Collaborative Project

Integrated Project Reflective Learning at Work

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Specification of Research Methodology and Research Tooling

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11	Infoman AG	INFOM	Germany
12	Regola srl	REG	Italy
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List of Abbreviations

App	Application; small self-contained software with specific purpose
BT	British Telecom
BPM	Business Process Management
CRM	Customer Relationship Management
NBN	Neurological Clinic Bad Neustadt
RNHA	Registered Nursing Homes Association
WPR model	Model of Work Place Reflection

Executive Summary

The vision of MIRROR is to empower and motivate employees to learn by reflection of tacit work practices and personal experiences. This will be achieved by complementing personal and organisational learning environments (which mainly rely on knowledge being explicitly available) with highly personal MIRROR applications for individual, social, creative, game-based as well as organisational reflection and real-time learning. MIRROR Apps will be seamlessly integrated in the work situation of their intended users. Reflection in the context of learning refers to “those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciations” (Boud et al., 1985, p. 19). Within MIRROR, we consider reflection as circulating among the *individual*, *inter-individual* and *organisational* level. Conceptually, the starting point for the design of MIRROR Apps is the model of Work Place Reflection (WPR) enriched by the individual perspectives of partners from WP3 to WP9. The model points to the potential of tools to mutually inform work and reflective processes (individual and collaborative) by capturing data from work processes and making them available as a resource for reflection. However, this model needs to be further refined.

User studies will be carried out in all MIRROR testbeds to ensure that the AS-IS situation in the testbeds before introducing MIRROR Apps is well-understood. The main purpose of the user studies is to find out which personal and context factors influence reflection in the testbeds, and how technology can support this reflection. The WPR model will also be iteratively refined based on results from the user studies. In our view, there is a two-way relationship between theory development and user studies: On one side, clearly the design of the user studies and applied methodology will be theory-driven; on the other side, findings from the user studies will be fed back into theory thus enabling us to further refine our theoretical concepts. In parallel to the user studies, requirements elicitation will take place. Requirements elicitation will focus on how MIRROR Apps can solve the needs, e.g. the desired to-be situation of reflective learning in the test beds. Therefore, user studies will build the basis for requirements elicitation activities.

Five different testbeds are part of MIRROR, the Registered Nursing Home Association (RNHA), the Neurological Clinic in Bad Neustadt (NBN), Regola, British Telecom (BT), and Infoman. This will ensure that the MIRROR system is usable in a variety of different scenarios.

The *RNHA* testbed comprises a sample of Care Homes in the UK. The relationship between carer and resident provides challenges particularly to inexperienced carers. Current knowledge of care for persons with dementia shows that the carer must actively take into account the unique history of the resident to adequately handle situations occurring in day-to-day interaction.

The *NBN* testbed are the medical staff in the stroke unit of the Neurological Clinic in Bad Neustadt. A big issue for care professions lies in coping with the amount of workload and emotional stress, although this is mostly neglected by hospitals. A key to preventing burn-out syndromes or similar problems lies in turning demanding situations into learning experiences by reflection on what was going on, how staff reacted to it, and if the reaction was beneficial in terms of outcomes.

The *Regola* testbed for MIRROR are the Regola headquarters and the Civil Protection Organisation in Turin (Torino). The Civil Protection is responsible for coordinating the effort of personnel from several organisations with respect to disaster management in the Turin area and in collaboration with other Civil Protection units. Simple and flexible resources are

needed to handle events. Some reflection and training (e.g. field trials) is happening within the associated organisations. A major challenge for the Civil Protection is to achieve learning from their experiences of handling the cases of disaster prevention and management. A goal of introducing MIRROR solutions is to help the Civil Protection improve learning from experience among their volunteers on an individual, team and organisational level.

In the *BT* testbed, the main target group will be service technicians within BT and the contract teams which they are part of. The participating branch of BT in UK is a testbed for similar scenarios in the BT group. BT currently has a large number of service technicians working on customer sites. The contract team managers need knowledge about issues that have a negative impact on the contract process (e.g., delays in service technicians' work) and want the team to learn from experience to avoid mistakes. There is a potential to learn from experience across contract teams and on the level of the organisation which may decide to implement changes to work processes.

The *Infoman* testbed will be the staff of the Infoman headquarters in Stuttgart. The targeted end users of MIRROR are sales people. Currently, systematic knowledge sharing and collaborative experience-based learning between sales consultants at Infoman happens only sporadically or face-to-face in a personal relationship. Explicit sharing of learning material does not take place at the moment.

The overarching research questions for the user studies are: (i) *How do reflection and reflective learning currently take place within the testbeds, and how does technology support these processes?*, and (ii) *What are current needs and ideas for supporting reflective learning in the future?*

The following aspects shall be addressed in the user studies:

- Organisational context and work practice
- Current technology usage and available data
- Reflection (individual, collaborative, and organisational perspective)
- Learning at the workplace
- User experiences with, and attitude towards technology

User studies will be carried out by WP3 to WP9, that is, researchers from all work packages will visit different testbeds and collect data. The process of who collects data at which testbed will be coordinated by WP1 (Task T1.2). Outcomes from all user studies will inform theory work in WP1.

A *toolbox* was developed, which is a collection of research instruments for data collection (questionnaires, interview guidelines etc.), that covers all research questions of the different work packages for the user studies. The toolbox was developed in close cooperation with the research partners taking into account the specific situation in the testbeds. A *Testbed Wiki* was set up where information about each testbed was collected in a way that everyone in the project could access that information easily. Moreover, *Testbed Visits* were organized, in the course of which all research partners had the opportunity to visit the testbed organisation, see the real work situation and talk to potential users of the MIRROR Apps (the target group). Based on the research questions of the different work packages, and in close cooperation with the researchers from WP3 to WP9, research instruments for data collection were then designed by KMRC. Some of these materials, namely the staff interview, a short version of the reflection questionnaire, and the reflection diary have already been applied in pilot studies.

It is worth noting that it is not intended that each tool of the toolbox is applied in each single testbed, and that prior to implementation, the tools need to be customized for the respective testbed.

Altogether, 15 research instruments plus additional materials are included in the toolbox.

Organisational context and work practice

- *Job Description Interview:* questions about duties and responsibilities, current work practice, learning and training issues, team work, communication and coordination
- *Work Observation Scheme:* observation form for work practice with a special focus on team meetings, coordination, and communication

Reflection (individual, collaborative and organisational perspective)

- *Reflection Interview:* individual, collaborative and organisational aspects of reflection
- *Reflection Diary:* explorative tool for examining reflection AS-IS during daily work
- *Reflection Questionnaire:* AS-IS situation of individual and collaborative reflection
- *Organisational Reflexivity Questionnaire:* to be answered by management staff; examines the AS-IS situation of organisational learning, change and reflexivity

Learning at the workplace

- *Needs and Requirements Analysis for Organisational Learning and Intelligence:* interview guideline examining the end users' needs and requirements with respect to organisational learning and respective technology
- *Organisational Learning Management Interview:* interview questions for management staff to examine organisational learning and intelligence practice
- *Learning at Work Questionnaire* questions on the status of and relationship between individual learning, team learning and organisational learning

Current technology usage and available data

- *Available Data Checklist*: checklist for data available within the testbed that could be used for reflection purposes
- *IT Checklist:* structured interview guideline for an interview with a system administrator about the IT infrastructure of the target organisation

User experiences with and attitude towards technology

- *IT Attitudes & Usage Questionnaire:* questions about general attitudes towards and usage of different kinds of technology (including sensors and serious games)
- *Privacy Questionnaire:* questions on sharing of information, trust within teams, trust in the organisation, and the organisation's handling and use of personal data
- *Serious Games Experience with In-Depth Interview:* interview guideline to acquire requirements with regard to serious games
- *Capturing Pilot Study Guidelines:* description of how to carry out a pilot study to test the applicability and usability of sensor data; diary with follow-up interview cover the acceptance of sensor data of the users

The following principles will be applied for the user studies: (a) minimal risk for participants, (b) comprehensive (de-)briefing of participants, (c) evaluation of participant comprehension of information received, (d) voluntary nature of participation, (e) obligation to observe confidentiality, (f) waivers and permissions for audio and video recordings and their transcripts, and (g) documentation that adheres to such policies. A detailed discussion of ethical guidelines for data collection and data sharing is also part of the Deliverable.

On-Site user studies will take place between February and April 2011. Each of the work packages will report on results of their user studies in June 2011 (M12). Findings will then be integrated and reported in September 2011 (M15) in Deliverable DI.2 by WP1.

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Reading Guide

The document can be read in several ways, namely as a(n)

(a) overview of the research interests of the different work packages
(b) description of how the toolbox was designed and created, and
(c) collection of data collection tools and ethical guidelines for carrying out user studies on ‘reflective learning at work’

Overview of the research interests of the different work packages

Chapter 2 gives a brief overview of the theoretical framework underlying MIRROR. In Chapter 3, the different MIRROR testbeds are being described. Then, in Chapter 5, the concrete research interests of the user studies are described, and concrete research questions are derived for each work package. In order to provide the big picture again, in Chapter 6, research interests of single work packages are aggregated into 5 broader research areas that are of interest for the whole project: ‘Organisational context and work situation’, ‘Current tool usage and available data’, ‘Reflection’, ‘Learning at the workplace’ and ‘User experiences with and attitudes towards technology’.

Description of how the toolbox was designed and created

The document also provides a comprehensive description of how the toolbox was developed in cooperation with the testbed partners and the researchers from the different work packages. Starting from the collaborative work on research interests and research questions of each work package (Chapter 5), and from information about our testbed partners (Chapter 3) collected in the Testbed Wiki (Chapter 6.2.1) and during the Testbed Visits (Chapter 6.2.2), we designed a variety of ‘tools’ (questionnaires, interview guidelines etc.) three of which were piloted (Chapter 6.2.3).

Collection of data collection tools and ethical guidelines for carrying out user studies on ‘reflective learning at work’

The document also constitutes a collection of tools (questionnaires, interview guidelines, etc.) that can be useful in various settings where reflection and learning at work shall be investigated. Chapter 6 gives an overview of research areas that are covered by the toolbox. Chapter 7 contains an overview, and brief descriptions of all tools in the toolbox. The actual tools can be found in the appendix of this Deliverable. Detailed ethical guidelines for carrying out user studies and for storing the data are given in Chapters 7 and 9.

1 Introduction

The vision of MIRROR is to empower and motivate employees to learn by reflection of tacit work practices and personal experiences. MIRROR is intended to help employees capture experiences and collaboratively develop creative solutions for problems that need to be solved immediately. This will be achieved by complementing personal and organisational learning environments with highly personal MIRROR applications for individual, social, creative, game-based as well as organisational reflection and real-time learning.

Reflective learning has the potential to lead to flexible working routines and thus higher performance in a rapidly changing work context. Accordingly, reflective learning has the potential to lead to change and development as it leads to insights into working practices and identifies where working routines need to be modified. We consider reflection as circulating among the *individual*, *inter-individual* and *organisational* level (Gherardi 2001; Järvinen & Poikela 2001). Within MIRROR, the questions are how to improve the understanding of current practices of reflective learning, what are the requirements for MIRROR Apps, what does a reference framework for the development and deployment of MIRROR Apps looks like and how can this be evaluated within the different testbeds in order to evaluate the impact of MIRROR Apps on reflective learning.

The conceptual starting point within MIRROR is the WPR (Work Process Reflection) model by Krogstie (adapted from Krogstie 2009). The model points to the potential of tools to mutually inform work and reflective processes (individual and collaborative) by capturing data from work processes and making them available as a resource for reflection. The WPR model will be iteratively refined into a Model of Computer Supported Reflective Learning (D1.4 and D1.6) based on results from user studies.

In order to support reflection, there is a need to understand when reflection is taking place as part of daily work within the specific circumstances and organisational culture (Olsson, Bjöörn et al. 2008). This is considered to be highly specific for different organisations, thus, we included five testbeds to be able to both generalize our knowledge gained from the user studies and to provide recommendations for applications that consider the specific needs and characteristics of each organisation. More specifically, we need to find out where reflection takes place, and what potential technologies have for promoting it. Therefore, user studies have been designed. The user studies will be carried out with the prospective users of the MIRROR Apps within all MIRROR testbeds.

Through the user studies the project will develop an understanding of the as-is situation of reflective learning in the test beds: what the current work practices look like, what tools are currently used and which deficits or potentials the target groups see in terms of reflective learning and the way it is supported – i.e. needs, barriers, problems etc. related to reflective learning. This understanding of the AS-IS situation is necessary to elicit requirements for MIRROR Apps. The requirements elicitation process, which happens in parallel to the user studies, will focus on how MIRROR Apps can solve the needs, e.g. the desired to-be situation of reflective learning in the test beds. Also, the requirements elicitation process will deepen the understanding of the needs of the test beds by having users creatively think about their work and learning processes as supported by the new solutions and also partially try out new solutions. Both the user studies and the requirements elicitation processes are based on the project's shared theoretical understanding of reflection, and both processes feed into the development of the MIRROR Model of Computer Supported Reflection (D1.4).

The two main research questions driving the user studies are

(i) *How do reflection and reflective learning currently take place within the testbeds, and how does technology support these processes?*, and

(ii) (ii) *What are current needs and ideas for supporting reflective learning in the future?*

In order to carry out user studies that lead to comparable results across the testbeds, a common methodology was needed for data collection and data analysis. The aim of this Deliverable is to provide a *toolbox,* i.e. a collection of data collection techniques that takes into account theoretical considerations as well as research questions from all research-intensive work packages in the MIRROR project. With this Deliverable, we provide 15 tools, namely questionnaires, interview guidelines, observation schemes, pilot study designs and diaries that can be readily applied in the different user studies (i.e. the toolbox), or that can be customised for the specific testbeds. In addition, the Deliverable provides compact descriptions of the tools and their usage. The process of deriving the research questions and designing the tools has been driven by KMRC who has profound expertise in study design and implementation.

Figure 1 illustrates the intertwined processes of theory development, study design and requirements analysis. As stated above, the starting point for the design of the user studies was reflective learning theory, including the model of Work Place Reflection (WPR, Krogstie, 2009). In addition, the research interests of partners from WP3 to WP8 had an impact on toolbox design: also here, theory informed the very perspectives of the WPs and these perspectives fed into the design of the different tools from the toolbox which provides all research materials necessary for the user studies. Starting from the collection of tools in the toolbox, we defined the ‘user studies methodology’, i.e. the different types of user studies that will be carried out in the testbeds. Requirements elicitation methodology will also have an impact on how user studies will actually be carried out in the testbeds. The ‘user studies’ box in Figure 1 shows that user studies will be carried out by researchers from the different work packages; i.e. a ‘federated approach’ will be applied instead of a ‘centralised approach’. This is due to the multiple research interests of the researchers, preferences in terms of data collection methodology, and interests of the testbed partners. Findings from the user studies will have an impact on the reflection model which will be further refined. They also build the basis for requirements elicitation, as stated above, and they may also lead to concrete requirements.

The user studies will be reported in M12. In M15, DI.2 will report on the integrated findings from the individual work packages’ user studies. The WPR model by Krogstie will be iteratively refined based on the results from user studies.

