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Executive Summary

The MIRROR project aims at empowering and motivating employees to learn by reflection over work practices and personal experiences without necessarily making tacit knowledge explicit first. As learning can happen mainly on three different levels, namely personal, team and organisational, MIRROR is targeting at complementing personal and organisational learning environments (which mainly rely on knowledge being explicitly available in TEL approaches) with highly personal MIRROR applications with the so-called MIRROR 'app-sphere'. At the same time, as TEL approaches fail when there is no teacher, no HR manager, no author etc., and as individuals learn most by observing others and from experiences, MIRROR investigates with a collection of different but combinable approaches, how to support self-regulated and personalized learning, as well as team and organisational learning by reflection. These approaches range from individual to collaborative learning, to learning by creative problem solving, to game-based learning as well as organisational learning and capture of learning experiences.

In this context, the main objective of WP7 is to investigate how serious games can contribute to trigger reflection over one's own experiences as well as willingness to share these experiences reflecting within a team. To contribute to this aspect of the whole MIRROR research, the first research question that was tackled in year one by WP7 was how to foster motivation of adults to reflecting and learning with games.

This deliverable describes the theoretical background and the empirical studies carried out with testbeds and users to identify which elements of the serious games need to be implemented in order to increase adult learner motivation to use this tool.

Research undertaken in WP7, towards the achievement of the first objective was grouped in three main activities: a collection of user studies, a well-designed development of a first set of games application and the completion of a first set of design studies.

Based on these activities, different tools with different samples were used: off-site and on-site studies with testbeds and other adult workers sample were carried out through some questionnaires, interviews, focus groups and workshops.

After analyses of the qualitative and quantitative data it is possible to assume that users, notwithstanding their lack of knowledge about serious games, are in general motivated to experiment learning with serious games in several working scenarios and to reflect upon them both as individuals and in a team.

For the next project year this objective will evolve in a method, based on the Vygotskian theory, to enlarge the gaming environment introducing a virtual coach, thus addressing research question two. Moreover the initial experience with serious games and their conceptualization as reflection tools will be used in Y2 to bring forward the state-of-the-art understanding of reflection in close cooperation with WP1.

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1 Introduction

Due to the dynamics in business environments nowadays and the large number of changes in job roles and tasks for employees, a time-consuming development of formal learning offers and need for an organisational-wide provision of vocational training are barriers for the wide adoption and use of learning technologies. A much more efficient approach is needed that allows to capitalize and share knowledge at different levels without losing it and to quickly turn experiences into keys to solve new situations. Especially SMEs perceive current learning technologies as insufficient to support learning-on-the-job. In this scenario, the overall objective of MIRROR is to empower and engage employees to reflect on past work performances and personal learning experiences in order to learn in 'real-time' and to creatively solve pressing problems immediately. MIRROR shall help employees to increase their level and breadth of experience significantly within short time by capturing experiences of others. A prerequisite for exploring innovative solutions in this context is to rely on human ability to efficiently and effectively learn directly from tacit knowledge – without the need for making it explicit.

The aim of work package WP7 is to study, design and develop a creative serious game environment to foster reflection both for individual learning as well as group learning, moderated by an expert or tutor. The tutorial services, with a virtual or real coach, will be integrated as much as possible within the game to make user groups able to tutor one another. Furthermore gaming functionalities will be provided both for single use and for joint activities workers, to maximize individual organisation of learning objectives, self-consciousness of users and to foster cooperation with a virtual or real tutor on a personal level as well as within a group of learners.

The project specifies 4 concrete objectives, that WP7 will focus on, one per year, with which to deliver this aim:

Objective 7.1: fostering users motivation to learn and reflect through serious games;

Objective 7.2: maximizing the zone of proximal development;

Objective 7.3: fostering shared knowledge and shared reflection through serious games;

Objective 7.4: consolidation and validation of serious games based learning experience.

Research undertaken in WP7, towards the achievement of the first objective, taken place concurrently in the first 12 months, was grouped in three main activities:

1. a collection of user studies to find out evidences about users potential motivation to use serious games as a new tool able to foster reflection and learning, within Task T7.1;
2. a well-designed development of a first set of games application, within Task T7.1;
3. the completion of a first set of design studies to explore how these game environments are motivating to learn and reflect in a work experience, within Task T7.1.

The research already carried out together with the next steps, will bring to understand how to exploit these new experiences as new 'best practices' in order to re-routinize 'better' behaviours making them the new starting base for one's working behaviours. Unlearning routinized knowledge is namely harder than learning new knowledge, because changing ones behaviours introduces fear, uncertainty and several other negative feelings, as can be found in literature. But to do so, learners must be motivated and convinced of the advantages of the new behaviours. These aspects can be tackled with the use of serious games: 'filling' the gaming apps with content and practices from the testbeds, will give the opportunity of introducing some of the 'data' MIRROR apps want to treat in their original scenario (context-dependence is fundamental for comprehension as well as for motivating people who, being working since several years often are not willing to learn 'theoretical' concepts any more). Learners will thus have the opportunity to experiment different practices and behaviours in a

realistic (but protected!) scenario, exploring consequences, risks, opportunities and being also invited to make mistakes that are immediately turned into learning elements, exploiting some of the positive characteristics of games. This will help enhancing problem awareness, critical thinking and other aspects targeted by MIRROR apps, at the same time reducing stress, a sense of failure and raising motivation, all aspects that are treated and inducted by the methodological approach of MIRROR.

This deliverable will describe in detail the work carried out in year 1. It will cover principally:

a) work around motivation of adult users to learn with games through sections 2 presenting the theoretical approach; 3 sketching test bed users scenarios; 4.1 about methods and research instruments for user studies and 5.1 about data analysis and results in the case of user studies.

b) games and their effects on reflection. This part was not covered with the same level of intensity because first good and tailored prototypes were necessary. After these were produced some activities could already be organized and some results obtained as is described in sections 4.2 and 5.2.

Section 6 with a discussion and implications translated into future activities close the present document.

2 Theoretical background

2.1 MIRROR's understanding of the role of reflective learning at work

Reflective 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). In MIRROR we base our understanding of the process of reflective learning on the model of Boud et al (1985), in which the learner re-evaluates past experience by attending to its various aspects, thereby producing outcomes (see Fig.1). This process is a core element in collaborative reflection and in organizational learning.

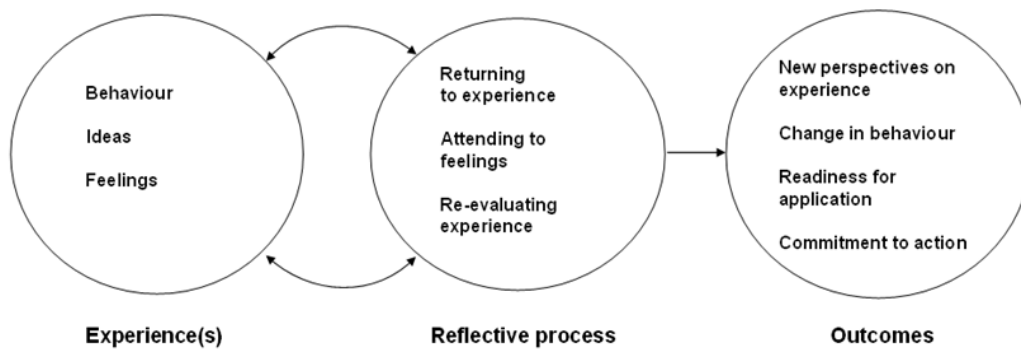


Figure 1 - The process of reflective learning (Boud et al. 1985)

In everyday as well as academic language 'experience' refers both to single experiences (of specific events or situations) and general experience in the form of knowledge/skills/attitudes collected and developed over time. Also, experience can be seen as a continuous 'flow' of which people can be more or less conscious.

