible individual approaches within a group make it difficult to access and discover information	search for documents in a shared folder structure is difficult as others structure differently	FZI
motivational factor	information technology	barrier: systems separation	information and processes are separated into different software systems that are not connected, thus creating additional effort that hinders sharing between different activities	data about customers and events is kept in several systems	FZI
motivational factor	information technology	barrier: usability	software solutions cannot be used adequately as there are not appropriate for their usage context (e.g., for the person, the process) or do not fulfil certain non-functional requirements	software does not work or is too difficult to understand how to use it properly	FZI
motivational factor	information technology	barriers to knowledge sharing – technology	how knowledge sharing is hindered by technology	IT systems are not set up to enable knowledge sharing amongst organizational members	UWAR

motivational factor	information technology	problem with understanding a tool/service or parts of it	the employee has problems with understanding a tool or service or only parts of it	he tries to get the proper layout for the tables in his wiki article but it doesn't work the way he thought	UPB
motivational factor	instruction	instruction	a person does something because of an assignment	a person prepares and report for his/her boss	initial code
motivational factor	instruction	motivation: leadership	managerial practice like appreciation, transparency, participation promotes employee motivation	superior involves employees in planning of future topics	FZI
motivational factor	knowledge	knowledge	a person does something in order to gain knowledge	attend to a new project with the intention to learn more about the used technology	initial code
motivational factor	organizational	barrier to knowledge sharing: workload	knowledge is not shared with and disseminated to others because of lack of time	employee does not pursue new ideas because of high workload	FZI
motivational factor	organizational	barrier: money (lack of resources)	lack of budget for resources does not allow to develop ideas or engage in certain activities	new employees cannot be hired who could take care of new offerings so that new offerings are not developed	FZI
motivational factor	organizational	barrier: workload	actual workload leaves little freedom to do extra activities, e.g. because of lack of money to hire additional employees	colleagues cannot exchange their experiences, new ideas are not developed further	FZI

motivational factor	organizational	barriers to knowledge sharing – geography	how knowledge sharing is hindered by size and geographical distribution of organization	knowledge and information for a particular geographical location in not shared to those in another part of the region as not considered relevant or systems not in place to enable this	UWAR
motivational factor	organizational	barriers to knowledge sharing – management/organisational structure	how knowledge sharing is hindered by organizational structures	high volume of knowledge and information means that individuals have to judge what information is shared	UWAR
motivational factor	organizational	barriers to knowledge sharing – workload	how knowledge sharing is hindered by individual workloads	work intensification of individual means that there is less time to quickly share information and knowledge	UWAR
motivational factor	personal (extrinsic)	incentive	external stimulus (mostly in terms of money or status) to influence employee behaviour towards certain goals	bonus for certain behaviour	FZI
motivational factor	personal (extrinsic)	membership within a community	a person does something in order to be or because he/she is member of a collective	helping a colleague from one's working group	initial code
motivational factor	personal (extrinsic)	money	doing something because of the earnings	a person attends to a new project because of the higher salary	initial code
motivational factor	personal (extrinsic)	protection	a person does something to protect himself or his community from something	holding back knowledge about a customer in order to stay important and needed	initial code
motivational factor	personal (extrinsic)	status and power	a person does something in order to improve his/her authority ranking	reprimanding an employee because of disturbing a presentation	initial code

motivational factor	personal (extrinsic)	success	a person feels great because of an own achievement	a software developer solves a tricky problem	UIBK
motivational factor	personal (intrinsic)	curiosity	a person does something because of he/she is interested in	a person takes part in an optional training course	initial code
motivational factor	personal (intrinsic)	motivation	general motivational issue that positively affects knowledge maturing	using paper-based task list because of feeling of satisfaction by ticking off	FZI
motivational factor	personal (intrinsic)	motivations to interact with knowledge	the reasons and purposes individuals use knowledge and information (i.e. desire to keep up-to-date, need to know what is going on in locality, target driven, part of reporting structure, recording work)	individuals maintains and expands their knowledge of local education, training and employment opportunities to ensure they can respond to customer enquires	UWAR
situations	what	what: learning-oriented occasion	lead to knowledge actions mainly dedicated with learning and thus contributing stronger to the development of competences	Igor performs activities in order to learn	initial code
situations	what	what: task-oriented occasion	occasions that triggers knowledge actions mostly contributing to the goals of the business process and having learning as a by-product	Silke performs activities in order to solve work tasks	initial code
situations	when	when: first event of an activity chain	starting point of an activity chain	knowledge worker gets a request via telephone call	initial code
situations	when	when: last event of an activity chain	ending point of an activity chain	Silke submit a project report	initial code
situations	when	when: middle event of an activity chain	an event in an activity chain (neither first nor last)	Andrew calls Igor for help in ongoing projects	initial code
situations	where	where: client	office or meeting room of the knowledge worker's client	Igor has a discussion in a clients office	initial code

situations	where	where: colleagues office	the office a colleague of the knowledge worker	Aisha meets Igor in his office.	initial code
situations	where	where: meeting room	meeting room of the knowledge worker	Aisha and Andrew join a meeting in a meeting room.	initial code
situations	where	where: mobile	home office or any other temporary working space of the knowledge worker	Andrew has a home office day	initial code
situations	where	where: own office	the (current) office of the knowledge worker	Sally solves problems in her own office	initial code
situations	who	who: colleagues	knowledge worker interacts with colleagues	colleagues	FZI
situations	who	who: group (external) (> 1 external)	a situation, where the knowledge worker interacts with more than one external person	a group of colleagues with one client	initial code
situations	who	who: group (only colleagues)	a situation, where the knowledge worker interacts with several colleagues	a internal group meeting	initial code
situations	who	who: one actor	a situation, where the knowledge worker acts alone	Sally works alone	initial code
situations	who	who: two actors (colleague)	a situation, where the knowledge worker interacts with a colleague	Sally and Igor work together	initial code
situations	who	who: two actors (external)	a situation, where the knowledge worker interacts with an external person	Igor has a discussion with one client	initial code
situations	who	who: two actors superior	a situation, where the knowledge worker interacts with a superior	employee wants to clear actions with someone	FZI
situations	why	why: extrinsic	motivation for the activity comes from the outside	Andrew is trigger by an e-Mail	initial code

situations	why	why: intrinsic	motivation for the activity comes from the person itself	Silke wants to learn something and acts without any external trigger	initial code
supporting tools	(mobile) Telephone	mobile device	pocket-sized computing device, typically having a display screen with touch input or a miniature keyboard	mobile phone	initial code
supporting tools	(mobile) Telephone	telephone	telecommunication device that is used to transmit and receive sound	touch tone single line business telephone	initial code
supporting tools	computer-based communication support	communication add on	a feature with communication capabilities that probably extents the functionality of another product / software	short message plugin for outlook	FHNW
supporting tools	computer-based communication support	remote control tool	software used in remote administration to allow use of computers or other hardware at a separate location	control a computing server or desktop computer from another desktop computer via UltraVNC	UIBK
supporting tools	computer-based communication support	teleconferencing tool	live exchange and mass articulation of information among persons and machines remote from one another but linked by a telecommunications system	flash meeting at EA-TEL or Skype	initial code
supporting tools	e-Learning	e-Learning	computer supported form of individual learning	WBT, CBT	FZI
supporting tools	e-Learning	e-Learning platform	a platform which supports learning / training	eTutor / moodle	FHNW
supporting tools	e-Learning	portal	central access and navigation interface that gives user the possibility to enter a virtual information source	MATURE-IP Web site	initial code

supporting tools	knowledge base	knowledge base (external)	a collection of documented knowledge and/or contributions by experts or professionals external to an organization	SAP Developers Network	UIBK
supporting tools	knowledge base	knowledge base (internal)	a collection of documented knowledge and/or contributions by experts or professionals internal to an organization	internal document and content management system, for a and newsgroups	UIBK
supporting tools	PIM	electronic address book	tool to manage addresses	MS Outlook	FHNW
supporting tools	PIM	electronic calendar	a computer tool to manage appointments	MS Outlook	FHNW
supporting tools	PIM	PIM (personal information management)	tool for managing personal information (email, tasks, calendar)	MS Outlook	initial code
supporting tools	QM	SixSigma	SixSigma is responsible for the current process	as part of the second phase he tries to formulate some hypotheses	UPB
supporting tools	software (organizational scope)	ERP Software	enterprise resource planning system	SAP	FHNW
supporting tools	software (organizational scope)	issue tracking system	an issue tracking system (also called trouble ticket system or incident ticket system) is a computer software package that manages and maintains lists of issues, as needed by an organization	issue tracking systems are commonly used in an organization's customer support call center to create, update, and resolve reported customer issues, or even issues reported by that organization's other employees	UIBK

supporting tools	software (organizational scope)	management information system	IT system used to store records of all customers/clients	organisational wide mechanism for the recording and management of data for easy retrieval and reporting purposes	UWAR
supporting tools	software (organizational scope)	notification agent	informs about new or changed contents, appointments, answers to questions in discussion forums and the status of support tickets	document management system (DMS), Outlook, helpdesk	initial code
supporting tools	software (organizational scope)	social network platform	a platform which enables people to stay in contact or find new contacts (as experts)	XING	FHNW
supporting tools	software (personal usage)	command-line interface	a command-line interface (CLI) is a mechanism for interacting with a computer operating system or software by typing commands to perform specific tasks	the window one gets by running windows cmd.exe	UIBK
supporting tools	software (personal usage)	file manager	computer program that provides a user interface to work with file systems (common operations are: create, open, edit, view, print, play, rename, move, copy, delete, attributes, properties, search/find, and permissions)	Windows Explorer	initial code
supporting tools	software (personal usage)	graphic tool	software program that provides a user interface to work with image files	Adobe Photoshop, Corel Draw	initial code
supporting tools	software (personal usage)	office-software	set of interrelated desktop applications (word processing, spread sheet processing)	Microsoft Office	initial code

supporting tools	software (personal usage)	semantic desktop	desktop organization that is based on links between different items like emails, documents, calendar entries etc.	access information regarding a topic	FZI
supporting tools	software (personal usage)	software development tool	a software platform comprising extensible application frameworks and tools for software development and management providing an integrated development environment	eclipse	UIBK
supporting tools	software (personal usage)	text editor	software program used for editing plain text files	Windows Editor	initial code
supporting tools	strategy	coping strategy	personal strategy how to deal with information overload and other cognitive demands	email practices	FZI
supporting tools	strategy	learning strategy	personal strategy to learning and competence development	instructor voluntarily participates in operational work procedures to stay up-to-date	FZI
supporting tools	strategy	organisational learning strategy	strategy and institutionalized measures of an organization or an organizational unit to develop their competencies	ensure transfer of training outcome to practice by giving the opportunity to apply as part of everyday work practice	FZI
supporting tools	strategy	PIM: strategy	personal strategy to deal with personal information management (appointments, notes, contacts, emails)	paper-based system to keep to-dos and additional notes	FZI

Table 12: Identified codes

8.5 Code Clouds

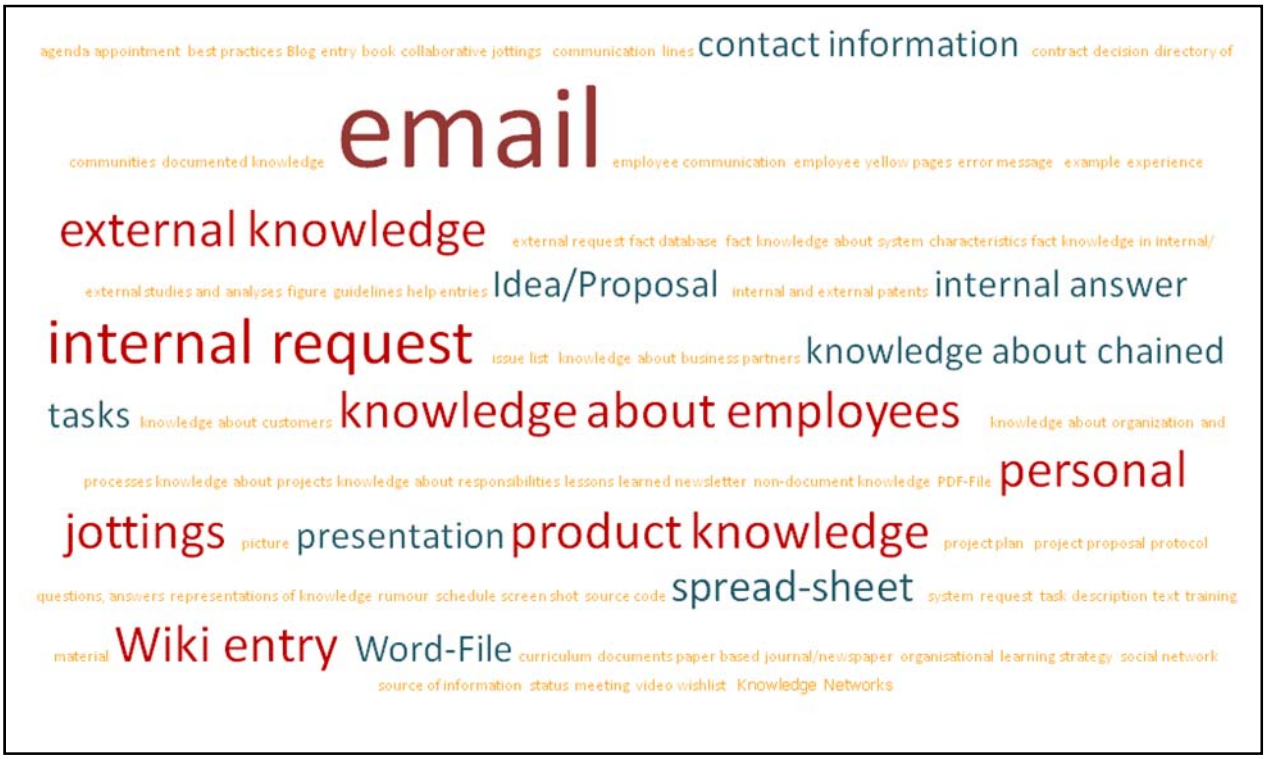

Figure 23: Code cloud for the dimension "knowledge elements"

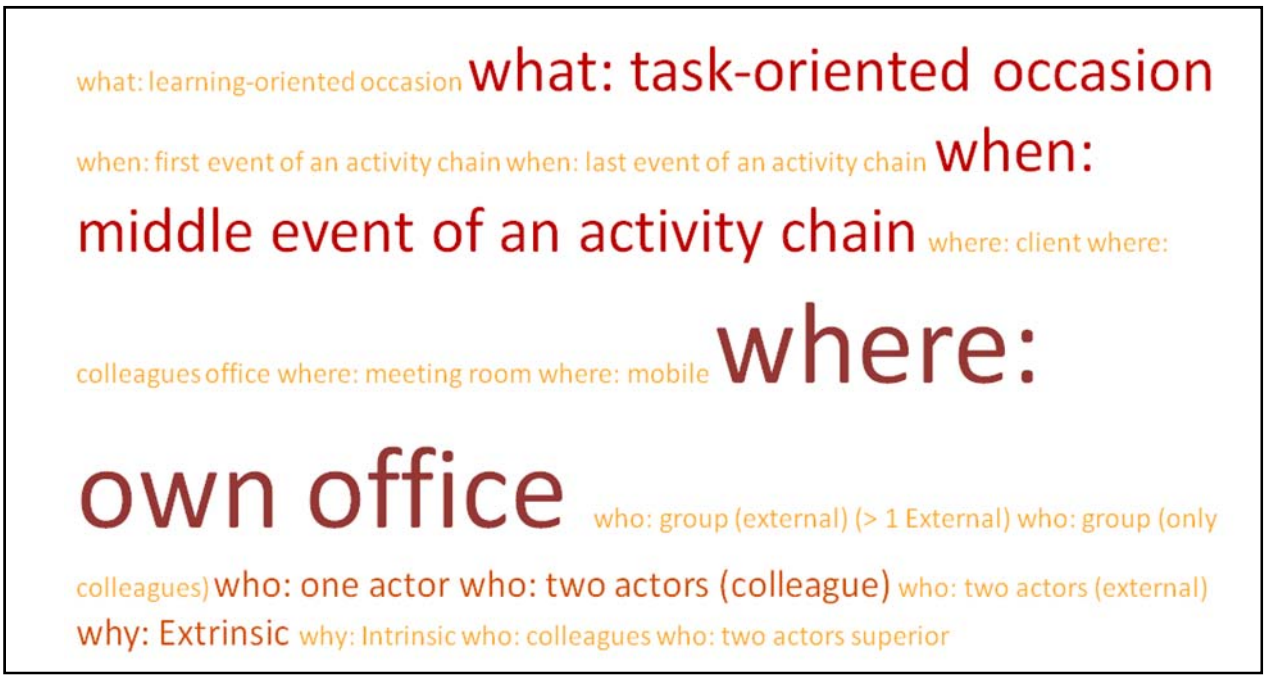

Figure 24: Code cloud for the dimension "situations"

Figure 25: Code cloud for the dimension "motivational factors"

Figure 26: Code cloud for the dimension "tools"

Figure 27: Code cloud for the dimension “knowledge structures”

8.6 Personas

8.6.1 Characterization of Personas

provided by	UIBK
name	Igor
motto	There are no stupid questions, only stupid answers.
education and professional background	He holds a Bachelor degree in Management and Economics and a Master degree in Information Systems. He worked two years in an international company and has been employed for one year in the company.
role / degree of standardization	Igor works as IT consultant in the consulting department of the company and his most relevant tasks are not standardized at all (excluding administrative tasks).
workplace / colleagues	He works in different project teams, offices and stays mainly in client offices. Typically, he works together with two or three other people from our company and shares small offices.
learning	Igor has to continuously acquire new knowledge, especially about clients' circumstances. Igor's demand for learning occurs during execution of work tasks, typically in customer projects. Knowledge about clients and their routines is highly relevant, but not part of formal trainings.
knowledge	His tasks require a wide variety of knowledge and highly depend on involved systems at client side and on clients themselves. Specific knowledge about clients is usually not transferable to other clients, however, previous experiences and best practices are crucial to fulfill Igor's job. Knowledge about other people and their skills are highly relevant.
content types	He primary uses personal information management elements, like E-Mail, contact information or calendar entries. Moreover, presentations related to the client or the technology and documentations are important. Figures which summarize complex structures are useful for Igor.
structures	He organizes his own workspace with hierarchies based on topics and projects. His team uses project-based folder structures with a standardized format. Sometimes, Igor tags pictures in online picture collections, like Picasa. But mainly Igor relies on (Desktop) search as well as lets his colleagues take care of the structures.
problem solving and other knowledge routines	If Igor has a problem and he needs knowledge to solve it, his first approach is to ask people currently in his room. He has no stoppages. If nobody in the room has a proper answer or knows another person who can help, he initiates a discussion about the topic regardless of what tasks his colleagues are currently engaged in. Different ideas and perspectives on the main problems are discussed. In many cases, solution ideas could be generated or the discussion team can refer to somebody. At least, he gets a more concrete and comprehensive problem understanding. After such a discussion, all participating people have learned something no matter whether they need it right now or not and become more aware of Igor's activities. If the discussion is unsuccessful, he moves to other relevant people in the building or he calls people. If Igor has the opportunity to move to a person physically, he prefers that. Personal meetings allow him to interact in a more personal way and to amplify social relationships. In case nobody could help Igor and he has no helpful contact in mind, he searches the Internet.
reaction to requests from colleagues	Igor asks many people for help and many people ask Igor for help. Igor has good knowledge and he likes to help other people. Usually, Igor has a proper answer in mind or at least an idea. Many times such an explanation ends in a discussion in which Igor involves other people. Furthermore, Igor could name other helpful people.
communication strategy / approach to knowledge sharing	Igor has a good network and maintains relationships to other people intensively. If he meets new and interesting people, especially people from clients, he tries to have a small chat in order to scan their skills and to exchange contact information. So, he can access these people more easily in case he needs help. Igor is somebody known all over the place and he attends every informal event he can. Lunch and coffee breaks are sacred for him. He uses these breaks to get information about other people's work and activities or to discuss own work problems. Thus, he has a comprehensive picture of ongoing activities and is constantly well informed.
formal training	Between two and four times a year, Igor participates in formal trainings. He likes such events because it gives him the opportunity to have a break from the busy consulting business and an opportunity for networking. Welcome are trainings related to Igor's activities and generally applicable to many different cases. Training materials, e.g., presentations, are not particularly important for him. Contact details of all participating people and especially of the trainer are most valuable.
important tools	Office software, PIM, instant messaging, social networking software, mind mapping software

motivation / drives / interests	Igor is highly motivated and he likes his tasks and job and even more so his colleagues. Some of his personal interests overlap with his job tasks and thus he is very interested to work in projects which are closely related to his interests. Furthermore, he meets many colleagues in his leisure time in which he acts as opinion leader with respect to the latest mobile communication devices.
task management	In general, he is guided by milestones from his projects. In daily business, his work is based on ad-hoc processes, on communication and thus often unpredictable.
attitude towards technology	Igor is very interested in the newest technology, especially in the consumer sector.