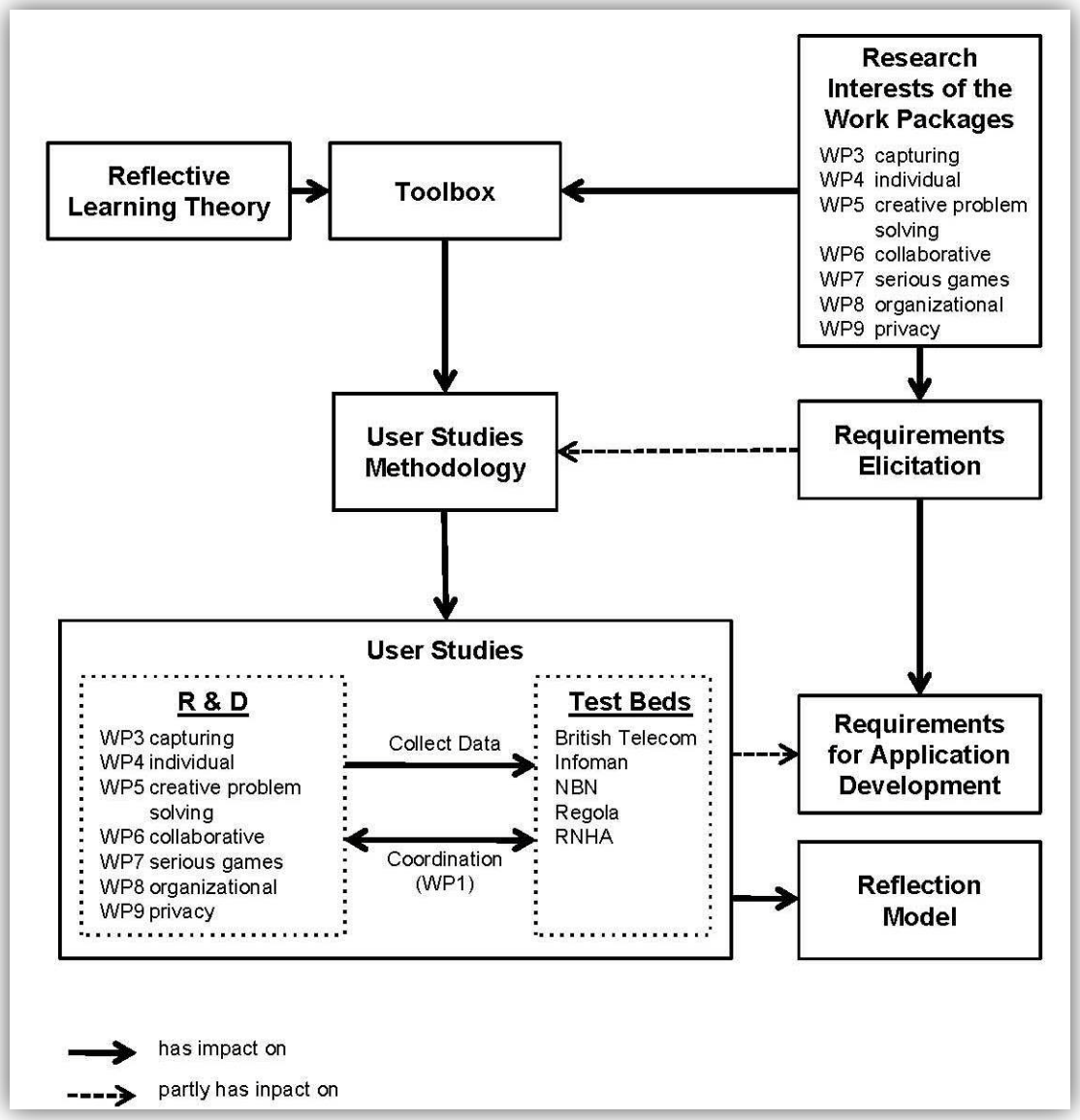

Figure 1: The role of user studies and the toolbox in MIRROR

In the following, the Deliverable will introduce different perspectives of reflection and reflective learning within the MIRROR project (Chapter 2), and the MIRROR testbeds (RNHA, NBN, Regola, Infoman, and BT; Chapter 3). Then, the design and coordination of the user studies is sketched (Chapter 4). Based on theory, research questions for the user studies are then derived for WP1, WP3, WP4, WP5, WP6, WP7, WP8, and WP9 (Chapter 5). Then, research questions from the different work packages are integrated (Chapter 6.1), and the development of the toolbox in cooperation with testbeds is described (Chapter 6.2). An overview of the different tools is provided in Chapter 7. Finally, we comment on the code of conduct for the user studies (Chapter 8), and on ethical issues to be taken into account for the preparation and sharing of data (Chapter 9).

2 MIRROR Perspectives on Reflection and Reflective Learning

In order to carry out user studies that provide insights into how reflection and reflective learning currently take place within (our partner-) organisations, a definition of reflection is needed. Reflection and reflective learning at work are multi-dimensional concepts that can be (and need to be) looked at from multiple angles in order to account for their complexity. While it is the goal of Task1.1 (Model of Computer Supported Reflective Learning) to provide a unified comprehensive model of reflection and reflective learning (Deliverable D.1.4, M. 24) taking into account the different perspectives that exist in the MIRROR project, we emphasise that the following definition of reflection is shared within the project: “Reflection in the context of learning is a generic term for those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciations” (Boud et al., 1985, p. 19). The process of reflection includes 1) returning to experience, 2) re-attending to feelings, and 3) re-evaluating experience. Moreover, from the literature, the following characteristics of reflection have been derived and applied for the case of reflection within organisations that are agreed upon within MIRROR:

- In MIRROR, we focus on reflection on own work-related experiences: the subject matter of reflection is likely to be one’s own practice.
- Reflection refers to examination of past or current experiences for the purpose of guiding future behaviour, i.e. it has both a retrospective connotation and a forward orientation.
- The content of reflection can be own individual experience (individual data), own team work experience (team data) and information on the organisational level (organisational data = accumulation of individual and team experiences).
- Reflection might also be based on relevant others’ experience (“vicarious experience”) as long as it is relevant for making sense of one’s own experience.
- Reflection leads to a new/better understanding of the experience and allows for deriving implications, conclusions or “lessons learned”; this requires generalization and abstraction from the concrete experience. Therefore, the term ‘reflection’ implies some kind of learning, namely ‘reflective learning’. It is worth noting that we do not claim that learning always involves reflection.
- The outcome of reflection can be individual learning, team learning and organisational learning.

Within MIRROR, reflection and reflective learning shall be looked at from an *individual*, *collaborative*, and *organisational* perspective, and solutions (Apps) shall be developed that support reflective learning in all these regards. These perspectives will drive the user studies. In addition, the user studies shall improve our understanding of the *relationship of reflective learning and creative problem solving*. In the following chapters, we will give a brief overview of all these perspectives on reflective learning underlying the MIRROR Project, and on the Apps that shall be developed to support these processes. These perspectives on reflection and reflective learning build the basis for the research questions that shall be answered in the course of the user studies, and, as a consequence, they determine which data collection tools need to be applied to answer them.

In our perspective, there is a two-way relationship between theory development and user studies: On one side, clearly the design of the user studies and applied methodology will be theory-driven; on the other side, findings from the user studies will be fed back into the theory thus enabling us to further refine our theoretical concepts.

2.1 Individual Reflection and Learning by Individual Reflection

One goal of MIRROR is to allow workers to capture tacit knowledge in the form of work practices and experiences and to provide tools (Apps) to enable systematic reflection on those captured practices and thereby facilitating learning. Automatically generated user profiles will play a central role within MIRROR for individual reflection in that they represent, aggregate, and visualize the raw data of work practices and experiences captured using sensing Apps. However, a conceptual user model will need to be developed, since the current theoretical understanding of individual reflection comes mostly from the areas of educational learning, project management (e.g. project retrospectives) and knowledge management theories (e.g. Nonaka and Takeuchi,1998). WP4 will first develop a conceptual user model, containing those aspects of work practices that are most relevant for reflection. The conceptual user model will be grounded in existing theoretical understanding mainly from the areas of educational learning, project management and knowledge management theories, and in the research carried out within WP 1 (Reflection Model and User Studies). The prime goal is to create an interactive presentation of a user profile (in the sense of an open learner model as in Bull and Kay, 2007) that lends itself directly to reflection. Additionally, research on user profiles will be extended so that user profiles become comparable, and through such comparison individual reflection will be fostered. Learning by observation from others is also among the topics that are of most interest for our research. At this stage of the project, the aim is to understand the prerequisites for individual reflection at work more deeply. One important question will be along which dimensions aggregation should take place in order to provide users with meaningful information about their own/others' work and learning practices.

The user studies shall give insight into three aspects (see also Chapter 5), namely (i) when and how individual reflection happens at work in practice (after, during, because of which activities), when no efforts to reflect, exceeding the typical work routine, are made, ii) whether individual reflection is aided by tools and if so, by which tools, and iii) which activities, or which aspects, are relevant for individual reflection on the work and learning practices from others.

2.2 Collaborative Reflection and Collaborative Knowledge Construction

MIRROR aims to support collaborative reflection and knowledge co-construction from recorded work data. In accordance with constructivist theories of cognition, learning occurs socially as a collaborative construction of knowledge (Roschelle and Teasley, 1995). In this context, learning is seen as a group process in which individuals are engaged in group interactions like negotiation, sharing of knowledge, and collaborative meaning making (Stahl et al., 2006). In the past years, several tools have been created which are suitable for supporting collaborative knowledge construction, such as wikis, collaborative tagging systems (e.g., Viegas et al., 2007), concept maps or systems for group discussions (Nakakoji, 1999; Kerne et al., 2008) to name just a few. Making knowledge relevant for individual and organisational tasks available as well as its continuous adaptation and extension are usually supported by organisational knowledge management. These approaches and solutions mainly refer to explicit goals, task descriptions, guidelines – to our knowledge there is no socio-technical solution referring to concrete recorded data of individuals' (collaborative) work. One theoretical model which will serve as a basis is the Co-evolution model (Cress and Kimmerle, 2008; Kimmerle, Cress and Held, 2010). Within MIRROR, We are aiming at a deeper understanding of collaborative reflection on shared work data. WP6 will develop solutions that support articulation work for learning at the workplace, tools that support collaborative knowledge construction by scaffolding, and

facilitation and guidance which have the potential to lead to significant benefits in terms of learning outcomes and knowledge construction (e.g., Scardamelia, 2002). Furthermore, WP6 will provide support for workers to build synergy between their own results of reflection with those of others, to clarify differences between their own interpretations of shared material and the viewpoints of others, and to meld their own ideas with those of others.

In the course of the user studies, the research focus with regard to collaborative reflection is set on identifying, analyzing and understanding collaborative reflection needs and practices in the testbed (see Chapter 5).

2.3 Organisational Reflection, Learning and Intelligence

At the organisational level, learning is understood as a process of individual knowledge creation, explication and organisational utilization and further development, complemented by a result-oriented notion that defines the "organisational knowledge base" (Duncan and Weiss, 1979, p. 86f). So far theory and practice of individual and organisational learning "have traditionally focused on the explicit part of knowledge while ignoring tacit knowledge although it has been estimated that only 10 per cent of an organisation's knowledge it explicit" (Ahmed, Lim and Loh, 2002, p. 11; see also: Schüppel, 1996, p. 187). Within MIRROR, we are aiming at developing concepts and tools for strengthening the link between individual knowledge creation and organisational knowledge sharing from a business process perspective. These concepts will be enhanced by an organisational intelligence (OI)framework that unites the worlds of organisational learning and business intelligence. This approach continues the research efforts of Mueller-Merbach (1996) and Oberschulte (1996) who were the first to apply OI theories to Business Administration. Concretely, WP8 will develop Apps that monitor, mash, analyse and react on their organisational learning experiences. Here, WP8 will first explore existing technical and non-technical approaches to reflection on the organisational level, and see if new approaches to reflection at an organisational level, either derived from literature or from observations carried out in the MIRROR project, can be supported technically in reflection Apps. Moreover, WP8 will integrate MIRROR Apps for reflective learning and observation at the organisational level into a platform where work practices and experiences are shared.

The central research interest of the user studies conducted in WP8 is to get an overview of and an insight into work practices and associated organisational processes within the testbeds (see Chapter 5). These insights are necessary to identfy key activities and crucial aspects for individual and organisational learning.

2.4 Learning by Creative Problem Solving

Creativity research today is a large and multidisciplinary body of knowledge of theories and models of creativity, and large collections of methods, techniques and software tools for creative problem solving. MIRROR will explore the relationship between creative problem solving and learning. Research and development will be built on established research results in both creativity and learning in cognitive science. First, WP5 will build on existing techniques and software tools for creative problem solving by individuals (Resnick 2007, Shneiderman, 2007) and teams (Hilliges et al., 2007, and Warr and O'Neill, 2007) in a manner similar to that proposed by Resnick. WP5 will also develop an own experience of supporting collaborative creative problem solving in teams using technologies such as multi-touch interactive walls and tabletops (Jones and Fields, 2008) in developing new software- and hardware-based techniques that are both usable and effective in terms of supporting learning through creative problem-solving and reflection. Concretely, WP5 seeks to understand individual and collaborative creative problem solving in the selected work

domains and situations in order to detect opportunities, barriers and constraints on learning during creative problem solving. WP5 will select between established creative problem solving strategies and techniques and adapt them to the test-bed work domains and situations, based on both pragmatic (suitability for testbeds) and scientific (support for implicit and explicit learning) criteria. We will investigate learning cycles of imagining, creating, playing, sharing and reflecting process and their impact on learning by knowledge workers in workplace domains. Some creative problem solving methods and techniques already support and reinforce learning directly and indirectly, for example solution verification activities in the CPS method (Osborn, 1953) and schema induction during analogical problem solving (Gick, 1989) however there are few strategies that directly support learning during creative problem solving. Therefore WP5 will develop a new descriptive model of learning behaviour and outcomes in creative solving. WP5 will develop Apps that both implement and support the learning reinforcement strategies described above.

The user studies shall improve our understanding of (i) how creative thinking and problem solving is taking place in the domains and the testbeds at the moment, and (ii) what opportunities for new creative problem solving exist in the domains, based on the new capabilities that the future MIRROR tools will offer (see Chapter 5).

3 Description of MIRROR Testbeds

MIRROR Apps shall be developed for and applied in five different testbeds, i.e. partner organisations that have different needs and requirements with respect to reflective learning at work. Testbed partners of the MIRROR project consortium are the Registered Nursing Home Association (RNHA), the Neurological Clinic in Bad Neustadt (NBN), Regola, the British Telecom (BT), and Infoman. These very different testbeds and their various work situations shall ensure that the developed MIRROR solutions will be applicable in a range of situations. The testbeds are strongly involved in the project. Amongst others, they participate in creativity workshops and requirements sessions, and it will be at their work places where the MIRROR solutions will be object to formative and summative evaluation. Clearly, user studies to investigate the AS-IS situation of reflection and learning by reflection at work will also be carried out in the testbeds. Thus, in the following, the testbed partners and their application scenarios will be briefly described. First, the 'application case' states the target group of MIRROR Apps, the Chapter 'current situation' briefly sketches the context of the target group, the Chapter 'business process' describes the actual work processes that shall be supported with MIRROR Apps, and the Chapter 'goals and challenges' describes concrete goals to be achieved with MIRROR Apps.

3.1.1 Registered Nursing Homes Association

Application Case: The MIRROR reflective learning methodology including Apps will be implemented, tested and validated within nursing homes belonging to the Registered Nursing Home Association. The Partnership in Care Limited group of homes in Suffolk will provide the main interface initially.

Current Situation: The mature economies of Western Europe have increasing numbers of elderly people and an increasing proportion of those of great age suffer from some form of dementia. However, care for people with dementia is in its infancy with sufferers typically 'managed' rather than 'cared for'.

The relationship between carer and resident provides challenges particularly to inexperienced carers. From their perspective as expert practitioners, RNHA have identified a suite of business needs to help improve care. For example, the carer must actively take into account the unique history of the patient to adequately handle situations occurring in day-to-day interaction. These are set out under 'Goals and Challenges' below.

The sector has historically been a slow adopter of new technology but recent rapid advances have led to an increasing perception that certain technologies may assist in the introduction and development of the processes of reflection and learning from reflection when caring for people with dementia.

Constraints include the limited spread of Information and Communication Technology (ICT) within care homes where there is a culture of face-to-face communications; and multi-tasking managers with little senior support or time to network with others, and the fact that each care home is different.

Business Process: The business process takes place in the context of private sector nursing homes. These homes aspire to deliver high quality services to residents whilst generating a commercial return. To protect the vulnerable service users the homes are externally inspected and must carry out and report on their own annual quality assessments.

The specific work process to be supported by MIRROR Apps is the end-to-end process of providing care to people suffering from dementia. It covers all the sub-processes necessary

to provide the best possible care. Within each sub-process a learning environment will be stimulated where all stakeholders (workers, residents and managers/owners) can work together and satisfy their respective objectives of quality of life and financial return.

Goal and Challenge: RNHA identified the following 5 business needs at the kick off meeting and at the initial meeting for technical partners at TPIC (Risby): creating a life history of the service user, small targeted mobile training elements, virtual reality (serious) games, help with challenging behaviour, and the creation of a virtual 'rummage box'.