In the reflective learning process (see Fig.1) we can consider the experience returned to as a single experience or as a set of such single experiences.

A single experience is defined as the total response of a person to a situation, including behaviour, ideas and feelings. Given the differences between individuals, the experience of one and the same event will be different in different persons.

In the reflective process, the re-evaluation of experience requires generalization and abstraction from the concrete experiences as well as attention to their emotional aspects. The learners' knowledge serves as a resource for – and outcome of - the re-evaluation.

The outcome of reflective learning can be cognitive, affective, and/or behavioural. A reflective process, through its outcome, always results in some 'resolution', even if the outcome does not necessarily have an immediate and/or measurable impact on the work practice in question. For our purposes (in MIRROR) reflection and reflective learning are considered to be the same thing.

A key aspect in making a reflective process happen is the presence of triggers. Triggers are unexpected situations (e.g. disturbances and perception of uncertainty, or positive situations like surprising success) creating awareness of discrepancy between expectations and the current experience. Reflection might be triggered by an external event or agent (external trigger/incident) or might develop from one's own thinking (internal trigger/inner need to reflect).

Reflective learning on individual, collaborative and organizational levels

Reflection can take place individually and collaboratively. For reflection to be collaborative, the participants need to share experiences and relate to others' experiences in their own reflection, resulting in a spiral-like interaction between individual and collaborative reflection.

Collaborative reflection may be based on experiences of shared events and situations of collaboration between the participants, but also on individual experiences that are not related to the same events but are comparable through a shared context (e.g. experiences from similar, individual work tasks taking place at different times and/or different locations). Individual and collaborative reflection has different advantages and can complement each other in workplace learning.

Reflective learning can also be viewed on the level of the organization. Organizational learning, an organization's improvement of its task performance over time (Argyris & Schön 1996), can be seen as a consequence of the learning taking place in individuals and teams in the organization in the context of their work, e.g. through a bottom-up learning process. Learning in an organization is also framed by the organization's top-down management of its processes, which may be more or less explicit about the role of informal learning and employees' reflection on work experience. Management in an organization may reflect on their own performance (and that of the organization) on the basis of data from the organization; this data may originate in processes of work but also in processes of reflection through which the employees share their ideas and views.

In workplace learning, reflection and problem solving can be seen as closely related and feeding into each other (Schön, 1983).

The reflection session

By reflection session we refer to a time-limited activity framing and supporting processes of reflection. Reflection sessions range from the small, individual, spontaneous pause in between work tasks to the scheduled, elaborately organized and facilitated workshop in a team. Key dimensions that can be used to characterize reflection sessions are Objectives, Content, Process, Outcomes, Support, and Timing. These dimensions, to be elaborated below, are not completely independent.

Objectives

The objective(s) of a reflection session link the reflection to work processes. The objectives may be more or less explicit. Objectives can be characterized in more detail outlining whether they are on individual, team and/or organization/management level, in which specific work/business processes and the objective(s) originate (e.g. day-to-day needs of individual work practice, plan for individual competence development, etc.), to which roles they relate, and what are the more specific goals (e.g. related to sense making, problem solving, improvement or performance).

Content

By content we refer to 'the thing reflected upon'. The content can be characterized in more detail by outlining whether the reflection is addressing individual experience and/or shared experience (e.g. among the members of a work team), whether the reflection is addressing a single experience and/or a set of experiences, whether the reflection is concerned with one work process or issues that span several work processes, which work process(es) are in focus, and whether other representations of the relevant work practice (e.g. best practices, standards, simulations such as in a serious game) are being used in the re-evaluation of the experience.

Process

This refers to how the activities in the reflection session are being conducted. These processes can be individual and/or collaborative.

Outcomes

This refers to the results of the reflection session, e.g. what is being produced, some of which may be planned and some unplanned. In characterizing the outcomes of a reflection session, the following should be considered: Which articulated knowledge is developed/constructed (e.g. lessons learned, creative solutions, proposed changes to certain work processes, and refined/annotated/aggregated data from a work process), which artefacts are produced (e.g. reports and personal notes), to which roles and processes the outcomes are relevant, which knowledge and artefacts are intended to be shared (and with whom), and what are the actual changes in work practices.

Support

This refers to support or scaffolding for reflection, which can be provided by a human coach/facilitator and/or by tools. Support can be characterized by the way access to data from the work process is being provided (subject to numerous considerations regarding availability, privacy, representation/presentation, sharing etc.) by the roles in the reflection session (e.g. is there a facilitator), by the procedural support (e.g. guidance through certain steps), by the support for articulating and sharing knowledge within the reflection session and in the creation of its outcomes, and by the specific techniques/approaches used (such as creativity techniques and serious games).

Timing

This refers to when the reflection session takes place, in particular how it is scheduled with respect to work processes. It also refers to the duration of the session. The timing can be characterized by outlining to what extent the reflection session is separate from, or intertwined/concurrent with, the work process (If reflection happens in frequent, small steps, e.g. in between work tasks, it may be convenient to consider these steps together as one reflection session), whether the session is a pre-scheduled activity or initiated upon need or convenience, and what are the criteria and conditions for starting and terminating the session. The start of a session may for instance be based on the learners' initiative (e.g. on the occurrence of a trigger for a reflective process) and/or on some form of prompting. The termination of the session may be based on time allocated/elapsed, the occurrence of certain events in the work process, the completion of certain outcomes, etc.

The roles of tools in reflection at work

Tools may have different roles in supporting reflection at work (Krogstie, 2009). Two key categories of tool use are gathering data from the work process and providing support for the reflection session.

Tool support for a reflection session includes providing access to data from the work process. Some of this data may serve to trigger reflection, other data may be used to make sense of (recall, reconstruct) the experience(s) in question. Tool support for the reflection session may also take the form of process guidance, e.g. guide its steps. Further, tools may support the articulation and sharing of knowledge in a reflection session and in producing outcomes of value to the surrounding work and business processes.

Finally, in considering support for reflection we need to consider tools that support the work process more broadly, since tool use in day-to-day work and reflection may be closely intertwined and one may impact on the other.

2.2 WP7's perspective on learning and reflection

In this section the WP's perspective about how serious games are linked to the theoretical frame of MIRROR are described. In particular the relationship between motivation, learning, reflection and serious games will be taken into account and stressed to better understand how serious games can be a motivating tool able to increase reflection in users.

2.2.1 Motivation

The willingness or desire to engage in a task was named motivation. More specifically, motivation refers to an individual's choice to engage in an activity and the intensity of effort or persistence in that activity (Pintrich & Schrauben, 1992; Wolters, 1998). Individuals who are highly motivated are more likely to engage in, devote effort to, and persist longer at a particular activity.

There are a number of models of motivation that differ in emphases and constructs (Pintrich & Schrauben, 1992; Schunk, 1995). These range from expectancy/valence approaches (Mathieu, Tannenbaum & Salas, 1992) to Keller's (1983) Attention, Relevancy, Confidence, and Satisfaction (ARCS) model.