provided by	UIBK
name	Sally
motto	If I have not seen it working, I do not believe it anyways.
education and professional background	She has a Bachelor degree in Computer Science and has been employed for four years.
role / degree of standardization	She likes precise task descriptions and written documentations and therefore she documents her working solutions precisely and completely.
workplace / colleagues	She shares her office with five co-workers, engaged in similar tasks and problems. She feels comfortable inside her familiar environment.
learning	Sally has to continuously acquire new knowledge to fulfil her tasks. Sally's demand for learning occurs during execution of work tasks. Usually, she learns during problem solving.
knowledge	She needs knowledge about, e.g., configuration parameters and their consequences, systems interfaces and underlying procedures or client decisions. Her tasks require a wide variety of knowledge and this volatile knowledge highly depends on involved systems and clients.
content types	She always collects training materials, e.g., presentations, and stores them on her local disk. Besides that, she maintains a rather large collection of product documentation, personal notes, relevant emails, business/system proposals and configuration summaries.
structures	She organizes her workspace according to her own hierarchical structure, based on topics.
problem solving and other knowledge routines	If Sally has a problem and she needs knowledge to solve it, her first approach is to try something. In case of system functionalities, she changes several parameters and looks at the consequences. After some unsuccessful trials, she opens the system help or manuals. She has local copies of manuals and training presentations and she searches in her local data. By browsing through documents, she usually has some new ideas and starts some new trials in the system. Should these tests be unsuccessful as well, she starts searching in the Internet. She uses well-known developer pages or search engines to find relevant information. Again, she experiments with new solution ideas directly in the system and applies her search and test approach for a longer period of time. Typically, she is successful after a longer period of time and returns to her works tasks. In the case of no success, she writes a request in a developer forum or tries to delegate the task to a colleague (typically sitting in the same room) via e-mail. After getting a response in the developer forum, she occasionally writes a short thanks note to the anonymous or pseudonymous provider of the information the identity of whom she does not care about.
reaction to requests from colleagues	If one of her colleagues asks her for something directly, she answers if she has a proper solution. In the best case from her perspective, she can show solutions directly on the affected systems. Therefore, she moves to the colleague's computer and performs the solution. In this way, she avoids long explanations and discussions with asking colleagues. In the case she has only an assumption or a vague idea, Sally refuses the answer.
communication strategy / approach to knowledge sharing	Sally principally dislikes discussions or other verbal interactions with her colleagues. If a discussion occurs in her office, she ignores it and concentrates on her current tasks. She likes clear task descriptions and therefore, writes tight e-mails that make the receiver understand if his or her request was imprecise.
formal training	Between two and four times a year, Sally has to participate in formal trainings. Welcome are trainings closely related to her current or upcoming tasks with concrete solution procedures. She avoids general trainings or trainings without relation to her tasks whenever possible.
important tools	Office Software, PIM, software development environment.
motivation / drives / interests	Sally likes her work, especially finding solutions to given problems. Furthermore she has no career ambitions.
task management	Sally likes the time early in the morning and during lunch, because she can work unhurriedly. Routinely, tasks are distributed in the company per email or task assignments in the collaboration system. Sally's project or line manager or sometimes consultants delegate tasks to her. If some parts of her tasks remain unclear, she thinks about it and investigates the problem by browsing through related documents. Every morning, she plans her day by creating a paper-based to-do-list for herself. She hates to deviate from her plan, hence she dislikes ad-hoc tasks.
attitude towards technology	As a developer, Sally is interested in the functioning and further development of technology and has profound knowledge of this area.

provided by	UIBK
name	Aisha
motto	There is nothing, but experiencing it by yourself, so try and make errors, however, if we should translate it into a (customer) product, it needs to go formal.
education and professional background	She is a Master of Management Information Systems. Since her recruitment, she has been involved in an innovation project concerned with developing internal competencies about a new product promoted by a big vendor of standard enterprise systems which is the company's primary business partner. Aisha was manager of an internal project with the goal of the product's deployment within her company. For the last two years, she has had a number of formal training courses provided by the vendor of standard enterprise systems and thus is now a certified analyst for the product she is responsible. She kept with the project until it matured into a product being now sold to leading customers. Aisha was the only person in the company who had profound knowledge and long-standing experiences with the product.
role / degree of standardization	Aisha leads a group of seven people responsible for operation and maintenance of productive business application systems according to predefined service levels. She is still heavily involved in software development and is the network centre for every aspect of this product. From all these experiences, Aisha has learned not only to rely on personal communication and her network, but that once the product had left the experimental state, formal agreements gradually grew important. When she was promoted to manager of a group responsible for application development she felt the dramatically changed role and the need for formal approval of even the tiniest change that would be made to operative business applications.
workplace / colleagues	Aisha shares one office room with four of her team members.
learning	Due to her new role, Aisha still needs to learn a lot. Therefore, she attends formal trainings and reads recent articles about upcoming product developments during her working time. She also spends a part of her leisure time to read the company's process documentation on certain administrative processes and exchanges experiences with fellow team leaders.
knowledge	Aisha needs to know the technology, she is responsible for. Therefore, Aisha reads product documentation and stays informed, about projects her team members are working on by reading meeting minutes. Only if things remain unclear, she asks her colleagues. As team leader, she needs to gain knowledge about management, leadership and related processes in the company.
content types	Aisha does not have any content or documents that are not part of the organized content space coordinated by the organization which she constantly uses to support all aspects of her work. This includes her personal information management system (calendar, address book and task list).
structures	Organized content space coordinated by the organization. All her documents are accessible by her co-workers.
problem solving and other knowledge routines	If Aisha has a problem or she needs knowledge in order to fulfil a task, she firstly searches in the organizational knowledge base. If the search was unsuccessful, she searches in the developer fora or she contacts a known expert. The needed translation from the informal, experimental and explorative world of innovation to the formal, routinized and productive world of operative business applications is what she excels in.
reaction to requests from colleagues	When she is addressed with a new problem, she always first tries to be helpful by transferring a pointer towards a formally approved source of content. If that does not work, she starts her own interrogation and updates formal documents in the employee portal, specifically the quality management space so that the problem will be solved according to the rules next time.
communication strategy / approach to knowledge sharing	She typically communicates very efficiently. Telephone calls rarely last longer than 2-3 minutes. Emails usually consist of a sentence and a link. This is important because she receives a large number of phone calls, emails or personal questions every day. Her network is topic-oriented on her product and includes business consultants, software developers and infrastructure managers. Recently, she has knitted a tight network with the main customers as well due to the fact that the product requires integration with a number of application systems and thus involves a large amount of communication.
formal training	She usually visits training courses provided by the vendor of standard enterprise systems. Besides, she attends an internal management program.
important tools	PIM, DMS, CMS, Office Software, software development environment
motivation / drives / interests	She enjoyed the time to experiment with new products. Besides technological aspects, she is interested in the development of her career and therefore applied for the internal management program.
task	Due to the fact that the product Aisha is responsible for is in high demand, her schedule is

management	consistently filled to capacity. Thus, she has learned quickly how to organize her work well. She entirely relies on putting whatever content or messages she receives into formal documents or formal communication channels.
attitude towards technology	Aisha has a positive attitude towards technology. Up to the time, she became a team leader, she was interested in experimenting with new products. Now, she shifted her interests towards providing working solutions, rather than trying new things.

provided by	CIMNE
name	Carolina
motto	Use the network to find a solution, but don´t loose your criteria.
education and professional background	She holds a bachelor degree in business (management and economics) and a master degree in organizational/enterprise sociology. Her actual position is the second where she deals with enterprise social and ethical responsibility (her expertise). She has been in this company for 6 months (2 years in the previous one)
role / degree of standardization	Carolina works as a producer and consultant for tailored content used in Enterprise social responsibility consultancies. Her tasks are not standardized at all (excluding administrative tasks).
workplace / colleagues	She works in different project teams, but mainly at the main office. Typically, he works together with two or three other people from our company and shares small offices.
learning	Carolina has to continuously acquire new knowledge as every client and their needs are different. She implements her own methodologies to learn something new and uses various sources for that. She is "learning by doing" all the time, but there are processes that now repeat (e.g. looking for an article in a topic, she would follow more or less the same steps). Knowledge about clients and their context vary, so the ways to get required information.
knowledge	Her tasks require a wide variety of knowledge, they depend on information available at the client's side, and at the client's market and highly depend on involved systems at client side and on clients themselves. Previous experiences are crucial for Carolina's work. There are no best practices defined. knowledge about the market and business environment of the client is highly relevant, as it is general public perception of the client's market and products.
content types	She primarily uses academic articles, news, and client's knowledge. Also personal information management elements, like E-Mail, contact information or calendar entries. Presentations related to the client strategies (especially if they are related to social responsibility) are very important.
structures	She organizes her own workspace with hierarchies based on, sources, topics and projects. Her team uses project-based folder structures with a standardized format. There are informal procedures of control in place (e.g. meetings with the director of the company to present advances of the project, consultancy or content creation)-. Carolina relies on internet searches (especially on specialized journals) and personal contacts in her network in-office and sometimes outside the office.
problem solving and other knowledge routines	Carolina uses her own criteria to approach the solution of a problem. For example if she needs a specific methodology to frame an approach to be applied to a social responsibility strategy she is building for a client, she starts using her own experience and knowledge, journal sources. Then she revises her choices with the director of the company and interacts with in-office colleagues to polish the approach.
reaction to requests from colleagues	The cooperation dynamics seems well oiled in this company, people seems very cooperative in all directions. Carolina likes to help and is not afraid to ask directly for help is she needs a hand, has doubts, or need another opinion.
communication strategy / approach to knowledge sharing	Carolina is well informed of all relevant topics to her position. The only barriers of communication in the organization are mechanism to prevent sharing of information about clients (through staff awareness and IT restrictions -she can´t access a colleagues client data/folders, and others can´t access hers, the directors access all-). But articles, news, comments, specialized blogs, etc., flow freely from and to her.
formal training	Since her Master degree 2 years ago she has not receive further formal training. But the nature of her job maintains a constant training on the topics of her specialization (enterprise social responsibility).
important tools	Office Software, email, instant messaging.
motivation / drives / interests	Carolina is highly motivated and she likes her tasks, job and working environment. She is passionate about the area of her job, which matches the area of her Master degree. She has actually stayed in Madrid (and not going back to Argentina) because in Buenos Aires the possibility to find a job where she develops further her expertise, has a low probability. But its very possible in Europe. She is highly motivated.
task management	Carolina organizes with outlook calendar and tasks to do. She changes tasks priorities on the go depending on other urgent matters that emerge (the matters observed were always related to the content she was creating, e.g. "the director needs a draft, so I have to quickly revise it, mark parts pending and send it to him asap". The first thing she opens is her calendar and tasks to do

	views in outlook.
attitude towards technology	She seems to be keen to try new technologies for her work tasks. She believes in technology that helps or assist on clear tasks, not in fancy or trends (she uses a mobile phone 2 years old. (The ethnographer didn´t see ipods, iphones, nor other type of trendy technology).

provided by	CIMNE
name	Raquel
motto	Transforming the usual flat text content into an interactive experience is more an art than a science.
education and professional background	She holds a bachelor degree in education and specialised studies on multimedia related areas and technologies.
role / degree of standardization	Raquel works as a course producer and consultant for Structuralia. She will receive the content from Carolina (plain text document and a PowerPoint presentation) and translate it to the various formats of an online course.
workplace / colleagues	She works in different project teams, 80% of the time in STRUC office (as she has to move to, e.g. specialist video producer's office or clients sites sometimes). Typically, she works together with a group of editors, and designers (image, flash, sound, video), from STRUC and from 3rd party providers.
learning	Raquel has to continuously acquire new knowledge related to technology and pedagogy applied to online and new technologies. She is constantly testing new tools and at least once a year she enrols in a course related to a tool or pedagogic methods.
knowledge	Hr tasks require a multidisciplinary approach. She needs to understand technology, its limits and possibilities and match that with the pedagogical goals of specific courses using methodologies and approaches learned personally.
content types	She mostly uses the content from the primary producers of the content. Then with the help of other designers and producers, she creates new content or by adding existing related content (e.g. images, drawings, new diagrams).
structures	She organizes her own workspace with hierarchies based on, sources, topics and projects. Her team uses project-based folder structures with a standardized format. There are formal procedures of control in place (e.g. meetings with her manager to show the advances and revise if goals have been meet.
problem solving and other knowledge routines	Raquel also uses her own criteria to approach the solution of a problem, but continuously shows and ask for opinions to her colleagues and manager. One of the most common mechanisms to prepare for needs of possible problems is the creation of story boards of course processes and user interaction.
reaction to requests from colleagues	The cooperation dynamics seems also well oiled in this company, people seems very cooperative in all directions. Raquel is very open to work related comments, questions, anecdotes, etc, likes to help and is not afraid to ask directly for help is she needs a hand, has doubts, or doesn´t find the solution.
communication strategy / approach to knowledge sharing	Raquel is well informed of all relevant topics to her position. The only barriers of communication in the organization are as in the Carolina cases, mechanism to prevent sharing of information about clients (through staff awareness and IT restrictions -but she has read access to other producers content as is one of her sources-. Information seems to flow formally and informally, as well as structured and unstructured.
formal training	Since ending her bachelor degree 3 years ago she has done various short courses on various technologies related to content production (flash, video, e-learning platforms) but is constantly revising materials and tools for her job.
important tools	Office Software, email, instant messaging, Photoshop, flash editors, sound and video editors.
motivation / drives / interests	Raquel is highly motivated, loves her job and stay long hours on the office testing tools and different approaches that can help her to produce content in various format faster, or that can allow her to understand the needs of the clients and the possibilities of the providers STRUC hires (e.g. for sound production).
task management	Raquel schedules task to do in a online calendar that she shares with other colleagues. She has reminders showing her important tasks to do for the day, and re-organize them depending on how the previous tasks developed and the importance perceived.
attitude towards technology	She is a MAC lover, she has an ipod (and has "not bought the iphone because is still to expensive"). She is always trying new technology for her work and for fun. She had a computer (mac related) magazine on her desk.

provided by	FHNW
name	Thomas
motto	A phone call is more efficient than 10 e-mails.
education and professional background	He holds a bachelor degree in business information systems but he has also studied two years psychology and history. He worked 5 years in an international company and has been employed for 10 years in our company.
role / degree of standardization	Thomas works as a project manager. He is responsible for 15 project leaders and their projects. He also generates new project ideas. Therefore, his most relevant tasks are not standardized at all (excluding administrative tasks).
workplace / colleagues	He is responsible for 15 project leaders involved in different projects (mainly IT projects). He works mainly in his open plan office and has meetings in meeting rooms very often, where he discusses projects with his project leaders or new project ideas with product managers.
learning	Thomas mainly gets his knowledge during discussions and informal information exchange. Additionally, he gets his knowledge through reading and reviewing relevant internal documents about the projects and organisations as well as through consulting appropriate sources like internal portal entries, newsletters, books, magazines, blogs, and forums.
knowledge	His tasks require a wide variety of knowledge. The main area of interest concerning knowledge relevant to Thomas are existing products, technological developments and visions as well as market trends. Often this knowledge helps to generate new project ideas. His knowledge about organisation helps to find appropriate people for new projects.
content types	He mostly uses personal information management elements, like email, contact information or calendar entries. Moreover, he writes down information which he gets during meetings in a book. Figures which summarize complex structures are very useful and Thomas uses them to explain difficult issues in discussions. He also organizes his contact information in his mobile phone.
structures	To get an overview about his projects and project leaders, he uses excel spread-sheets. Additionally, he organizes his tasks according his e-mails: if he has fulfilled a task and has answered the e-mail he archives this e-mails in outlook. For document sharing he defines a file structure on the public file system, which has to be followed by his project leaders. During discussion he uses presentations which can be adapted during discussions.
problem solving and other knowledge routines	If Thomas has a identified a problem which occurs in a project, he calls the responsible project leader; smaller problems are discussed directly on phone, otherwise he makes an appointment to bilaterally discuss the problem. If they cannot solve this problem via telephone, he invites a couple of people involved in the project and tries to find a solution together. After all, he invites external experts. Smaller problems, like finding a specific link, are solved by asking his colleagues. If they are not able to help, he tries to find it on his own using search engines in the internet.
reaction to requests from colleagues	He likes to help other people. If a colleagues have a request he can refer to his knowledge about the organisation and his projects, so he usually has a proper answer in mind or at least a person, who can help the asking person.
communication strategy / approach to knowledge sharing	Knowledge about his colleagues and about other people are highly relevant for him. Therefore, he maintains relationships in his social networks intensively during informal meetings, workshops and by using web 2.0 technologies, like forums, online-communities and blogs.
formal training	Thomas often reads newsletters and relevant internal documents about the projects. Sometimes, he joins special internal education programs, like communication trainings or he joins one of their company shops, to get practical experiences about problems while e.g. selling products.
important tools	Office Software, especially excel-sheets, PIM, social networking software, blogs
motivation / drives / interests	Thomas is highly motivated and he likes his tasks and job and even more so his colleagues.
task management	He organizes his tasks using a calendar and emails. According his meetings he prepares his tasks. If he has no appointments and there are urgent emails he work on this emails. Additionally, if he uses a personal book, where he added some tasks.
attitude towards technology	He likes to use new technologies. If he can see, that this technology helps him doing his job. Therefore, he uses currently Web2.0 technologies to extend his social network and to share his information in a FAQ.

provided by	FHNW
name	Kurt
motto	Collect relevant information, use it at the right time and transfer it to the right person.
education and professional background	He holds a master degree in economics and marketing and has been working for 10 years in the company.
role / degree of standardization	Kurt works as Product manager in the product development department of our company and leads a team of 7 persons. Most of his relevant tasks are not standardized at all (excluding administrative tasks).
workplace / colleagues	He works mainly in his open plan office and has meetings in meeting rooms very often. There he also discusses projects with his team members and other involved partners. Except this cooperation in form of meetings or workshops he works by himself.
learning	Kurt proactively acquires knowledge on relevant fields by joining workshops and conferences and through informal information exchange as well as through consulting appropriate sources like magazines or the internet.
knowledge	The main areas of interest concerning knowledge relevant to Kurt are existing products, technological developments and possibilities as well as client and market trends. Because of his function as team leader also process knowledge is needed to guide his team.
content types	He primarily uses personal information management elements, like email, contact information or calendar entries and especially for personal notes. Moreover, presentations related to the client, products or the technology and documentations are very important.
structures	He organizes his own workspace and electronic notes with hierarchies based on topics and projects. His team uses project-based folder structures with a standardized format.
problem solving and other knowledge routines	If Kurt has a problem and he needs knowledge to solve it, his first approach is to ask people currently in his room. If nobody in the room has a proper answer, he discusses the question in a meeting with team members or he makes an appointment with persons which may help and which are otherwise interested or concerned with the problem. In cases where problems occur in larger projects which involve external partners, independent experts may be involved to analyse the situation and propose solution approaches. Simple questions Kurt may ask by email. If this becomes too complicated or Kurt guesses that a discussion is necessary, he prefers a meeting to a phone call where possible. When a problem or question cannot be clarified by communication, an internet search may be the preferred mean.
reaction to requests from colleagues	Kurt has a consolidated knowledge in the areas of interest. Above the already mentioned topics, Kurt knows about the organisation and responsibilities of people. Therefore he is able and, at least concerning his team, willing to help by providing answers or by proposing persons to contact. He also deliberately imparts knowledge to his team.
communication strategy / approach to knowledge sharing	Kurt has a good network and maintains relationships to other people intensively. If he meets new and interesting people, he tries to have a small chat in order to know about their skills and to exchange contact information. In that way he can access these people more easily in case he needs some help. Kurt therefore attends formal and informal events. He skimps breaks but uses them to speak with people on business relevant topics predominantly. Thus, he has a comprehensive picture of the ongoing activities and is constantly well informed. Within his team, as hinted, he actively provides information he gained, if he appraises it as useful.
formal training	Formal training is not scheduled. There are presentations from other divisions, informative meetings, roadshows and conferences which he visits. Using services provided by his company and in this case being a customer can be seen as training and source of ideas and knowledge.
important tools	Office Software, PIM, instant messaging, mind mapping software
motivation / drives / interests	Kurt is highly motivated and he likes his tasks and job. The relation to his team is mainly on a professional basis, private discussions are rather unusual. He works mainly for success and appreciation. He attaches importance on cultivating a creative space.
task management	He organizes his tasks using a OneNote and Outlook.
attitude towards technology	He is experienced in using the standard office products and windows facilities. He also uses mobile devices and communication software (like Desktop SMS). He is critical using special software-applications, if he cannot see the benefit for him or his team. He also dislikes software-applications enforcing the people to adapt their work according the software.

provided by	FZI
name	Silke
motto	Always well organized.
education and professional background	Silke has completed her academic studies in pedagogy after a vocational training, and has been employed at the company for several years.
role / degree of standardization	Silke is responsible for a certain advanced vocational training programme.
workplace / colleagues	She works in a shared office with three other colleagues who are responsible for other programmes of advanced vocational training.
learning	She has high personal standards and aims at continuously learning to improve her work practice. To that end, she regularly reflects about how tasks were carried out and what could have been done better or worse. Based on those insights, she updates templates and process descriptions. Where possible, she discusses her experiences with others. She also regularly visits the operational departments in order to learn about the current situation, problems, and developments.
knowledge	For training others, she needs to be up-to-date with the state-of-the-art practices in the field covered by her. This is also important to live up to her own high standards. She also needs profound method-level knowledge in order to design the learning setting, to guide the participants, and to give advice on learning strategies.
content types	She uses a wide variety of different content types. This includes a significant amount of paper-based content, but also e-mail, electronic documents, intranet and internet sites, videos etc.
structures	For her it is very important to have clear structures, which applies to both the paper-based part and the digital part of her workplace. These structures are both based on subject (as a kind of reference book) and chronological (for business transactions) . This applies both to documents and emails. Although currently these structures and document archives are mostly only used by her, she would also like to have access to similar sources of her colleagues in order to avoid working something out that others have already prepared. She finds shared folder structures with several levels difficult to use because the criteria for structuring are not always her own. Also the labelling of files is frequently a source of problem. She likes to use two-window explorers like Freecommander.
problem solving and other knowledge routines	If Silke has a problem, she tries to solve it on her own. If that doesn't succeed, she will ask colleagues in her own department, she will phone and send an email to persons in her own network, which includes internal and external contacts, or will conduct an internet search. She sticks to the problem until it is satisfactorily solved.
reaction to requests from colleagues	Before responding to a request, she consciously reflects about whether she is the best person or somebody else. She also thinks about what is the most efficient help for the other, i.e., she asks herself whether it helps to answer directly on the question, or the other would benefit more from finding a solution on his own, and she just provides guidance or scaffolding. This especially applies to requests from operational departments.
communication strategy / approach to knowledge sharing	For Silke it is important to maintain good relationships to many others. She is very interested about what others do and likes to listen to their problems, experiences, and insights in order to learn from them. This results in being approached frequently.
formal training	She participates in formal training as often as her workload and the company regulations allow for it. She particularly selects trainings which are challenging for her and where she has significantly underdeveloped skills. This also includes longer-term trainings which result in certificates for successful completion.
important tools	Paper, office software, PIM, browser, flipchart, blackboard, event management, handheld
motivation / drives / interests	She has very high personal standards and is committed to improving her work practice in all aspects. She is very open and interested, also in topic not directly related to her current work situation. She tries to make sense of new trends.
task management	Her sense of perfection also applies to her everyday task management. She plans her tasks and appointment each day meticulously, and prepares each meeting with elaborate notes. She always uses paper and pencil for that, and she needs the feeling of satisfaction of ticking off completed items.
attitude towards	She often has problems with the usability of computer software. Particularly, labels, buttons,

technology	and icons should be uniform across different applications and should not change with software updates. Clear structures within the applications are crucial as she lacks deep knowledge about computers.