The success of MIRROR Apps can be measured at the individual, team and organisation level. For individuals, 'before' and 'after' questionnaires will provide an indication of usefulness whilst at the organisation level the application of the Star Rating Tool methodology will provide an indication of usefulness for the organisation.

3.1.2 Neurological Clinic Bad Neustadt (NBN)

Application Case: The MIRROR Apps will be implemented, tested, and validated within the medical staff (physicians, nurses and therapists) in the stroke unit of the Neurological Clinic in Bad Neustadt/Saale (Specialist Hospital for neurological diseases).

Current situation: Although this is mostly neglected by hospitals, a big issue for medical professionals lies in coping with the amount of workload and emotional stress. One key to preventing burn-out syndromes or skills shortage is seen in turning demanding situations into learning experiences. This shall be achieved by supporting reflection on previous work experiences, i.e. by asking oneself questions like 'What was going on?', 'How did I react to the challenging situation, and was my reaction adequate?', 'How did I feel in that situation?', etc.

Business Process: MIRROR Apps shall be designed that support reflection and reflective learning in all work areas of the health professionals at NBN. On important stream within NBN is error management. Providing support for reflection based on capturing learning and training experiences will enrich the error management process by taking a more holistic perspective, taking emotions, stress level as well as other contextual factors into account. This will help to tackle problems that arise from deficiencies in the individual's coping strategies for different forms of stress. Complemented by collaborative reflection, it will create insights needed for continuously improving skills, work organisation, education training and continuing education etc. In addition, in the sense of stress management, reflection on positive events, e.g. success stories, shall also be supported.

Goal and Challenge: The goal for MIRROR Apps within NBN is to create a rich learning environment that is not only focused on factual knowledge or processes, but also on the tacit dimension of knowledge and the affective dimension. On one side, this will clearly improve care/medical practices, but also safeguard the health of nurses and thus enable sustainable engagement. For the hospital as a whole, the service quality shall be improved, and costs of absence shall be reduced. One important challenge for NBN is the question how, through methods of reflection, the attractiveness of the medical profession as a whole can be improved. The introduction of a selected set of MIRROR Apps for the participating different professionals is the mid-term goal of the Neurological Clinic. To roll out the MIRROR Apps into the other divisions to support the medical staff (physicians, nurses and therapists) during their daily work is envisioned as a long-term goal.

3.1.3 Regola

Application Case: The MIRROR test bed will run at the Civil Protection Organisation in Turin (Torino) and, when feasible, at the Regola headquarters.

Current Situation: The Civil Protection in Turin is responsible for coordinating the effort of personnel from several organisations with respect to disaster management in the Turin area and in collaboration with other Civil Protection units. This includes four different types of activities: Expectation, prevention, rescue and clearing emergency. Also, it involves three different levels: A ('ordinary events') B ('intermediate events') and C ('extraordinary event'). The operational structure includes many different organisations as well as a group of volunteers working directly for the municipality. Altogether there are about 450 volunteers coordinated by the Civil Protection in Turin.

Business Process: The events handled by the Civil Protection are managed by institutional parts on different levels: A: Municipality, B1: Provincial towns and main cities, B2: Regions and independent provinces, and C: Government. Apart from handling events, the Civil Protection in Turin has a 24 hours continuous operation in the municipal operations centre. The centre contains a crisis room (ready for the managers of the different associated organisations to use in the event of a disaster) as well as an operational room to which the crisis room has direct audio lines. The operations room contains 'islands' where groups of operators sit separated by glass walls, providing audio insulation but enabling visual contact. When there is no particular event, this room is mostly empty and ready for use, but one of the islands is continuously used by the Turing Civil Police, who have their call centre in an adjacent room.

Goal and Challenge:

The Civil Protection is stressing that simple and flexible resources are needed to handle events: emergency planning cannot be detailed and strict. It is difficult to organize training because of the discontinuous nature of the work. Some reflection and training (e.g. field trials) is happening within the associated organisations. A major challenge for the Civil Protection is to achieve learning from their experiences of handling the cases of disaster prevention and management. This involves volunteers learning from their own experience as well as that of others, across events, and also identifying individuals who might not fit as volunteers in crisis situations. A goal of introducing MIRROR solutions is to help the Civil Protection improve learning from experience among their volunteers on an individual, team and organisational level.

3.1.4 British Telecom

Application Case: The first users of the MIRROR testbed will be members of the contract teams and the teams of which they are part. The MIRROR apps will be implemented, tested, and validated in their working environment. The participating branch of BT in the UK (BT Learning Solutions) is a testbed for similar scenarios in the BT group.

Current Situation: BT has 1500 contracts which are managed by contract teams. Some of them are small contracts (1 million GBP) and some very large (complete communication infrastructure of global companies like Philips) A contract team consist of multiple members with responsibilities for the different areas of the contract like Sales, Delivery, service, etc. Each contract (team) is managed by a contract manager or contract director. Team members are engaged into a contract on a project base. Therefore the team members will switch over time. Team members also learn and share knowledge with their professional community (peers) and their contract teams. The contract team managers need knowledge about issues that have a negative impact on the contract process (e.g. delays in service technicians' work), and want the team to learn from experience to avoid mistakes. Similarly there is a potential to learn from experience across contract teams and on the level of the organisation which may decide to implement changes to work processes.

Business Process: BT would like to investigate and test how MIRROR can contribute to more effective contract management processes by supporting effective working and learning practices for service technicians and contract teams.

Goal and Challenge: BT would like to use the MIRROR project to experience how they can facilitate learning for individuals and team supported by reflection. BT will test how MIRROR can facilitate and promote knowledge sharing and enable team members to build informal networks for support of their colleagues. The job of a team member consists of a number of activities not specific for their role such as: travel, reporting and dealing with customers. Managing these different tasks can help a team member to be more effective. Sharing information with peers and learning from each other will be enabled and stimulated by MIRROR so team members and teams can improve their own effectiveness and thereby contribute to the improvement of effectiveness in the contract team as well as across teams and in the organisation at large.

In order to reach these objectives it is essential as a first step for BT to analyse their current situation and gaps. The mid-term goal of BT will be the participation in the different testbeds. A selected group of BT team members will actively work in the evaluations. We plan as a long-term goal the spread of customized MIRROR Apps into all service organisations broadening the range of employees using MIRROR.

In general, only applications which are very easy to use will be accepted. The team members have full schedules so it has to be clear what is in it for them. BT has a strictly manager IT infrastructure and strict rules on information management and where information is maintained, how etc. These will be difficult circumstances to implement Mirror solutions.

3.1.5 Infoman

Application Case: MIRROR will be implemented, tested, and validated during the project within the Infoman headquarters in Stuttgart. The end users of MIRROR are sales consultants within Infoman.

Current Situation: Currently systematic knowledge sharing and collaborative learning between sales consultants at Infoman happens only sporadically or directly on a personal basis. Knowledge is shared using files (mainly Microsoft Office files) on the company file system. A defined directory structure exists that allows finding relevant information faster. Additional information such as the history of sales processes is stored in the Infoman internal CRM system. The system also provides a support for the complete sales process (e.g. lead management, opportunity handling, offering). However, an overview of all available resources is missing. Explicit sharing of learning material does not take place at the moment. The situation will become even worse when an external call centre will be included into the tele-sales process.

Business Process: The main strategic objective of Infoman AG is to analyse and optimise the marketing, sales and service processes of companies mainly active in the mechanical engineering industry. Infoman AG supports the companies with strategic consultancy, process optimisation and implementation of IT solutions. Each solution is a unique tailored IT system tackling the special needs of each individual customer. The value creating business scenario to be supported within MIRROR is the sales process for projects implementing Customer Relationship Management (CRM) at customers from the mechanical engineering industry. Infoman envisions their sales people and especially trainees to follow the innovative approach of MIRROR and to use the MIRROR prototypes. The sales people will be supported within their creative work to learn from previous sales experience in the organisation and transform the business and technical demands into offers for efficient

processes and solid IT solutions. An additional use case is the development of a new business approach selling CRM systems using tele-sales activities and hosting of CRM system for a trial period.

Goal and Challenge:

Infoman's sales people need to have a deep understanding about existing solutions and broad knowledge of market demands. In order to stay ahead of the competition and to best advise the customers each sales representative needs to continuously improve her skills in the focus field, rapidly learn aspects of other fields relevant to one customer project, and apply both within the customer's solution space. The uniqueness of each project as well as the time constrains in the offering process poses an essential challenge to Infoman.

Infoman plans to iteratively approach the objectives in this project. As a first step the underlying processes and existing knowledge artefacts should be identified and analysed building a common knowledge base for all sales personnel. These activities will be started in our headquarters in Stuttgart and will be rolled out to our subsidiary in Luzern (Switzerland). As a mid-term goal we will define a pilot that will use the prototypes developed in MIRROR for real world sales activities. The experiences will be played back into the project providing valuable insights. We envision as a long-term goal the broad usage of adapted and customized MIRROR tools and concepts within our sales department.

4 User Studies Design and Implementation Plan

As stated in the introduction, the user studies within MIRROR have multiple purposes. While they shall inform theory development and provide starting points for requirements elicitation, the main purpose of the user studies is that researchers and developers from WP3 to WP9 have the chance to investigate the AS-IS situation in the testbeds in a systematic way. In the following, we will describe the process of user studies design and the implementation plan. Table 1 gives an overview of the timeline for toolbox development, coordination and implementation of the user studies. A more fine-granular schedule of user studies in each testbed will be developed in January 2011. This schedule will be documented in Deliverable DI.2 together with the results from the user studies.

Table 1: Implementation plan for User Studies including preparation and documentation

Date	**Activity**
Beginning of August 2010	Coordination of Test Bed Days, Introduction of Test Bed Wiki
August 17-20, 2010	Test Bed Days
September/October 2010	Collection of research questions from different work packages
Mid October 2010	Integration of research questions from different work packages into higher-level research questions
October/November 2010	Toolbox development in close cooperation with partners from different WPs
Mid November 2010	Draft Deliverable DI.1 (toolbox) ready for internal review
November 23-24, 2010	MIRROR General Assembly, presentation of the toolbox, assignment of researchers to testbeds for the user studies
December 2010	Coordination of off-site user studies (questionnaires, diary)
December 20, 2010	Revised Version of DI.1 ready for submission
December 31, 2010	Deliverable DI.1 due
January 2011	Coordination of on-site data collection, customisation of tools for off-site data collection
End of January 2011	Off-site data collection (questionnaires, diary)
January/February 2011	Customisation of tools for on-site data collection, Guidelines for data analysis
February-April 2011	On-site Data Collection; User Studies of WPs in the testbeds
June 2011	Results Reports of each WP (DX.1, each WP) due
July/August 2011	Results Integration (KMRC)
September 30, 2011	Deliverable DI.2 due

4.1 Integrating Multiple Research Interests

At the outset, due to the different perspectives on reflection and reflective learning within MIRROR, all research partners had different perspectives and thus different research foci (details will be given in Chapter 5). Additionally, they had different methodical preferences, e.g., questionnaires or observations. Therefore, it was decided to design user studies in a bottom-up process starting from the interests and research questions of the different work packages. In a next step, these different research interests were aligned; overlaps were identified and data collection tools were developed that cover all research questions of the different work packages. A summary of research questions from the different work packages will be given in Chapter 6.1. In a next step, a variety of data collection tools were developed to cover all these research questions. The toolbox development and the tools will be described in more detail in Chapters 6.2 and 7.

4.2 User Studies Methodology: Different Types of User Studies

Based on the different settings and target groups that need to be involved for data collection depending on the tools (e.g., some involve IT staff, some involve management, some require observation, some interview etc.) we designed three types of user studies, (i) off-site data collection with the target group, (ii) off-site data collection with other groups, and (iii) on-site data collection with the target group.

Off-Site Data Collection with the MIRROR Target Group

Data collection with some of the tools that will be described in Chapter 7 requires participants from the target group, i.e. potential future users of MIRROR Apps, but does not require face to face interaction. Concretely, this holds true for the questionnaires and the reflection diary. Therefore, it is planned to carry out off-site data collection where participants from the target group are provided with data collection tools. These tools should be distributed to the MIRROR target group, and ideally to additional persons within the organisation (to have a rather large sample). These materials do not require a researcher being at the site. Ideally, they are distributed before the actual face-to-face data collection in form of a staff survey.

Off-Site Data Collection with Management and/or IT Staff

Data collection with some of the tools that will be described in Chapter 7 requires participants who know the IT infrastructure within the testbed organisations. These tools are mainly checklists and forms that can be filled by the IT staff on their own, or with the help of a facilitator from the testbed who knows the vision of the MIRROR project (in order to explain what some of the questions are for). A short questionnaire will be distributed in parallel which shall be filled in by members of the management of the test beds, e.g. the Organisational Reflexivity Questionnaire. Ideally, this data is to be collected before the on-site user studies.

On-Site Data Collection with Target Group

Some of the data collection tools will require face-to-face interaction with potential future users of the MIRROR Apps. Researchers from the different work packages will visit testbed organisations and carry out interviews, observations, workshops or small pilot studies. These face-to-face visits will involve rather small samples of the MIRROR Target Group. The on-site data collection will take place between February and April 2011 and will be coordinated by WP1. The on-site data collection will also be aligned with requirement elicitation activities led by NTNU.

4.3 Customisation of Tools

It is important to stress that not all research instruments will be applied in every testbed, and that they do not have to be applied exactly as they are. Instead, some customisation will be necessary in order to take into account the needs and constraints of the testbeds and the interests of the researchers who cooperate closely with the respective testbeds. For example, the questionnaires (currently in English) will have to be translated into German and Italian; while some testbeds need paper-based versions (e.g., NBN). In others, only online versions are applicable (e.g., BT). Some test beds, where literacy is not very high, short versions of the questionnaires will have to be provided (e.g., RNHA).

4.4 Coordination of On-Site Data Collection

As can be seen from Table 1, the detailed coordination of on-site user studies will take place in January 2011. While during the MIRROR General Assembly (November 2010) a preliminary assignment of research partners to testbeds was achieved, in January 2011 it will be decided which of the data collection tools will applied in which testbed by which research partner. Thereby, constraints of the testbed partners (e.g., time, participants, types of data collection) as well as particular interests of the research partners will be taken into account. Specifically, it shall be ensured that all relevant data is collected in all testbeds, and that no data is doubly collected. The coordination by WP1 will ensure synergy in data collection and the researchers share efforts to collect data.

The user studies and requirement elicitation processes will be aligned by WP1 to utilize project resources in the best possible way, e.g., by using the opportunity to conduct user studies as well as to run requirements elicitation sessions when technical partners are present at the test bed.

4.5 Data analysis

Further details on the analysis and sharing of data will be provided by WP1 prior to the data collection for the different kinds of research tools. The data analysis is in the responsibility of the respective work package while WP1 will assist based on its expertise in empirical research.

For the quantitative (questionnaire) data, a template will be provided to collect the data in a standard format. Analysis can then be done by looking at item-by-item results for the different testbeds or by computing means of scales or sub-scales.

Data can be visualized using histograms to get an impression of the specific condition of the testbeds and variance across questions.

Given sufficient sample sizes, the Excel file can be imported into SPSS to perform more sophisticated statistical tests, e.g., to assess significant differences between the testbeds or subgroups within a testbed.

For the qualitative data, the data will be collected as accurately as possible (e.g., if allowed, by audio recording the interviews and detailed transcripts or comprehensive summaries) and will be made available by the work packages to other involved partners in anonymised form in English.

5 User Studies to Investigate the Situation AS-IS: Research Interests of the Different Work Packages

As described in the introduction of Chapter 4, user studies will be carried out by the research partners themselves. Outcomes from all user studies will inform theory work in WP1. It is therefore necessary to make sure that the data collection is closely aligned in order to avoid missing data, or overlaps between different data collection techniques.

As mentioned above, in a first step, the research interests of all research partners were collected along the following questions:

(1) What are the research questions you want to answer during the user studies?
Please specify any research interests for the user studies. Please indicate if a question is only applicable to specific testbeds.

(2) Which indicators of reflection and learning by reflection do you consider as appropriate?
While the theory discussion is an ongoing process, we need to know here which indicators for reflection you consider to assess during the user studies.
Please specify for each indicator if you have a preference for a specific method (e.g., questionnaires, interviews, observation).