Following most of these models, to motivate means to 'provide with an incentive': to motivate someone to learn is to provide him or her with an incentive to engage in the act of gaining knowledge. In traditional instructional design practice, motivation is often considered as a preliminary step in the instructional process.

Behaviour can be intrinsically or extrinsically motivated. Most models have emphasized *intrinsic motivation*, focusing on the motives to perform a task that are derived from the participation itself (Malone, 1981; Malone & Lepper, 1987). Malone (1981) proposed that the primary factors that make an activity intrinsically motivating are challenge, curiosity, and fantasy and specifically applied this framework to the design of computer games.

Although instructional games are primarily seen as a means to enhance intrinsic motivation, *extrinsic motivation* is also important. The goal is to develop learners who are self-directed and self-motivated, both because the activity is interesting in itself and because achieving the outcome is important.

Intrinsic motivation in learning, however, focuses on the development of motivation throughout the entire instructional process. Though traditional instructional design practice focuses on a less integrated approach, developing life-long learners who are intrinsically motivated, display intellectual curiosity, find learning enjoyable, and continue seeking knowledge after their formal instruction has ended, has always been a major goal of education (Small, 1997).

Looking at the 'effort' expended during the learning process will help determine whether learners are motivated. However, for 'effort' to even occur, two necessary prerequisites are required: the person must value the task (Chamberlin, 1998) and the person must believe he or she can succeed in the task (Chan & Terence, 1999). In any given instructional situation, the learning task needs to be presented in a way that is engaging and meaningful to the learner, and in a way that promotes positive expectations for the successful achievement of learning objectives (Small, 1997).

There is a tacit model of learning that is inherent in most studies of instructional games. First, the main aim is to design an instructional program that incorporates certain features or characteristics of games. Second, these features trigger a cycle that includes user judgments or reactions such as enjoyment or interest, user behaviours such as greater persistence or time on task, and further system feedback. To the extent of success in pairing instructional content with appropriate game features, this cycle results in recurring and self-motivated

game play. Finally, this engagement in game play leads to the achievement of training objectives and specific learning outcomes.

There are several benefits that this perspective offers. First, the traditional model of learning emphasizes that a learner must perform a task over a single trial. But the key component is the game cycle that is triggered by specific game features. A central hallmark of game play is not that users play a game and then put it down but that users are drawn into playing a game over and over. The game cycle is iterative, such that game play involves repeated judgment-behaviour-feedback loops. That is, game play can lead to certain user judgments or reactions such as increased interest, enjoyment, involvement, or confidence; these reactions lead to behaviours such as greater persistence or intensity of effort (Garris, Ahlers & Driskell, 2002).

Thus, the game cycle is a defining characteristic of computer game play that indicates to what extent users are engaged in repetitive play and continually return to the game activity over time. It is this feature of computer game play that training professionals hope to incorporate and exploit in instructional applications: the learner can actively construct knowledge from his/her experience. This model is consistent with the experiential learning approaches of Dewey (1938) and Kolb, Boyatzis, and Mainemelis (2000) and with modern constructivists such as Duffy and Jonassen (1992). Although the model is a cyclic training model, it does not imply that all learners necessarily learn in the same way, nor that all learners proceed through these stages in a sequential or linear manner. There are two important points to emphasize coming from the experiential learning tradition: people learn from active engagement with the environment (a) and this experience coupled with instructional support can provide an effective learning environment (b).

The motivational process in the context of a game cycle in which game play triggers repeated cycles of user judgments (e.g., enjoyment), behaviour (applied to the game play), and feedback. The game cycle focuses attention between three elements: to elicit desirable behaviours from learners (a), they first need to experience desirable emotional or cognitive reactions (b), which result from interaction with and feedback generated from game play (c). There are different elements in a serious game that support this motivational process. In this specific context the focus will be on two of them: rules and feedbacks. In fact, these two elements are two important pillars for any kind of serious games.

Rules

The role that fun plays with regard to intrinsic motivation in education is twofold. First, intrinsic motivation promotes the desire for recurrence of the experience. Secondly, fun can motivate learners to engage in activities with which they have little or no previous experience. A brain enjoying itself is functioning more efficiently (Rose & Nicholl, 1998), therefore when we enjoy learning, we learn better. The principal roles of fun in the learning process are to create relaxation and motivation. Relaxation enables learners to take things more easily, and motivation enables them to put forth effort without resentment, feeling more free and to avoid a potential sense of failure in case of mistakes.

This force of serious games stems from the fact that they are a form of fun and play, and particularly from what Prensky (2007) call the 'key structural elements of games: Rules, Training Objectives and Game Goals, Feedback, Competition and Challenge, Storyboard and dialogues construction'.

The rules of a game describe how players can act within a game in order to reach its goals. One of the most robust findings in the literature on motivation is that clear, specific, and difficult goals lead to enhanced performance (Locke & Latham, 1990). The definition of clear, specific goals allows the learner to be able to understand and evaluate feedback as a measure of goal- performance discrepancy, which reveals itself as crucial in triggering

greater attention and motivation. That is, when feedback indicates that current performance does not meet established goals, individuals attempt to reduce this discrepancy.

Under conditions of high goal commitment (i.e., the individual is determined to reach the goal), this discrepancy leads to an increase in effort and performance (Kernan & Lord, 1990). Therefore, game contexts that are meaningful and that provide well differentiated, hierarchical goal structures are likely to lead to enhanced motivation and performance.

At the same time, whereas rules and goals may be clear and fixed, they must allow for a wide range of permissible actions within the game. Crookall and Arai (1995) noted that the strategic selection of moves or actions within a game must be flexible to allow game activity to evolve based on player styles, strategies, previous experience, and other factors. Although we may clearly know the rules of a game beforehand, we are never able to predict exactly how the game will play out.

System feedback

Feedback or knowledge of results is critical to support performance and motivation (Annett, 1969; Wexley & Latham, 1991). Research suggests that the effects of feedback on performance are highly variable; under some conditions, feedback may improve performance, and under other conditions, feedback may reduce performance (Kluger & DeNisi, 1996). However, the role of feedback in regulating motivation is more unequivocal. Feedback is a critical component of the judgment-behaviour feedback cycle. Individual judgments and behaviour are regulated by comparisons of feedback to standards or goals. If feedback indicates that performance has constantly attained the goal, the game is deemed too easy and motivation declines. However, during initial game play, feedback typically indicates that the current player's performance is below expected standards, to motivate him/her to improve. To solve this feedback-standard discrepancy, the individual has several options, including abandoning play or increasing effort to meet the standard. Under conditions in which the goal is clear, there is high goal commitment and confidence in eventual success is high, so that players respond to the feedback-standard discrepancy by increasing their effort to attain the standard. Thus, feedback provides an assessment of progress toward goals that drives the motivated performer to spend more effort, to persist, and to focus attention on the task.

2.2.2 Flow

Csikszentmihalyi (1990) described the positive experience of being fully engaged in an activity as a state of 'flow.' Csikszentmihalyi defined flow as 'the state in which people are so involved in an activity that nothing else seems to matter'. Thus, flow represents an optimal state of performance at a task, a sense of enjoyment and control, where an individual's skills are matched to the faced challenges. Furthermore, flow derives from activities that are optimally challenging and in which there are clear goals and feedback, concentration is intensely focused, there is a high degree of control, and users are absorbed to the extent that they lose a sense of time and self. The concept of flow provides one perspective on the feelings of enjoyment and engagement that can be experienced by game users.