provided by	FZI
name	Otto
motto	Why does nobody solve the problems? - I have proposed many solutions.
education and professional background	Otto has made his way via second-chance education. After vocational training and several years of professional experience, his employer supported his academic studies. He has now a safe job in middle management, but also does not have much further career opportunities.
role / degree of standardization	To compensate for that, he seeks to expand his sphere of influence by specializing in certain emerging domains. He is responsible for 10 employees in the training department.
workplace / colleagues	He works in his own office.
learning	If he encounters new subjects he does not know about, he immediately tries to find out via Internet search or he approaches somebody to explain it to him. If he finds interesting new topics or methods for his training events, he will simply try them out and learns from his mistakes or other experiences from the participants.
knowledge	For his management tasks, he acquires up-to-date knowledge from his large social network within and outside the company. He furthers needs to stay up-to-date about the state-of-practice in the field he trains in.
content types	He uses internet search very extensively, but also receives documents from others in form of e-mail, or paper-based documents. He regularly reads journals and magazines, which he archives electronically or paper-based (depending on the media type of the journal/magazine).
structures	He often spends a lot of time searching, because his sources of information are distributed over several different tools/media and have no clear structure or archiving strategy. This includes browser bookmarks, local folder structures, email folder structures. In addition to that, his email management is hampered by a strict limitation in size. It frequently happens that he is looking for an email he might have already deleted.
problem solving and other knowledge routines	In case of problems, the first step is approach other employees in his department. The next step is to phone (preferred) or email members (in case he cannot reach them on the phone) of internal/external social networks. If the problem cannot be solved, he persists in talking about the problem to almost everybody. He hopes to stimulate a solution with that strategy.
reaction to requests from colleagues	He has an open and cooperative management style, gives freedom of action, and also takes over responsibilities of his employees if they are in need of support. But he gets annoyed if an employee asks the same again and again. He expects proactive behaviour.
communication strategy / approach to knowledge sharing	He has built a large social network inside and outside the company in order to be up to date about developments in the company as he thinks that his superior does not inform him appropriately. He considers this as very important. He is very communicative, prefers direct face to face contact, and he often goes directly to departments and units which are being restructured in order to get a personal view of what's going on. If he has questions, he approaches his colleagues or someone from his social network. They also help him to overcome restrictions inside the organization.
formal training	His workload does not allow for attending too many formal training courses, but he still tries to participate in trainings over years which relate to the topics that are most important for him and where he tries to specialize.
important tools	Paper, browser, office software, PIM, flipchart, blackboard, event management, handheld
motivation / drives / interests	His superior is satisfied with him, but gives him the impression that none of his proposals are realized. As a result, he has become a very critical manager, always touching sore spots in the company, but without pursuing constructive proposals for solutions anymore. He tries to secure his sphere of influence by gathering information about developments in the company early on through his social network.
task management	He usually plans his day using Outlook and paper-based notes, but this usually done in a very coarse-grained and relaxed way. He is susceptible to interruptions and rather wants to know what's going on than sticking to a strict planning. As he is also responsible for training planning, he wants to have a much more systematic approach to planning. Currently, he gets to know about new training needs only accidentally within his social network, as the official programme planning is done together with the upper management and not with individual departments.
attitude towards technology	He uses IT tools with very limited background knowledge. He has no fear of contact with those tools, but loses a lot of time from inefficient use. This applies to both office software, but also to email management.

provided by	UPB
name	Axel
motto	Let me test it, then can I tell you what's good and what's bad.
education and professional background	He studied law, linguistics, German language and literature and computer science. He worked in different companies before he started working in this company three years ago.
role / degree of standardization	Axel is a management assistant in this company. He is responsible for different e-business projects. His work is not standardized at all, he decides what to do when and how. Usually his workflow depends on requests and it is not unusual that he starts doing a task in the morning, moves on to other tasks and finishes the first one later in the afternoon.
workplace / colleagues	Axel works in a small office with one, sometimes two, other colleagues. His main co-worker has nearly the same tasks as he has.
learning	He is mad for new knowledge, therefore he uses all possible time to gather new ideas and information. His tasks require that he keeps up to the current developments in the techniques. Therefore he browses websites, blogs and forces whenever possible.
knowledge	According to his tasks Axel needs knowledge about used techniques as well as people's way of using social software. This knowledge is changing very fast and so he has to keep on learning all the time. Requests from partner companies and problems with the software reported by staff members often require new knowledge, too.
content types	He uses emails and social software like blogs and networking facilities. His main focus is on wikis and blog, he reads and writes entries nearly all the time.
structures	His desk is structured spontaneously, according to the tasks he is currently up to.
problem solving and other knowledge routines	If Axel has a problem he always uses his communication channels to solve it. He asks his colleague in the office or writes instant messages to other colleagues to get an answer. Only if he can't solve the problem he uses Google or another search engine. He reads a lot of blog entries and bulletin boards and links these with his own if possible. He successively develops entries in blogs and the company wiki as a result of his problem-solving. This usually is part of a long-time development including revision and rewriting of the articles.
reaction to requests from colleagues	Depending on the topic of the request, Axel either refers to the company wiki, browses the wiki himself or starts a discussion with the person. He is very impatient, especially if other people do not work in the same way as he does but he tries to help nevertheless. If he is interested in the topic he will investigate the problem himself, if not he would tell the person who asks the questions to ask somebody else.
communication strategy / approach to knowledge sharing	Axel likes discussions about interesting topics and he does not think about his or other people's time during this discussion. Axel is of the opinion that every problem can be solved by discussing the topic. He does not care whether this discussion is on a personal basis or over the internet. It is a common policy in his office that if somebody does not want to be disturbed in his work, he uses earphones with music to signalize it.
formal training	Axel participates in trainings which cover topics like SIX SIGMA, business management, strategic business-planning and elocution.
important tools	PIM, instant messaging, social networking software, wiki, blogs
motivation / drives / interests	Axel is very enthusiastic. He loves his job and his job is part of his hobby. He wants to establish himself in the growing web community.
task management	Axel mainly does his tasks as soon as they turn up, he mainly responds to requests. His big tasks are organized by a project plan but other than that he has no written task management, it is all in his head.
attitude towards technology	Axel loves to use different technologies and he knows a lot about the internet technologies called Web 2.0 technologies. He likes to try new things.

provided by	UPB
name	Heather
motto	If you have a problem, talk about it and you may find an appropriate solution.
education and professional background	She is an industrial clerk and has worked in a small IT company for 15 years.
role / degree of standardization	Heather works as an event manager in the department for partner care and support. She organizes events for the partner companies which include organizing hotels, equipment and staff members. There are no standards for her tasks, she decides everything herself. She is creating a lot of standardization for her work in the company wiki.
workplace / colleagues	She usually works alone but gets help from colleagues if she has to organize a big event like an exhibition.
learning	During her planning, new problems often occur and so does the need for new knowledge. Usually she needs knowledge about locations or travelling options like trains or airports. She also needs knowledge about customer's interests, needs and desires to fulfil their expectations.
knowledge	Heather's tasks require a wide knowledge about organizing big events with more than 100 people. She has to know a lot about logistics to manage travelling to and from the location of the event. Therefore she also has to know where to find required information about locations and other necessary things.
content types	She uses a variety of information elements like emails from previous events, questionnaires she handed out to the participating customers previously and wiki entries she or other staff members created. She also uses a calendar with information about colliding events like other important exhibitions and school holidays.
structures	Heather has rarely any work lying on her desk. Her workspace is her computer where she organizes her folders according to the different types of events she organizes. She uses "talking names" for her folders like "locations for event XY" or "event XY 2008" to minimize searching time. She also structures the wiki pages concerning her tasks. She regularly checks the pages and changes the structure if necessary.
problem solving and other knowledge routines	If Heather has a problem she cannot solve herself, she first asks the people currently in the same room. If they cannot help her, either, she then decides whether it is more helpful to browse the internal knowledge base or call another colleague for the answer. If she still has not found an answer she would start a discussion with the person most likely to find an answer. She tries not to disturb people in their own workflow though and may put the task aside until there is a better time to solve it if possible. After solving a problem Heather also changes the documentation of the task due to that problem to help improve the documentation.
reaction to requests from colleagues	If she can answer the request she always most willingly does. If she cannot answer a request she usually knows where to find an answer or names another colleague who might know it. If she has no idea who could be helpful she starts discussing the request in order to find an answer with the one who asked her in the first place.
communication strategy / approach to knowledge sharing	Heather likes to talk to other people. In her job as an event manager she gets to know a lot of different people with different skills and from different professional backgrounds. She uses networking tools like XING to maintain her business contacts and tries to add contacts when possible. She maintains these contacts and tags them with their skills or other important information. She likes to have a personal entry topic into a conversation like the last holiday of the customer or a former meeting.
formal training	Heather does not participate formal trainings herself because they are not offered to her. She would use them to broaden her knowledge but the tasks assigned to her are usually not a topic in a formal training.
important tools	Office Software, PIM, instant messaging, social networking software, wiki, telephone
motivation / drives / interests	Heather loves her job. She really likes to organize and manage big events which she also sometimes does in her free-time. She likes to work with different people and she involves her whole personality. She does not like to leave a task unfinished and therefore she hardly ever leaves the office at the set time.
task management	Heather organizes her tasks by using her office tools and writing notes on paper. She usually has a task list which she uses to find the next task. Afterwards she makes notes about the step she has just finished to simplify the task if possible.
attitude towards technology	Heather is not afraid of using different technologies. She uses the internet for research and likes to work with new office tools that may simplify her work.

provided by	UPB
name	Kevin
motto	Tell me what to do, and I'll do as you say.
education and professional background	He studied business administration and finished this with a diploma. He is currently participating in an intern program to achieve the rank of SIX SIGMA green belt.
role / degree of standardization	Kevin works as an intern in this company. His main task is a SIX SIGMA project on which he spends a lot of time. The project is strictly standardized and he is not interested in improving the process.
workplace / colleagues	He works in an office with two other people from the Human Resources department who have completely different tasks.
learning	During his project, Kevin needs knowledge concerning this project. Apart from that, he does not care about learning other things in the company.
knowledge	Kevin knows the things about his project he has learned in formal trainings. He has to know the process and the standards that are defined for the several process steps.
content types	He mainly uses the company wiki, email client and the instant messenger.
structures	His workspace is organized in order to fulfil his tasks.
problem solving and other knowledge routines	If he has a problem with the project, he starts reading the company wiki immediately. If he has a problem with the software, for instance, he asks his colleague and then does as he is told. He does not bother to remember this process, so when the same problem occurs again he has to ask again. Kevin likes to use a good and formal description for his work because he does not like to think about the process itself. He would accept a complicated workflow rather than thinking of a new and easier way to process the task.
reaction to requests from colleagues	He usually is not bothered by other people's requests because he has his own task and is only an intern.
communication strategy / approach to knowledge sharing	Kevin likes to participate in discussions that either concern his project or his problems with certain tools. Apart from that he concentrates on his own tasks and does not participate in discussions that have nothing to do with his own work. In his position in the company he does not have outward contacts during his working time.
formal training	Kevin takes part in formal trainings concerning his project. There he gathers information about the proceedings and the way the documentation of the results.
important tools	Office Software, PIM, instant messaging, wiki
motivation / drives / interests	Kevin is highly motivated because he wants to achieve the project goal and receive his green belt.
task management	Kevin's tasks are clearly structured by the SIX SIGMA method and he does follow this structure at all times.
attitude towards technology	He uses technology without a huge knowledge about it and has often difficulties with the different functions of the used technologies.

provided by	UPB
name	Stella
motto	I don’t want to know everything; I only want to know where to find it.
education and professional background	She is an Information Technology Officer who just has finished her education in this company.
role / degree of standardization	Stella works as an accountant in our company. She has started only a couple of month ago after she had finished her education. Her tasks are standardized and leave only little room for her own decisions.
workplace / colleagues	Stella works in an office with three co-workers who are accountants as well. Every accountant has their own work field.
learning	Stella has a strictly defined work field. As she has only finished her education she has a huge need for new knowledge. Her education did not completely cover the tasks that she has to fulfil in her position and therefore she needs to generate a lot of knowledge. Stella is also involved in a SIX SIGMA project and needs knowledge about project strategies and workflows.
knowledge	Stella knows the basic routines of her tasks and is able to fulfil them without help. Her knowledge is limited to her tasks so that if one of her colleagues has to pass a task to her she would need information about the specific routines.
content types	She uses emails, instant messenger entries and the company-wiki. She also uses calendar entries and presentations she or others created.
structures	Stella's desk is structured according to her different tasks. She has a small filing system which is labelled with different tasks. Her folder structure reflects her tasks as well and her email folder is structured using the names of the different colleagues and tasks.
problem solving and other knowledge routines	If Stella has a problem she cannot solve she always asks the people in her room first. If they cannot answer her request she uses the instant messenger to ask somebody else. If the person cannot provide an answer or name somebody who can, she almost always leaves the task undone until she can find someone who can answer her request. She hardly browses the internet for information because this takes too much time and does not always yield in an answer.
reaction to requests from colleagues	Stella asks a lot of questions but she can only answer those questions concerning her own tasks. If she knows the answer she always gives it. This is very helpful for the person who asked the question, but she does not waste time thinking about a problem too long. She then would rather say that she does not know the answer and name a person who might know it, if she knows a person who could know it. If not she would just say that she is no help on this subject.
communication strategy / approach to knowledge sharing	She talks to other people and likes to know which skills other people have to know whom to ask. She rarely has contact with customers. Usually she talks with vendors and these talks are formal and concentrate only on the given subject. Stella does not use a small talk topic to start a conversation, she usually is straight forward with her request.
formal training	Stella participates in trainings concerning SIX SIGMA.
important tools	Office Software, instant messaging, social networking software, wiki, telephone, PIM
motivation / drives / interests	Stella works because she wants to have her own money and to live a comfortable life. She does her tasks in the time set in the contract and she hardly ever leaves the office after that time. Her private interests have nothing to do with her work tasks and she does not want to mix her private interests with her work.
task management	Most of Stella's tasks recur monthly. Apart from that she has a SIX SIGMA project where the different steps are written down and she follows these steps. She answers requests as soon as possible but without disturbing current workflows.
attitude towards technology	Stella does not know much about the technologies she uses. If problems occur she asks her colleagues but does not try to understand the technology itself.

provided by	UWAR
name	Deborah
motto	The world is my oyster - anything is possible!
education and professional background	Deborah is an IT specialist with academic qualifications.
role / degree of standardization	Deborah is the organisation's web project manager. She has worked for the organisation for many years and has experienced many changes. She is responsible for the external website, staff intranet and developing new online services and applications. There is little standardisation to her work role.
workplace / colleagues	Deborah manages the organisation's IT team. She is based in one of the main offices, but frequently travels to the head office to attend meetings.
learning	Deborah continually researches new IT innovations and applications, to develop her knowledge and insight in to possible IT solutions for the organisation. Web 2.0 technologies are central to her developments on the website and future plans.
knowledge	Deborah requires substantial knowledge of IT systems and future IT developments, together with a strategic understanding of the organisation and how IT can support the realisation of the strategy.
content types	She uses office software, the internet, email and electronic calendar. As she is mobile, she uses a laptop.
structures	Deborah organises and structures her own work, using her own filing system.
problem solving and other knowledge routines	Deborah has a long term view and broad overview of problems. She is very innovative and visionary in her approach to problem solving and knowledge routines.
reaction to requests from colleagues	Deborah is responsive to colleague and management requests, focusing her work on updating organisational systems.
communication strategy / approach to knowledge sharing	Visionary knowledge maturation – where an individual, or group of individuals understand the potential and possibilities for the use of ICT in the process of knowledge maturation both within the organisation and externally, but who are currently constrained by policy, finances or organisational culture. Changes pending within the organisation will refocus services, giving IT a central role as the organisation moves to providing web-enabled services for clients. The knowledge she has developed and her enthusiasm for IT means that she has developed a vision of services that can and should be provided for the end-user. For instance, she has started to implement the use of avatars to guide end-users around services. She wants to develop this idea further by enabling users to use avatars to try out different jobs. The ideas she has are for the organisation as a whole and based on the 'bigger picture'.
formal training	Data not collected
important tools	office software, email, internet, MIS, social networking technologies, Web 2.0, internet forums
motivation / drives / interests	She is an IT enthusiast and is knowledgeable regarding the potential applications of technology for delivering services for clients.
task management	Deborah often has a full schedule as is responsible for maintaining the external and internal websites of the organisations, overseeing the delivery of IT services for customers and developing new IT delivery systems. Her task management is organised using her laptop.
attitude towards technology	She is enthusiastic user of IT at work and is knowledgeable about new IT developments as this is essential to her role

provided by	UWAR
name	Harry
motto	I learn for a particular purpose - not relevant to anyone else!
education and professional background	Harry previously worked in the finance sector, where he was employed to undertake risk assessment and crisis management.
role / degree of standardization	Harry is a senior manager in the organisation and is responsible for managing several initiatives aimed at reducing the number of young people who do not enter further education, training or employment after leaving school. These pilot initiatives funded by the government specifically target the NEET group (Not in Education, Employment or Training). These initiatives are county-wide and managed by Harry, who is also responsible for reporting to the organisation senior management team and government.
workplace / colleagues	Harry is part of the organisation's senior management team reporting to the Chief Executive. Harry manages his own team working on the various initiatives.
learning	His work is dependent on funding from government initiatives and pilot. Harry has learnt how to find tenders/applications to undertake pilots and report on the lessons learnt.
knowledge	Harry seeks and applies for further funding opportunities to run these initiatives. His knowledge extends across the different initiatives and pilots aimed at getting young people into education, training or employment. The lessons learnt from these schemes are then implemented into the next initiative, but are not shared or disseminated to the wider organisation. Knowledge or what works in practice and the targets which need to be met are essential to his role.
content types	Harry uses office software for producing tenders, reports and presentations, which are major part of his role. Internet and email are used for research and communication purposes.
structures	For the tendering process and reporting mechanisms, there are specific structures in place. This includes document structures for the various types of tender and reports required. Each tender has a reporting mechanism agreed, which Harry follows. Different initiatives require outcomes to be measured in different ways.
problem solving and other knowledge routines	Harry works alone to resolve issues.
reaction to requests from colleagues	Harry tends to work in isolation.
communication strategy / approach to knowledge sharing	Isolationist knowledge maturation – information and communication throughout the organisation is limited to an individual or team and not shared across the organisation. The initiatives, managed by Harry, are highly successful in Kent, reducing the number of young people who would have otherwise been classified as NEET. Harry recognises that the success of these initiatives, but does not recognise the value of sharing the good practice and lessons leant from these initiatives to others across the organisation. This represents an isolationist knowledge maturation process in the organisation. There is little or no understanding that information and knowledge could, and should be, shared. Consequently, information and communication through the organisation is limited for this manager and his team.
formal training	Data not collected
important tools	office software, email, internet, MIS, blogging and social networking technology (for personal use)
motivation / drives / interests	Harry is focused on meeting targets, reporting to external funders and seeking out further opportunities for funding similar initiatives. Harry is very driven to achieve.
task management	Harry is methodical in his work. Tasks are managed through a electronic calendar.
attitude towards technology	Technology is a tool for supporting Harry's work.

provided by	UWAR
name	Becky
motto	You just have to ask the right people!
education and professional background	Becky has gained a postgraduate qualification in career guidance, together with an employment based National Vocational Qualification Level 4 in information, advice and guidance (IAG).
role / degree of standardization	Becky is an experienced employment adviser, who has been working with for the organisation for the last seven years. Her role includes delivery of employability skills to those seeking work. This includes supporting clients to research education, training and employment opportunities, apply for these opportunities and write their curriculum vitae. Similar to careers advisers in the organisation, it is her aim to equip clients with the skills to make informed choices and find education, employment or training opportunities
workplace / colleagues	She works in one school and a local office. When not in school, she works in an open administrative central office with a laptop – hot-desking.
learning	Becky plays an active role in maintaining her knowledge of the labour market and the opportunities available. As part of her job, she regularly visits and telephones employers not only to gain an understanding of the local labour market opportunities, but also a broader understanding of available opportunities.
knowledge	Her knowledge and understanding of the local labour market is broad and gained using more traditional methods of gathering LMI, such as searching local newspapers, using job search websites or speaking to local contacts.
content types	Becky primary uses office software, email, the internet, and organisational management information systems and her employer contact database. Information can be received in both electronic and hard copy.
structures	She primary uses office software, email, the internet, organisation management information systems. Information can be received in both electronic and hard copy. Her diary is the main source of her information and is used to manage her work and deadlines.
problem solving and other knowledge routines	Based on her knowledge of the local team and their needs, she assesses information collected and determines who needs to know this information. Although she would like to store this information centrally in order to be able to look back on employers who have had vacancies or employed particular clients, there is no method for doing this at present. In order to solve this problem, Becky has her own method of recording, storing and disseminating information she collects.
reaction to requests from colleagues	Some colleagues do not see the need for developing a database of past, current and future vacancies. Becky would value the opportunity to share knowledge across the organisation, with colleagues who work in and across different areas/ regions, developing her knowledge to a more sophisticated level.
communication strategy / approach to knowledge sharing	Network knowledge maturation – a heavily reliance on information/ knowledge being shared within local networks. Individuals played a central role in this process of maturation as holders of the information and knowledge, determining what would be shared, when and with whom. Individuals often unaware of what they know, or how they acquired this knowledge. She has a central role within her local area for disseminating this local LMI (her knowledge), by email to colleagues for whom she believes it has relevance. Information is primarily shared with her social networks at work.
formal training	She regularly attends training courses run by the organisation and has regular review sessions with a line manager.
important tools	Office software, internet (including Planit Plus, organisational website), email, telephone, MIS
motivation / drives / interests	Becky is enthusiastic about her work. She has a keen interest in expanding her knowledge of local employers and opportunities.
task management	Becky uses a paper diary to manage her tasks. Her work means that she is invariably at different locations every day. Her daily work routine is driven by an appointment schedule with clients and employer visits.
attitude towards technology	Becky recognises the important role IT plays in her daily work and communication with her colleagues. For her, IT is a useful tool.