(3) Do you already have questionnaires or specific items you want to ask? If so, please provide us with the questionnaires or items. These questions do not need to be perfectly verbalized but any concrete information/material is useful

Besides those work packages mentioned in Chapter 2 who are working on different perspectives of reflection, all other work packages should also have the chance to acquire data in the course of the user studies. In the following, the research questions of all work packages and the desired research methodology will be described. Clearly, there is overlap between the different work packages. It is the aim of Chapter 6.1 to provide an integrated perspective of the research interests of the research questions to be answered with the user studies. This integrated view then builds the basis for the development of the toolbox.

5.1 WP3: Capturing Learning Experiences

5.1.1 Research Interests for the User Studies

Within MIRROR we will use context acquisition as a basis for supporting reflective learning by (a) making explicit the contextual element of learning experiences, and by (b) exploiting contextual information for adapting the system's support of reflective practice, e.g., by detecting and making aware of patterns. Context-acquisition and context-management are key concepts within ubiquitous and pervasive computing research. Context information can be captured from physical sensors (i.e. hardware sensors) providing information about users and their environments (Dey et al., 2001; Schmidt/Van Laerhoven, 2001; Lymberis, 2005; Engin et al., 2005; Zimmermann et al., 2007), as well as from information systems such as personal organizers, enterprise portals or workflow management systems (Baldauf et al., 2007; Lokaiczyk et al., 2007). Technologies seeking to capture the emotional state of a user, the user affect, have been studied within the new research field usually referred to as Affective Computing (e.g., Picard, 2000). Within MIRROR, WP3 wants to explore possibilities

for capturing user context in real-world applications at the workplace. The remaining key challenge concerning the handling and abstraction of collected context information lies in the domain specific aspects of context management, which includes (i) modelling the ontology, and (ii) aggregating and semantic abstraction of sensor-level information.

In order to provide meaningful context information to support reflective learning, we have to find practical ways to capture task context in real workplace settings. In the case of MIRROR, we have to look at non- or little computerized environments as well. Here we have to think about which elements can be realistically sensed. Moreover, we have to think about how existing sensor technologies for psycho-physiological and physical activity monitoring can be adapted for long-term use for capturing user experiences in the workplace.

For the user studies, WP3 is interested in i) identifying technology that is currently used at the workplace and that can deliver data for reflection, ii) how to ensure the necessary motivation to use technologies to gather data useful for reflection, and iii) in identifying sensing technologies that are usable in workplace reality and that contribute to capture meaningful data which is relevant for reflective learning. This includes general, application-independent information sources (such as information on the personal state of the learner) as well as domain-specific information (such as task context).

Concretely, the following research questions shall be addressed:

<u>Technology use AS IS</u>

i. What technology is currently used by the employees that might be used for personal reflection or data collection?
ii. What is the general attitude towards technology usage?

<u>User readiness to use capturing technology (motivational barriers and drivers)</u>

iii. What are the attitudes toward the use of specific technologies to capture data?
iv. What benefits are expected from using a new technology?
v. What works as an incentive to motivate employees to capture data?

<u>Requirements/Needs regarding capturing technologies</u>

vi. Which sensors are applicable?
vii. Is the usability of these sensors sufficient for larger deployments?
viii. How is the data quality affected by the work environment, e.g. constant movement?

5.1.2 Research Approach

To answer the use of technology as is, a questionnaire will be used in all testbeds. This questionnaire will address current usage of technologies like mobile phones as well as assess the acceptance of technology in general.

Motivational barriers and drivers will also be assessed in all testbeds. A questionnaire for all testbeds will ask for feedback on the estimated usage of a non-domain specific reflection tool, such as a diary. What benefits are expected from using such a tool. Moreover, we will look at concrete simple sensors (e.g., heart rate/proximity sensors) and their possible deployment in the testbeds. In a first step we want to focus on the applicability, usability of these sensors and the generated data quality. An analysis of the data regarding stress or task context will not be possible, because in a work setting it will be hard to validate our results. A validation would require reference data to compare our interpretations of the data with the real task or stress level. However, this kind of analysis is planned at a later stage of the project in more controlled settings. In this first study we will focus on the practical issues in the testbeds. This will inform the selection of sensors for the next Deliverable.

5.2 WP 4: Learning by Reflection and Observation

5.2.1 Research Interests for the User Studies

WP4 is interested in three aspects, namely (i) when and how individual reflection happens at work in practice (after, during, because of which activities), when no efforts to reflect, exceeding the typical work routine, are made, ii) whether individual reflection is aided by tools and if so, by which tools, and iii) which activities, or which aspects, are relevant for individual reflection on the work and learning practices from others. This is important insofar as we think it is important to learn from others. However reflection is a kind of "analysis of one's own past experience". One hypothesis is that reflecting on experience of others only can occur if there is sufficient relation of one's own experience with the other person's experience. Then that comparison can be made, and analyzing the other's experience can be related and compared to one's own experience.

The focus will be on individual reflection, which includes individual reflection on one's own, at work or elsewhere, informal individual reflection with colleagues, boss, or friends/family, and institutionalized individual reflection with boss, supervisor, peer-groups. This focus complements the user studies executed within WP 6 (Collaborative Knowledge Construction), which focus on collaborative reflection and knowledge co-construction.

Concretely, the following research questions shall be addressed:

Individual Reflection AS IS

i. When and how does individual reflection about work and learning practices occur at work?

ii. What information about work practice is already available?

Role of Tools in Individual Reflection

iii. Is individual reflection currently aided by the use of tools, and if so, by which tools?

Other Relevant Activities for Individual Reflection

iv. Which activities, or which aspects, are relevant for individual reflection on the work and learning practices from others?

5.2.2 Research Approach

To answer the above research questions, different methods will be applied: reflection diaries, questionnaires, semi-structured interviews (including story-telling), and group discussions (retrospectives).
Reflection diaries will be used for individually capturing activities, for capturing important or concerning events or experiences of each working day.

Follow-up interviews will be conducted with individuals about their diary entries to clarify reflection events and, if possible, resulting activities or changes of behaviour. Ideally, diary entries shall also be evaluated by a „supporter" (e.g. a researcher who asks questions about triggers etc. to further analyse the reflection experience) to detect relevant actions or triggers for reflection.

In addition, storytelling will be applied as a method for obtaining further examples of where individual reflection took place, what were the triggers etc.

5.3 WP5: Creative Problem Solving

5.3.1 Research Interests for the User Studies

For the user studies, WP5 is interested in (i) understanding how creative thinking and problem solving is taking place in the domains and the testbeds at the moment, even if it is informal and not normally documented, and (ii) what opportunities for new creative problem solving exist in the domains, based on the new capabilities that the future MIRROR tools will offer. In terms of current creative problem solving, WP5 is interested to know where current reflection related to the problem solving happens - before the problem solving as a trigger for it, or potentially afterwards to reinforce the new knowledge generated.
Concretely, the following research questions shall be addressed:
Work context AS-IS

i. What is the current work context of users in the testbeds in terms of interaction and communication, and the context of the socio-technical MIRROR solutions to be developed within the project?

Current practices of creative problem solving in the domain (AS-IS)

ii. What are barriers of and enablers to effective and integrated creative problem solving
iii. Do learning cycles of imagining, creating, playing, sharing and reflecting process lead to learning by knowledge workers in workplace domains?

These questions shall be answered for individual and co-located groups of knowledge workers.

Opportunities for new creative problem solving

iv. What new opportunities exist for effective and integrated creative problem solving?

5.3.2 Research Approach

In order to analyze the work context of the users in the testbeds and the context of the socio-technical solutions to be developed within MIRROR, context modelling was used as a technique.

A context model is a graphical representation that shows different candidate boundaries for

1. The technical systems, expressed in terms of software and hardware actors
2. The redesigned work system, expressed primarily in terms of human actors
3. Other actors which are strongly influenced by the redesign of the new system, although they do not interact directly with it
4. Systems that interact with elements of the new socio-technical system but are not strongly influenced by its redesign are shown outside the outer boundary.

These context models were created as a preparation for the actual user studies.

In order to analyse creativity, creative problem solving and the role of reflection in the creative problem solving process during the user studies, expert interviews and focus group workshops will be run. Reflection can manifest itself in shared knowledge that is externalized in some way. Indicators include:

- Shared new knowledge generated by creative problem solving, and shared with a community of knowledge workers after a period of validation of the new knowledge which happens during the reflection;

- Explicit documentation of the results of reflection after creative problem solving in an external artefact that can be shared.

Therefore there should be direct evidence of this knowledge in terms of social artefacts (e.g. whiteboards documenting care home), re-shared electronic artefacts (e.g. patient records, draft business contracts and physical notes) that can then be analyzed. Hence, collection of the artefacts and their copies is essential. We also need to understand how these artefacts are produced and used directly, some direct data gathering about the use of the artefacts is essential. Observation-based techniques combined with more directed techniques such as contextual enquiry are most likely to succeed.

Another indicator for reflection is an individual cognitive and collaborative social process. This process can be observed, recorded (audio and video) and, itself, reflected on, so the use of different types of retrospective interviews or, if resources permit, retrospective protocols. In order to identify opportunities for future creative problem solving, WP5 will use the techniques of cultural probes, creative thinking, storyboarding and low-fidelity prototyping with selected creativity techniques.

5.4 WP6: Collaborative Reflection

5.4.1 Research Interests for the User Studies

The research focus of WP6 in the course of the user studies is set on identifying, analyzing and understanding collaborative reflection needs and practices in the testbed. What are the characteristics and modes of collaborative reflection? It shall also be investigated, how people articulate, share and make sustainable their reflections on recorded work data and how can these tasks be supported, and what are the factors which lead from collaborative reflection to collaborative knowledge construction

Concretely, the following research questions shall be addressed:

Characteristics of collaborative reflection

We will use indicators of collaborative reflection (see below) and observe whether and to which extent they can be found in the testbeds. Additionally, we will strive to find new indicators not mentioned in literature or to provide details for existing indicators. For this, we will answer the following questions:

i. Which characteristics of different modes of collaborative reflection can be found in the testbeds and which characteristics have to be added?

ii. Which indicators to identify reflection in a communication act can be found in the testbeds and which new indicators for collaborative reflection in communication can be derived from our work?

The user studies will be led by the following questions:

Collaborative Reflection AS-IS in the Testbeds

iii. In which situations does collaborative reflection take place?
iv. Which triggers (situations, problems, successes etc.) are relevant for collaborative reflection in the testbeds?
v. Which data / information is available/used for collaborative reflection?
vi. Which documents are results of collaborative reflection?

Collaborative Reflection TO-BE in the Testbeds

vii. In which situations would people benefit from collaborative reflection in the future?
viii. Which data should be available for collaborative reflection in the future?

ix. Which (further) persons should participation in the collaborative reflection?
x. Are there more situation/events/problems about which should be reflected collaboratively?

5.4.2 Research Approach

The research approach of WP6 for the user studies is twofold and combines qualitative observations of current reflection and work practice, and interviews with members of the test testbeds' target groups.

Observation is necessary to understand what people in the testbeds actually do all day – e.g. when do they have time to communicate, what happens in meetings, where do they gather for chats etc. Interviews are necessary to clarify rationales, needs and wishes of certain individuals within the testbed, that is, to explore reflection needs and possibilities in depth. According to this, the first step in our user studies should include observations to clarify how people actually work and the second step should be interviews in order to deepen the understanding.

In order to combine these two methods of research for one testbed, it will be important to be at the testbeds when e.g. meetings take place and when enough interviewees are available (important for e.g. the consulting companies).

5.5 WP 7: Creative Learning with Games

5.5.1 Research Interests for the User Studies

Learning must be heavily experience-based since, according to a constructivist approach, everyone compares (even unconsciously) new situations with previous experiences, before a given behaviour is turned into action or a decision is taken (Bocca, 2003). In line with this perspective, learning can be supported by broadening the spectrum of experiences a worker can draw on, as the key to interpret new situations quickly, especially in changing scenarios. However, reflection about the experiences has to happen in order for learning to occur. Learning through experiences and deep insight can be fostered by using an interactive simulation and gaming environment either individually or within a small group (Pannese et al., 2005; Michael and Chen, 2006), especially when it comes to behavioural and soft skills training. Simulations and games present a unique opportunity to put the learner at the centre of the learning experience and to make learning a flow of meaningful experiences – both for the individual and for the group, always focusing on experience-based reflection, soft skills and behavioural topics. An important aspect to be taken into account will have to be the question of how adult learners can be motivated to engage in games.

In the user studies, WP 7 will examine the current learning from experience and practice at the testbeds in order to specify the potential of serious games for facilitating learning from experience and identify deficiencies in learning from experience which can be solved by means of serious gaming. Furthermore, the target groups' readiness for serious games will be investigated to identify potential barriers for the implementation of serious games as learning resource. This involves examination of current use of technologies for learning (as well as experiential approaches) and attitudes towards serious gaming. Requirements, needs and opportunities with regard to serious games will be researched to inspire development of games for learning from experience.

At the same time WP7 is interested to know how the testbeds link reflection activities and processes to training and how they currently evaluate how reflection happened and what results it brought. It will also be useful to find out where reflection should be fostered and what the expectations are. Serious games can provide a basis for reflection (especially to

long-term thinking) in a reality-near given context, and reflection should happen during the gaming experience as well as thereafter through de-briefing sessions. Therefore some way to link the game to current activities and a long-term reflection process involving both the virtual and the real experience has to be carefully planned.

The concrete research questions that should be addressed by WP 7 are:

Learning Practices AS IS

i. To what degree are people motivated to learn (particularly via technologies) and how do personal (learning) goals relate to the organisational goals?
ii. What obstacles prevent people from learning at work? Are people aware of what prevents them from learning?

User Readiness for Serious Games

iii. What are the target group's attitudes towards technology-enhanced learning and specifically serious games?
iv. What is the current use of serious games (private/work/leisure) if any?
v. What experiences and skills do they have with serious games?

Requirements/Needs with regard to Serious Games

vi. What are the target group's expectations towards the use of serious games?
vii. Which situations/scenarios would the target group like (or consider meaningful) to have a serious game for?
viii. Which design factors must be considered to fulfil the users' needs and expectations?

5.5.2 Research Approach

The research approach to investigate how serious games may effectively support reflection include: practical experience (mock-up) with in-depth interview, semi-structured interviews, questionnaires, diaries and storytelling about actual working activities to find occasions where reflection might be useful, as well as specific stories about perceived changes in behaviours, obtained results, level of confidence in performing tasks.

5.6 WP8: Organisational Learning and Intelligence

5.6.1 Research Interests for the User Studies

In WP8, organisational learning is understood as improvement with regard to organisational (business and learning) processes within the testbeds mainly. Improvement of organisational processes might be the result of 1) employee's reflection on current work practices and 2) reflection of the process owner or responsible management on (the accumulation of) work practice experiences of several employees. In the first case, the MIRROR apps should accomplish to gather and share individual and team reflection outcomes (such as individuals' and teams' changes in routines) which then finally would result in error prevention within and/or best-practices for organisational business processes (Bottom-Up organisational learning). In the latter process (Top-Down organisational learning), individual instances of processes should be collected and aggregated to allow for thorough analysis of improvement opportunities from a management viewpoint. For both organisational learning strategies, WP8 will investigate when and how organisational learning currently takes place at the workplace (within the testbeds).

WP8 will examine the Information and/or Learning Systems used in the testbeds and the organisational and individual learning environment available there. Furthermore, ideas and

expectations from future MIRROR users should be gathered, revealing in which way testbed users expect MIRROR to improve their learning processes and the learning process of their organisation respectively. In this context, known deficiencies of existing (software and learning) systems in the testbeds are of special importance.

Organisational intelligence in the context of WP8 comprises methodologies to assess organisational learning through the specification of key (performance) indicators for learning and process improvement within organisations. WP8 will also address whether and which specific monitoring and controlling processes of organisational learning are implemented in the testbeds in order to assess Organisational Intelligence practice as it is. Based on this information, hints for the design of apps that could facilitate organisational intelligence will be derived.

The central research interest of the user studies conducted in WP8 is to get an overview of and an insight into work practices and associated organisational processes within the testbeds. These insights are necessary to identfy key activities and crucial aspects for individual and organisational learning.