Chan and Ahern (1999) suggest Csikszentmihalyi's Flow Theory as a method for understanding and implementing motivation. Flow explains a phenomenon that many people find themselves experiencing when they reach a state where a perfect balance between challenge and frustration is reached and where the end goal becomes so clear that hindrances fall out of view.

While in flow state, learners are completely motivated to push their skills to the limit. This is a highly desirable state both in instructional contexts and in informal ones (i.e. work places). Csikszentmihalyi states that, 'A flow experience has got to be challenging. Anything that is

not up to par is going to be irritating or ignored.’ To learn, users need to be motivated, and an appropriate level of challenge combined with a clear and attainable goal is highly motivating. Since flow experiences share these key aspects of motivational design, they can be described as intrinsically motivating.

Serious games have the potential to induce in players the state of flow, often reported by game players, but certainly not limited to this area, in which people are so involved in an activity that nothing else seems to matter (Csikszentmihalyi, 1990). Flow refers to the awareness of a balancing among elevated challenges of action offered by the environment and appropriate–personal skills. If the challenge is beyond skills, the activity becomes so overwhelming that it may generate anxiety. If the challenge fails to engage the player, he or she quickly loses interest and tends to leave the game, feeling bored. Fortunately, there is tolerance for a temporary lack of stimulation, a fuzzy Safe Zone, where the activity is not too challenging or boring (Chen, 2007).

Csikszentmihalyi’s research (1990) identified eight major components of flow: a challenging activity requiring skill, a merging of action and awareness, clear goals, direct and immediate feedback, concentration on the task, a sense of control, loss of self-consciousness, an altered sense of time.

Findings from a wide range of domains, including chess playing, writing, sports, and visual arts, show a positive correlation between flow state measures and objective measures of quality of performance (Csikszentmihalyi & Csikszentmihalyi, 1988). In addition, flow has been suggested to function as a reward signal to promote practice (Csikszentmihalyi, 1997). Yet, other studies have found positive correlations between flow and quality of life (Csikszentmihalyi, 1990). Effective serious games are able to induce and keep players in a state of flow and this is probably the main reason why people are so motivated to devote more time playing games that would be expected based solely on associated external rewards. In fact, serious games should involve the player deeply and actively in a task, performing at the peak of ability under high levels of concentration, which for most tasks indicates a state of heightened arousal. The link between flow on one hand and affect and arousal on the other means that the flow experience carries certain emotional content. However control over the technology perceived by the user and the ability to transport the user to a virtual environment was shown to facilitate the experience of flow. Flow was linked to exploratory behaviour and positive affect as well (Ghani & Deshpande, 1994). There are a lot of typical elements of the flow experience dependent on emotional state: challenge appraisals and task engagement both vary as a function of affect (Maier, Waldstein, & Synowski, 2003); emotional stimuli can modulate attentional processes and concentration (Brosch, Sander, Pourtois, & Scherer, 2008; Jefferies, Smilek, Eich, & Enns, 2008; Sheth & Pham, 2008); perceived personal control is related to greater self-reported coping ability prior to a task and lower self-reported stressfulness following that task (Weinstein & Quigley, 2006); sense of time is altered such that highly arousing stimuli with positive valence are perceived as having shorter duration and are reproduced at a faster tempo than negative, low arousing stimuli (Droit-Volet & Meck, 2007; Noulhiane, Mella, Samson, Ragot, & Pouthas, 2007). It is not possible to choose whether and when to enter in a state of flow. Such experience is aroused by the presence of some elements, like: concrete goals and manageable rules, a balance between perception of the challenge and perception of personal competences, the presence of immediate and clear feedback during the game play. Effective serious games fully satisfy these conditions, inducing a state of flow and promoting forms of *hyper-learning* (Csikszentmihalyi, Abuhamdeh & Nakamura, 2005). Hyper-learning consists in the mental ability to totally focus on the task also resorting to forms of visualization, to path of simulation, to the attention on the single action. In this way an expansion of abilities of learning is achieved with the attainment of excellent performances.

Flow As An Important Component In The Process Of A Serious Gaming Experience Evaluation

Although Csikszentmihalyi provides one of the most widely cited explanations for flow in activities, Koufaris (2002) and Agarwal and Karahanna (2000) among others, have noted that the construct itself is ill-defined and broad because of the numerous ways it has been operationalized, tested, and applied in research studies. But it is often very important to have the possibility to measure this construct and in order to reach this aim it is possible to use different tools based on different theories or different modalities. Of course, in each of these cases it is important to note that flow is thus not usually regarded as an all-or-nothing peak experience; rather, degree of flow is a continuous variable that can be used to characterize the experiential quality of any everyday activity (Csikszentmihalyi & Csikszentmihalyi, 1992). One of the first attempts to measure the flow experience was proposed by Trevino and Webster (1992) who identified four main dimensions of the flow experience in the context of information technologies: control over the interaction with the technology; focused attention to the narrow stimulus field created by the technology (e.g., computer screen); curiosity in terms of a heightened arousal sensory; and intrinsic interest by which a user is involved in the activity solely for the enjoyment it provides rather than for instrumental purposes. Curiosity and intrinsic interest were subsequently combined into a concept defined as cognitive enjoyment (Webster, Trevino, & Ryan, 1993). However, among the above described four main dimensions, concentration and enjoyment are those most commonly and consistently used to measure flow (Bakker, 2005; Chen et al., 1999; Delle Fave & Massimini, 2005; Finneran & Zhang, 2005; Ghani & Deshpande, 1994; Koufaris, 2002; Novak, Hoffman, & Yung, 2000).

In literature, self-reports are the main approach used to measure flow. Self-reported descriptions of flow experience involve easily identifiable correlates that often accompany the experience, such as feeling alert, a perception of control, and a distorted sense of time (Csikszentmihalyi, 1997).

For example one of the most used self-report tool is the Flow State Scale, which has been shown to be a reliable and valid measure of the flow construct (Jackson & Eklund, 2004). Items in this self-report questionnaire are formulated as propositions about the trial experience, with which the respondent will agree or disagree, answering on a Likert-scale. It was designed to measure dimensions relevant to flow across different tasks and contexts. In other words, the dimensions are higher order/intermediate constructs that capture how various more specific contextual factors affect flow. However, there are other self-report scales. Jackson and Marsh (1996), for example developed a flow scale to test the empirical nature and structure of flow as measured by a series of questions and scales. Using confirmatory factor analysis, they studied athletics and sports and provided evidence that the different components of flow listed above (Csikszentmihalyi, 1990; Jackson & Csikszentmihalyi, 1999; Jackson & March, 1996) did indeed form a holistic and integrated whole. Finally, there is also a list of items developed by Quinn (2005). These items describe thoughts and feelings individuals have experienced during a flow event. All of the flow items were assessed along a seven-point Likert-type scale. Even this simplified approach showed some difficulties as assessment method of flow experience. Wheeler and Reis (1991) advocated that the closed-ended questionnaire approaches are incapable of accounting for the complex and dynamic nature of flow. A real-time assessment, with multiple measures at multiple time points, is desirable to allow observation of the flow experience, not in terms of state but as continuous changing process. Therefore a multimodal approach represents the cutting-edge assessment method for flow experience. Specifically, by locating flow in the affective and emotional space, it is also possible to think that also some psycho-physiological measures of emotion can be used to describe the flow experience. In fact, de Manzano and

colleagues (2010) measured flow avoiding invasive equipment, through muscle tone, head movements, thoracic respiration, heart period and blood pressure measurements, and the full-width-at-half-maximum (FWHM) of the pulse pressure waveform. The most of these measures resulted significantly associated with self-reported flow. This suggests that during a physically and cognitively demanding task, an increased activation of the sympathetic branch of the autonomic nervous system in combination with deep breathing and activation of the muscle tone (ZM) might potentially be used as an indicator of effortless attention and flow.