provided by	UWAR
name	Gina
motto	You just have to ask the right people!
education and professional background	Gina is a professionally trained adviser with academic qualifications with a degree in Careers Guidance and postgraduate qualification.
role / degree of standardization	Gina is an experienced P.A., who has been working in a particular locality for several years. Her work is quite varied and there is no daily or weekly routine. There are set days where she is expected in school or at the local access point, but this is changeable dependent on meetings and school activities (such as parent evenings, enterprise days, work experience week etc.).
workplace / colleagues	Gina works in two schools, and a town centre access point offering services for young people throughout the week. In her local areas there is a strong sense of teamwork.
learning	She learns through informal processes and self-development, often taking advantage of opportunities and volunteering to pilot new initiatives.
knowledge	She believes that she has good knowledge of the local area and the opportunities available to young people. This is continually developed as part of her occupational role. She is also a learning coach for a small team of advisers.
content types	She primary uses office software, email, the internet, and the organisational management information system. Information can be received in both electronic and hard copy. Her diary is the main source of her information and is used to manage her work and deadlines.
structures	Her local office has a service where information is stored in a file system, which is complex and confusing. Gina operates her own folder system on her laptop. Hard copy information is often stored in her diary.
problem solving and other knowledge routines	The individual plays a central role in this process of knowledge maturation as they hold the information and knowledge, and determine what will be shared and with whom. These types of networking meetings are good evidence of knowledge maturation occurring in pockets across the region. However, Gina, similarly to her colleagues, believes that this process of communicating and sharing information could be improved. For instance, locally shared information and knowledge is not disseminated to the wider organisation and across the county. She understands that the information she holds is not recorded or stored, but also that information would be of relevance (and interest) to others in a similar position in other localities.
reaction to requests from colleagues	At this office she has responsibility for maintaining one section of LMI. This means she has to ensure that hard-copy of the information is available and that it is up-to-date. P.A.s within that locality share this information, which is not disseminated or stored by any other means. As she is responsible for this section she would expect to deal with requests from colleagues.
communication strategy / approach to knowledge sharing	Network knowledge maturation – a heavily reliance on information/ knowledge being shared within local networks. Individuals played a central role in this process of maturation as holders of the information and knowledge, determining what would be shared, when and with whom. Individuals often unaware of what they know, or how they acquired this knowledge. Within the locality, local team meetings are regular with agenda and minutes recorded. It is in these meetings that network knowledge maturation is evidenced. In local teams meetings, lead P.A.s and P.A.s share information and for those who cannot attend there is a reliance on them to seek out colleagues for an update or retrieve the minutes stored on the local intranet/server. Gina finds these meetings essential part of keeping up-to-date with developments, initiatives and opportunities for young people in the locality. There is a heavily reliance on information/knowledge being shared within these local networks, but not to the wider organisation.
formal training	An annual appraisal system is in operation in the organisation which she participates in. She has regular review sessions with a line manager.
important tools	office tools, email, internet, MIS, diary, texting, blogging and social networking technology (for personal use)
motivation / drives / interests	She is very enthusiastic about her job and is very keen to develop and try out new IT systems.
task management	Becky uses a paper diary to manage her tasks and record deadlines. The organisational MIS drives her workload as information has to be recorded on a daily basis. Becky has no daily or weekly routine as she is responsive to school and administrative needs.
attitude towards	Communication within the organisation is driven by email so there is some resentment to the

technology	number of emails she receives on a daily basis. However, she understands the important role of IT, particularly email, in maintaining her knowledge and learning about what is going on in the organisation and local labour market opportunities.

provided by	UWAR
name	Colin
motto	Everything is learned according to plan!
education and professional background	Colin has gained a degree and postgraduate qualification.
role / degree of standardization	Colin has worked for the organisation as a specialist in LMI for a number of years and has experienced many structural changes in the organisation, as well as policy changes and shifts in focus.
workplace / colleagues	He works in a small team, which is currently undergoing some changes.
learning	Colin learns through informal processes and self-development.
knowledge	He has excellent knowledge of the organisation and the context in which it operates. Colin has knowledge about the national, regional and local labour markets, education and employment statistics and trends. He deals with statistical data collected by the organisation, supplementing it with data from external official statistics.
content types	Statistical information is of most interest to Colin, which is presented in its raw form or with some statistical analysis.
structures	Colin is very structured and uniform in his work.
problem solving and other knowledge routines	He has produced information sheets for local areas on the take-up of different vocational qualifications and wants to link these to past and present vacancies and employer information. This, he believes would better enable careers advisers seek out opportunities for clients. However, there are tensions with utilising employer and vacancy information for this purpose. The organisation has shifted from vacancy handling to enabling clients to make informed choices and plan their careers. Technology systems are in place for storing and retrieving vacancy information, but it is not used.
reaction to requests from colleagues	Colin responds enthusiastically to his colleagues' requests for information as likes applying his knowledge and putting it in to practice.
communication strategy / approach to knowledge sharing	Conscious knowledge maturation – Communicating and sharing information both internal and external to the organisation accords with an explicit (organisational) strategy and is shared or disseminated in many different formats. Colin researches, analyses, assesses and collates hard data about the labour market, education and employment statistics and trends. He deals with statistical data collected by the organisation, supplementing it with data from external official statistics. Data collected is then represented for dissemination within and through the organisation for different audiences. He has particular skills in analysing statistical data ensuring its reliability and validity, before synthesising it and re/presenting it. Colin recognises the potential applications of his knowledge for supporting the work of the careers advisers and is keen to do more with the LMI he has produced and that softer LMI (and local knowledge) held by individual careers advisers.
formal training	Data not collected
important tools	office tools, email, internet, statistical software packages, excel, survey databases, MIS
motivation / drives / interests	Colin is keen to develop resources and information to support his colleagues. He sees the potential for handling and linking different kinds of information and knowledge produced by the organisation. In the past, he has felt that his ideas have not been accepted.
task management	Colin manages his workload in a systematic and methodical manner. He has regular tasks which need to be completed, but this is supplemented by developmental tasks and responding to requests from colleagues.
attitude towards technology	Colin uses technology on a daily basis and recognises the role it plays in his work. The data he works with is electronic and is accessed through specific statistical analysis programmes.

provided by	UWAR
name	Fiona
motto	Everything is learned according to plan!
education and professional background	Fiona has worked for the organisation for a few years and is responsible for communication and marketing. She has a background in PR and marketing for large public organisations.
role / degree of standardization	It is her role to share and disseminate information through the external organisational website, staff intranet and produce publicity material for key stakeholders. There is some standardisation to her work as she likes routine.
workplace / colleagues	She works with one other person; an assistant. The team is located in the head office of the organisation.
learning	Fiona's learning is centred on the organisation. She continuously researches what materials similar organisations are producing.
knowledge	Fiona's knowledge is focused on the organisation and the wider external context in which is operates. She has good knowledge of what services the organisation offers, what government initiatives it is operating, what collaborative projects are underway, output/outcome statistics, and operational requirements. Importantly she has knowledge of what similar organisations are producing in terms of marketing information. Knowledge she has must be up-to-date.
content types	Fiona is office-based and works on a PC using the usual software. She deals with both hard and electronic copy which she receives from various sources.
structures	She operates her own filing system, both electronic and hard copy.
problem solving and other knowledge routines	Much of Fiona's work has been focused on producing hard copy of materials, which have been aimed at, and distributed to, young people, parents/carers and school staff. However, there has been a significant shift in thinking and information is now been developed for the website and organisational staff, particularly careers advisers.
reaction to requests from colleagues	Fiona recognises that the organisation is geographically diverse and a staff intranet is an effective method of disseminating, storing and sharing information. The intranet consists of information on education, training and employment opportunities, and the services provided by the organisation. For staff, there is information on organisational policy and procedures.
communication strategy / approach to knowledge sharing	Conscious knowledge maturation – Communicating and sharing information both internal and external to the organisation accords with an explicit (organisational) strategy and is shared or disseminated in many different formats. Currently, Fiona is developing and expanding the information on the external website to promote the services of the organisation, and provide information both to support young people with the future career decisions and inform parents/carers of key educational choices of young people. For staff, predominately P.A.s, Fiona is starting to develop the resources and information available focusing on uploading content on county-wide initiatives and shared information. It is recognised that, at present, there is no hared space to store information on a county-wide basis. Fiona believes that a county-wide networked shared drive would become unwieldy if everyone uploaded information. In this instance the information would become difficult to manage, control and keep up-to-date. There is conscious knowledge maturation process evidence as materials are produced and re-presented for external audiences.
formal training	She has received training from the company on their IT systems. An annual appraisal system is in operation in the organisation.
important tools	office tools, email, desktop publishing tools
motivation / drives / interests	Fiona is not confident in her IT usage.
task management	She works on paper for the majority of her work recording what tasks have to be completed and by when.
attitude towards technology	Fiona uses technology when required, particularly desktop publishing as it is useful for her work. She is not confident in her usage of IT and often works on paper. She does not rely on email for communication.

provided by	UWAR
name	Andrew
motto	No idea how I learned that - it just happened!
education and professional background	Andrew has gained an off-the-job postgraduate qualification in career guidance, together with an employment based National Vocational Qualification Level 4 in information, advice and guidance (IAG). Additionally, organisational training also formed part of his induction. As part of his on-the-job training, there were opportunities to visit employers and research different sectors of the labour market.
role / degree of standardization	Andrew has been working as a careers adviser for the last 3 years. There is little standardisation to his work as has to react to the needs of the clients.
workplace / colleagues	He works in one secondary school helping young people with career decisions ensuring that they have the skills to make informed decisions. When not in school, he works in an open administrative central office with his laptop – hot-desking.
learning	Andrew likes to learn and is keen to find out more about different websites which can help him further his knowledge of the local labour market.
knowledge	Andrew has to continuously acquire knowledge in the form of national, regional and local labour market information. This includes: education, training and employment opportunities; occupational trends and forecasts; information on local employers etc. Over the last 3 years, Andrew has gained a significant amount of local knowledge about the labour market and the education, training and employment opportunities available. This knowledge has not be gained through any conscious process or training. It was considered as 'something you get to know'. As a new employee, Andrew asked questions of his colleagues to gain this information and knowledge. By reading internal communications sent by email and local newspapers he has been able to gain knowledge about the local labour market, which is central to his role, exemplifying his title as a knowledge worker.
content types	He primary uses office software, email, the internet, organisation management information systems. Information can be received in both electronic and hard copy.
structures	Information on clients is stored on a national MIS maintained by the organisation. Local intranets are available for storing and retrieving information.
problem solving and other knowledge routines	The internet has become a valuable resource for researching and developing knowledge of the local labour market and the available opportunities. A favourite website, Planit Plus, has information on local opportunities and labour market information (LMI) and is often utilised. Email communication for colleagues also ensures that he is aware of current opportunities for training and employment in the local area. This soft data is vital to his work and needs to be continuously updated. Due to work pressures, he believes that in the current work climate there is little time to undertake employer visits to gain (and develop) knowledge about local employers. Time to research different sectors and gather LMI for analysis and synthesis is restricted and considered a luxury. Advantage is taken any opportunity presenting itself. Andrew recognises that he would value more time to develop his local knowledge by not only supplementing it with hard data, but also by returning to knowledge development methods used during his training and induction within the organisation.
reaction to requests from colleagues	Requests for colleagues are normal by email and are usual a general query to see if he knows a particular piece of information. As a new employee, Andrew asked questions of his colleagues to gain this information and knowledge. By reading internal communications sent by email and local newspapers he has been able to gain knowledge about the local labour market, which is central to his role, exemplifying his title as a knowledge worker.
communication strategy / approach to knowledge sharing	Serendipitous knowledge maturation – Knowledge sharing and maturing is ad hoc and haphazard. Knowledge typically developed and shared as part of a development process for a product or service within the organisation or as part of training. Over the last 3 years, Andrew has gained a significant amount of local knowledge about the labour market and the education, training and employment opportunities available. This knowledge has not be gained through any conscious process or training. It was considered as 'something you get to know'.
formal training	He regularly has the opportunity to attend training courses run by the organisation and has regular review sessions with a line manager.
important tools	Office tools, internet (including Planit Plus, organisational website), email, MIS
motivation / drives / interests	Andrew is sceptical about some applications of IT and does not like to rely on them for information. He says it is unprofessional to go to the organisational website with a client to show them some information and then it freezes or is unavailable.

task management	Andrew has no daily or weekly routine as he is reactive to client needs and requests. Task are managed by an electronic diary.
attitude towards technology	He is keen to use technology and sees it as a way forward for many of clients in developing their research skills in locating local education, training and employment opportunities. Email communication is central to networking and finding out what is happening in the local labour market.

provided by	UWAR
name	Edward
motto	No idea how I learned that - it just happened!
education and professional background	He has been employed for 18 months in the company.
role / degree of standardization	Edward works was employed to implement a new IT system (a website initiative) as part of government policy changes for school leavers. Edward oversees the development of the website and the uploading of content, co-ordinates the development with other initiatives in the county and disseminates to wider audiences in the county. There is little standardisation in his work as it is quite innovative.
workplace / colleagues	He works in a small team of eight. The team work in a large room with all the desks in one block, so workers are at a PC and are facing each other.
learning	Edward learns through informal processes and self-development.
knowledge	The website initiative has been developed by Edward who has researched this area of technology to ensure that the organisation has the most effective system. The software has been developed through a process of testing and re-testing. Focus groups were run by Edward with young people and key stakeholders to gain feedback on the system in order that it could be refined and fully rolled-out. Edward acquires his knowledge through research and feedback/ideas/information from his networks both internal and external to the organisation. Government documents and research are central to his knowledge development.
content types	He uses office software, email and internet. Blogging and networking are also used for collaborative purposes.
structures	Edward has a structured and organised workspace. There is limited space for storage so where possible documents are stored electronically. He also works with a laptop when he is out of the office.
problem solving and other knowledge routines	Edward has been centrally involved in the design, implementation, piloting and roll-out of the county-wide initiative, which supports young people to research, locate and apply for education, training and employment opportunities when they leave school. The website contains all the education, training and employment opportunities available in the country for school leavers, together with information on local employers and job information. It is part of the September guarantee for all school leavers, which promises them a placement.
reaction to requests from colleagues	During the piloting stage of the software development, Edward, with his team, have managed and addressed technical issues and problems that were reported by both email and telephone. Different members of the team, like Edward, dealt with the queries, but the resolutions were not formally recorded or shared with others. The website has been rolled out across the county, problems and queries with the software are dealt with on a daily basis by the team, but unless it has to be fixed by the IT company, who maintain the website, they do not share the problems arising with each other. Where an individual cannot respond to a query, then it is shared. Team meetings are used to report the more serious problems and monitor progress. Edward recognises that knowledge sharing in his team is ad hoc and haphazard. He would like to implement a more formal process of recording problems and resolutions by creating some kind of database.
communication strategy / approach to knowledge sharing	Serendipitous knowledge maturation – Knowledge sharing and maturing is ad hoc and haphazard. Knowledge typically developed and shared as part of a development process for a product or service within the organisation or as part of training. Edward has a company mobile phone, but does not like to use it so rarely turns it on. He said he much prefers people to contact him by email as it is more manageable. It was noted that incoming mail can be excessive and can be difficult to manage if away from the office. Edward enjoys engaging with colleagues and gains much of his knowledge through this process of sharing. Social networking technologies are becoming of increasing interest as he found this is a good method of communicating with developers across the country and Europe.
formal training	He has participated in the company training on IT systems used in the company.
important tools	Office tools, internet, email, blogging, social networking technologies, Feedreader
motivation / drives / interests	Edward is enthusiastic about innovative IT solutions and sees great potential for IT applications. He can be disheartened by those who are less enthusiastic or less willing to see the potential in IT systems. He has highly developed IT skills and knowledge.
task management	His work is managed around email communication, which is central to his daily tasks. He attends meetings with his laptop and uses this to record minutes and actions. He is very reactive

	with his work so recording of tasks and information is ad hoc.
attitude towards technology	Edward is enthusiastic about IT and is very keen to learn about, and research, new IT developments and solutions. He regularly communicates by email and uses online discussions forums to develop his knowledge. IT is central to his work and knowledge development.

8.6.2 Clustering of Personas

	dimension A		dimension B		dimension C	
	standardization	guidance / visionary	learning by formal artefacts	learning by informal artefacts	learning in isolation	learning via networking
Axel						
Heather						
Igor						
Thomas						
Deborah						
Edward						
Kurt						
Otto						
Andrew						
Gina						
Becky						
Sally						
Harry						
Stella						
Aisha						
Raquel						
Carolina						
Silke						
Colin						
Fiona						
Kevin						

Table 13: Personas matched to maturing phases displayed as opposites

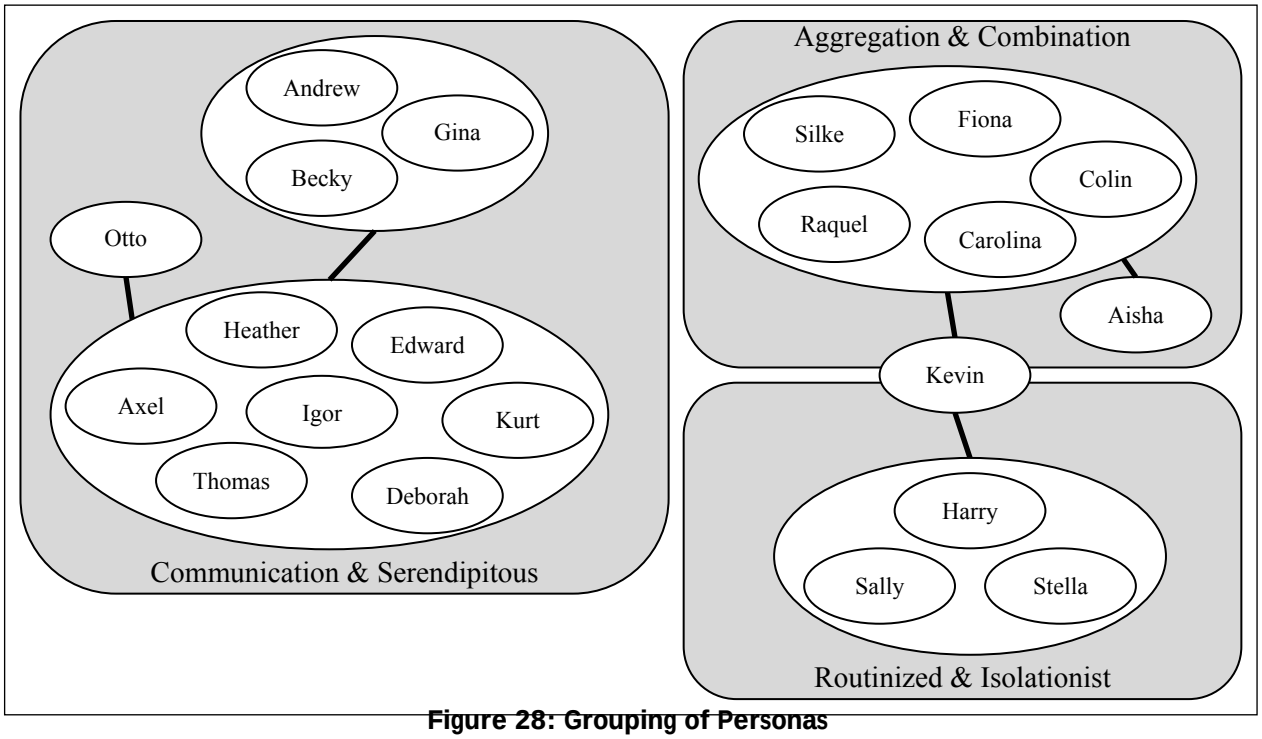

Figure 28: Grouping of Personas

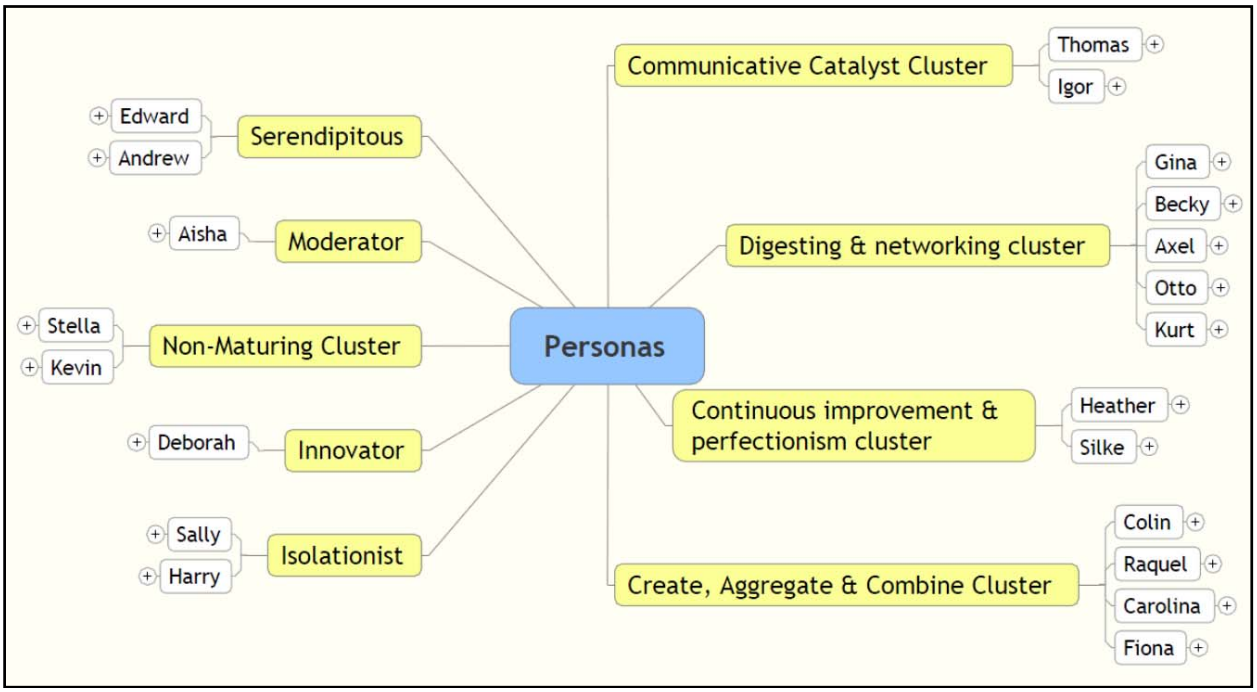

Figure 29: Initial clustering of Personas (FZI)