Concretely, the following research questions shall be addressed:

Organisational learning and intelligence practice AS IS:

i. Which activities or which aspects of work practices of individuals and teams are relevant for organisational learning and organisational learning processes respectively?

ii. Which concepts already exist to support organisational learning and intelligence based on tacit knowledge?

iii. Which barriers hinder organisational learning and intelligence within the testbeds?

Computer-support for Organisational learning and intelligence AS IS

iv. Does any technology support already exist in the testbeds which enables organisational learning and intelligence based on tacit knowledge?

v. Which are the specific deficiencies of existing (software and learning) systems in supporting organisational learning and intelligence?

Organisational learning and intelligence TO BE:

vi. Which (aggregated) information on individual or group work practice can provide the organisation with meaningful information (so-called organisational profile) in order to support organisational learning and intelligence based on tacit knowledge?

vii. Are there any negative user experiences with existing software and learning systems within the testbeds which should be taken into account when designing an intuitive and interactive user interface for an organisational profile ?

5.6.2 Research Approach

Through observational studies, and interviews WP8 expects to get a further insight into work practices associated with specific business processes. These insights are necessary to derive important activities and essential aspects of work for both individual and organisational learning.

Through observational studies and interviews within the testbeds, WP 8 will investigate current organisational learning and intelligence practices. The target group for these user studies includes both employees and management staff, e.g., quality managers.

Business Process Management (BPM) methodology will be used to examine the business processes of the testbeds. Since BPM offers methods and approaches for designing, modelling, executing, monitoring and optimising business processes, WP 8 intends to transfer these concepts to organisational learning processes with special focus on reflective learning.

5.7 WP9: Privacy

5.7.1 Research Interests for the User Studies

To support individual, collaborative and organisational reflection it is necessary that users share (collected) data as well as data that is created later in the reflection process (e.g. annotations as articulations of reflection outcomes). This seems like a question of sharing culture and trust between employees. This concerns on the one hand other employees on the same level of hierarchy as well as trust in supervisors or project leaders. We differentiate four fields related to privacy that we focus on in the user studies: Individual concerns, real sharing behaviour, trust in organisation, and trust in other users.

Several studies have found out that individual concerns about privacy are not directly related to the real behaviour of users when it comes to revealing and sharing data (e.g. Taylor, 2003, Acquisti and Grossklags, 2005, Cranor et al., 2000) and for social networks (Dwyer et al., 2007).

Influences on the behaviour may be short time benefits that persuade even users that rated themselves as "privacy fundamentalists"[1] to reveal personal information, especially on e-commerce sites. Other studies indicate that the design (Naone, 2010) or given information about how the data will be processed have an effect on the amount of data users are willing to share. This is why WP9 take a closer look at how data sharing is organized in the testbeds.

We also think that privacy concerns are closely related to aspects of trust: trust between individuals, towards a group as well as the organisation as whole, each with regard to an organisational and technical level. Evaluations of trust in the organisation have been designed, e.g. by (Dwyer et al., 2007), and (Smith et al., 1996) in other contexts. Results of this question may also influence MIRROR Apps in the way they store data. If the organisation is not trusted it may be useful to keep personal data only on personal devices or apply stronger cryptographic methods to prevent unauthorized usage.

Concretely, the following research questions shall be addressed:

<u>Individual privacy concerns</u>

i. What is the level of privacy concerns for different individuals?
ii. How important are privacy and informational self-determination to the employees?

<u>Real Sharing Behaviour</u>

iii. Which data (e.g., calendars, documentation or notes) exist?
iv. What are the data storing and processing procedures of the organisation?
v. Are employees aware of what data they share with whom?

<u>Trust In Organisation</u>

vi. How do the different types of trust influence the sharing behaviour?

[1] other groups are "privacy pragmatists" and "privacy unconcerned" (Westin, 2003)

vii. How is sharing of data within the organisation organized (what are the standard sharing options)?

Trust in other users

viii. How much and which data are employees willing to share and with whom?
ix. What influences the sharing behaviour (hierarchy, structure, personal relations)?

5.7.2 Research Approach

We plan to apply two methods for the study regarding privacy aspects in MIRROR, namely questionnaire and interview.

The questionnaire should be relatively short to allow a huge number of participants and a short time for answering. The questions may be adapted to fit the individual testbeds. For example we may ask INFOMAN on their calendar sharing practices in Outlook, but would avoid this question at RNHA since they do not use Outlook. The survey may be paper-based for testbeds where not all addressed participants have a computer workplace and an electronic version will be designed for BT. To measure individual privacy concerns we will use questions based on existing surveys on privacy concerns. There are surveys that measure privacy concerns in e-commerce settings that used three categories of users: privacy fundamentalists, which describe themselves as very cautious with sharing their personal data, the pragmatic majority that is concerned but share data if they are convinced that it is useful and unconcerned users, based on Westin (2003). Others focused on the concerns and categories of data privacy like Smith et al. (1996) and Cockcroft and Clutterbuck (2001) who developed a 16 Item standardized questionnaire asking for privacy concerns regarding the collection of data, errors of collected data, unauthorized secondary use (by external persons), improper access (by internals). We will analyze these surveys and derive relevant questions from them.

We will do interviews in some testbeds with a focus on trust perception and the question of how trust in the organisation as well as in the colleagues influences the way employees are willing to participate in collecting and sharing data.

5.8 WP1: Reflection Model and User Studies

5.8.1 Research Interests for the User Studies

Apart from the specific research interests of the different research work packages (WP3-WP9), one aim of the user studies is to refine the reflection model (WP1). Thus, WP1 also has specific research interests in the user studies.

Concretely, the aim of WP1 is at refining the conceptual understanding of learning by reflection in the workplace and its contribution to a holistic treatment of knowledge in the organisation by means of data collection within the testbeds. Building on the reflective learning model by Krogstie (2009), the user studies will advance the understanding of reflection in the workplace using a multitude of approaches in testbed partner organisations.

There is a need to understand when reflection is taking place as part of daily work within the specific circumstances and organisational culture. This is considered to be highly specific for different organisations, thus, WP1 addresses all five testbeds to be able to both *generalize* the knowledge gained from the user studies and to provide recommendations for applications that consider the *specific* needs and characteristics of each organisation.

Specifically, WP1 is interested on reflection practices AS IS in the testbeds including all three levels of reflection: Individual, team, and organisational learning through reflection. For these

levels of reflection, WP1 will assess triggers, occasions, frequency, supporting tools, and outcomes of reflection. Of special interest is the relationship between the three levels of reflection: How does individual and team reflection lead to organisational learning and knowledge creation? What is the role of tools and knowledge representations in bridging work and reflection across these levels?

Reflection AS IS

i. When and how does reflection currently take place?
ii. Which are occasions and triggers of reflection?
iii. Which are contents of reflection?
iv. What aspects of the work process are subject to reflection?
v. What is the outcome of reflection?

Learning AS IS

vi. To what degree do individual, team and organisational learning take place?
vii. What are interrelationships between individual, team and organisational learning?
viii. How are the outcomes of individual reflection shared and re-used within the company?
ix. How are the outcomes of team reflection shared and re-used within the company?
x. What is the role of tools in individual, team and organisational learning and in connecting them?

Technology to support reflection AS IS

xi. What technology is currently used by the employees that might be used for personal reflection or data collection?
xii. For what aspects of work are these tools used?
xiii. Is reflection currently aided by the use of tools, and if so, by which tools?

Organisational Reflexivity

xiv. Does organisational learning and intelligence take place within the testbeds?
xv. Are organisational routines and work practice object of change and innovation?
xvi. Is knowledge created and exchanged within the organisation?
xvii. Are there formal and informal organisational learning and intelligence practices?

5.8.2 Research Approach

WP1 will use some data gathered by other work packages, e.g. the job description questionnaire, IT checklists etc. Additionally, some reflection and learning questionnaires will be used in all five testbeds to compare relevant aspects for learning through reflection and assess the AS IS situation with respect to reflection and learning systematically. Reflection Diaries will be implemented to gather qualitative data on “reflection incidents”.

6 Integration of Research Questions for the User Studies and Toolbox Development

6.1 Integrated Research Questions for the User Studies

As mentioned in Chapter 1, the overarching research questions for the user studies are

(i) How do reflection and reflective learning currently take place within the testbeds, and how does technology support these processes?, and
(ii) What are current needs and ideas for supporting reflective learning in the future?

Taking together the interests of the different work packages (Chapter 5), the research questions for the user studies can be summarized into different topics, *namely Organisational context and work situation*, *Reflection (individual, collaborative and organisational perspective)*, *Learning at the workplace*, *Currently used tools and available data*, and *User experiences with, and attitude towards technology*.

Organisational context and work practice

One family of research questions refers to the organisational context and work situation. Questions are targeting the work tasks of the target group, the interaction and communication between the employees, and the context of the socio-technical solutions (MIRROR Apps) to be developed within the MIRROR project. Moreover, barriers, enablers and new opportunities for effective and integrated creative problem solving shall be addressed.

Reflection

Another group of research questions is focusing on the concept of ‘reflection’ in its multiple facets. The central question to be answered is to what extent reflection currently takes place in the testbeds. More specific questions look at individual and collaborative reflection, and its processes, contents, support, outcomes, etc. Future needs for individual and collaborative reflection shall also be looked at. In addition, research questions address the organisational perspective on reflection, and its role for organisational learning by asking which aspects of work practices of individuals and teams are relevant for organisational learning and organisational learning processes respectively. Existing tools and data that support individual and collaborative reflection and organisational learning shall also be investigated, and needs and requirements for tools that support reflection shall be elicited.

Learning at the workplace

One group of research questions is tackling learning at the workplace. While reflection always includes some kind of learning, learning may also happen without reflection. The questions in this group are looking at the degree to which individual, team and organisational learning take place within the company, to what degree employees are motivated to learn, and how personal learning goals relate to organisational goals. Desired outcomes of learning from work shall be looked at, and needs and requirements for tools that support learning shall be found.

Current technology usage and available data

Current technology usage and available data shall also be researched during the user studies. Questions to be answered are referring to technology that is currently used by the employees, aspects of work for which they are used, and to data that already is captured

within the company that could be used to support reflective learning at work. Most questions of this group can be asked to system administrators.

User experiences with and attitudes towards technology

One category of research questions refers to the target group's experiences with different kinds of technology, and about their attitudes towards technology. General questions are foreseen as well as specific questions with regard to serious games and solutions for creativity. Piloting of sensors including follow-up questionnaires and interviews is also foreseen. Moreover, aspects of privacy and trust shall be looked at.

6.2 Toolbox Development

The questionnaires, interview guidelines, and other materials of the toolbox were developed in close cooperation with the research partners and by taking into account the specific situation in the testbeds.

A Testbed Wiki (Chapter 6.2.1) was set up where information about each testbed was collected in a way that everyone in the project could access that information easily. Moreover, Testbed Visits were organized (Chapter 6.2.2), where all research partners had the chance to visit the testbed organisation, see the real work situation and talk to potential future users of the MIRROR Apps. In parallel, based on the research questions of the different work packages (Chapter 5), and in close cooperation with the researchers from WPs 3-9, data collection materials were then designed. Some of these materials, namely the testbed interview, a short version of the reflection questionnaire, and the reflection diary were applied in pilot studies (Chapter 6.2.3).

6.2.1 Testbed Wiki

6.2.1.1 Description

The testbed wiki is a platform to collect and structure all information about the testbed partners of MIRROR. The major goal of the testbed wiki is to give an overview of all testbed-related activities within the MIRROR project. It is intended as a "living" documentation of all discussions revolving around testbed characteristics, requirements, and development for testbeds throughout the project. This encompasses general descriptions and information about the testbed-partners, the description of the testbed-visits as well as all data about the user studies and in future all concerns about the App development for the specific testbeds.

As the wiki is able to deal with different file-types, it is easy to insert images, texts or videos, which will help to create a whole picture about each testbed partner and the concerning activities currently taking place. At the moment the testbed wiki contains general information about the testbed partners and additionally a complete documentation about the past testbed-visits.

6.2.1.2 Purpose

Up to now the testbed wikis have been used to collect characteristics of the work environment at the five testbeds, and documents the testbed visits (see Chapter 6.2.2)**.** All testbed partners were asked to provide information about their company or institution, insert it into the wiki and make it available for all other partners. This information includes general descriptions about the testbed partner, solutions and product information or medical care information as well as working processes. This gives all other partners the possibility to gain insights or impressions about the testbeds and get a picture about how the testbeds work and function. This information about the testbeds led to first ideas where reflection

might take place or where Apps developed within the MIRROR project might be used in. Furthermore, each testbed visit was collaboratively documented inside the testbed wiki.

6.2.1.3 Structure

The main page of the wiki starts with a short general description covering the purpose of the wiki and the corresponding links to each testbed partner pages. The starting page of each testbed partner includes a chapter about the “collected information about the partner” during the testbed visits, and general information about the partner. The general information section was inserted by the partners themselves and consists of a broad spectrum of data, depending on what the testbed partners want to share, including “briefings” for the testbed visits, expectations from MIRROR, challenges, information materials (brochures, links etc.), training materials etc.

Additionally, for all testbed partners, a detailed documentation about the testbed visits was inserted. Beside the agenda of the visits and the participants from the different partners, a complete documentation structured according the following criteria were collaboratively created, including photos as well as videos, documenting most of the interesting events of the visit.

1. Organisation
2. Work
3. Target Group
4. Learning
5. Technology and IT Infrastructure
6. Artefacts
7. Reflection AS IS
8. Reflection TO BE
9. Other Remarks
10. Videos

6.2.2 Testbed Visits

One and a half months after the MIRROR kick-off meeting, from August 17-20, 2010, Testbed Days were organized for visiting our testbed partners NBN, Infoman, BT and RNHA. An overview of the Testbed Days agenda is given in Figure 2. The testbed visit of Regola, our fifth testbed partner, could not be combined with these testbed days due to the holiday period in Italy. Thus, a separate testbed visit at the civil protection service in Turin (partner of Regola) took place on November 22, 2010.

	General Agenda - all Partners				
	Monday, August 16	Tuesday, August 17	Wednesday, August 18	Thursday, August 19	Friday, August 20
8:00 AM					
9:00 AM	WP1 Meeting	Test Bed Visit: Neurological Clinic Bad Neustadt	Test Bed Visit: Infoman, Stuttgart	UK Time! Test Bed Visit: British Telecom	UK Time! Test Bed Visit: RNHA
10:00 AM					
11:00 AM					
12:00 PM					
1:00 PM					
2:00 PM					
3:00 PM			Travelling to London	Travelling to Bury St. Edmonds	
4:00 PM					
5:00 PM	Travelling to Bad Neustadt	Travelling to Stuttgart/Tübingen			
6:00 PM					
7:00 PM					
8:00 PM					
9:00 PM					

Figure 2: Agenda for Testbed Days (August 17-20, 2010)

The testbed visits gave the research partners of MIRROR the possibility to visit the testbed partners physically to get an impression about their daily work and the concerning environments, including meeting rooms, coffee kitchens as well as technical equipment. Moreover, an "exchange of interests" took place in order to find out who of the research partners would like to cooperate more closely with which testbed(s) in the future. Additionally the first insights and impressions were collected about where reflection might occur, which serve as base for the first discussions about possible Apps and how it could be implemented and applied.

The agenda of each testbed visit was structured the following way:

1) Presentations or demonstrations of the testbed partners about their work, their issues and their training approaches.

2) Site visit, during which rooms, workplaces, technical equipment etc. (the "physical work environment") were presented.

3) Discussion session, where technical partners posed questions (e.g. about existing software, requirements, working processes etc.) and the first brainstorming for the project took place.

Each testbed visit was collaboratively documented and inserted into the testbed wiki. It was structured, as described in above, to cover all important information and facts. Additionally pictures and videos were included, where they were allowed to be taken.

Not every project member was able to participate in the testbed visits but many of them will need to know details about testbeds. IMC recorded testbed visits on video to provide all project members with a kind of direct impression of what the testbeds look like, for example in terms of work processes, work environment or field of business. Video documentation enables the entire, comprehensible transition of information without media transfer (as in textual reports) and ensures the traceability of written reports of testbed visits.