2.2.3 Learning and Reflection

One of the difficulties with flow experiences is the lack of reflection that can take place while one is in this state. Though some may be pushing their skills to the limit, they may not be reflecting on their experience and are therefore limiting what they can learn from it. While in a state of flow or while playing a game, learning is made possible through the use of concrete goals.

To prevent the learner from wandering around aimlessly, a game creates goals that the user must meet before being able to progress. While playing the game, the learner may take on the responsibility of reaching specific goals continuously without ever reflecting on the strategies used to reach these goals but just being driven by the engagement of the game. Though knowledge or skills may be gained, learning is not fully realized unless the player reflects on the events that took place during the experience.

On the contrary, if the play must be broken up by a reflection period, there is a lack of continuous experience and any advantages gained by using game strategies are futile. The solution to this problem lies in the endogenous implementation of reflection. In educational game design it is important to ensure that learning takes places within the realm of play, even if learning is only made possible through reflection. To do so, reflection must appear to the learner as one of the many in-game goals that drive the game-play.

The act of reflection is incorporated into both the core mechanics of the game, and the fantasy experience of the game world. During the reflection period, it is likely that the player will not exit an immersive experience, and the reflection period will encourage the player to learn how to play better. This is an example of an integrated design approach that reconciles flow, learning, and endogenous motivation within an immersive experience. Learning¹ 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 is how adult learners can be motivated to engage in games.

Serious games might offer a complementary approach to training, motivating users by providing an enjoyable activity. Most important, serious games might be designed to

¹ From here to the end of the paragraph this is taken from D1.1

experience a working situation virtually. For example in the serious game 'CLinIC' (for further information see section 4.2.6) developed for NBN, nurses have the possibility to live a real working situation in the virtual environment (e.g. a patient is calling you while at the same time your phone is ringing: what do you do? What consequences might either decision have?). This allows players to experience working situations that are difficult to live in the real world. In addition, by playing multiple times, the user can try out different behaviours to see how that impact on the final result. For this to lead to learning, it is however important that the game is design to promote reflection. As reflection tools, serious games offer a complementary approach to monitoring and visualization tools that collect data on a real working situation to support reflection. As illustrated in figure 2, serious games should be designed to support:

- Experiencing of a work process virtually in the game,
- Collecting data on the work process to support reflection
- Reflection sessions that have as content the work experience supported by the game.

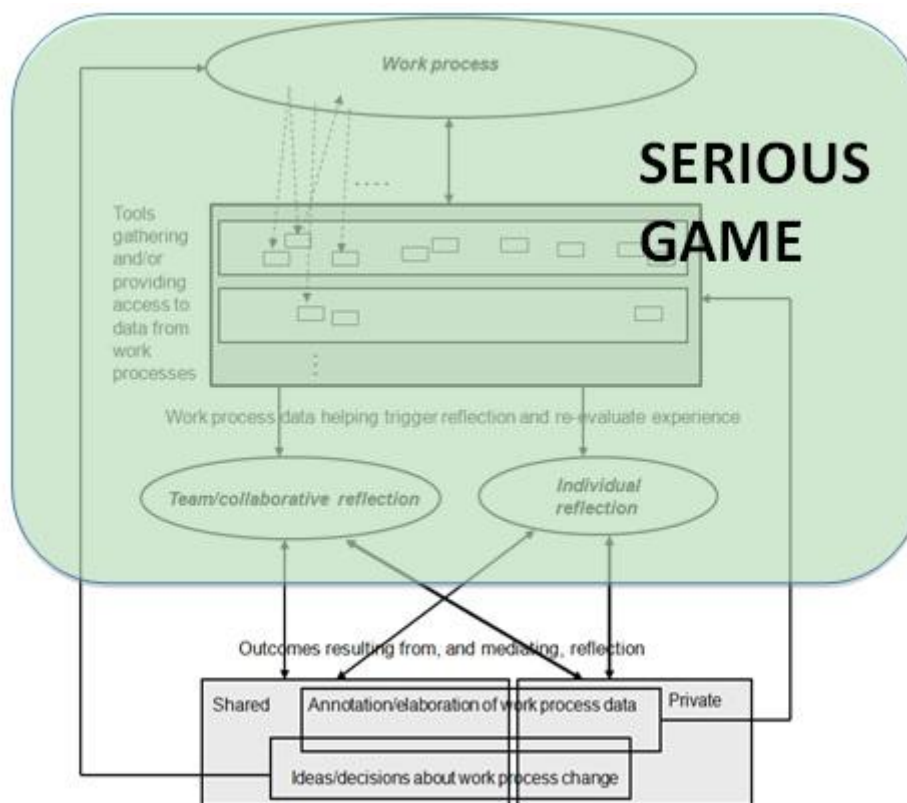


Figure 2 - Serious games and reflection, modified from Krogstie (2009)

Recollecting the model of Boud et al. (1985, Fig.1), when designing a game, it is important to collect data on the work process not only regarding the behaviour of users, but also their feelings and ideas. It is however important to consider that the additional input required from users should be kept to a minimum to avoid interrupting the flow. One design challenge is therefore to decide what type of data should be collected on the work process and which mechanisms can be used to collect them without breaking the flow.

There are two main ways a serious game can support reflection. It might support reflection in action by providing triggers that make the player aware of alternative behaviours that one can take. This could for example be realized in terms of alternative patterns in the game. Again, the challenge is to provide triggers without interrupting the flow.

Reflection might be supported by allowing the player to re-visit the virtual work experience, e.g. by reconsidering the actual choices that the player has taken during the game. The data can be provided through short reflection sessions interleaved with the working process or as a feedback session at the end of the game. The design challenge is to identify mechanisms that allow providing feedbacks without interrupting the player.

In this approach, playing a serious game can be seen as a learning experience. As such, it is something that can be shared with other players, for example with list of top scorers, shared annotations, and discussion on the game. Community support might be integrated to provide an additional motivational factor.

During the user & design studies, WP7 examined current learning practices at the testbeds in order to specify the potential of serious games for facilitating learning from experience. Furthermore, the target groups' readiness for serious games was 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 were researched to inspire development of games in combination with other apps produced by MIRROR.

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 is also useful to find out where reflection should be fostered and what the expectations are. After a long preparation phase, this activity started around the end of Y1 and will be continued throughout the follow-on activities of the project in the next periods.

2.3 Serious games as a tool to increase reflective learning

Today a consistent and generally accepted definition of the term serious games has not been agreed upon yet. However, in general we can define a serious game as an interactive simulation which has the look and feel of a game, but is actually a simulation of real-world events or processes or is represented in form of a metaphor. As a first representative, Abt writes in 1970 of 'serious games in the sense that these games have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement'. Although in this definition, the entertainment aspect is put in the background, it is not said that serious games must not be entertaining. Fun elements are in fact key elements of a serious game: they are the sources of positive emotions as well as the engine of motivation. Furthermore, entertaining elements can capture users' interest and curiosity, speed up the acquisition of content and skills and motivate learners to engage themselves in activities in which they have little or no previous experience (Abt, 1970).