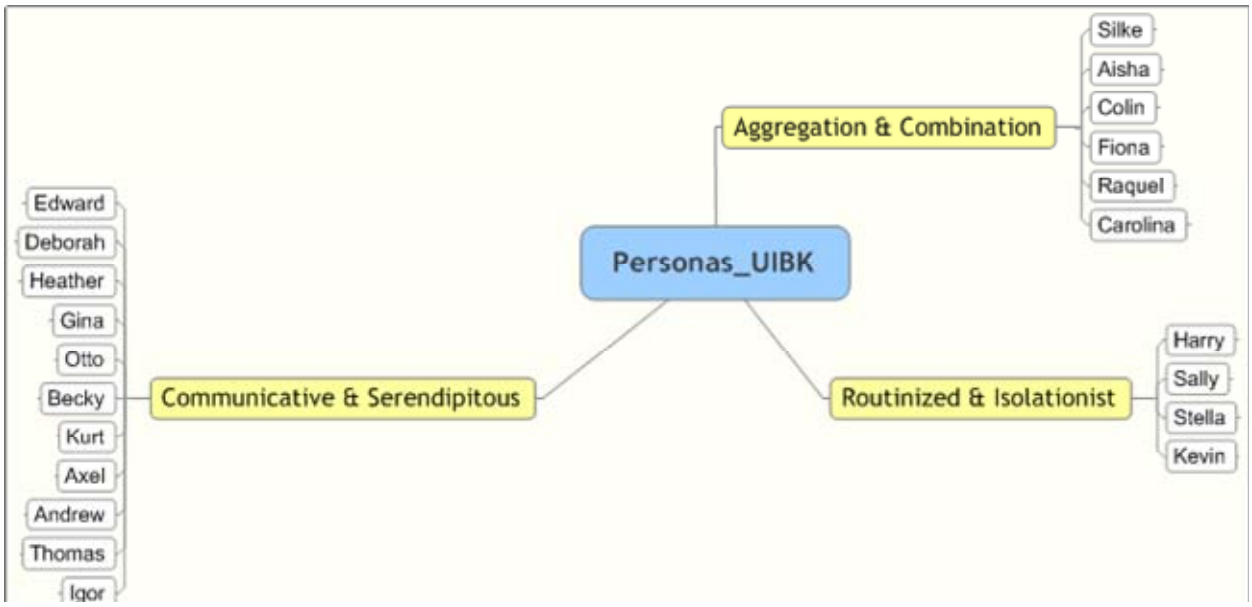

Figure 30: Clustering of Personas (UIBK) as presented at 4th consortium meeting

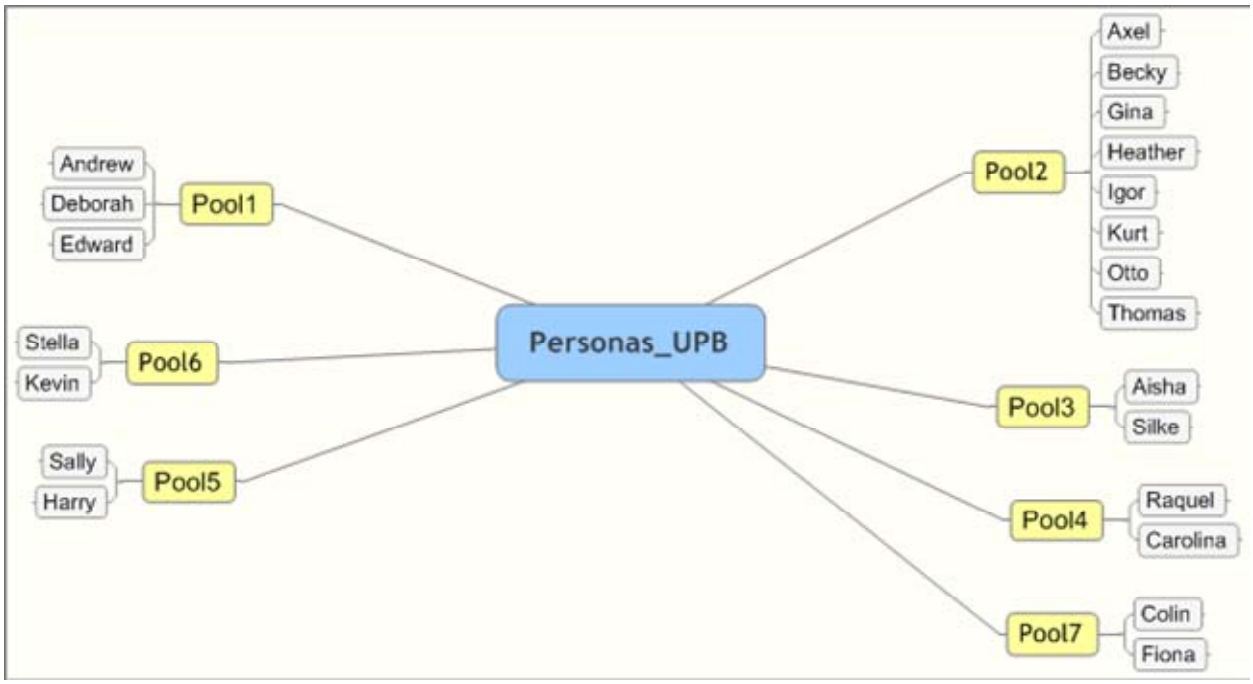

Figure 31: Clustering of Personas (UPB) as presented at 4th consortium meeting

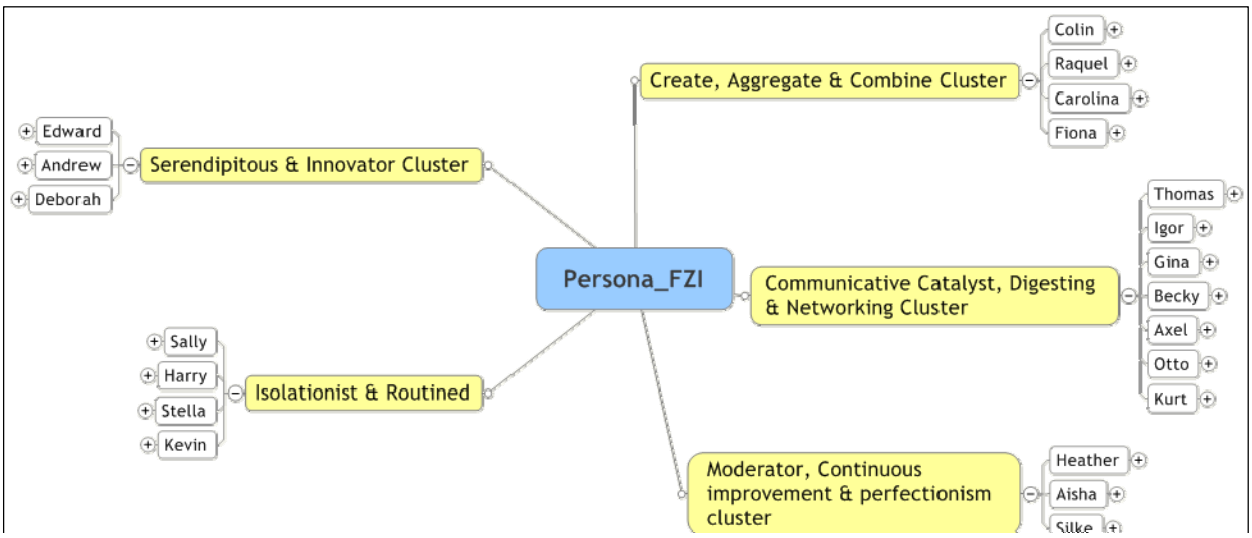

Figure 32: Clustering of Personas (FZI) as presented at 4th consortium meeting

8.6.3 Reasoning for Selection of Personas

group	I: moderator, continuous improvement &perfectionism
selected primary Persona	Silke
reasoning	Silke was chosen because: • She fits most to continuous improvement: continuous learning. • She gives advice on learning strategies → scaffolding • She is interested in other people → understanding of other people helps her to moderate between them → tries to find most efficient help for others • Focus on moderator "Hub-Persona" • Perfectionism: clear structures and processes, tries to improve efficiency, always tries to improve own processes and also processes that have connections to other people within the organization Aisha focuses more on leadership than on being a moderator. Heather mostly works on her own and tries to improve only her own processes instead of the organizational ones.

group	II: isolationist & routinized
selected primary Persona	Sally

reasoning	Sally's profession (programmer/software developer) fits well with the isolationist and routinized category. She tends to seek solution within her local collection (knowledge repository) first and mainly carries out passive search in developer forums and only occasionally replies anonymously or pseudonymously. Sally's learning is usually self-motivated and the outcomes are seldom proactively communicated to other fellow workers. She prefers "hands-on" demonstration to verbal communication. As a mid-high level manager, Harry is actively seeking and applying further funding opportunities that suggests active communication with funding bodies and colleagues. Daily management of his team also rules out routine and isolation. Stella has a very communicative work style---"if ... she always asks the people in her room first" instead of trying to find solutions in documents and company wiki. Kevin's attitude towards work and fellow workers is more to do with his (intern) status within the company. Still, he likes to participate in discussion even though he has no direct gain from such a process.

group	III: create, aggregate & combine
selected primary Persona	Colin
reasoning	It was noticed that there are two sub-groups within the cluster: • Sub-cluster 1: Fiona and Raquel are rather less intimately concerned with the contents of the artefacts they handle, i.e. they combine and disseminate (without really needing to intimately understand), but they do not really create or aggregate. • Sub-cluster 2: Carolina and Colin are more creative, they have criteria for selecting and aggregating knowledge. The actual selection of a primary persona was then a two-step process; first selecting one representative from each subcluster and then decide for one of them. The main criterion for the selection was diversity: in order to lose as little persona characteristics as possible, we tried to choose a person that would cover most of the aspects present in the cluster. From sub-cluster 1, we chose Fiona instead of Raquel because Fiona - although she is not really creative - has to understand the background for the artefacts she deals with and does some aggregation in addition to combining and disseminating. Raquel, on the other hand, really does not need to look at the contents she pieces together. From sub-cluster 2, we chose Colin instead of Carolina because Colin also does some dissemination (in addition to creation, aggregation and combination) whereas Carolina is not concerned with dissemination. Between Colin and Fiona, we went for Colin because obviously (as just stated) he has to deal with all 4 activities in the cluster title. One possible concern with this decision was that Colin only deals with one type of knowledge artefacts (namely statistics) whereas others deal with more diverse kinds of artefacts. This might be important to keep in mind when analysing variations in use cases.

group	IV: communicative catalyst, digesting & network
selected primary Persona	Igor

reasoning	Igor is very proactive in initiating and maintaining communication and networks. He does not get put off if something does not work at first but continues to work at it. Gina and Becky were considered but didn't stick out in any way. Kurt would fit nearly as well as Igor but his description was more based on technology where as Igor's description emphasized the knowledge process. Thomas doesn't fit the others as well in terms of his described communication behaviour

group	V: serendipitous & innovation
selected primary Persona	Andrew
reasoning	All people fit into the group and the dominant characteristic is innovation. For that reason the cluster should be named as Innovative. Andrew fits best to the already created use cases and he is a career advisor. Andrew represents general characteristics of innovative people and can be generalized easy.

Aggregation of data

		influence of valuation of knowledge on						
appl. partner	core competencies	recruiting	project staffing	personnel dev.	formal knowl. sharing events	management objectives	dealing with errors	valuation of networking
Gisa	provision of a holistic range of IT products and service single-handedly	pre-existing knowledge is an important factor, but soft skills are equally important.	Employees' knowledge and skills have a limited influence, no unified process and no company-wide (although business area-wide) skill matrix, personal perception of the project leader and possible past projects are important criteria as well.	besides gaining experience in the respective field, gaining knowledge is seen as the most important factor. mentor for new employees	lessons learned meetings at the end of projects, team meetings, some communities of practice	personnel development can be part of objectives. it is planned to create a new distinct position to which work effort can be allocated.	errors are a part of learning, and are being tolerated to a certain degree (the higher the position within the company, the lesser errors are to be made)	dependent on the role, they are recognized to a certain extent
Swisscom	[not provided]	[not provided]	according their interests and experiences which they have got in historical projects and personal fit	[not provided]	weekly meetings	[not provided]	project leader is responsible for errors	one of the highest values
Structuralia	[not provided]	main way to gain new knowledge	staffing of project members by skill	Personal development is encouraged as a way to ascend positions (responsibility levels and salary rises)	scheduled meetings for knowledge transfer	[not provided]	[not provided]	[not provided]
Connexions Kent	Delivery of careers guidance services to 14-19 year old young people across a specific region in the South East of England.	career guidance practitioners have various academic and vocational qualifications, and experience	career guidance practitioners and support staff deliver the core service, with support staff occupying subsidiary roles – but service delivery remains the prime goal of the organization	there are particular requirements for both general and specialist updating of careers practitioners, who find this challenging because of the many demands on their time	conferences, seminars and INSET training, with explicit updating functions	To provide a world class free impartial and confidential advice, guidance, support and personal development services throughout the county of Kent.	strong reporting and hiearchical strucutre within the organisation, which manages errors	networking has an important role to play in individuals updating and maintaining their knowledge of local labour markets
Careers Scotland	A national organisation operating throughout Scotland delivering career guidance and employability services to people of all ages	career guidance practitioners have postgraduate qualification in information, advice and guidance, this is often supplemented with vocational qualifications, induction training and professional development	career guidance practitioners and support staff deliver the core service, with support staff occupying subsidiary roles – but service delivery remains the prime goal of the organization	careers practitioners have a requirement to maintain and update their knowledge, but this can be challenging due to demands on their time	conferences, seminars and INSET training, with explicit updating functions	Organisational objectives are to: be a catalyst for real and positive change in Scotland's skills performance; help individuals realise their full potential; help employers be more successful through skills development; and work in meaningful partnership to enhance Scotland's sustainable economic development.	strong reporting and hiearchical strucutre within the organisation, which manages errors	networking has an important role to play in individuals updating and maintaining their knowledge of local labour markets
Synaxon	[not provided]	[not provided]	[not provided]	If an employee develops competences that qualify him or her for tasks in another department, he/she may change the department (if there is a personnel need in the desired department)	take place, when the need occurs, formal training on the internal knowledge base for new empoyees	[not provided]	[not provided]	[not provided]
SKK	four primary values: customer satisfaction, economic efficiency, employee satisfaction, and innovation.	company-wide guidelines for the recruitment process, high valuation of knowledge	not applicable	life-long learning, mentor for new employees	training event for new employees	introduced, but dependent on the single case	[not provided]	important for informal learning

app. partner	levels of expertise	criterion	changes
Gisa	3-4 per career path (junior, 'normal', senior)	The employee should be able to work independently (at the client's site). He/She can solve problems and negotiate with customers there.	identify his/her own learning needs, learn autonomously about needed topics and be able to teach less experienced colleagues
Swisscom	status as project leader, but no distinct levels of expertise	(number of project experience)	(leading bigger projects)
Structuralia	trainee, junior, senior, associates and directors	[not provided]	channels knowledge needs through peers
Careers Scotl./ Connexions Kent	trainee, qualified, senior (qualified and experienced – often offering a particular specialism, like labour market information).	trainees would be supervised with a minimal caseload and be expected to participated in training; qualified practitioner would have larger caseloads (perhaps supportig CEG in one or two schools) and be more involved in the operation of services in a locality; senior practitioners will manage several practitioners and support staff, oversee CEG activities across several schools, attend managment meetings, disseminate information to staff in locality, specialise in a particular area (i.e. LMI, training, CAG	engage in continous professional development and self-directed learning, more autonomous acting in terms of researching and developing knowledge
Synaxon	no distinctions	none	none
SKK	apprentice, specialized, ward manager, nurse manager	[not provided]	[not provided]

app. partner	role	content	sources	available time	infl. on personal dev.	formal training	occasion
Gisa	team leader	broad knowledge of technology and arising business needs of customers	magazines, reading news on the Internet, by offered seminars or workshops, by talking to colleagues	self-decided, to a certain degree, usually 1-2 days/month	needed in order do work (keeping up)	mostly on mgt./leadership topics	parallel to work
Gisa	consultant	technology/ products in use and on upcoming releases	product documentations, exchanging with colleagues and trying out test systems	dependent on work-load and expertise, 1 day/month	needed in order do work (keeping up) in projects and advance on expertise level	once a year / 3-5 days	parallel to work, project -specifc needs
Gisa	appl. supporter	new products and applications	product and solution documentations, colleagues	dependent on the number of new solutions, 0.5 day/month	needed in order do work (keeping up)	once a year / 3-5 days	new solution goes into production
Swisscom	project manager	visiting workshops, news on relevant topics, team meetings	colleagues	[not provided]	[not provided]	[not provided]	[not provided]
Swisscom	project leader	visiting workshops	[not provided]	[not provided]	[not provided]	[not provided]	[not provided]
Swisscom	product manager	information on and around products, technical developments	[not provided]	[not provided]	[not provided]	[not provided]	[not provided]
Structuralia	consultant	knowledge about industry and related issues	[not provided]	[not provided]	needed in order do work (keeping up)	[not provided]	parallel to work, project -specifc needs
Careers Scotl./ Connexions Kent	career advisors	Labour market information	colleagues, newspapers, internet, government reports, sector skills councils, employers, local contacts	determined by the individual, self-directed, time often not allocated unless a specified part of their role	needed in order do work (keeping up)	limited use	parallel to work
Synaxon	employee	[not provided]	wiki	20% of working time, dependent on workload	needed in order do work (keeping up)	[not provided]	[not provided]
SKK	employee	[not provided]	journals, books, internet, e-learning	[not provided]	[not provided]	yes	[not provided]

app. partner	artefact	formalization	location
Gisa	training material (by vendor)	formal	employee's hard drive, net drive
Gisa	training material (by vendor)	formal	paper based, office
Gisa	project documents (presentations, requirement documents, meeting protocols)	semi-formal	projects network drive
Gisa	product documentation	formal	network drive of app. support, personal hard drive
Gisa	documentation for productive solutions	formal	network drive of app. support, projects network drive, SAP SolMan
Gisa	Lessons Learned, how-Tos	informal	personal hard drive, org. units network drive, wiki
Gisa	contracts, SLAs, offers	formal	DMS
Gisa	ideas, proposals	informal	personal hard drive, org. units network drive
Gisa	emails	informal/ semi-formal	PIM, network drives
Gisa	process documentation	formal	portal
Gisa	news	semi-formal	portal
Swisscom	emails	informal/ semi-formal	PIM
Swisscom	FAQ	semi-formal	[not provided]
Swisscom	presentation slides	semi-formal	[not provided]
Swisscom	surveys, trend analysis	semi-formal	[not provided]
Swisscom	personal notes	informal	[not provided]
Structuralia	emails	informal/ semi-formal	PIM
Structuralia	[not provided]	[not provided]	[not provided]
Careers Scotl./ Connexions Kent	labour market information	informal	portable drive, personal laptop, paper-based, email, occassionally on local shared drive
Careers Scotl./ Connexions Kent	Organizational information, procedures and targets	formal	organisational intranet, paper based
Careers Scotl./ Connexions Kent	Technical knowledge to operate IT systems	semi-formal	organisational intranet, paper based
Careers Scotl./ Connexions Kent	Education, training and employment opportunities in local area	informal	paper format, email, occassionally on local shared drive
Careers Scotl./ Connexions Kent	Policy information	semi-formal	organisational intranet, paper based
Synaxon	knowledge about tasks and elements	semi-formal	wiki
Synaxon	formalized routines and task descriptions	formal	wiki
Synaxon	meeting protocols	formal	wiki
Synaxon	emails	informal, semi-formal	PIM
Synaxon	instant messenging protocols	informal	IM tool
SKK	best practices	formal	intranet, paper-based
SKK	organizational and management guidelines	formal	paper based, office
SKK	training materials	formal	net drive
SKK	emails	semi-formal	PIM

appl. partner	type	location	contents	structuring concept (example)	str. changeable	formats	resp. for updating	access rights
Gisa	group	file server	org. units documents like: training, administration, (projects,) workshops, marketing	hierarchy	yes	office (MS Word, Excel, PowerPoint, Visio or PDF)	members of org. unit	org. unit only
Gisa	group	file server	project documents	hierarchy	no	office (MS Word, Excel, PowerPoint, Visio or PDF)	project team	project team only
Gisa	group	wiki	information on well known errors and specific information on software releases and hardware configuration	networked, hierarchy	var.	text and pictures	PC support and service	PC support and service
Gisa	group	dms	mainly the document types offer, inbound invoice and contract (with customers and vendors)	hierarchy	no	PDF, TIFF, Excel	process owner	based on content
Gisa	group	portal	documentation on the company's organizational structure, its processes, news, a glossary, presentations and documentation on commonly needed tools	networked, hierarchy	no	office (MS Word, Excel, PowerPoint, Visio or PDF), text, pictures	editorial dpt., original creator of information	company
Gisa	personal	PIM (eMail)	communication on, e.g., projects, administration, …	hierarchy	yes	Emails, office documents	n.a.	personal / colleagues
Gisa	personal	file server/ hard disk	product descriptions, course materials, self-made documentations on specific questions, FAQs and example data	hierarchy	yes	office (MS Word, Excel, PowerPoint, Visio or PDF)	personal	personal
Swisscom	group	file server	project documents	hierarchy	yes	[not provided]	project team	project team only
Swisscom	group	file server	[not provided]	[not provided]	[not provided]	[not provided]	[not provided]	employees
Swisscom	personal	file server	[not provided]	hierarchy	yes	[not provided]	personal	personal
Swisscom	personal	eMail	communication, links on files	?? (topics)	yes	Emails	n.a.	personal
Structuralia	personal	file server	[not provided]	hierarchy	[not provided]	office (MS Word, PowerPoint), web pages	personal	personal
Structuralia	group	file server	articles, documents	hierarchy (expertise field, industry)	[not provided]	office (MS Word, PowerPoint), web pages	[not provided]	employees
Careers Scotl./ Connexions Kent	group	file server	administration, communication, storage, dissemination, teaching, supervision - all materials are stored on a local server by each locality	ad hoc, topics in folders	yes	PDF, office (MS Word, Powerpoint, Excel), web pages	practitioners working in locality	employees in locality
Careers Scotl./ Connexions Kent	group	paper-based archive	local labour market information stored in a file, known to be dated, individual has responsibility for maintaining information, not shared with other localities who collect same information	topics	yes	print-out, pamphlets, hand-outs, brochures	individual assigned role	employees in locality and customers
Careers Scotl./ Connexions Kent	personal	eMail	administration, communication, storage, dissemination, teaching, supervision	hierarchy	yes	Emails	n.a.	personal
Careers Scotl./ Connexions Kent	personal	paper-based filing system	administration, storage, labour market information, calendar, deadlines and reminders, action, training events, documents	individually organised and managed, few alternatives	yes	paper-based printed documents, hand written notes	n.a.	personal
Synaxon	personal	workspace	[not provided]	hierarchy (task, time)	yes	[not provided]	n.a.	personal
Synaxon	group	workspace	[not provided]	hierarchy (task, time)	[not provided]	[not provided]	[not provided]	[not provided]
Synaxon	group	file server	[not provided]	hierarchy (department, tasks)	[not provided]	[not provided]	[not provided]	[not provided]
SKK	group	event management solution	informatin about training events	[not provided]	[not provided]	[not provided]	[not provided]	[not provided]
SKK	group	eMail	communication	hierarchy (event)	no	Emails	n.a.	[not provided]
SKK	personal	eMail	communication	hierarchy (time or event)	yes	[not provided]	n.a.	personal
SKK	personal	file system	[not provided]	hierarchy (time or event)	yes	[not provided]	n.a.	personal