IMC produced video documentation of three testbed visits: BT, Infoman and RNHA. The NBN MIRROR project manager tried to obtain a video recording allowance for IMC, but it was not possible within the time frame before the visit, so NBN documented the visit with a still camera themselves and provided the photos in the testbed wiki.

The videos are available for the consortium in the testbed wiki. The length of the video recordings varies from 40 minutes to 1 hour 40 minutes per testbed. Video parts, like

presentations for the visitors, containing special testbed information of particular importance have been cut out and stored as separate video files, to allow quick access. The full length videos are available as well:

Contents of videos (BT):

- Who We Are And How We Work: description (structure, services), work cycle
- Technology: applied/existent technology's within BT
- British Telecom as a Testbed Partner: target group on applying Mirror Apps

Contents of videos (Infoman):

- Office Presentation: office in and outside, office apportionment, work-sharing regarding offices
- Who We Are And What We Do: business description (structure, legal form, services, partnerships)
- Procedure and Technology: procedures regarding Infoman's customers, applied/existent technology's within Infoman AG
- New Employees: information on new employees (selection, trainings), possibilities on applying Mirror Apps (retrieving knowledge from the new employees)

Contents of videos (RNHA):

- In and Outside: RNHA houses in and outside, workplace apportionment, division of the occupant area
- Who We Are: business description (structure, legal form, services, partnerships), work description, employees
- What is Dementia: elucidation of the medical condition, needs of dementia diseased persons, important factors
- IT: applied/existent technology's within RNHA, IT perception of the staff

In parallel to the testbed visits by all participants, KMRC carried out interviews with small groups of employees of each testbed partner in order to collect information about what tools (questionnaires, interview guidelines, data collection techniques, etc.) will be needed for the user studies. These interviews were not user studies themselves but only preparations for the user studies, which will be conducted in spring 2011.The results of these interviews were anonymised, revised and summarized, and presented to the MIRROR partners. The interviews cover information about the current work situation, the role of learning in the organisation, current practices on reflection, ideas for reflection tools, and a final statement.

6.2.3 Piloting Materials for User Studies

In order to test the applicability of some of the materials, KMRC carried out three pilot studies in the testbeds.

First, in the course of the testbed visits, we had the chance to carry out group interviews with staff from all testbeds where we could test a first version of the staff interview. Second, as a new employee started working at Infoman, we applied a pilot of the reflection diary with this employee. Third, in the course of regular (biennial) quality assurance survey at NBN, KMRC was invited to test a short version of the reflection questionnaire with the entire staff of the Neurological Clinic. This questionnaire will be distributed to the employees of NBN with the pay slip of December 2010. In the following, these pilots will be briefly described.

6.2.3.1 Staff Interviews during the Testbed Days

The purpose of the staff interviews during the testbed days was to understand, when and how employees reflect about existing work practices and what impact this reflection has on their current work. In addition, the purpose of the group interview was to acquire a deeper understanding of current work practices and current practices of learning within the organisation.

During the group interview, one interviewer asked open questions, another person observed and took notes.

Questions on the following topics were posed:

- Current work practice (incl. motivational structures, autonomy of workers)
- Role of learning/further education within the organisation
- Current practices of formal reflection (both individual and collaborative)
- Current practices of informal reflection (both individual and collaborative)
- Existing tools and media that are currently used for reflection/exchange of knowledge
- Short brainstorming about ideas for tools which could be helpful in the future

After a brief introduction round, the interviewer encouraged the participants to discuss their points of view, in order to find similarities and differences between individuals. The discussion was focussed on examples and individual experiences, thus no preparation of the participants was needed. The group interview took 90 Minutes approximately. If the participants agreed, the session was audio recorded in order to be able to analyze the findings in more detail afterwards.

The interviews were transcribed - while ensuring anonymity of the participants - and the answers were paraphrased and categorised. These executive summaries were then shared with the MIRROR consortium to inform both theory development and tool development.

The interview guideline of the staff interview was revised according to the lessons learned and is now partly included in the interview guidelines of the toolbox (job description interview, reflection interview, see Part B of the deliverable).

6.2.3.2 Infoman: Reflection Diary

For the purpose of piloting materials, and in order to seize the opportunity of having the view of a new employee within an organisation, a new employee of Infoman was asked to fill a pilot of the reflection diary.

After an extensive introduction about what is MIRROR, what we mean by “reflection”, and what is the purpose of the diary, the employee was given the following instruction:

We would like you to do the following exercises:

- *A daily exercise includes questions that shall be answered on a daily basis (e.g. in the afternoon after a work day); This daily exercise shall only be done in the first two weeks at your new work place*
- *There are two weekly exercises that shall be filled at the end of each week between September 1, and the end of the year.*

Then, the participant found three types of tables where he should enter (i) Things that puzzled him on that day (daily exercise), (ii) Things that he had thought about outside the work place (weekly exercise), and (iii) Things that triggered reflection (weekly exercise)

For each of these exercises, he should give a brief description (who was involved, context, etc.), a reason why this had happened, and he should describe what were the consequences. The table for the “daily exercise” in German is depicted in Figure 3.

Dinge, die ich heute bemerkenswert gefunden habe
(d.h. unerwartet, unklar, kritisch, herausfordernd, überraschend, etc.).

Für jeden Tag in Ihren ersten zwei Wochen bei der Infoman AG würden wir gerne wissen, welche Ereignisse sie **bemerkenswert fanden** (d.h. unerwartet, unklar, kritisch, herausfordernd, überraschend,, etc.). Beschreiben Sie diese Ereignisse/Situationen kurz (z.B. Zeitpunkt, beteiligte Personen, Ihre Aufgaben/Aktivitäten), und was die Konsequenzen der Reflexion waren (vielleicht haben Sie beschlossen, etwas anders zu machen, oder Sie sind zu neuen Einsichten und Überzeugungen gekommen).

Bitte verwenden Sie die folgende Tabelle für Ihre Aufzeichnungen. Bitte machen Sie Kopien von der Tabelle für Ihre Eintragungen.

Datum:

Ereignis/ Gegenstand/Situation/Thema, das mich zur Reflexion angeregt hat	
Warum habe ich darüber nachgedacht?	
Kurze Beschreibung (**Wann** war es, **wer** war beteiligt, **Kontext,** in dem es passiert ist, **was war anders als erwartet**, etc.)	
Was waren die **Konsequenzen**? (z.B. haben Sie etwas daraus gelernt oder etwas anders gemacht?)	

Figure 3: Reflection diary for pilot study at Infoman (extract) – “Things that puzzled me today”

The new employee at Infoman filled the “daily version” of the diary on every day between September 6 and September 16. In addition, he filled the “weekly version” six times, namely every week between September 6 and October 29, 2010.

The diary was easy to use, and produced rich data on reflection incidents. From that it is concluded that the diary is a useful data collection technique that can be applied to collect self-reports on reflection.

6.2.3.3 Employee Survey at NBN

Every two years, NBN carries out a quality assurance survey with their staff where they have to fill a questionnaire with questions regarding their satisfaction with multiple aspects of their work. For 2010’s quality assurance survey, we had a chance to pilot a short version of our reflection questionnaire. Concretely, we were allowed to add 12 items on individual and collaborative reflection at work (Figure 4, the English version is below the German items). These questions were discussed within NBN and revisions were made in order to improve the comprehensibility of the questionnaires for the staff. The quality assurance questionnaires will be distributed to the NBN staff together with the pay slips in December 2010. The results will be analysed at the beginning of 2011. The findings will be taken into account for selecting participant groups for the on-site user studies.

Reflection Scale (KMRC) – DE (kurz)

Bitte geben Sie für jede der folgenden Aussagen an, wie sehr sie zustimmen:	*Stimme garnicht zu*	*Stimme weniger zu*	*Stimme teilweise zu*	*Stimme völlig zu*
Ich habe häufig das Bedürfnis, über meine Erfahrungen bei der Arbeit nachzudenken.	☐	☐	☐	☐
Ich habe ausreichend Zeit, über meine Erfahrungen bei der Arbeit nachzudenken.	☐	☐	☐	☐
Man wird in unserer Organisation dazu ermutigt, über seine Erfahrungen bei der Arbeit nachzudenken.	☐	☐	☐	☐
Ich denke häufig über meine Erfahrungen bei der Arbeit nach.	☐	☐	☐	☐
Es hilft mir, über meine Erfahrungen bei der Arbeit nachzudenken.	☐	☐	☐	☐
Wir überlegen uns als Team, was wir aus vergangenen Erfahrungen lernen können	☐	☐	☐	☐
Wenn wir als Team erfolgreich waren, nehmen wir uns die Zeit und denken darüber nach, wie wir das erreicht haben.	☐	☐	☐	☐
Wenn die Dinge nicht so laufen wie sie sollen, versuchen wir als Team herauszufinden, was der Grund dafür ist.	☐	☐	☐	☐
Wir diskutieren regelmäßig, ob wir als Team erfolgreich zusammenarbeiten.	☐	☐	☐	☐
Wenn ich denke, dass ich meine Arbeit nicht gut gemacht habe, diskutiere ich mit meinem/r Vorgesetzten, wie ich mich verbessern kann.	☐	☐	☐	☐
Wenn ich denke, dass ich meine Arbeit nicht gut gemacht habe, diskutiere ich mit Kollegen, wie ich mich verbessern kann.	☐	☐	☐	☐
Ich mache mir häufig Gedanken darüber, wie man in unserer Organisation Dinge verbessern kann.	☐	☐	☐	☐

Figure 4: Reflection short scale for NBN pilot study (German version)

Respective items in English:

- Sometimes I feel the need to think over what I have been doing and consider alternative ways of doing it.
- I have time to think about my work.
- In our organisation, we are encouraged to think about our work practices.
- I frequently think about my work.
- I benefit from thinking about my work.
- As a team, we work out what we can learn from past activities.
- If we are successful as a team, we take the time to analyse how we achieved this.
- If things don't work out as they should, we take the time as a team to find the likely cause of the problems.
- We regularly discuss whether the team is working effectively.
- If I think I have done my work badly, I discuss this with my supervisor.
- If I think I have not done my work well, I discuss this with colleagues.
- I come up with ideas how things could be organised differently here.

7 Toolbox

Starting from the integrated view on research topics (Chapter 6.1) and taking into account the desired methods of the research partners as well as situational constraints in the testbeds (which we learned from the Testbed Visits, Chapter 6.2.2), we developed a toolbox of 15 tools (interview guidelines, questionnaires, etc.) which will enable us to answer all the different research questions. In the following, for each of the broad research topics, we name the tools that may be useful to answer research questions in these topics. These tools will be described in more detail below. In two cases, in Chapter 5, research approaches were described in the work packages that are not related to tools, namely context models and business process management methodology.

Organisational context and work practice

- *Job Description Interview:* questions about duties and responsibilities, current work practice, learning and training issues, team work, communication and coordination
- *Work Observation Scheme:* observation form for work practice with a special focus on team meetings, coordination, and communication

Reflection (individual, collaborative and organisational perspective)

- *Reflection Interview:* individual, collaborative and organisational aspects of reflection.
- *Reflection Diary:* explorative tool for examining reflection AS-IS during daily work
- *Reflection Questionnaire:* AS-IS situation of individual and collaborative reflection
- *Organisational Reflexivity Questionnaire:* to be answered by management staff; examines the AS-IS situation of organisational learning, change and reflexivity

Learning at the workplace

- *Needs and Requirements Analysis for Organisational Learning and Intelligence:* interview guideline examining the end users' needs and requirements with respect to organisational learning and respective technology
- *Organisational Learning Management Interview:* interview questions for management staff to examine organisational learning and intelligence practice
- *Learning at Work Questionnaire* questions on the status of and relationship between individual learning, team learning and organisational learning

Current technology usage and available data

- *Available Data Checklist*: checklist for data available within the testbed that could be used for reflection purposes
- *IT Checklist:* structured interview guideline for an interview with a system administrator about the IT infrastructure of the target organisation

User experiences with and attitude towards technology

- *IT Attitudes & Usage Questionnaire:* questions about general attitudes towards and usage of different kinds of technology (including sensors and serious games)
- *Privacy Questionnaire:* questions on sharing of information, trust within teams, trust in the organisation, and the organisation's handling and use of personal data
- *Serious Games Experience with In-Depth Interview:* interview guideline to acquire requirements with regard to serious games
- *Capturing Pilot Study Guidelines:* description of how to carry out a pilot study to test the applicability and usability of sensor data; diary with follow-up interview cover the acceptance of sensor data of the users

Table 2 gives an overview of the toolbox that has been developed to answer the research questions named in Chapter 6.1.

Table 2: Overview of tools in the toolbox

Name of the Tool	Type	Main Topic(s)
Available Data Checklist	Checklist	Current Technology Usage and Available Data
Capturing Pilot Study Guidelines	Pilot Study with Interview	User Experiences and Attitudes towards Technology
IT Attitudes & Usage Questionnaire	Questionnaire	User Experiences and Attitudes towards Technology
IT Checklist	Checklist	Current Technology Usage and Available Data
Job Description Interview	Interview	Organisational context and work situation, to be combined with work observation scheme
Learning at Work Questionnaire	Questionnaire	Learning at the Workplace
Needs and Requirements Analysis for Organisational Learning and Intelligence	Focus Group, Interview	Learning at the Workplace
Organisational Learning Management Interview	Interview	Learning at the Workplace
Organisational Reflexivity Questionnaire	Questionnaire	Reflection
Privacy Questionnaire	Questionnaire	User Experiences and Attitudes towards Technology
Reflection Diary	Diary	Reflection
Reflection Questionnaire	Questionnaire	Reflection
Reflection Interview (also to be used as Diary Interview)	Interview	Reflection
Serious Games Experience with In-Depth Interview	Practical Experience and In-depth Interview	User Experiences and Attitudes towards Technology
Work Observation Scheme	Observation	Organisational context and work practice, to be combined with Job Description Interview

7.1 Tools

In the following, we will give a brief description of each of the tools including the purpose and target group(s) for which the tool shall be applied (in alphabetical order). The tools themselves can be found in the appendix of this Deliverable. Additional materials (consents, participant forms etc.) will be described in Chapter 7.2.

7.1.1 Available Data Checklist

Of special interest for: **WP3**

Purpose: The Available Data Checklist can be used to first create a list of available data/information in the testbed. This is a different from the mere IT Infrastructure covered in the "IT Checklist" as here the focus is data-centric. Given that sometimes employees are not aware of the available information, in an optional second step the members of the target group can be asked about their awareness and usefulness of the data/information. *Note:* To assess the technical infrastructure see IT Checklist.

Research Questions to be answered:

- Which data (e.g. calendars, documentation or notes) exist?
- Of which data is the target group aware that might be useful for supporting reflection?

Target Group: IT/System administrator or the like, as an optional second step the potential users of MIRROR Apps can be asked whether they are informed about the data

Description: The available data checklist consists of two parts. Note that to answer the question what technology could be used for reflection the person has to have a working understanding what reflection is. See "Short Explanation of Reflection".

Part I: Available Data/Information and Awareness of Data: This is a more technical/ managerial approach – it needs a person who knows which data is available and who has access to it. It probably captures more the formal "as it should be" status in the organisation. It should be used to first create a list of the data/information available in the organisation and then members of the target group should be asked specifically whether they have access to the data/information and know about it.

Part II (optional): Awareness of Data/Information of Members of the Target Group: If a list of available data/information is collected, members of the target group can be asked specifically about their awareness of the data/information and the use they see in it for reflection. The first step should be to let participants recall freely which data/information they have access to. Then the list should be presented and participants should be asked specifically about each data/information.

7.1.2 Capturing Pilot Study Guidelines

Of special interest for: **WP3**

Purpose: The Capturing Pilot Study Guidelines are used to conduct a small pilot study regarding the applicability of sensor technology in selected test beds and the possible benefits and problems it might provide. It is intended as a first test without necessarily fixing sensors and assessed data. Given that the used sensors likely are unknown to most of the target group, this tool serves as a 'field test' to assess user acceptance and data quality. The sensor data of this pilot study can be assessed, for example, for its quality (e.g., whether there is a continuous stream of data), environmental influences (e.g., whether the data is systematically biased by some activities), and its correlation to specific activities or psychological states (e.g., stress) of the wearer. Given that stress might point to issues at

work that might be resolved through reflection, the possible relation between stress and incongruence (as trigger of reflection) and the importance of stress in at least one testbed, one aim is to identify phases of high stress via physiological measures. The interview allows an estimation under which conditions a deployment of the sensors on larger scale will be possible.