An approach which most notably accommodates the idea of gaming and already describes the potential areas of application of serious games comes from Zyda (2005). He defines serious games as a 'mental contest, played with a computer in accordance with specific rules that uses entertainment to further government or corporate training, education, health, public, policy, and strategic communication objectives'. According to this definition the main intent of a serious game is imparting knowledge or skills through direct experience of carrying out a task ('learning by doing'). Furthermore, serious games can support contemporary learning activities and foster intellectual growth.

Thanks to these researches it is possible to understand why, in the last years, the use of serious games has become increasingly popular. In general, in fact, a serious game has always one or more of the following main goals:

- train and educate

- inform
- change attitude and behaviour.

Furthermore, some key aspects are very important to understand how serious games could be considered as a new important way to support reflection:

1. A simulated environment, system or a realistically recreated role play scenario can allow learners to experience something that is too costly, too risky or even physically impossible to achieve in the real world, the so-called 'experimenting with alternatives' approach (van Woerkom et al. 2008).
2. Repeatability is also a key strength of a game or simulation-based approach. Learners can play out a particular strategy or adopt a certain approach. If they fail or do not quite deliver the desired outcome, then they can try again with a modified approach.
3. A serious game has to be considered as an experience. Games engage people psychologically (they can be very emotional experiences) and also physiologically.

Reflective learning in the workplace entails there-and-then reflection intertwined with the work as well as reflection with some distance from the work, denoted reflection-in-action and reflection-on-action by Schön (1983). A serious game provides unique opportunities to pace the simulated work process and the reflection sessions to achieve a good combination of reflection *in* as well as *on* action based on the learner's needs.

With reference to the model of Boud et al. (1987), serious games provide particularly good opportunities to help a learner return to (and reconstruct) experience, the environment of the experience being captured within the game environment and the events of the experience (e.g. the steps chosen by the learner) being stored and available for replay. Re-evaluation of experience involves considering the experience in light of alternatives, and in the game environment there will be the alternative options already incorporated in the game as well as the possibility to capture and replay the choices made by other learners.

Work settings may entail situations that are emotionally challenging to handle. Returning to these emotional aspects is an important element of the reflective process (Boud et al. 1987). A serious game which successfully captures the aspects of work in a way that makes the user react emotionally in a way similar to that of the real work situation thus holds the potential to support important aspects of reflection. In this way the serious game also serves as a tool for the learner to come to terms with the emotional aspects of the job and understand his/her own reactions, in this way becoming more prepared to meet them in the real life situation.

For all these reasons, serious games can be considered a useful way to trigger and support reflection. However there are no scientific evidences about the relationship between serious games and reflective activities so far.

Notwithstanding, we can consider serious games as a part of the main class of 'new technologies', in specific as simulations and virtual environments turned towards training and education. In this way we can relate serious games to the new research area of 'Captology' (Computer As Persuasive Technologies, Fogg, 2005). During last years, in fact, Fogg underlined the relationship between new technologies and different elements of the persuasive process: behaviour change, motivation, change in world view, compliance and attitude change (see Fig.3).

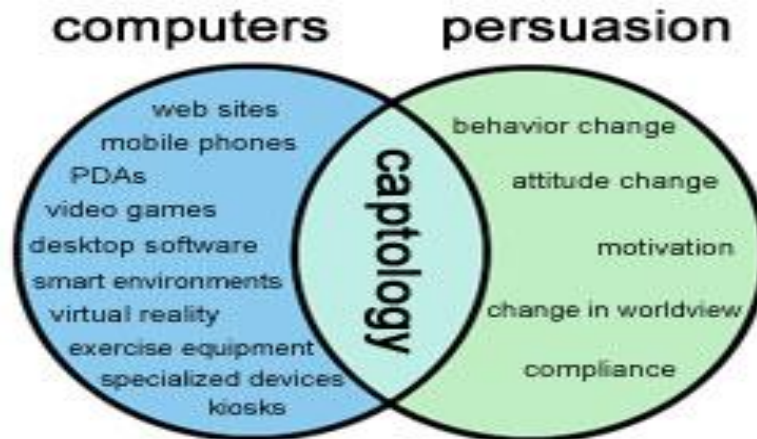


Figure 3 - Captology is the study of computers and persuasive technologies (Fogg 2005)

According to Fogg's studies, from a user's perspective, new technology in general, and serious games more in specific, function in three basic ways. As a *tool*, a serious game can provide humans with new abilities, allowing people to do things more easily. As a *medium*, a serious game can convey symbolic or sensory contents. Finally, as a *social actor*, serious games can invoke social response from users.

In light of these theoretical considerations in the following paragraphs the serious games that were created for the MIRROR testbeds will be described in detail. Furthermore also the other serious games used for the MIRROR users study will be shortly described.

3 TESTBEDS AND SAMPLES

3.1 Registered Nursing Homes Association (RNHA)

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 of persons with dementia must actively take into account the unique history of the patient to adequately handle situations occurring in day-to-day interaction. 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. The main constraints to the use of technology in this frame include the limited spread of ICT support 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, as well as the fact that each care home is different. The specific work process to be supported by MIRROR apps is the end-to-end process of providing care to people suffering from dementia. In particular RNHA identified the following 5 business needs at:

1. creating a life history of the service user,
2. small targeted mobile training elements,
3. virtual reality (serious) games,
4. help with challenging behaviour,
5. the creation of a virtual 'rummage box'.

With specific attention to need nr 3, IMA has developed a *first prototype of serious game* called 'Think better CARE' targeted at the carers and particularly dedicated to the topic of reflection around 'difficult dialogues'. Thanks to this tool carers can improve their behaviour in a safe environment and improve their learning and reflective skills taking into account four main parameters ('resident satisfaction', 'quality of response', 'sensitivity of response' and 'time management'). The core of the 'game' is to explore situations knowing what to do, in what order (when), and why. The game is built on this simple principle, provoking reflection by posing questions that create business dilemmas. The objective is to prepare the carer to make a good instant decision when confronted with a similar real life occurrence. Reflection on the real life experience could lead to further improvement in the quality of the next decision taken in similar circumstances. For details about the game and how it was designed, see section 4.2.6. In 'Annex C: Description of serious games elements' some screenshots can also be found.

3.2 Neurological Clinic Bad Neustadt (NBN)

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.

MIRROR apps shall be designed that support reflection and reflective learning in all work areas of the health professionals at NBN. 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.

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 and the affective dimension of knowledge. 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.

In this scenario IMA developed a *first prototype of serious game* for NBN, called 'CLinIC', that aims to improve the nurses ability of reflect and learning from past behaviour, particularly dedicated to the topic of reflection around 'difficult dialogues'. CLinIC is, in fact, a learning simulation which supports self-reflection at the workplace and is about the communication between nursing personal and patients. This prototype is the twin to the one developed for RNHA. After CLinIC had been used by several representatives of the NBN staff, WP7 conducted a debriefing workshop with five participants to explore the potential of CLinIC to trigger or support reflection and to clarify whether scenes used in the game are relevant for and can immerse into real world reflective practice. For details about the game and how it was designed, see section 4.2.6. In 'Annex C: Description of serious games elements' some screenshots can also be found.