8.7 Knowledge Maturing Cases

8.7.1 Long running Knowledge Maturing Cases

Process Description (UIBK)

Process Instance (PI): New Solution Development (Portal)

task number (level)	task name	task description	participating organizational units				resources (input) (name and short description)	resources (output) (name and short description)	know-ledge intensive task? (yes or no)	task number pre-decessor	task number suc-cessor	remarks / reflection for potential requirements
			responsible role(s)	performing role(s)	communicating role(s)	informed role(s)						
1	New employee enters the company	the company employs a new employee who is interested in portal technology	Team Leader (SAP R3 Application Support)	Employee (Initiator)					no	start of tasks	2	
2	SPI: Acquiring knowledge about portals	the employee acquires, encouraged by his boss, more knowledge about portals in general and about SAP-based portals in particular	see sub process instances				see sub process instances	see sub process instances	yes	1	3	
3	Evaluates the found solution	the employee evaluates the solution and thinks it will be a benefit	Employee (Initiator)	Employee (Initiator)			product information (about portal technology)	weighted product information (about portal technology)	yes	2	4	
4	Inspires management and colleagues	the employee discusses his ideas with his colleagues and tries to convince them of its advantages	Employee (Initiator)	Employee (Initiator)			product information (about portal technology)		no	3	5	
5	Evaluate idea of the employee	idea is evaluated taking into account the team leader's existing knowledge about the company result: the idea fits into the company's strategy	Team Leader (SAP R3 Application Support)	Team Leader (SAP R3 Application Support)	Employee (Initiator)		idea (regarding usage of portal technology in a company)		yes	4	6	
6	Discusses the idea with the head of department	idea is evaluated as a benefit for the company and fits into the strategy	Head of Department (SAP Application Support)	Employee (Initiator)		CIO	idea (regarding usage of portal technology in a company)	further developed idea (about portal technology)	no	5	7	
7	Decide to start the project	after the employee's head of department was convinced of the proposal, the CIO of the company was involved in order to start an internal pilot project	CIO	CIO	Head of Department (SAP Application Support)	Employee (Initiator)	project proposal (for first internal portal project)	decision about project (about first internal portal project)	no	6	8	
8	Send employee to training	the employee is sent to a training of the software vendor in order to gain product knowledge before starting the internal pilot project	Team Leader (SAP R3 Application Support)	Team Leader (SAP R3 Application Support)					no	7	9	
9	Employee receives formal training	the employee is gaining knowledge about designing and implementing the portal solution	Employee (Initiator)	Employee (Initiator)				product information (about portal technology)	yes	8	10	
10	Planning project	based on the gained knowledge about portal technology and previous projects that implemented software of the vendor, the pilot project is planned in detail	Team Leader (SAP R3 Application Support)	Employee (Initiator)	Colleagues of Employee (Initiator)		decision about first internal project	project plan of first internal portal project	no	9	11 and 12	
11	Transferring knowledge	by implementing the project, product and implementation knowledge is distributed by the employee and gained by the other project members	Employee (Initiator)	Employee (Initiator)	Project Members (Internal Project)		product knowledge about portal technology and implementation knowledge gained during implementation	product knowledge about portal technology and implementation knowledge gained during implementation	yes	10	13	
12	Implementing internal portal project	conducting the internal project and implementing the portal technology	Employee (Initiator)	Project Members (Internal Project)			product knowledge about portal technology and implementation knowledge gained during implementation	implemented first internal portal	no	10	13	
13	Evaluate project	after finishing the first release, the project is presented to the CIO and the results are evaluated	Team Leader (SAP R3 Application Support)	CIO			implemented first internal portal	project evaluation of first internal portal project	no	11 and 12	14	
14	Decide to establish new organizational unit	an organizational unit is dedicated in order to support the internal portal and to gain more knowledge	Division Manager (Application Support)	Division Manager (Application Support)			experiences with portal technology	decision regarding organizational unit	yes	13	15 and 16	

task number (level)	task name	task description	participating organizational units				resources (input) (name and short description)	resources (output) (name and short description)	know-ledge intensive task? (yes or no)	task number pre-decessor	task number suc-cessor	remarks / reflection for potential requirements
			responsible role(s)	performing role(s)	communicating role(s)	informed role(s)						
15	SPI: Develop proposal for pre-commercial solution	see sub process instances	see sub process instances				see sub process instances	see sub process instances	yes	14	17	
16	Develop follow-up internal portal release	after implementing the first release, lessons learned are used to improve the initial release and to implement more functions previously nested in the old intranet homepage	CIO	Employee (Initiator)			lessons learnt (initial project), requirements	second release for internal portal	yes	14	17	
17	Acquire potential customer	the company tries to acquire a customer for the recently used and experienced portal technology	Employee (Initiator)	Employee (Initiator)					no	15 and 16	18 and 19	
18	Implement first customer solution	after an interested customer is found, a portal solution based on the knowledge gained with the internal portal is implemented	Project Leader	Project Team	First Customer		project plan, product and implementation knowledge	implemented second release of internal portal	yes	17	20 and 21 and 22	
19	Transferring knowledge	by implementing the project, product and implementation knowledge is distributed by the employee and gained by other project members	Employee (Initiator)	Employee (Initiator)	Colleagues of Employee (Initiator)		product knowledge about portal technology and implementation knowledge gained during implementation	product knowledge about portal technology and implementation knowledge gained during implementation	yes	17	20 and 21 and 22	
20	Training colleagues of other departments	by using the technology in customer projects, more employees need to be instructed on use and impact of the implemented portal technology (e.g. helpdesk)	Employee (Initiator)	Employee (Initiator)	Colleagues of Employee (Initiator)		product knowledge about portal technology and implementation knowledge gained during implementation	product knowledge about portal technology and implementation knowledge gained during implementation	yes	18 and 19	24	
21	Design plan for enterprise-wide roll-out (customer)	as the first customer project comprises only a small part of the possible functionality of the technology, the remaining use cases need to be implemented therefore, a plan for an enterprise-wide roll-out is developed	Division Manager (Application Support)	Employee (Initiator)	Employee (Initiator)		product knowledge about portal technology and implementation knowledge gained during implementation	rollout plan of first customer's portal technology	yes	18 and 19	24	
22	Maintain implemented solution (first customer)	after the projects completion, the first customer solution goes live and is maintained	Application Manager (Portals)	Application Manager (Portals)	First Customer		product knowledge about portal technology and implementation knowledge gained during implementation	lessons learnt about internal processes	yes	18 and 19	23	
23	Identify need to adapt internal processes	by maintaining the customer's solution in a live environment, several support processes are identified which need to be changed because of the new, integrated nature of the portal solution	Employee (Initiator)	Employee (Initiator)			lessons learnt about internal processes	identified improvements of internal processes	yes	22	24	
24	Implement follow-up customer solution	after the enterprise-wide usage for the first customer is planned, the next release/project is conducted	Follow-up Project Leader	Follow-up Project Leader	First Customer		product knowledge about portal technology and implementation knowledge gained during implementation, further requirements of the customer	enterprise-wide implementation of portal technology	yes	20 and 21 and 23	end of tasks	

Process Description (UIBK)

Sub Process Instance (SPI): Acquiring Knowledge about Portals

task number (level)	task name	task description	participating organizational units: responsible role(s)	performing role(s)	communicating role(s)	informed role(s)	resources (input) (name and short description)	resources (output) (name and short description)	know-ledge intensive task? (yes or no)	task number pre-decessor	task number suc-cessor	remarks / reflection for potential requirements
2.1	Searches for knowledge in company internal databases	the employee tries to find existing knowledge within the company and therefore investigates the company's knowledge base	Employee (Initiator)	Employee (Initiator)			existing information within the company's database	aggregated knowledge about existing portal technology	yes	start of subtasks	2.3	
2.2	Talks to colleagues to find knowledge sources	after finding only a small amount of information, the employee talks to his colleagues in order to get some hints	Employee (Initiator)	Employee (Initiator)	Colleagues of Employee (Initiator)		questions/requests about further knowledge/information sources	further information/knowledge about portal technology	yes	start of subtasks	2.3	
2.3	Investigates standard software	the employee investigates the software provided by the company's main software vendor	Employee (Initiator)	Employee (Initiator)			product documentation of the vendor's portal technology	aggregated product documentation of the vendor's portal technology	yes	2.1 and 2.2	2.4	
2.4	Evaluates acquired information	after collecting a lot of information, the employee evaluates the benefits and the potential of the portal software	Employee (Initiator)	Employee (Initiator)			aggregated product documentation of the vendor's portal technology	weighted product documentation of the vendor's portal technology	yes	2.3	2.3 or end of subtasks	

Process Description (UIBK)

Sub Process Instance (SPI): Develop Proposal for Pre-Commercial Solution

task number (level)	task name	task description	participating organizational units: responsible role(s)	performing role(s)	communicating role(s)	informed role(s)	resources (input) (name and short description)	resources (output) (name and short description)	know-ledge intensive task? (yes or no)	task number pre-decessor	task number suc-cessor	remarks / reflection for potential requirements
15.1	Take results of internal project as starting point	the results of the internal project are used in order to derive a similar project for customers	Employee (Initiator)	Employee (Initiator)	Internal Project Team		results (lesson learnt, documentation) of the internal project		no	start of subtasks	15.2	
15.2	Develop proposal	a proposal is developed and formalized	Employee (Initiator)	Employee (Initiator)			results (lesson learnt, documentation) of the internal project	proposal for commercial portal solution	yes	15.1	15.3	
15.3	Qualitative review of proposal	the proposal is reviewed regarding functional and technical requirements	Team Leader (SAP R3 Application Support)	Team Leader (SAP R3 Application Support)	Employee (Initiator)		proposal for commercial portal solution	quality-reviewed proposal for commercial portal solution	yes	15.2	15.4	
15.4	Review of the formal criteria	the proposal is reviewed with respect to formal criteria like layout and presentation	Sales Representative	Sales Representative	Team Leader (SAP R3 Application Support)	Employee (Initiator)	quality-reviewed proposal for commercial portal solution	fully-reviewed proposal for commercial portal solution	no	15.3	end of subtasks	

Process Description (CIMNE)

Process Instance (PI): corporate social responsibility base content course development at RC

(RC is the acronym for the company making the course, STRUC is the acronym of Structuralia, who hire them to do the course for their client OHL)

task number (level)	task name	task description	participating organizational units				resources (input) (name and short description)	resources (output) (name and short description)	know-ledge intensive task? (yes or no)	task number pre-decessor	task number suc-cessor	remarks / reflection for potential requirements
			responsible role(s)	performing role(s)	communicating role(s)	informed role(s)						
1	create a profile for the course	RC consultant creates a profile or description of the objectives of the course and the clients objectives	responsible RC consultantº	Director of RC, STRUC manager, OHL contact	RC consultant	Director of RC, STRUC manager, OHL contact	OHLs "about us" web pages; yearly reports with strategy discourse (vision and mission), objectives, etc.; corporate responsibility field papers; clients (OHL) specific field laws and best practices (construction area)	1 page document with an executive summary of the course, objectives and rationale with client´s vision and mission	yes	start of task	2	
2	create index of course content	RC consultant creates an index of the course content	responsible RC consultant	RC consultant	RC consultant	Director of RC, STRUC manager, OHL contact	as above but also emails, colleagues info and journals	index (items and sub items to be covered with objectives on each of them)	yes	1	3	
3	create word document of course	RC consultant creates for each specific item on the index a block of content that is no longer an 2 A4 pages and not less that half a A4 page	responsible RC consultant	RC consultant	RC consultant	Director of RC, STRUC manager, OHL contact	as above	a 40+ page document with "flat" content to be used by STRUC to 'build' the course online	yes	2	4	
4	create ppt presentation of course	RC consultant creates not less than 1 and not more than 4 slides for each item on the approved course content items	responsible RC consultant	RC consultant	RC consultant	Director of RC, STRUC manager, OHL contact	as above	a 80+ ppt presentation with "flat" content to be used by STRUC to 'build' the course online	yes	3	end	

Process Description (CIMNE)

Sub Process Instance (SPI): create index of course content

task number (level)	task name	task description	participating organizational units: responsible role(s)	performing role(s)	communicating role(s)	informed role(s)	resources (input) (name and short description)	resources (output) (name and short description)	know-ledge intensive task? (yes or no)	task number pre-decessor	task number suc-cessor	remarks / reflection for potential requirements
2.1	Searches for knowledge in company internal databases	RC consultant tries to find existing knowledge within the company and therefore investigates the company's knowledge base	RC consultant	RC consultant		RC consultant	existing information within the company's database, clients and industry WebPages, industry best practices	aggregated knowledge about corporate social responsibility applied to analogue client's companies or industry	yes	start of subtasks	2.2	
2.2	Talks to colleagues to find knowledge sources	RC consultant engage with knowledgeable colleagues in order to get ideas on how to approach the course distribution based on the pre-established index and the colleague knowledge and previous experience. Also RC consultant is interested in finding reusable content, and colleagues are the fastest way to get directed to them inside the company and a suitable way to get it from external sources	RC consultant	RC consultant	Colleagues of RC consultant	Colleagues of RC consultant	questions/requests about further knowledge/information sources	further information/knowledge about corporate social responsibility applied to analogue client's companies or industry and about approaches/conceptual frameworks that could help achieving the content objectives	yes	2.1	2.3	
2.3	Investigates industry regulation and best practices	RC consultant investigates regulations applied to the industry at stake and best practices published by relevant public bodies and private associations.	RC consultant	RC consultant	Colleagues of RC consultant		existing information within the company's database, regulatory bodies, clients and industry WebPages, industry best practices	documentation about regulation and best practices for corporate social responsibility in client's companies or industry	yes	2.2	2.4	
2.4	tries to find similar cases	RC consultant investigates for similar clients having social corporate responsibility policies and frameworks that could provide insight on "what is important for the clients competition" and "what is important for the industry's market observed"	RC consultant	RC consultant	Colleagues of RC consultant		existing information within the company's database, google for clients with similar cases	examples of structures and approaches about social corporate responsibility, if available on the same industry. Much better: cases highlighted as valuable from agencies representing the market of the industry as stake	yes	2.3	2.5	
2.5	Writes or revise content written	RC consultant creates a draft index -to be revised and changes through various loops of this sub-tasks	RC consultant	RC consultant	RC director and STRUC manager		all information found on above tasks	final draft structure	yes	2.4	2.6	
2.6	Evaluates acquired information and approves index structure	RC consultant evaluates the draft index with the comments gathered in previous sub-tasks and confront relevant colleagues (RC director and STRUC manager with the content to be approved or redrafted.	RC consultant	RC consultant	RC director and STRUC manager		all information found on above tasks and draft index	final accepted structure and objectives for each item in the structure (this will allow RC consultant to start creating the content for each item on the index)	yes	2.5	end of subtasks	

Process Description (FHNW)

Process: Product development process

task number (level)	task name	task description	participating organizational units: responsible role(s)	performing role(s)	communicating role(s)	informed role(s)	resources (input) (name and short description)	resources (output) (name and short description)	know-ledge intensive task? (yes or no)	task number pre-decessor	task number suc-cessor	remarks / reflection for potential requirements
1	Idea Generation	Generate a new product or service idea by using the following inputs: try out products and services and find some disadvantages; By reading customers feedback; By interviewing external and internal people; By discussing in teams	product manager	employees		project manager, team leader	product information, product experience, ideas, evaluation, market analysis	document, which allows the review of the ideas	yes		2	
2	Approve ideas	Approveal of ideas including specifying budget. If the idea is not supported, the process stops. Otherwise, the next phase (Customer Experience Creation) starts	product manager(leader)	product manager(leader)	product manager	project manager, project team	document, which allows the review of the ideas		yes	1	3	If the project is rejected the process stops
3	Define customer benefits	Defining customer benefits and specifying the project scope (phase: Customer Experience Design)	product manager	product manager				document, which specifies the product scope	yes	2	4	
4	Estimate potential demand/turnover	Estimating the potential demand / turn over (phase: Customer Experience Design)	product manager	product manager /project team	project team			document containing bullet points of potential demand and turn over	yes	3	5	
5	Business requriments	Defining the business requirements (phase: Customer Experience Design)	product manager	product manager/project team	project team			Document which lists all business requirements	yes	4	6	
6	Check portfolio compliance	Proof if the set portfolio is adequat (phase: Customer Experience Design)	product manager	product manager	project manager			First version of business plan	yes	5	7	
7	Approve customer experience creation	Approval of feasibility and specifying budget for the next phase (Feasibility)	product manager/project manager/IT-Specialist	product manager	product manager, project manager, team leaders	project manager, product manager	Project scope, list of business requirements, business plan, bullet points of potential demand and turn over		yes	6	8	If the project is rejected the documents have to be improved or the project is stopped
8	Systems Requirements	Specification of the systems requirements (phase: feasibility)	project leader	project team	project team	product manager, project manager	Project scope, list of business requirements, business plan, bullet points of potential demand and turn over	More detailed list of requirements	yes	7	9	
9	Complete Business plan	Regarding the more detailed list of requirements the new version of business plan is specified (phase: feasibility)	project leader	project team	project team	product manager, project manager	Detailed list of requirements and first version of business plan	New version of business plan	yes	8	10	
10	Addtional check of portfolio and compliance	Depending on the new version of business plan and systems requirements the portfolio has to be adapted (phase: feasibility)	project leader	project leader	project team	product manager, project manager	business plan, detailed list of requirements	updated version of business plan	yes	9	11	
11	Concept of market development	A concept, how the product can be pushed into the market is generated (phase: feasibility)	project leader	marketing expert	product manager/project manager	product manager, project manager	Project scope, bullet points of potential demand and turn over	Concept of market development	yes	10	12	
12	Approve of feasibility	Approve if the project can be realised	product manager	product manager, project manager, project leader		project manager, project leader	business plan, concept of market development		yes	11	13	If the project is rejected the documents have to be improved or the project is stopped
13	Setting up project plan	Specification of milestones, deadlines of the project (phase: realisation)	project leader	project leader	project team	product manager, project manager	business requirements, concept of market development	project plan	yes	12	14	
14	Sub Process: Realising project	In this phase, the project is realised	project leader	project leader/ project team		product manager, project manager	business requirements, project plan	deliverables	yes	13	15	
15	Testing project	In this phase the project is tested (phase: realisation)	product manager	testing team	project team	project manager	business requirements	testing document	yes	14	16	
16	Complete Business plan	Depending on the tests and realised project the business plan can be completed (phase: realisation)	product manager	product manager/project leader	project team	project manager	testing document, deliverables	updated version of business plan	yes	15	17	
17		This is the last decision, whether the project was successfull or	product manager/ IT	IT-Specialist/product				date of project ending,				

Process Description (FZI)

Process Instance (PI): SimMan

task number (level)	task name	task description	participating organizational units				resources (input) (name and short description)	resources (output) (name and short description)	know-ledge intensive task? (yes or no)	task number pre-decessor	task number suc-cessor	remarks / reflection for potential requirements
			responsible role(s)	performing role(s)	communicating role(s)	informed role(s)						
1	External event	Training departments wins a SimMan as a prize	Training center					SimMan	no	-	2	
2	Idea: Enhancement of training offer	Idea is discussed about enhancing an existing training offer (MegaCode) with the SimMan as a tool	Training center manager	Training Center Manager, Trainers					yes	1	3	
3	Find rooms	Search for appropriate rooms to be used for a training with the SimMan	Training Center Manager	Training Center Manager					no	2	4	took 2 years!
4	Decision on marketing strategy	Discussion on and decision whether to do active marketing of enhanced training offers, which is finally declined because of lack of resources	Executive board		Training Center Manager, Executive				yes	3	5	
5	Offer trainings to internal employees	Instead, the enhanced training will be offered to the employees. Plans are made for that.	Training Center Manager						yes	4	6	
6	Working out scenarios	The training center works out scenarios for the enhanced training offer, mostly on their own, partially based on material from the European Resuscitation Council, which are translated.	Trainer	Trainer			ERC scenarios	scenarios	yes	5	7	
7	Adapt PowerPoint slides	PowerPoint slides are adapted	Trainer					Training material	yes	6	8	
8	Prepare supplementary materials	Participant list, confirmation of participation, training material	Trainer	Trainer			Training material	Printed training material	no	7	9	
9	Prepare training room	All preparations usually needed for the room. Participants are informed that the foldable tables in front of them are not suitable for beverages	Trainer	Trainer					no	8	10	
10	Training		Trainer	Trainer, Participant			Training Material, SimMan		yes	9		