Research Questions to be answered:

- What are the attitudes toward the use of specific technologies to capture data?
- Which sensors are applicable in the test bed?
- Is the usability of these sensors sufficient for larger deployments?

Target Group: Members of the MIRROR App target audience.

Description: The tool consists of a description of the study setup, two consent forms for the sensors and the diary, the daily diary questions and an post-study interview. The interview assesses the users experience with the sensors and the reasons why stress-diary entries were not done (if this is the case). The stress diary with closed questions is mandatory. The interview with open questions is optional.

7.1.3 IT Attitudes & Usage Questionnaire

Of special interest for: **WP3, WP4, WP7, WP8**

Purpose: The IT Attitudes and Usage Questionnaire assesses the relevant attitudes to technology in the target group to ensure that users of the MIRROR Apps accept the proposed computer programs and can use them. It should be applied broadly in the MIRROR test beds.

Research Questions to be answered:

- What is the general attitude towards technology usage?
- What are the attitudes toward the use of specific technologies to capture data?
- What are the target group's attitudes towards serious games?
- What is the current use of serious games (private/work/leisure) if any?

Target Group: The target group are the future users of the MIRROR Apps.

Description: The tool consists of a general part that deals with attitudes and usage of computer technology in general and related to smart phones and two specific parts that are highly relevant for two MIRROR work packages: sensors to capture information (WP3) and Serious Games (WP7). Both specific parts can be answered without the need of a personal experience with the sensor technology/Serious Games first.

7.1.4 IT Checklist

Of special interest for: **all**

Purpose: The purpose of this checklist is to get a good overview of the available technology in the testbed. The first part can be answered without knowing what reflection is, given that the questions focus on hard- and software only. To assess which technology can be used for reflection a short definition is available under “Additional Material”. For information about *available data/information* that can be used for reflection and employees awareness of these uses see “Available Data Checklist”. For the technology that is privately owned by the employees see “IT Attitudes & Usage Questionnaire”.

Research Questions to be answered:

- What technology is currently used by the employees that might be used for personal reflection or data collection?
- What technology is currently used by the employees that might be used for individual or collaborative reflection in the future?

Target Group: Most of the questions can probably be answered by the system administrator, but some policy questions may be needed to address to the management. Regarding the personal availability of private devices, the target group must be asked.

Description: The checklist assesses the responsible person for further IT related questions, the general technical infrastructure/equipment in regard to PCs for individual employees and shared PCs, mobiles, planned changes in the infrastructure, and the connectivity of the testbed (in terms of Internet access). A second part addresses the use of specific technological infrastructure for reflection.

7.1.5 Job Description Interview

Of special interest for: **WP3, WP5, WP6**

Purpose: The Job Description Interview allows the structured assessment of the job a person has with regard to multiple aspects (see description).

Research Questions to be answered:

- What is the current work context of users in the test beds in terms of interaction and communication, and the context of the socio-technical solutions (Mirror Apps) to be developed within the project?
- What are barriers of and enablers to effective and integrated creative problem solving
- What new opportunities exist for effective and integrated creative problem solving

Target Group: MIRROR target group.

Description: The Job Description Interview consists of multiple questions regarding various aspects that characterise work practice within the test beds such as formal assessment practices, contacts and communication, collaborative work and coordination of work, knowledge, skills and experience needed, learning in the workplace, and creative problem solving. The Job Description Interview might be combined with the Work Observation Scheme to get a comprehensive overview of daily work practice of future end users of MIRROR apps.

7.1.6 Learning at Work Questionnaire

Of special interest for: **WP1**

Purpose: The Learning at Work Questionnaire sheds light on the interrelationships of individual, team and organisational learning and assesses the status of each learning type at the test beds.

Research Questions to be answered:

- To what degree do individual, team and organisational learning take place?
- What are interrelationships between individual, team and organisational learning?

Target Group: All employees, special focus might be the target group of MIRROR, but this is not obligatory.

Description: The questionnaire consists of several items divided in three subscales that cover individual, team, and organisational learning.

Important Note -- Reversed Items: Some items are inverse scaled and must be reversed for analysis!

7.1.7 Needs and Requirements Analysis for Organisational Learning and Intelligence

Of special interest for: **WP8**

Purpose: This interview guideline is to assess organisational learning and organisational intelligence practices and any related needs and deficiencies.

Research Questions to be answered:

- Which concepts that support organisational learning and organisational intelligence are employees aware of?
- Which barriers hinder organisational learning and organisational intelligence within the testbeds?
- Does any technology support already exist in the testbeds which enables organisational learning and organisational intelligence?
- Are there any negative user experiences with existing software and learning systems within the testbeds that should be taken into account when designing an intuitive and interactive user interface for an organisational profile?

Target Group: MIRROR target group, all employees.

Description: The Needs and Requirement Analysis for Organisational Learning and Intelligence provides information on the MIRROR target group's awareness of organisational learning and intelligence practices and any related needs and deficiencies. It covers both the AS IS situation and the TO BE situation within the test beds. As it addresses all employees it complements insights from the Organisational Learning Management Interview, which addresses the management's perspective.

7.1.8 Organisational Learning Management Interview

Of special interest for: **WP8**

Purpose: This management interview provides insights into organisational learning and organisational intelligence practices at the five testbeds from the view of the involved managers. The sample shall consist of members of the management, e.g., responsibles for Quality Management if available.

Research Questions to be answered:

- Which concepts already exist to support organisational learning and intelligence based on tacit knowledge?
- Which barriers hinder organisational learning and intelligence within the testbeds?
- Does any technology support already exist in the testbeds which enables organisational learning and intelligence based on tacit knowledge?
- Which (aggregated) information on individual or group work practice can provide the organisation with meaningful information (so-called organisational profile) in order to support organisational learning and intelligence based on tacit knowledge?
- Are there any negative user experiences with existing software and learning systems within the testbeds which should be taken into account when designing an intuitive and interactive user interface for an organisational profile?

Target Group: Management - Learning Director, Human Resources, Knowledge Management, etc.

Description: This interview addresses various aspects of organisational learning and organisational intelligence for a management perspective, such as formal and informal knowledge exchange, learning, organisational change and innovation practices, and technology for organisational learning and intelligence. It also sheds light on needs and requirements from a management perspective. It complements insights from the Needs & Requirements for Organisational Learning Interview, which addresses the employee's perspective.

7.1.9 Organisational Reflexivity Questionnaire

Of special interest for: **WP8**

Purpose: The Organisational Reflexivity Questionnaire assesses - from the perspective of the Management - the role of organisational learning and organisational intelligence in a testbed.

Research Questions to be answered:

- Does organisational learning and organisational intelligence take place within the testbeds?
- Are organisational routines and work practice object of change and innovation?
- Is knowledge created and exchanged within the organisation?
- Are there formal and informal organisational learning and organisational intelligence practices?

Target Group: Management of test beds, might be Learning Units, etc., but also general management.

Description: The questionnaire consists of 25 Likert scale items. *Important Note -- Reversed Items:* Some items are inverse scaled and must be reversed for analysis!

7.1.10 Privacy Questionnaire

Of special interest for: **WP9**

Purpose: The purpose of the Privacy Questionnaire is to assess the stance of the testbed employees regarding privacy - which includes sharing of information, trust in team members, trust in management staff, and concerns with regard to the handling of personal data by the organisation.

Research Questions to be answered:

- What is the level of privacy concerns for different individuals?
- How comfortable are the users with these policies?
- What influences the sharing behaviour (e.g., hierarchy, structure, personal relations)?
- How do the different types of trust influence the sharing behaviour?

Target Group: End-Users of the MIRROR-Apps

Description: The questionnaire will shed light on the four separate issues of General Privacy Concerns vs. Real Sharing Behaviour as well as Trust in Management and Trust in Colleagues. Trust is the key issue that impacts the willingness to share personal information. The questionnaire will be applied within all testbeds either paper-based or as a web-based questionnaire. *Important Note -- Reversed Items:* Some items are inverse scaled and must be reversed for analysis!

7.1.11 Reflection Diary

Of special interest for: **WP1, WP4**

Purpose: The purpose of the reflective incident technique is to find specific instances where reflection has occurred and capture them in rich detail. While this method can be used to assess memorable incidents of the past, it works best if it is used as a diary during or at the end of the day.

This method should deliver highly detailed descriptions of reflection events that can be used for further questions (e.g., regarding the frequency of these incidents) and for the identification of concrete aspects of reflection in a given workplace. An additional set of questions to be filled out after the task is finished should give information about tools that would assist the user in remembering these events and reflecting about them. Research Questions to be answered:

- Does reflection currently take place in the test bed?
- When and how does individual reflection occur at work?
- What are the objects of reflection: Cases/Tasks/Patients/Clients?
- What is the outcome of reflection and how is it documented?
- Which activities, or which aspects, are relevant for reflection on the work and learning practices from others?

Target Group: The target group are people who have personally experienced incidents of reflection. In the context of the MIRROR project, the target group are the users of the MIRROR Apps. This technique requires writing longer texts (about 1/2 to 1 page per incident). Typewriting skills are helpful. For a target group which is not comfortable with writing, the questions can also be asked in an interview (difficult if the incident is private) or recorded.

Description: The Reflection Diary consists of 4 open-ended questions. The participant is asked to answer the reflective incident questions regarding incidents that made them reflect, i.e., incidents that surprised/challenged/confused them or made them curious or think. The time needed to answer the questions is about 10 minutes per incident. An additional set of questions takes a meta-perspective on these incidents and asks what the participant would need to better remember the similar incidents in the future and tools that would help him/her reflect.

7.1.12 Reflection Questionnaire

Of special interest for: **WP1, WP4, WP6**

Purpose: This questionnaire assesses the degree of reflection in the test beds. It includes aspects of individual, collaborative and team reflection as well as reflection for the purpose of organisational learning and learning by comparison with colleagues. Reflection attitudes, the need and the opportunity to reflect are assessed.

Research Questions to be answered:

- Does reflection currently take place within the testbeds?
- Is reflection experienced as beneficial?
- Is there time to reflect during a work day?
- Which are the attitudes with regard to reflection?
- Does reflection contribute to organisational learning?

Target Group: MIRROR target group, all employees

Description: This questionnaire consists of 40 items which deal with individual reflection, collaborative reflection, team reflexivity, organisational learning through individual/ collaborative reflection, and learning through comparison.

Important Note -- Reversed Items: Some items are inverse scaled and must be reversed for analysis!

7.1.13 Reflection Interview (also to be used as Diary Interview)

Of special interest for: **WP1, WP4, WP6**

Purpose: The Reflection Interview allows the structured assessment of reflection with regard to multiple aspects (see description).

Research Questions to be answered:

- Does reflection currently take place in the test bed?
- When and how does individual reflection occur at work?
- What are the objects of reflection: Cases/Tasks/Patients/Clients?
- What is the outcome of reflection and how is it documented?
- Which activities, or which aspects, are relevant for individual reflection on the work and learning practices from others?
- Which data/information is available/used for reflection?
- Is reflection currently aided by the use of tools, and if so, by which tools?
- What are the outcomes of reflection and how are they documented?
- In which situations would people benefit from reflection in the future?
- Which data should be available for reflection in the future?
- What technology is currently used by the employees that might be used for reflection in the future?

Target Group: MIRROR target group.

Description: The Reflection Interview assesses various aspects of reflection including frequency of reflection, triggers for reflection, outcomes of reflection, inclination to reflect on own work, collaborative reflection, learning through comparison with colleagues, awareness of data/information as the basis for reflection, documentation of reflection processes and outcomes, sustainability of reflection, reflection for organisational learning, and perceived appreciation of reflection by the management. The Interview Guideline allows for different foci on various aspects of reflection - it shall be used based on specific research interests.

7.1.14 Serious Games Experience with In-Depth Interview

Of special interest for: **WP7**

Purpose: The aim of this tool is to get the target groups expectations and requirements of serious games after first confronting them with an example of a Serious Game. Given that many people will have insufficient knowledge about serious games, participants of this tool must first be confronted at least with one serious game, e.g., a mock-up or a working example of a serious game. This will allow them to gather some practical experience and working knowledge what a serious game is and can do for them.

Research Questions to be answered:

- What are the target group's attitudes towards serious games?
- What is the current use of serious games (private/work/leisure) if any?
- What experiences and skills do they have with serious games?
- What are the target group's expectations towards the use of serious games?
- What benefits are expected from using a new technology?
- Which situations/scenarios would the target group like (or consider meaningful) to have a serious game for?

Target Group: MIRROR target group.

Description: The tool consists of two parts: Part I describes the confrontation of the interviewee with a serious game/serious game mock-up. Part II includes the interview questions for the post-confrontation in depth interview. This interview will give insights into the target group's readiness for serious games, their expectations and needs, and requirements for a serious game app.

7.1.15 Work Observation Scheme

Of special interest for: **WP3, WP6**

Purpose: This observation scheme shall help researchers to get rich data about current work and reflection practice in a systematic way.

Research Questions to be answered:

- Does reflection currently take place in the test bed?
- In which situations does collaborative reflection take place?
- Who reflects with whom?
- Which data / information is available/used for collaborative reflection?
- What are the outcomes of collaborative reflection and how are they documented?
- What are barriers of and enablers/motivators to transitions between individual, group, and organisational level?
- In which situations would people benefit from collaborative reflection in the future?
- Which (further) persons should participate in the collaborative reflection?
- Are there more situations/events/problems which should be reflected on in a team?

Target Group: MIRROR target group

Description: The observer will join a targeted end-user in her or his daily work to get a deeper understanding of daily work practice, occasions of reflection, and opportunities for the implementation of future MIRROR-Apps. After the observation, people are interviewed based on the outcomes and interesting findings of the observation for clarification purposes and interpretation of the results.

7.2 Additional Materials

The following additional materials are contained in the toolbox.

- **MIRROR Project Information:** The MIRROR Project information is a short paragraph about the MIRROR project. This can be used as introduction to a questionnaire, or interview.

- **Short Explanation of Reflection:** The short explanation of reflection is a brief paragraph on the understanding of reflection within the MIRROR project including various examples for triggers of reflection. This can be used as introduction to a questionnaire, or interview.

- **Participant Form:** The Participant Form is a form for noting information about participants, specifically in interviews. Slightly modified, the participant form can also be used to collect socio-demographic information about participants in questionnaires.

- **Consent for Group Interviews:** The Consent for Group Interviews is a declaration of privacy and ethics to be signed by the participants and the interviewer before a group interview. Slightly modified, the participant form can also be used for individual interviews, or observations.

- **Follow-Up Questionnaire for Group Interview:** The follow-up questionnaire for the group interview is a 3-item questionnaire to be filled anonymously by the participants of a group interview. The purpose of the follow-up questionnaire is to have an estimate of how openly the participants could answer.

- **Interviewer's and Observer's Diary:** The Interviewer's Diary and Observer's Diary is a brief form where the interviewer and observer of a group or individual interview can briefly document their observations (and feelings) during a group interview. This information may be useful for interpreting the data from the interview at a later data, and also for improving the interviewer's interview skills.

- **Introduction to Diary Study:** The Introduction to Diary Study is a brief paragraph that explains the MIRROR project, and the purpose of the diary study to a participant.

- **Consent for Diary Study:** The Consent for Diary Study is a brief form to be filled by a participant in a diary study where he or she can explain who may receive the information in the diary, if the information needs to be approved by the employer, etc.