3.3 Regola

In the frame of the MIRROR project the testbed Regola represents two main authorities: The Civil Protection in Turin and the 118 EMS' service in Piedmont. 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. Main activities are identified into four tasks: expectation, prevention, rescue and clearing emergency. In addition, there are three different priority levels: A ('ordinary events'), B ('intermediate events') and C ('extraordinary event').

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 organise training because of the discontinuous nature of the work and the occasional availability of the volunteer personnel. Some reflection and training (e.g. field trials) are 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 process involves volunteers learning from their own experience as well as from others across events, sharing the perceptions and improving approach methodologies.

Moreover 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.

In this frame IMA has worked with Regola from a different point of view and with different methodologies than what was described for the previous two testbeds. In particular both the civil protection and the 118 EMS' service were taken into account.

It is important to stress that serious games might be a very useful tool for this testbed because:

- there are very limited occasions for organised training of volunteers due to the lack of regular working hours and the limited time that volunteers can use;
- there are limited occasions to experience some of the possible situations given the nature of the work, e.g. help to the population during an earthquake.

The experience that a volunteer can gain is therefore limited and a simulation might be the only way to promote reflective learning.

Some results of first interactions with REG can be found in section 4.1.2, section 5.2.3 and Annex A.

3.4 Other samples

In addition to activities carried out with the three testbeds IMA decided to broaden the sample to collect more data, in order to collect further useful information to tackle the research question 'how to foster adult motivation to reflect and learning thought serious game'.

In particular, in order to be able to address different groups and extract as much information as possible, different methodologies had to be used for different samples:

- off-site study (questionnaire) with different target groups (adult learners);
- MIRROR workshop at the LUDUS conference (http://www.serious-gaming.info/5b_-SGEED-2011/Conference_programme) about the key elements of motivation in a serious games (target adult learners) with specific interaction with the before mentioned MIRROR serious games 'CLinIC' and 'Think better CARE' and collaborative discussions in collaboration with NTNU.

Further activities have already been planned for the next period:

- workshop at EC-TEL (<http://www.ec-tel.eu/>) at Palermo to investigate the relationship between motivation, collaborative reflection, creativity and serious games in collaboration with RUB and CITY;
- A debriefing session with a group of 5-8 serious games players will be carried out by RUB at NBN in order to analyse how individual reflection can trigger collaborative reflection while establishing a link between virtual experience and real work practice.

4 METHODS AND RESEARCH INSTRUMENTS

4.1 User studies

Since this WP has already a concrete idea of what technology should be used, namely serious games, the focus was put more on the design studies than in the user studies. As serious games are innovative technologies, user studies were conducted more in the other WPs. For this reason, from now on WP7 will be increasingly closely integrated with WP4, WP5 and WP6 to better understand how to integrate their findings and combine their solutions with the serious games approach.

4.1.1 Off-Site data collection

Between end of February and May 2011, in the course of the user studies, KMRC distributed staff surveys to the testbed partners containing the 'Learning at Work Questionnaire', the 'Reflection Questionnaire', the 'IT Attitudes & Usage Questionnaire' and the 'Privacy Questionnaire' as well as questions addressing the willingness to use of sensors and serious games.

Due to the specific nature of the RNHA testbed, mainly a lower level of education and concerns about the level of literacy, a shortened version of the staff survey with easier language was used. The modifications were well received by the testbed and likely lead to an increases response rate. While the level of detail and accuracy in which the key aspects can be captured is lower, these aspects can still be compared to the other testbeds.

The surveys were distributed within the testbeds by the testbed partners, filled out and send back to KMRC who collected the filled out questionnaires, digitalized them when necessary, and distributed the data files to the WPs for their individual analysis.

In specific, IMA focused the attention on the questions about serious games, to deeply understand how testbeds know this educational tool: their experiences and their motivation to use them as a learning tool at work.

4.1.2 On-Site data collection

IMA spent a lot of time and effort for the design and creation of the two prototypes of serious games with continuous participatory activities involving samples of the target groups. The first of these was organised with NBN: on November 8th, 2010 a serious games *workshop* was conducted by IMA with a group of about 10 nurses, therapists and doctors of the NBN clinic in order to explain the concept of serious games and to try to investigate their interest and motivation to experiment these instruments. Interest was so high that during the same workshop it was possible to carry out already a first needs analysis and a scenario collection. The following table describes the main ideas (with an overall topic and some specific training goals) that were collected during this workshop:

ANATOMY	Anatomy 3D Orientation on disease pattern and deficits Diagram - Where is the damage? Which symptomatology? Goal > e. g. Lyse Deposit Anatomy / Physiology of special areas For new staff and for refreshing Anatomy and disease pattern Spec- Stroke Unit - Which Stroke causes which symptomatology? Physiology of the brain, deposited as audio Include typical general diseases (Cardio...) 3D
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<p>WOUND TREATMENT</p>	<p>Wound treatment Different wound conditions - How do I have to act? Deposit the offer of dressing material in the clinic How to create documents as easy as possible? Visualized wound course</p>
<p>ADMISSION</p>	<p>Admission - How do you have to test? - What should be included? Try to swallow / bedding Plan for testing (protocol) Who has which function (relate to an occupational group) Swallow training (dysphagia in common) Allocation of tasks (occupational group) - interdisciplinary but also about information and internal processes Therapy - doctor-patient about physio > interdisciplinary understanding of the therapy focus point.</p>
<p>ADJUSTMENT</p>	<p>Adjustment of new staff > clarify processes. QM-Checklists Kinds of therapy in the SU Work safety Introduce to team - aim of stroke unit - setup Adjustment- checklist for new staff (all occupational groups) Training (annual) Therapeutical approach (Bobath, Basale, Kinäs) anatomy, disease pattern Virtual walkabout - interdisciplinary and related to different occupational groups Duty further education</p>
<p>COMMUNICATION</p>	<p>Communications board at base (electronical) Kind of handover (note data security!) All occupational groups share the same information Compile communication / interdisciplinary > Like fast information sharing/ appointment arrangement/coordination Know-How transfer -> knowledge base PC demonstration of doctors/staff - which room belongs to whom? structured - interdisciplinary handover - efficiently Electronical Board at base</p>
<p>NIS-SCALE (FOR APOPLECTIC STROKES)</p>	<p>Training Of The NIS-Scale Which Measures If Points Change? How To Asses Individual Functions? (For Nurses And Doctors) Common Speech, Interdisciplinary/ Clearly Defined Short Forms, Deposited And Visible NIS Scale - Communication Between Nurses And Therapy + Doctors</p>
<p>TRAINING</p>	<p>Deposit Regular Trainings Scoring System/Electronical Signature/Admission As Forbi- Particpance Fire/ Data/ Work Safety</p>
<p>EMERGENCY/STRESS SITUATIONS</p>	<p>Priority During Stress Situations Different Situations - What To Do First? Information Duty - To Whom? How Many People Participate? Classification Of Patients 'Search For Help' At Colleagues > Assistance Emergency Training /Neurological Emergency Situations Special Training For Improvement Of Psycho-Social Ability During Stress Situations Training Of Manual Work</p>
<p>CHART MANAGEMENT</p>	<p>Charts/ Chart Management - What Has To Be Written Down? Kind Of Food/ Vigilance Signature Food Note Checklist - Completeness Soft Food... If Patient Can Eat It Checklist > For Improvement And Adjustment Or Assistance Of Sundayshift</p>