Process Description (UPB)

Process Instance (PI): New e-commerce project

task number (level)	task name	task description	participating organizational units: responsible role(s)	performing role(s)	communicating role(s)	informed role(s)	resources (input) (name and short description)	resources (output) (name and short description)	know-ledge intensive task? (yes or no)	task number pre-decessor	task number suc-cessor	remarks / reflection for potential requirements
1	Employee has marketing idea	an employee has a marketing idea and tells the company management about it in a meeting	Employee	Employee					no	start of tasks	2	
2	SPI: workshop initiated with external speaker	a group of employees forms a workshop and discuss ideas	see sub process workshop				see sub process workshop	see sub process workshop	yes	1	3	
3	several employees develop own product ideas	employees develop own product ideas individually after the introduction workshop	project leader	Employee	Employees	project leader	product and process knowledge (about different e-commerce types)		yes	2	4	
4	consolidation of ideas and start of e-commerce project	In a meeting different ideas are discussed; decision which ideas are relevant for the project, start of the e-commerce project afterwards	project leader	project leader, employees			ideas (of the different employees regarding the topic)	idea of e-commerce project	yes	3	5	
5	building of department E-Business	according to the growing importance of the task, a special department (department of E-Business) is created and some employees move to this department to be able to concentrate on this project	CEO, project leader	CEO	Employees	Employees	knowledge about project dimension		yes	4	6	
6	SPI: hire external developer	the project cannot be realized with the manpower of the internal development team so an external team is hired	see sub process hire external developer				see sub process hire external developer	see sub process hire external developer	yes	5	7	
7	formal training for business partner with certification	business partners who wanted to use the e-commerce project had to attend a formal training which ended with a certification for the business partner	project leader	Employee	Employees, business partners	Business partners	presentation about e-commerce project	certification	yes	6	8	
8	SPI: map social networking on the product	social networking ideas and practices were mapped on the product	see sub process map social networking				see sub process map social networking	see sub process map social networking	yes	7	9	
9	monetary motivation of business partners	business partners were motivated by telling them about an excess value they can gain by using the product	Employees	Employees		Business partners	knowledge about excess value provided by product		no	8	10	
10	drop of formalization within the e-business platform	according to the idea of employees the formalization within the platform was dropped and the users could now rate in a greater variety	Employees	Developers		Business partners, users			no	9	11	
11	development based on informal feedback	feedback that was received via email, telephone or reported on the platform. New features and changes were developed using this feedback.	Project team	External developer team	Employees, external developer team	users	feedback about features and bugs, knowledge about new techniques	new version of platform	yes	10	12	
12	formal trainings of colleagues to explain possibilities of it	colleagues who are in direct contact with the business partners received a formal training to be able to explain the benefits of the platform and get business partners to use the platform as well	project leader	Employees	Employees (E-commerce department and business partner handling department)		presentation about e-commerce project including new features and reasoning		yes	11	end of tasks	

Process Description (UPB)

Sub Process Instance (SPI): workshop initiated with external speaker

task number (level)	task name	task description	participating organizational units				resources (input) (name and short description)	resources (output) (name and short description)	know-ledge intensive task? (yes or no)	task number pre-decessor	task number suc-cessor	remarks / reflection for potential requirements
			responsible role(s)	performing role(s)	communicating role(s)	informed role(s)						
2.1	external project leader initiates workshop	together with an internal employee who was responsible for the project an external project expert starts initiating a workshop to develop ideas	external and internal project leader	external and internal project leader		employees of different departments	knowledge about e-commerce tools and ideas and about developing them	knowledge about employee's requirements	yes	start of subtasks	2.3	
2.2	find workshop attendants	around 15-20 employees of different departments were put together in a workshop to develop ideas	external and internal project leader	employees of different departments	employees of different departments		knowledge about the employees interests, level of interaction, etc.	aggregated knowledge about employees, a group that comes from different departments and is willing to take part in the specific process	yes	start of subtasks	2.3	
2.3	project leader informs about techniques and ideas	in a presentation the internal project leader informs the employees about different techniques and ideas of different e-commerce tools	internal project leader	internal project leader	all workshop attendants	employees of different departments	knowledge about e-commerce tools and ideas	knowledge about different types of e-commerce tools and ideas	yes	2.1 and 2.2	end of subtasks	

Process Description (UPB)

Sub Process Instance (SPI): Hire external developer

task number (level)	task name	task description	participating organizational units				resources (input) (name and short description)	resources (output) (name and short description)	know-ledge intensive task? (yes or no)	task number pre-decessor	task number suc-cessor	remarks / reflection for potential requirements
			responsible role(s)	performing role(s)	communicating role(s)	informed role(s)						
6.1	organization's developers have no time to implement project	The internal developers have too many other tasks to ensure a fast and correct implementation of the							no	start of subtasks	6.2	
6.2	hire external developer	an external developer is hired to implement the project	Project leader	External developer	Employee, external developer		knowledge about the project requirements		yes	6.1	6.3	
6.3	external developer develops first version of e-commerce project	an external developer implemented the first version of the e-commerce project alone	Employee (contact person for external developer)	External developer	Employee, external developer		knowledge about the structure and features of the project	first version of project	yes	6.2	6.4	
6.4	project becomes bigger	more tasks turn up, project team fears that one developer cannot do this alone	Project team		External developer, Project team	External developer			no	6.3	6.5	
6.5	hire external developer team	an external team of developers is hired. They implement the features of the project.	Project leader	External development team	Employee (contact person), development team		knowledge about the project requirements	different versions of the project	yes	6.4	end of subtasks	

Process Description (UPB)

Sub Process Instance (SPI): map social networking on the product

task number (level)	task name	task description	participating organizational units: responsible role(s)	performing role(s)	communicating role(s)	informed role(s)	resources (input) (name and short description)	resources (output) (name and short description)	know-ledge intensive task? (yes or no)	task number pre-decessor	task number suc-cessor	remarks / reflection for potential requirements
8.1	product platform is released	after team workshop a product platform is released. Information about different products can be found and added by users	Project team	External developer	Project team, external developer	users	requirements for product platform	version of product platform	yes	start of subtasks	8.2	
8.2	implement question and answer system	After thinking and discussing methods of panels, an employee has the idea to implement an question and answer system to allow to ask specific questions about a product	Employee (contact person)	External developer team	Employee, external developer team	users	requirements for question and answer system	new version product platform	yes	8.1	8.3	
8.3	implement social networking	due to requests and new ideas in the e-commerce department social networking features were implemented by the external developer team	Project team	External developer team		users	requirements for social networking features	new version product platform	yes	8.2	end of subtasks	

Case	Number of actors	Number of tasks	Number of sub processes	Tools	Tasks not supported by IT	Number of transitions	Number of content types	Barriers	Motivational effects
UIBK: New Solution Development	10	32	2				10		
FHNW: Product Development Process	6	17	1				11		
FZI: SimMan	4	10	0				1		
CIMNE: course development	6	12	1				8		
UPB: New eCommerce Project	6	23	3				8		
UWAR: responding to client/ customer query	numer-rous	9	?	6	3	?	5	3	2

Table 14: Comparison of long-running knowledge maturing cases

Aggregated phase	Tasks comprised	People / Roles involved
expressing ideas	1	2
appropriating ideas	2.1 (SP)	1
distributing in communities	2.2 (SP)	1 (n)
appropriating ideas	2.3 (SP),2.4 (SP), 3	1
distributing in communities	4	1
appropriating ideas	5	2
distributing in communities	6	3
formalizing	7	3
appropriating ideas	8,9	2
distributing in communities	10,11,12	4 (n)
formalizing	13,14	3
expressing ideas	15.1 (SP), 15.2 (SP)	1 (n)
appropriating ideas	15.3 (SP), 15.4 (SP)	3 (n)
expressing ideas	16	2
distributing in communities	17	1
formalizing	18	3 (n)
distributing in communities	19	1 (n)
ad-hoc training	20	1 (n)
formalizing	21,22	4
expressing ideas	23	1
formalizing	24	2

Table 15: Abstraction of case: New Solution Development (UIBK)

Aggregated phase	Tasks comprised	People / Roles involved
expressing ideas	1	3
appropriating ideas	2.1, 2.2, 2.3, 2.4 (all SPs)	1 (n)
formalizing	2.5 (SP), 2.6 (SP), 3,4	4

Table 16: Abstraction of case: course development (CIMNE)

Aggregated phase	Tasks comprised	People involved
expressing ideas	1	4
appropriating ideas	2	3
expressing ideas	3,4,5	2 (n)
appropriating ideas	6	2
formalizing	7	3 (n)
expressing ideas	8,9,10,11	3 (n)
formalizing	12,13	3 (n)
distributing in communities	14	2 (n)

formalizing	16,17	3 (n)

Table 17: Abstract case: Product Development Process (FHNW)

Aggregated phase	Tasks comprised	People / Roles involved
expressing ideas	2	2
appropriating ideas	3,4	2 (n)
distributing	5	1 (n)
formalizing	6,7,8	1
standardizing	10	1 (n)

Table 18: Abstraction of case: SimMan (FZI)

Aggregated phase	Tasks comprised	People / Roles involved
expressing ideas	1	1
distributing in communities	2.1 (SP)	3 (n)
expressing ideas	2.2 (SP)	3 (n)
distributing in communities	2.3 (SP)	3 (n)
appropriating ideas	3	2
distributing in communities	4	1 (n)
formalizing	5	2 (n)
appropriating ideas	6.2 (SP)	3
expressing ideas	6.3 (SP)	2
distributing in communities	6.4 (SP)	2 (n)
appropriating ideas	6.5 (SP)	2 (n)
standardizing	7	2 (n)
formalizing	8.1, 8.2, 8.3 (all SPs)	3 (n)
distributing in communities	9	2 (n)
formalizing	10,11	4 (n)
ad-hoc training	12	2 (n)

Table 19: Abstract case: New eCommerce project (UPB)

8.7.2 Frequently used Knowledge Routines

	UIBK: Search for problem solution	UIBK: Refining presentation	UPB: Provide information for partner
trigger	delegated task	delegated task	external request
search	check internal source (system) check external source (system) check external source (system)	check internal source (system) check internal source (system) check external source (system) check internal source (colleague)	check internal source (system) check internal source (system) check internal source (colleague)
transform	document knowledge (system)	document knowledge (system)	document knowledge (system)
discuss			
(re)use			provide information (phone)

Table 20: Knowledge routines 1

	UPB: Create job advertisement	UPB: Organization of an event	UPB: Create internal news
trigger	delegated task	delegated task	intrinsic motivated acting
search	check external source (internet) check internal source (system) check internal source (colleague)	check internal source (system) check external source (internet) check external source (phone)	check external source (internet) check external source (internet)
transform	document knowledge (system)	receive information	document knowledge (system)
discuss	discuss knowledge (colleagues)	discuss knowledge (colleague/boss)	
(re)use	adapt presentation (system)	document knowledge (system)	adapt presentation (system)

Table 21: Knowledge routines 2

	FZI: Search problem	FZI: Stay up2date	UWAR: Recording and sharing local knowledge and information
trigger	intrinsic motivated acting	intrinsic motivated acting	Intrinsic motivated acting /delegated task/external request
search	check external source (internet) check internal source (colleague)	check external source (advertisement) check external source (journal) check external source (internet)	check external source (internet) check external source (hard copy data) check external source (phone) check internal source (system) check internal source (colleague)
transform			document knowledge (system) both personal and shared
discuss			discuss with customer/client, colleagues
(re)use		document/adapt knowledge	document/adapt/present/re-present knowledge

Table 22: Knowledge routines 3

	UWAR: Managing targets and tracking individuals	UWAR: MIS - recording client/customer/information	UWAR: Recording a client/customer query
trigger	external/delegated task	delegated task	external request
search	contact customer/client document knowledge (system)	check internal source (system)	check external source (internet) check internal source (system) check internal source (colleague)
transform	adapt knowledge	document knowledge (system)	document knowledge (system) evaluate knowledge
discuss	discuss knowledge (colleagues)/reviewed by senior management	discussed a local team level discussed/reviewed by senior management	not discussed
(re)use	provide information	provide information	apply changes (system)

Table 23: Knowledge routines 4

	FHNW: Writing a product	FHNW: Conduct a team	FHNW: Write a job

	proposal	meeting	advertisement
trigger	delegated task	recurring event	delegated task
search			check internal source (system)
transform			provide information (system) create draft
discuss	discuss knowledge (colleagues)	discuss knowledge (colleagues)	refine draft
(re)use	document knowledge (system)	document knowledge (system)	publish document (system)

Table 24: Knowledge routines 5

	CIMNE: Create course content index
trigger	delegated task
search	check internal source (system) check external source (system) check external source (internet) check internal source (colleague)
transform	document knowledge (system)
discuss	discuss knowledge (colleagues)
(re)use	document/create and adapt knowledge

Table 25: Knowledge routines 6

The following table provides an overview of the 4 triggers of frequently used knowledge routines

Activity	Number of occurrences of activity
delegated task	10
intrinsic motivation	4
external request	4
recurring event	1

Table 26: Overview of triggers of knowledge routines

Most of the routines are started because a task was delegated to the respecting knowledge worker.

The following table provides an overview of the 14 descriptions of frequently used knowledge routines

Activity	Number of occurrences of activity
document knowledge (system)	16
check internal source (system)	13
check external source (internet)	10
discuss knowledge (colleagues)	9
adapt content	8
check internal source (colleague)	7
check external source (system)	6
provide information	4
check external source (journal)	2
check external source (phone)	2
check external source (advertisement)	1
contact customer	1
evaluate knowledge	1
receive information	1

Table 27: Overview of frequently uses knowledge routines

8.7.3 Hot Knowledge Maturing Areas

Question 1:

Please describe the general valuation of knowledge or the handling of (core) organizational competencies in the organization you studied. How does this valuation materialize in, e.g., recruiting, project staffing, personnel development, dealing with errors, formal and informal knowledge sharing events, management by objectives etc.? What is the reasoning behind this?

Answers to question 1:

UIBK/GISA	Knowledge in general is valued much. GISA has three main business areas (consulting, application support and IT service), which have an influence on the question: For consultants, on the one hand, there is fact knowledge about the special consulting area of the respective employee, whether it is based on technology or certain business areas. On the other hand, there is soft knowledge (or "soft skills") like being able to work independently or being able to negotiate with customers. As the kind of work is highly knowledge-intensive, knowledge and the ability to learn new knowledge in a self-directed way is regarded one of the most important competencies. There exists a similar view on members of the application support department. However, the requirements for self-directed learning and working independently are somewhat less important. As for members of the IT service department, customer-relevant competencies can be neglected in this area of work, as these employees usually only have contact with their colleagues within the company. The respondent regards the provision of a holistic range of IT products and service single-handedly as its core competency. The formal training is seen as an important factor. It is handled and decided on a per-department level. Each head of department is responsible for the budget for trainings and the general direction of personnel development. A lot of knowledge transfer happens during breaks, in the cafeteria or, on a personal-network basis. For this, it is planned to create a new distinct position to which work effort can be allocated. Employees' knowledge and skills have a limited influence on the selection of project members by the prospective project leader (or the person responsible for project staffing, at the moment). However, there is no unified process and no company-wide (although business area-wide) skill matrix for selecting employees and managing their skills. The personal perception of the project leader and possible past projects are important criteria for selecting project members as well. Errors are seen as a part of learning, and are being tolerated to a certain degree (the higher the position within the company, the lesser errors are to be made). There are no directly knowledge related goals regarding management by objectives at present, although the personnel development, especially in terms of widening the area of expertise can be part of such an objective.

FHNW/Swisscom	Knowledge has a high value in the company and every employee is invited to visit additional trainings, like workshops or employees can visit the company's shops to see problems which sellers might have if they try to sell new products. They organize several informal meetings where the employees are invited to talk to other employees and to extend their personal network. Network is one of the highest values in this company, because of the great number of employees. For example if a new project leader is required, the project manager first publishes a job description in the internal portal, because internal project leaders have a better internal network. If errors within a project occur the responsible project leader has to explain why these errors happen. Project leaders are assigned to projects according their interests and experiences which they have got in historical projects. Additionally, the project leader must fit personally to the project team. Project managers generate own ideas and further develop them by themselves or in cooperation with colleagues responsible for corresponding product-areas. It is seen as important factor, that product managers have space for individuality to enforce their creativity. Once in a week, a meeting between project leader and project manager is done, where the project leader have to specify the status of the project. Additionally, they can mention personal problems. For product managers a weekly team meeting as well as an individual discussion meeting is conducted. This offers the possibility to exchange information and discuss ideas.
CIMNE/Structuralia	For Responsible Consulting (from now on R.C.) which is the 3rd party experts hired by STRUC to create the fundamental content of their specialized course, recruiting was the main way to get the expertise they needed. They have permanent specialist on staff, but they also do project staffing if a multidisciplinary project arise and the expertise needed is not in-house (e.g. a client is a biotechnology company, they hire somebody that knows well about the field and the industry regulations, which mixed with their expertise on corporate social responsibility, allows them to create, for example, a policy for such client that is: coherent with a conceptual framework of social responsibility, and complies with the law and industry best practices.). There were formal (scheduled meetings) and informal knowledge sharing events (e.g. talks while in lunch). I don´t know the reasoning behind this dynamics, but as there is not such a thing as process models (there aren´t definitions of processes), I guess is “the way they work around here” type of reasoning. For STRUC, recruiting, project staffing and personnel development where the mix to get the organizations and personal competencies. Also there were informal and informal knowledge sharing events. The organization has more personnel and it seems more dynamic on personal capabilities (meaning that there is more rotation, especially at junior level). Personal development is encouraged as a way to ascend positions (responsibility levels and salary rises) on STRUC.

UWAR/Kent, Careers Scotland	Organizational competencies (core) in the organization: Delivery of careers guidance services to 14-19 year old young people across a specific region in the South East of England. The nature of the service drives 'recruiting, staffing, personnel development, formal and informal knowledge sharing events, together with organizational targets - rather than 'management by objectives'. Recruitment: career guidance practitioners and support staff deliver the core service, with support staff occupying subsidiary roles – but service delivery remains the prime goal of the organization. Professional development: there are particular requirements for both general and specialist updating of careers practitioners, who find this challenging because of the many demands on their time (this is one of the key motivating factors for their wishing to participate in MATURE). Formal knowledge sharing events: conferences and seminars, with explicit updating functions. Informal knowledge sharing - commonly an updating function through meetings, email, web communities etc. Organizational targets – these are determined by purchasers of services and largely drive how these are delivered in terms of types of support offered (e.g. one-to-one interviews; group work sessions; careers conferences, etc.).
UPB/Synaxon	The knowledge of employees is valued very much. If an employee develops competences that qualify him or her for tasks in another department, the employee may change the department, if there is a personnel need in the desired department, for example. This guarantees that the employee is working on tasks he or she enjoys and therefore the employee is motivated to give his or her best. Formal and informal knowledge sharing events take place when the need occurs, for example if a department wants to change their task procedures they decide to start such an event. Employees that have just started working in the organization usually get formal trainings on the internal knowledge base.

FZI/SKK	Knowledge is considered an important competitive advantage in the field. The importance of life-long learning has been recognized, particularly because of the expected demographic change, resulting in an increased demand, but reduced offer of skilled employees. There are company-wide guidelines for the recruitment process, including training event the new employee has to attend. Each new employee gets a mentor for facilitating the introduction process. For human resource development, there are also guidelines. Systematic learning from errors is still in its infancy, and still encounters barriers in the company. There are some promising examples like in intensive care. But for other parts, only customer feedback is collected and forwarded to the respective departments. Informal knowledge sharing primarily takes place within personal networks and is generally considered of high value by the individuals and takes place both during usual working time and during breaks, sometimes also on the week end at private events. On the organizational level, this is fostered by organizing retreats. Management by objective has officially been introduced, but the actual implementation depends highly on the individual superior. The company has developed a mission statement consisting of the four primary values: customer satisfaction, economic efficiency, employee satisfaction, and innovation.

Question 2:

Which levels of expertise are distinguished within your organization, e.g., junior consultant, consultant, senior consultant? What are the changes with respect to learning and handling of knowledge once an employee is considered "fully qualified"? Please be as specific as possible. What are your own experiences?

Answers to question 2

UIBK/GISA	The company has several career paths for its main business units. The consultant's path, which emphasizes on business and technology themes, includes junior consultant, consultant, senior consultant and solution architect. The project management path, which emphasizes managing large projects, includes junior manager, manager, and senior manager. Besides these two paths, there exists the administrative path which is based on advancing within the organizational structure. In order to be regarded as "fully qualified" within the company an employee should be able to work on his/her own in general. Depending on the respective business area this means that the employee is able to solve problems on his/her own and can work at a customer's site independently. Although there is no direct correlation, the status of being fully qualified is mostly earned at not being a 'junior' anymore. A fully qualified employee should be able to identify his/her own learning needs, learn autonomously about needed topics and be able to teach less experienced colleagues.

FHNW/Swisscom	The level of expertise is because of the great number of employees very different. Some employees work in the shops, some are designing new products. In the departments we have been invited to observe people, they start to introduce a new classification of project leaders. Before the new classification, they classified the people regarding their competencies, which they have got during their schooling and trainings. Now, they want to take into account the experiences got by leading different project teams with different budget. For product development / product design, the personal interest in products and services offered by the company and creativity are quite important. There are several ways to get into the position of a product manager; a marketing based background is possible but also experience in other positions leading to product knowledge may enable one to hold that position likewise. There are no explicit levels of experience in terms of roles like senior or junior. There are teams for product areas consisting of a team leader and product managers which have about the same responsibilities for a specific range of products and their life-cycle. More experienced product managers may possibly deal with larger projects.
CIMNE/Structuralia	For R.C.: There is a director and all other 'consultants' seem to work on fields of expertise, but all seem to have education on social responsibility matters. There were 'senior' staff, but this was not declared on the business card, but declared on the distribution/amount of responsibilities each had. Everybody, at all levels seemed to learn and handle knowledge in analogue matters (except for the receptionist/secretary). From the Director of the company, to the younger consultant, all had an 'academic' context surrounding them (e.g. journals and academic papers around the desks, people talking with field-related vocabulary, citing field-related authors, etc.) For STRUC: There is a well differentiated distribution of responsibilities and levels of expertise. There were trainees, junior, seniors, associates and directors (I´m doing a translation from Spanish roles that is more illustrative, but roles were not called literally translated like that). Recruiting focus on general skills and project specific hiring is focused on focused expertise. It seems that a 'fully qualified' person at higher levels in the organization channel knowledge needs through her lower peers (e.g. ask them to find out about 'x' or 'z' and report on her).