8 Code of Conduct of User Studies

User studies involve employees of our testbed organisations who perform tasks during their work. It is not expected to record the experiments on video but to monitor and analyze their behaviour in order to design effective reflection Apps. The most established set of guidelines for conducting (usability) studies is the **Code of Conduct of Usability Professionals** (Usability Professionals Association, UPA http://www.usabilityprofessionals.org) which can be generalized to user studies as foreseen in the course of the MIRROR project:

> *6. Respect Privacy, Confidentiality, and Anonymity*
>
> *6.1. Researchers shall not reveal information that identifies colleagues or participants without their permission and shall take reasonable precautions to avoid such information from being disclosed unintentionally.*
>
> *6.2. Researchers shall ensure that participants in any study provide informed consent for use of all data collected.*
>
> *6.3. Researchers shall never disclose in their writings, reports, teaching materials or other public media or otherwise make public any information they have acquired about persons, employers or clients in the course of their professional work unless disclosure is both legal and that they have either taken reasonable steps to disguise the identity of the person, employer or client, or they have the express permission to disclose.*

The following principles (similar with Burmeister, 2001; Dumas and Redish, 1994, pp. 205-208) shall be followed when carrying out the user studies:

- **Minimal risk:** User testing should not expose participants to more than minimal risk (e.g., psychological or sociological risks)
- **Information:** Informed consent implies that information is supplied to participants: the procedures you will follow; the purpose of the test; any risks to the participant; the opportunity to ask questions; and, the opportunity to withdraw at any time.
- **Comprehension:** The facilitators need to ensure that each participant understands what is involved in the test. This must be communicated in a clear manner, and done so as to completely cover the information on the Informed Consent form that should be used.
- **Voluntary nature of participation**: Coercion and undue influence should be absent when the person is asked to give their consent to participate in the test.
- **Confidentiality:** Confidentiality is different from the participant's right to privacy; it refers to how data about the participants will be stored. The ACM Code of Ethics and Professional Conduct (http://security.isu.edu/acm_ethics.htm) has specific clauses on constraining access to certain types of data, and on organisational leadership to ensure confidentiality obligations are adhered to within organisations.
- **Waivers:** Permission needs to be obtained from participants to use materials such as questionnaires, audio and video recordings (and their transcripts). Participants should be given the option of having the data used for the purposes of the test, or of also having it used in a wider context.
- **Documentation** that adheres to such policies and procedures is going to be defined and used throughout the studies.

9 Preparation and Sharing of Data

Some of data collected during the user studies will probably be identified as "**personal data**". In the case of acquisition of personal data, we have to make sure that we adhere to the respective European and local legislation and guidelines. "Personal data shall mean any information relating to an identified or identifiable natural person ('data subject'); an identifiable person is one who can be identified, directly or indirectly, in particular by reference to an identification number or to one or more factors specific to his physical, physiological, mental, economic, cultural or social identity". This chapter provides guidelines for a pragmatic approach that will ensure that the collected personal data will only be used for the analyses of the results of the user studies and the reporting of the results. The guidelines will ensure that the "personal data" that has been acquired is treated with the utmost care to ensure that the privacy of individuals will not be at risk by abuse of this data.

9.1 Protection of Personal Data

The protection of personal data within Member States of the European Community is regulated by the European Parliament and Council Directive 95/46/EC of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data [Official Journal L 281 of 23.11.1995]

9.1.1 Object of the Directive 95/46/EC

1. In accordance with this Directive, Member States shall protect the fundamental rights and freedoms of natural persons and in particular their right to privacy with respect to the processing of personal data.
2. Member States shall neither restrict nor prohibit the free flow of personal data between Member States for reasons connected with the protection afforded under paragraph 1.

9.1.2 National Law applicable

Each Member State shall apply the national provisions it adopts pursuant to this Directive to the processing of personal data. The user studies will take place at the MIRROR Testbed partners having their main base in the United Kingdom (BT and RNHA), Germany (INFOM and NBN), and Italy (REG). Table 2 gives an overview of the laws that apply in the EC Member States where MIRROR partners are located.

It could be that each organisation has its own specific provisions defined for the treatment of personal data of their employees or related individuals as well as the local laws that apply. Company specific arrangements cannot be conflicting with EU or National Laws, of course. Sometimes, however, organisational regulations are more specific and refer to the existing technologies and practices while law tends to be more general.

Table 3: Overview of data protection laws that apply in the EC member states of MIRROR partners

Member State	**MIRROR Partner**	**Law**
United Kingdom	BT, RNHA, CITY	Data Protection Act
Italy	REG, IMA	Codice in materia di protezione dei dati personali
Germany	INFOM, NBN, IMC, DFKI, RUB, FZI, KRMC	Bundesdatenschutz and federal laws
Austria	KNOW	Datenschutzgesetz 2000, and Landesdatenschutzgesetz 2001 (federal law, Styria)
Norway	NTNU	Personal Data Act of 2000
The Netherlands	TQ	Wet Bescherming Persoonsgegevens

9.1.3 Common principles

We feel that it is beyond the objective of this guidance to give a detailed summary of the provisions of the above mentioned laws. However we found the underlying principles in these laws to be very similar (as a consequence of the EU directive). Therefore we have identified the following common principles on which we will base our guidelines for handling personal data within the MIRROR project:

1. Fair and Lawful processing (Consent)

- Data collection should apply according to local privacy principles and laws.
- A consent form should be signed by the data subjects. For questionnaires, the act of filling out the questionnaire can be construed as implicit consent however before being asked to fill out the questionnaire the data subjects should be informed about the purpose of the data collection, the policies of data handling in the project as well as about possible consequences.
- The usage of secondary data (that is data which is not collected directly from, and with knowledge of, the data subject) should be preferred. If primary data, e.g. data from regular work processes, is used a separate consent should be gathered.
- Researchers should sign a non-disclosure agreement (e.g., a statement like “I will not disclose any data from the testbeds without the consent of the user”); The non-disclosure agreement should be signed on time for each person that uses testbed data that refers to identifiable individuals (not if they only work with anonymous data).
- In published results (e.g., scientific papers, deliverables) the individual should never be identifiable.

2. Specified purpose

- Inform the data subject about with whom the data will be shared and what the purpose of the data collection is.
- When using the data, researchers should be aware of the purpose for which the data was collected. Change of purpose must be documented and remain in a research context.
- Specified purpose also means no disclosure to third parties outside the MIRROR Group. Sharing inside the MIRROR group should only be of unidentifiable or coded data and any raw material should remain only with the persons or institutions that collected it in the first

place. Raw data means the data collected in the testbeds before any kind of alteration, e.g. the original written or recorded Interviews.

3. Do not keep more data, or keep it longer, than necessary

- Delete or pseudonymise data, or better anonymise it, so there is no link to the individual) as soon as possible (for definitions of pseudonym and anonym see Pfitzmann A, Hansen M., 2010).
- The data should not be kept longer than necessary for the purpose it is needed.

4. Data subjects' rights

- The data subjects should have the right to access and correct the data if requested.

5. Security

- Data should be handled proportionately to the sensitivity of the data throughout the whole processing (see http://www.city.ac.uk/ic/Data_Protection/ Data_Protection_Rese.html for detailed instructions like backup etc.).

6. Control and responsibility

- Specify a responsible researcher at every institution who is in charge of data usage and changes of purpose. This person should also be the contact person for data subjects that want to know what is stored about them or have other concerns.

9.2 Guidelines for Actions to Safeguarding the Abuse of Personal Data Collected During the Users Studies

9.2.1 Data classification

The data to be collected during the user studies should be categorized as follows:

a) data that do not qualify as personal data (e.g., information about the organisation, the location or the size of the company)
b) anonymous personal data (see Pfitzmann and Hansen, 2010)
c) coded/pseudonymised personal data
d) non-coded personal data (a single person is identifiable e.g., by name or by her position in an organisation where only one person has this position)
e) secondary non-coded personal data
f) organisation-specific coded data (i.e. the organisation's name is a pseudonym)
g) organisation-specific non-coded data (i.e. it is clear which organisation is meant)

9.2.2 Overview of the actions by type of data

Table 3 gives an overview of actions to be taken for a specific category of data

Table 4: Overview of types of data collected in the user studies and actions to be taken for these data

Action	**Non Personal Data**	**Anonym. Personal Data**	**Coded Personal Data**	**Non coded Personal Data**	**Secondary non coded Personal Data**	**Organi-sation Specific Coded Data**	**Organi-sation Specific Non-coded Data**
Non disclosure agreement	No	No	Yes	Yes	Yes	Yes	Yes
Guideline for documentation of interview / observations	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inform the organisation about data policies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inform data subject about data policies	No	No	Yes	Yes	Yes, if possible	Yes	Yes
Get consent from organisation	No	No	Yes	Yes	Yes, if possible	Yes	Yes
Get consent from data subject (individual)	No	No	Yes	Yes	Yes, if possible	No	No
Implement data coding process	No	No	Yes	No	No	Yes	No
Implement encrypted data storage	No	No	Yes	Yes	Yes	Yes	Yes
Implement secured data access	No	No	No	Yes	Yes	No	Yes
Implement secured data access for data subjects	No	No	No?	Yes	No	No	No
Define maximum data retention policy	No	No	Yes	Yes	Yes	Yes	Yes
Define reporting guideline	No	No	Yes	Yes	Yes	Yes	Yes
Define review process	No	No	Yes	Yes	Yes	Yes	Yes

9.2.3 Non disclosure agreement

Document a non-disclosure agreement for all individuals involved in the collection, analysis and reporting of personal data collected during the MIRROR user studies, and ensure that they all have signed this non-disclosure agreement.

Document the penalties that will apply in the event of a breach of the non-disclosure agreement, and how the organisations and data subjects that are involved will be informed in this event.

Specify the code of conduct as part of the non-disclosure agreement.

9.2.4 Guideline for the documentation of interviews / observations

Document a best practice for collecting personal data during the interviews / observations.

- Specify the timeframe within which the results of the interviews / observations will be reported to the data subject for verification.
- Do not document any information about other data subjects or organisation entities which cannot be supported by objective evidence.
- Request the data subject to review and approve the report that results from the interview or observation. Ensure that whenever individual verification is not possible, that a representative from the data subject's organisation is appointed to carry out this review and approval.
- Destroy all handwritten notes containing personal data after the interview/ observation report has been approved.
- Decide whether audio or video recordings made during the interview / observation need to be archived for analysis purposes. In this case:
- Ensure that the audio or video recording does not contain any personal data that can be related to the data subject or any other individual in the organisation.
- If the audio of video recording contains personal data, try to remove this data before storage.
- If the audio or video recording contains personal data that cannot be removed, ensure that the data subject gives consent for the material to be stored as "non coded personal data". Ensure that the recording is labelled with this category.
- Destroy audio or video recordings if they are no longer needed for analysing user data.

9.2.5 Inform the organisation about data policies and get consent

- Inform the management of the organisation involved in the user study about:
    - The objective of the user studies;
    - The methods of data collection;
    - The types of data collected during the user studies;
    - The actual process for safeguarding the privacy of the data subject and the organisation;
    - How the results of the user studies will be reported.
- Check whether specific provisions are made within the organisation relating to safeguarding personal data
- Check whether specific organisation bodies (e.g. workers' council, data protection officer) have to be informed / give consent to the user studies and related collection of personal data

9.2.6 Inform data subjects about data policies

- Inform the data subjects (individuals) about the objectives and timing of the user studies;
- Inform the data subject about the types of data collected and how their privacy will be safeguarded
- Inform the data subjects how they will be involved in the verification and approval of the collected data
- Inform the data subjects how they can get access to their archived personal data once the data is stored
- Inform the data subjects how the collected data will be used and reported on.

9.2.7 Get consent from the organisation

- Obtain written consent from an authorized representative of the organisation as well as specific organisation bodies (e.g. workers' council, data protection officer) for the proposed collection, storage, analysis and reporting of personal data and organisational data collected during the user studies in their organisation.

9.2.8 Get consent from the data subject (individual)

- Obtain written consent from the data subject for the proposed collection, storage, analysis and reporting of their personal data collected during the user studies (this is not necessary for questionnaires, see Chapter 9.1.3).

9.2.9 Implement a data coding process

- If the user studies are using coded personal or organisational data make sure that:
    - The possibility of replacing coded data with anonymous data has been investigated;
    - The coding of the data has been done before the report of the interview / observation is presented to the data subject or representative of the organisation for review / approval
    - The coding has been done by a project representative, having also signed a non- disclosure agreement, independent from the project members involved with the collection, analyses and reporting of the data.
    - The retention period of the coding guideline has been established.
    - Ensure that there are no other indications in the coded data that could reveal the identity of the subject.

9.2.10 Implement encrypted data storage

- All data containing non coded personal data or organisational data (transcripts, documents, videos, audio recordings, scanned documents, etc.) should only be stored in secured, encrypted data stores.
- Personal data must also only be communicated through secured / encrypted e-mails or other types of secure data communication.
- Decryption should only be possible by accessing the data through password protected applications.
- Personal data recorded on paper (notes etc.) should only be stored as scanned copies in the secured encrypted data stores. The paper version should be destroyed immediately after the scanned versions are stored. Wherever possible notes / documents containing identifiable personal data should not be carried on public transport or other transportation where personal oversight is not possible.

9.2.11 Implement secured data access

- All personal data stored on secured and encrypted data stores should only be accessible by the application of secured data access (password protected access).

9.2.12 Implement secured data access for data subjects

- All personal data stored about a data subject should be accessible (through secured data access) for the data subject or his/her authorized representative. It should be clear to the data subject, where his/her personal data is stored and how to get access. This can be mentioned before the data is collected together with getting the consent. People only have to get access to data that can be traced back to their identity. So this means only for non coded personal data. So this is not needed for anonymised or coded data.
- When you pursue a "coded" approach for the questionnaires, there is no need to give the data subjects access to this information later.
- The data subject must be informed how (and where) the personal data stored after the data collection can be accessed by the data subject.
- Only the data related to that individual data subject should be accessible.
- Instructions should be made available to the data subject, describing what to do if anomalies are found.
- The data subject should be informed about the retention period for the personal data stored.

9.2.13 Define maximum data retention and disposal policy

- The maximum retention period for non coded personal data should be identified and communicated to all involved parties.
- There should be procedures implemented to ensure the proper disposal of various types of data. These procedures must be made available to all users with access to data that requires special disposal techniques

9.2.14 Define reporting guideline

- During the analyses of the results of the user studies, personal data should not be accessible to non authorized individuals
- The reports on the user studies, as documented in research papers, articles and deliverables, should not contain any personal data or data that could lead to the identification of a specific data subject
- If the organisation is mentioned, written consent has to be given by an authorized representative of the organisation (see Chapter 9.2.7)

9.2.15 Define review process

- A procedure to verify that all arrangements to prevent unintended abuse of personal data that could breach the privacy of data subjects should be in place.

9.3 Implementation Guidelines for Safeguarding Personal Data Abuse During the MIRROR User Studies

9.3.1 Analyze data to be collected

Determine what tools from the toolbox will be used to conduct your user study, and analyze the type of the data to be collected during the user study, using the data classification list as defined in Chapter 9.2.1.

In case there is no need for the collection of personal data, ensure that the identity of the data subjects cannot be traced back from the collected data by making the data anonymous during the data collection process or using a data coding process (see chapter 8.2.9)

9.3.2 Indentify actions

Identify the actions to be implemented based on the schema presented in the table in Chapter 9.2.2.

Verify within your own organisation whether specific requirements apply for conducting and reporting of user studies, and collecting and archiving of personal data obtained during a user study. Inform, if needed, the responsible persons in your organisation about the objectives of your study. Determine whether you have to sign a non-disclosure agreement within your organisation.

Create an instruction for conducting and reporting the user study using the guidelines as defined in Chapter 9.2.4 and 9.2.14 and the guidelines provided by your own organisation.

9.3.3 Inform the organisation

Inform the assigned contact person of the organisation, where the user study will take place, about the objectives, scope and planning of the data collection process.

Define, in collaboration with your contact person, which authorities have to be informed about the user studies. Determine whether a non disclosure agreement has to be signed to safeguard the abusive usage of the collected data.

Present your user study activities to the identified organisational entities and obtain, if needed, consent.

Inform the data subjects about their planned involvement in the user study and obtain, if needed their consent.

9.3.4 Implement actions for safeguarding personal data.

In the situations where it is needed to collect personal data, implement the following arrangements:

1. Implement encrypted data storage (Chapter 9.2.10)
2. Implement secured data access (Chapter 9.2.11)
3. Implement access for data subjects to their personal data (Chapter 9.2.12)
4. Define data retention and disposal policy (Chapter 9.2.13)
5. Define review process (Chapter 9.2.15)

9.3.5 Conduct the user studies.

Conduct the user studies according to your defined user study guideline. Ensure at the end of each data collection session that you did not unintended document personal data. Ensure that documents provided during the session do not contain personal data.

Ensure always that the data subject is clearly informed about the objective of the user study, how the collected data will be used and how it is organized that the data collected will be safeguarded.

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