UWAR/Kent, Careers Scotland	Professional levels of expertise: • Trainee Careers practitioner • Qualified Careers practitioner • Senior Careers practitioner (qualified and experienced – often offering a particular specialism, like labour market information). Knowledge handling once fully qualified: Once practitioners are qualified, they are expected to engage in continuous professional development – with days formally allocated for this purpose. The type of training undertaken will be partly determined by the individual and partly as a result of formal review/appraisal processes. So there is more autonomy for those fully qualified – but this comes with increased responsibility and accountability. The following persona illustrates how a qualified and experienced careers adviser develops their level of expertise, extends his knowledge of LMI, learns about his local labour market and then with experience shares this knowledge with colleagues. Andrew – Careers Adviser Andrew has been working as a careers adviser for the last 3 years. He works in one secondary school helping young people with career decisions ensuring that they have the skills to make informed decisions. When not in school, he works in an open administrative central office with his laptop – hot-desking. Andrew has gained an off-the-job postgraduate qualification (at a University) in career guidance, together with a work-based National Vocational Qualification (Level 4) in information, advice and guidance (IAG). Additionally, organizational training also formed part of his induction. As part of his on-the-job training, there were opportunities to visit employers and research different sectors of the labour market. Over the last 3 years, Andrew has gained a significant amount of local knowledge about the labour market and the education, training and employment opportunities available. Much of this knowledge has not be gained through any conscious process or training. It was considered as 'something you get to know'. As a new employee, Andrew asked questions of his colleagues to gain this information and knowledge. By reading internal communications sent by email and local newspapers he has been able to gain knowledge about the local labour market, which is central to his role, exemplifying his title as a knowledge worker. The internet has become a valuable resource for researching and developing knowledge of the local labour market and the available opportunities. A favourite website ('Planet Plus') has information on local opportunities and labour market information (LMI) and is often utilized. Email communication for colleagues also ensures that he is aware of current opportunities for training and employment in the local area. This soft data is vital to his work and needs to be continuously updated. Due to work pressures, he believes that in the current work climate there is little time to undertake employer visits to gain (and develop) knowledge about local employers. Time to research different sectors and gather LMI for analysis and synthesis is restricted and considered a luxury. Advantage is taken any opportunity presenting itself. Andrew recognises that he would value more time to develop his local knowledge by not only supplementing it with hard data, but also by returning to knowledge development methods used during his training and induction within the organisation.

UPB/Synaxon	There are only three hierarchy levels in the organization we studied. They are common employee, head of department and management. Then there are project leaders who can either be common employees or head of department. A special role a common employee can get is deputy head of department. These employees are a kind of link between the common employees of a department and the head of department. They have extra tasks and are responsible for the department when the head of department is not at work. As there are no distinctions like junior consultant, consultant and senior consultant in the organization, there is no change in the handling of knowledge once one is "fully qualified".
FZI/SKK	The company has 4.000 employees and 40 occupational groups. So there are very different experience levels. For the nursery domain this includes apprentice, nurse, specialized nurse, ward manager (can be achieved using professional training), and nurse manager (usually requires academic studies, which is often done after several years of practice). In detail, this system is even more complex due to governmental regulation and changes over time. There is plenty of possibility of specializing in certain topics without formally advancing on experience levels. This often involves moving to different departments, or even another hospital. But the difference to advancing on the experience level is not fundamental, except for the fact that there is no difference in salary. Usually, the specialization is completely self-initiated and depends on the individual interests.

Question 3:

How do you cope with the continuous need to learn, improve and keep up to date your knowledge and competencies?

Answers to question 3:

UIBK/GISA	The coping strategy differs with respect to the role the respective employee has within the organization. Team leaders (of organizational units) try to stay aware of new developments regarding technology and arising business needs of customers in their focus area. They do so by reading magazines, reading news on the Internet, by offered seminars or workshops or by talking to colleagues. However, team leaders try to have a more broad range of knowledge than to have detailed technology knowledge. In contradiction, employees without management responsibilities try to be up-to-date with the technology/ products in use and on upcoming releases. They do this by reading product documentations, exchanging with colleagues and trying out test systems. However, usually daily business leaves not so much time to experiment beforehand and so, most learning is done in actual projects. Besides the more informal trainings, employees can (to a certain extent) choose to which formal training they want to go (usually once a year). This is usually an application system-relevant training lasting 3-5 days. But also trainings on soft skills and for further qualifications, e.g. project manager are possible. For application supporters, learning, especially about new products and applications is mostly triggered externally. Usually they will get a new solution to support and therefore study the respective (solution) documentation and, in case of questions, talk to the colleagues who implemented the solution. For larger projects, they may be involved in the project with some tasks so that they are able to get to know the solution and have an influence on maintenance-related issues.
FHNW/Swisscom	The project manager often tries to motivate his project leaders to strengthen their skills, by visiting e.g. workshops. Also product managers are motivated to do so and are confronted with new technologies or information on news about relevant topics. For example, if one has been visiting an event, the experience is reported within the team meeting. In case of product management, also personal responsibility is an important factor. Team members want to succeed with their products and therefore are searching to gain relevant information and ideas actively. They use and test the company's services, exchange information in their personal network and monitor technical developments
CIMNE/Structuralia	Carolina: “is part of my job, I´m a consultant and need to be updated on the field. Besides, project specific needs oblige me to gather a basic knowledge of the industry at stake, so I update myself with every new project on the issues related to my field and the cross issues related with the industry of the client”. For Structuralia: Formal training and self training seems the two main forces to keep up to date for the positions observed in STRUC

UWAR/Kent, Careers Scotland	Informal learning in the workplace plays an important role, with only limited use of formal education and training. Then informal learning is primarily social, with much learning from other people. On the other hand, it is not simply socialization, in that there is considerable scope for individual agency - with practitioners making choices over whom they will communicate. There is also considerable learning from experience - learning to cope with different types of client, interviews, requests etc. Learning from experience is more personal, compared with the inter-personal learning with other members of the organization and networks. Practitioners draw on implicit learning in the sense that there were examples of getting a feel for the direction the interview was taking, from linking past memories with current experience. There was also deliberative learning where there were discussions and reviews with others of past actions, communications and experiences, both in relation to what had been successful and what had been unsuccessful, as well as the development of a contextual understanding of employers, schools, localities etc. Decision-making and planning of future events could also become opportunities for learning, reflection and review. Much learning tended to be opportunistic, in the sense that events or scenarios occurred to practitioners because they had been memorable for some reason. Deliberative learning was more considered and planned, with practitioners either making their own choices (e.g. choosing to check out particular types of Labour Market Information) or it was influenced by the nature of (shared) tasks (e.g. having to put packs of information together for a particular teaching event). Many deliberative activities, such as planning and problem solving, were not necessarily viewed as 'learning' - rather they were viewed as work activities, with learning as a by-product. Because most of these activities were seen as normal part of working life, they were rarely regarded as learning activities.
UPB/Synaxon	The employees are asked to spend around 20% of their working time to explore the different wikis and contribute as much as possible. Therefore the employees technically have enough time to augment their own knowledge. Depending on the department of the employee, the employee can either have enough time to learn and keep up to the current standard of his or her task and competences but in some departments this is a problem as the employees have a huge amount of work and they are interrupted by means they are not allowed to ignore (telephone).
FZI/SKK	All employees have the opportunity to take part in trainings. Beyond that, most employees actively make use of journals, books, or internet search, depending on their individual strategies and capabilities. An e-learning offer has been licensed and introduced for the whole nursery domain, but is not used very intensively, also because technical problems and the lack of available computer access on wards.

Question 4:

Which forms of representation for knowledge or artefacts are important in the company's daily operations, e.g., formalized training material, contributions in community platforms, emails? Why?

Answers to question 4:

UIBK/GISA	Throughout the company, several tools and forms are used for storing information and knowledge. Formalized training material is stored on the employees' local hard-drives, on file servers or may be stored in paper-based files in the office. This is mostly the case for training materials, if an electronic version is not available. Emails (e.g. communication on projects, on products or discussions) are kept within the PIM system and organized there (compare next section). Some important messages are archived within the relating project folder (net drive). There are a lot of documents which are sent by mail, so that certain snapshots in the development of documents are stored within the employees PIM. Usually employees tend to keep all emails, especially since there is an integrated mail archiving system into the PIM. (Semi-formal) project documents and product documentation (working documents) mostly reside on net drives which are hierarchically organized and are updated by the corresponding project member or application supporter. Documentation for productive solutions is additionally kept within the solution management tool by SAP in order to store the documentation together with the according implemented solution. More formalized documents like contracts, offers or service level agreements are – in addition to their storage in the paper archive – stored within the company's document management system. Ideas and proposals may be stored in an office document on the personal net drive of the employee or the employee's org. unit's net drive. However, there are a lot of ideas and proposals which are implementation-related and therefore, exist only in the specific application system. Lessons learned are handled on a per employee basis, but some org. units have a common repository for lessons learned different types of documentation. As there is no specialized system or standardized process, theses LL are stored within a MS Word document on a network server.
FHNW/Swisscom	It depends on the employees. The project manager likes to phone instead of answering emails, because he thinks it is more efficient. But, often e-mails are used. Often meetings are organized where knowledge about projects are exchanged. Additionally, the project manager starts to set up a FAQ. In product management the individual creativity is important. Thus formalized training material does not play a central role. There are a lot of presentation slides and personal notes used in meetings and also emails. Also reports on customers' feedbacks and surveys or trend analysis are important artefacts.
CIMNE/Structuralia	In both companies (R.C. and STRUC) emails, MSWord, PPT presentations, and web pages were the most used forms of representing knowledge. Anyhow in R.C. the ethnographer perceived that consultants had an industry specific knowledge not formalized (or should I say stored?) and provided them with a 'territory' of their own. This didn´t happened in STRUC as they hired specialists on fields depending on the demand for related courses to be developed and implemented. In STRUC, knowledge seemed to be formalized on web pages and office documents, and make available to all related personnel as a strategy to distribute knowledge on the organization.

UWAR/Kent, Careers Scotland	Types of knowledge considered important in the organization's daily operation include: Professional practice and theory; Education, training and employment opportunities in local area; Labour market information (including vacancies) both national, regional and local; Information as wide ranging as housing opportunities, financial information and health related information; Policy information – regional and national levels; Organizational information, procedures and targets; Technical knowledge to operate IT systems. The form careers guidance takes could be influenced by: An organizational view of an appropriate approach to follow; Work flow – that is, how clients presenting for careers guidance arrive (that is, were they referred, or did they elect to come along themselves); The professional judgment of the practitioner.
UPB/Synaxon	The company uses a variety of own wikis where the employees find and create knowledge about all kinds of tasks and events as well as interesting subjects. The most important wiki for the employees contains of different portals in which you may find formalized routines and task descriptions as well as the latest protocol of the department meeting. The idea behind putting all information into the wiki and allowing the employees to change the entries and improve the knowledge is that people can work more efficiently and find experts in the desired topic more easily. Other means of knowledge representation are of course emails and the instant messenger. These are used if somebody has a specific request which he or she knows can be answered by a certain employee.
FZI/SKK	For daily operations in the nursery domain, it is important that knowledge is internalized and can be applied in the daily routines. As a support, nursing standards exist that represent the company's best practices for common nursery routines (available from the intranet and on paper). For organizational and management topics, a paper-based folder exists in all departments where guidelines are collected. Also materials from trainings are used (handouts, presentation slides, videos etc.) Within the training department, shared email folders and shared file system is used to archive knowledge-related artefacts.

Questions 5:

How are individual and group work spaces structured, e.g., own file system, file servers, email archive? Which concepts are used? Why?

Answers to question 5:

UIBK/GISA	Group workspaces are structured on a per-group basis on a file server. Usually this means, that there is a hierarchy containing folders for trainings, administration, projects (customer/internal), workshops, marketing, team meetings and informal, internal files. Most of the files are stored in an office format (MS Word, Excel, PowerPoint, Visio or PDF). Some files, like example data are stored within exchange formats like XML, CSV or vendor-specific (proprietary) formats. The structure of project workspaces is also hierarchically, but the structure follows a company guideline to ensure homogeneity between projects and to help employees navigating properly in them, even if they are member of several projects. The organization of personal workspaces is more variable. However, most employees tend to have a folder hierarchy within their primary PIM-Tool (MS Outlook) which could comprise projects (sorted by customers), team, administration and workshops. Besides the PIM, there exists a folder hierarchy, either on the local hard disk of the employees or on a net drive in order to store documents like product descriptions, course materials, self-made documentations on specific questions, FAQs and example data. A wiki exists only within a single department (PC support and service) and is there internally used for storing information on well known errors and specific information on software releases and hardware configuration. The company's document management system contains mainly the document types offer, inbound invoice and contract (with customers and vendors).It is based on a predetermined hierarchy with the document type as the first level, the customer/vendor as the second level and, if appropriate, the project as the third. The company's portal also contains, besides integrated applications, several knowledge related documents like documentation on the company's organizational structure, its processes, news, a glossary, presentations and documentation on commonly needed tools.
FHNW/Swisscom	They use a file server, where they can publish documents regarding a project. The file structure is defined by the project manager Additionally, they distinguished between private (a private folder, which can only be entered by the owner), public (a folder every employee have access), intern, (where only the project have access to the documents) Because the e-mail profile has a space limit, the employees are enforced to send instead of attachments links to the documents The basic file system structure follows topics on the one side and projects on the other.
CIMNE/Structuralia	In both companies there was a file repository with differentiated access rights for individuals and groups. Besides the above, in R.C. there were articles and documents repository categorized by fields of knowledge (e.g. the distribution was clearly composed of expertise field related areas and industry areas of client markets.

UWAR/Kent, Careers Scotland	Careers guidance practitioners work in a wide variety of settings (e.g. the employing organization, schools, colleges, etc.), so are mobile workers. Individuals have a high level of professional knowledge and a great awareness about the local area and the education and employment opportunities available to young people. A great deal of information and knowledge is held by each individual. There seems to be a lack of organizationally shared knowledge, as local teams separately research, record and disseminate information to their local team only. In both organizations, this knowledge sharing process is supported by local server/intranet to which anyone can add a file structure, folder, or individual file. The view was expressed that this was difficult to manage and there was uncertainty as to when information was dated and needed replacing. No individual had responsibility for maintaining this shared information resource on the intranet. However, within Connexions Kent, each of the Connexions Access Point (CAP) offices also had a paper-based system of recording and sharing information in operation. One/ two individuals would take responsibility for maintaining the information on a particular topic (such as housing, health and well-being). There was no evidence of systems in place to facilitate the recording and sharing of this type of information within this particular organization. In Connexions Kent, each practitioner has their own laptop. In Careers Scotland, offices allocated in schools, colleges, community centres etc., will commonly provide access to a PC. As noted above, there are different models of how much work takes place in shared spaces. Much use is made of email systems (typically, use will be made of more than one email system – for example, one that is specific to the careers guidance organization, another that is specific to a particular school, etc.) for varied purposes: administration, communication, storage, dissemination, teaching, supervision, etc. Practitioners will also have access to their own filing systems, but also organizationally owned systems (like company intranets).
UPB/Synaxon	The structures of the individual workspaces differ in some places. Some employees structure their workspace according to their different tasks others use a time structure. Some employees change their structure from time to time according to their current work processes. Group workspaces are usually structured according to the different tasks and the file server is structured according to the different departments and then, in the parts of the department, it is structured according to different tasks. The different folders in group workspaces and the file servers are named after the departments or tasks. So when an employee is searching for a specific document, he or she is able to browse the right folders.
FZI/SKK	For operational issues in the training department, a specialized solution for event management is used to collect all information about training events. On an individual level, office documents, and personal email archives are primarily used. These are structured mostly using multi-level hierarchies. The levels of hierarchy as well as the structuring principle vary from employee to employee. Most of them use temporal and event-based structures. They are heavily constrained in their individual email spaces as their account size is strictly limited. This hampers efficient email organization. On the group-level, they also have shared email folders. Here, the shared exchange folders are administrated by the central IT department, which limits their structuring approach. Here, they also use primarily event-based folders. Employees used also paper based documents in order to be independent of unstable IT-infrastructure.

8.7.4 Stories describing Change in Knowledge Maturity

Criterion	SKK	Kent 1	Kent 2
situation	improvement of ward manager course	supporting practitioners in their assessment of labour market information	combine knowledge from different colleagues about the same subject
why (motivation)	intrinsic motivation of one course trainer (because of her sense of perfectionism)	need to improve process because of an identified risk	collaboratively develop an artefact (create a presentation or information sheet)
who (stakeholders)	active: course trainer passive: ward managers	active: organisation's managers passive: practitioners	active: practitioners
what (artefacts, cognifacts, sociofacts)	maturing of a process by introducing a new task: create report on "hospitation"	maturing of process by creating and introducing guidelines of how to do a task (development of guidelines (document) was not described)	maturing of people's knowledge by discussing topics with colleagues (development of the artefact (presentation) was not described)
how (procedure, tools)	idea of one trainer of how to proceed in own course has led to an improved course	need to improve a process was recognized by the organisation's management	peer discussions between practitioners lead to integration of knowledge
when (how quickly)	a few weeks	continuous	ad-hoc

Table 28: Stories describing change in knowledge maturity (Kent, SKK)

Criterion	Synaxon 1	Synaxon 2	Synaxon 3
situation	change of working atmosphere and image of department	try to overcome communication and organizational problems between two locally separated teams of the same company	adjust functionality and design of blog according to corporate identity
why (motivation)	Heather and her colleagues are trying to change the working atmosphere and the image of their department (especially the way they are treated by her department head and by other departments)	one of the teams fears that it has to do all the work after a planned meeting of two teams where responsibilities for doing something will be assigned	Axel maintains the blog in order to provide correct functionality and assure corporate identity
who (stakeholders)	active: Heather, her colleagues and her department head	active: team members of two teams from different departments and different locations	Axel, head of department, one colleague of axel
what (artefacts, cognifacts, sociofacts)	Maturing of people's knowledge and creation of documented knowledge	maturing of people's knowledge about different approaches of conducting work	maturing of presentation of contents (adjust appearance of blog with respect to corporate identity) maturing of functionality
how (procedure, tools)	during a lunch break: decide to have meeting with all department members on that topic; during meeting: define rules for the meeting, collect problems by using a flipchart,	beforehand an official meeting between two teams where workload will be assigned, one team recognises communication and organisational problems and discusses potential solutions;	new blog was introduced without being approved by Axel who is responsible for doing that; Axel was informed by a colleague and by his department head; Axel uses the web browser to

	discuss problems and assign responsibilities Outcome: A set of behavioural rules After two weeks: set up a second meeting with department members to check whether the rules where abided by everybody (using lotus notes)	during the team meeting both teams find out that they have different approaches of doing work and that they don't have to fear that one of the teams has to do all the work after the meeting	maintain the blog in order to assure correct functionality and corporate identity; Axel informs his department head via email that according to company rules, he has to be informed before releasing a new blog
when (how quickly)	idea to have a meeting, conduct the meeting, two weeks later check-up meeting	preparation phase of a meeting between two teams	ad-hoc problem solving

Table 29: Stories describing change in knowledge maturity (Synaxon)

Criterion	Swisscom 1	Swisscom 2
situation	workshop for merging different projects	idea of implementing FAQs
why (motivation)		not being asked the same questions a several times
who (stakeholders)	members of different project teams with different roles attending a workshop	project manager, meeting attendees
what (artefacts, cognifacts, sociofacts)	maturing of people's knowledge and awareness of currently running projects; creation of documented knowledge (ppt-slides)	FAQ list
how (procedure, tools)	a workshop was set up in order to merge projects that have nearly the same goals and try to develop approximately similar software tools; the meeting ended up in discussions that had no clear result, but some ppt-slides were created and the awareness of people about other projects was increased (informal common understanding)	During different meetings same questions are asked more often. The project manager had the idea, to collect all these questions and to create a FAQ. He gave the order to another employee with his first suggestion of questions. This FAQ should be available at the intranet portal.
when (how quickly)	workshop of around 4 hours	

Table 30: Stories describing change in knowledge maturity (Swisscom)

Criterion	STRUC	GISA 1	GISA 2
situation	creation of course content index	discuss a certain functionality/concept needed for a project	further development and sending out training material
why (motivation)	to include in an organize way specific content blocks that would cover the objectives defined for the course	Igor has a question about the functionality of a certain technology he is going to use and wants to understand this particular area completely.	Silke prepares for a training course she has to conduct on the next day between 9:00 and 12:00 at an university
who	Carolina as the driver, with	active: Igor, his colleagues	active: Silke

(stakeholders)	the input of other colleagues in the company		passive: employee at University
what (artefacts, cognifacts, sociofacts)	maturing of content integration, moulding area-specific knowledge with client-enterprise strategies and vision	Maturing of people's knowledge/understanding about a certain topic	maturing of documented knowledge
how (procedure, tools)	Carolina creates a draft index, then passes it to her director, who discusses with her each level (up to the lowest) in the index, revising what content and the source will be introduced or used to create the specific content for each point in the index	Igor requires clarification concerning the technology which came up. In order to get there, he asks a colleague about this topic. The colleague explains his opinion of this topic. However, by critically asking back, Igor initiates a discussion with other colleagues of his team being in the room. They discuss several arguments for their presented opinions, make some sketches on the whiteboard, and finally, come to a common explanation and understanding.	Silke opens an already existing PowerPoint presentation, that was created and further developed by her and another colleague; she goes through all slides and adds screenshots and adds or alters bullet points at different slides; finally, she sends the presentation in the final format to her contact person at the University
when (how quickly)	this is done in a few days, discussions happened in 2 hour meetings	ad-hoc problem solving, 15 minutes	took one work day, but there were some interruptions by colleagues or other appointments

Table 31: Stories describing change in knowledge maturity (Gisa, STRUC)

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