SPECIAL SHIFT	Activities Of Sundayshift Prioritise Of Medical Deficits More Therapy Checklists
PATIENT ROLE	Taking Over The Role (Getting Into The Shoes Of The Patient) (3D) Possibility To Change Roles In A Game Developing An Understanding For The Role Of The Patient
COMPLAINT MANAGEMENT	Complaint Management / Handling Patients And Relatives And Complaints Clarification Of Relatives And Patients At Admission (Checklists) Conflict Situations Communications Training Connection To QM-Handbook And Complaint Management Criticism Management (Handling)
HANDLING RELATIVES	Clarification And Relatives Talks To Learn Complaining Management Training Of Negotiation / Play Counterpart/ Talk Guidance Interactive With Talk Records And Reflection Afterwards Communication With Relatives - How Was The Patient Before? Aims?
THERAPY	Patient Arrangement - What Therapy? - How Long? Covered On Patient Deficit And Success Criteria Communication With Nurse Deficit Orientated Versus State Orientated > Clearly Structured Overview Possible?
STROKE UNIT	Stroke Unit-Patient Is Announced - Global Activity Responsibilities Of Therapists For Stroke Unit-Patients Responsibilities Of Staff In Ambulance Or Ward QM-Handbook Checklist - Handover Of A Patient Communication To Nurses And Doctors Which Tests? > Assessments? How Can Information Be Handed Over To Other Occupational Groups?

Table 1 - Scenario collection from NBN

Furthermore in November 2010 and February 2011 IMA conducted several interviews with some volunteers and the disaster manager of the civil protection within the REG testbed. A first interview was carried out in order to better understand the role and understanding of the reflective sessions in this scenario as well as the different tasks that employees of the civil protection have to deal with. During these interviews the lack of reflective sessions arose and in the same time the idea to use some innovative tools, as serious games, to support reflection was seen in a positive way.

During the second interview with two volunteers plus one team leader of the civil protection, serious games and their learning potential were presented and their potential use within the civil protection scenario was discussed. Furthermore values, contents, and information that volunteers might like to share with other users through a serious game were investigated (see Annex A). Being able to help volunteers to learn and reflect through their past behaviours, and at the same time offering the opportunity to train a new volunteer with the support of a real, but safe (as virtual) environment, serious games were perceived immediately as a high potential solution.

Finally, during a large event in March 2011, together with NTNU and REG some shadowing activities were carried out in Turin with the Civil Protection. In particular the attention was focused on two volunteer coordinators and their interaction with the volunteers who are part of their team. Finally during the observation, IMA attention was focused on how volunteers behave during a typical event.

Thanks to the interviews that were possible during all these meetings, two first scenarios for possible serious games were sketched to train the volunteers and help them reflect on their activities:

<p>SHOW EXPOSURE (LINGOTTO-TURIN)</p>	<p>Patrol around the place (check the fire exits and all exits, in this case each stand should have a fire extinguisher) Public access Situations of possible risks (e.g. hostesses who smoke, throw the cigarette not completely off into the trash and cause a fire) Panic situation, people are afraid Keep calm, direct people to the emergency exits and help those in need Call the fire department or who it may concern Ensure that all persons are safe When the fire is off, make another round patrolling the place. If everything is ok reopen the public access</p>
<p>NEW YEAR'S DAY</p>	<p>Outdoor party, logistic and reconnaissance 2/3 weeks before Volunteers work in the more high risk places (e.g. river walls), always at least two volunteers together If there is some quarrel, report to the authority (please remember that the primary function of civil protection is the logistic one! They are not authorised to request documents) Support to other authorities Learning how to properly use the radio Civil protection as an 'info point' (information about roads, security, etc.)</p>

Table 2 – Scenario collection from REG

In all cases useful data were collected for further activities around serious games and their combination to other MIRROR apps.

4.2 Design studies

Investigating how to foster adult motivation to learn and reflect through serious games both difficult and fascinating at the same time. The three testbeds RNHA, REG and NBN all included serious games in their storyboards created starting from the creativity workshops in London in November 2010 and refined thereafter. Nevertheless, because of the complexity of this topic and because there was the need to address as many people and groups as possible in a way that the testbeds could offer at the moment, IMA decided to conduct design studies with specific research tools that have been defined for capturing relevant aspects.

In particular several activities were carried out:

- off-site data collection with the MIRROR testbeds (questionnaire for NBN and RHNA target users - see Annex B²)
- off-site data collection with other groups (questionnaire for non-expert users)
- on-site data collection with the MIRROR testbed (focus group with the volunteers of the '118 EMS' service - REG testbed).
- on-site data collection with other groups (workshop at LUDUS conference).

4.2.1 Off-Site data collection with the MIRROR testbeds

An off-site study does not require face-to-face interaction. As for organisational (RNHA and NBN) and language reasons (NBN) it was not possible to carry out direct interviews, as

² The 'Serious Games Experience with In-Depth Interview' (that can be found as part of the 'sandbox tool' D1.1) was used as the initial base for the user studies to be used with NBN. Given that the strategy had to be changed for NBN-internal reasons and what should have been face-to-face interviews had to be turned into off-line investigations, the initially foreseen questions had to be heavily adapted to the new situation to capture participants' reactions to the games anyway.

originally envisaged, when the questionnaires for the ‘sandbox tools’ were prepared, a new questionnaire had to be prepared and to be administered to the NBN and RHNA target groups. In particular these questionnaires were administered to the nurses and the carers who played the previously described serious games. This questionnaire investigates how this target group was motivated and how the serious game experience was.

Different strategies needed to be applied even at these two testbeds: RNHA decided to play the game with the owner of a care home first and, once he was convinced, to repeat the process with a group of carers. Potentially a champion should be identified here, in order to have someone able to support increasing the number of users using the game. The idea is that given the novelty and complexity of the game, a careful introduction in a working environment needs to take place in order to be able to support users, guide them and steer the individual as well as the team reflection. Also the process of sharing knowledge and building a bridge between the virtual and the real world experience needs an experienced facilitator to create a meaningful, effective learning experience by reflection. Furthermore a meeting with David Wortley³, one of the most expert immersive technology strategist, was set to train the trainer and teach about debriefing.

This looks like a very promising approach, as NBN decided to just distribute the link to the games and the questionnaires and some users seem to be confused and not sure how they should interpret this virtual experience. In order to see whether the application of CLinIC at NBN had or could have impact on reflection at NBN, WP7 (RUB and IMA supported by NBN) organised a debriefing session, which was held in June 2011 (see next section).

4.2.2 On-site data collection during a CLinIC debriefing workshop at NBN

In order to complement the feedback questionnaires with feedback allowing for an assessment of CLinIC with respect to its effects on (collaborative) reflection outside game playing, WP7 conducted a workshop with five game testers at NBN in early June 2011, which was facilitated by the NBN MIRROR project manager to ensure that there was no bias brought in by researchers. Among the participants were four nurses and the chief physician managing the stroke unit ward. During the workshop, all participants were asked to comment and reflect on five scenes from the games chosen arbitrarily. The structure of the workshop was simple and focused on exploring the relationship of reflection of the games and real work reflection, as can be seen from table 3.

ACTIVITY	CONTENT	TASK FOR PARTICIPANTS
Introduction of the scene	Scene is introduced by facilitator: What is happening and what are participants supposed to do in the scene.	
Relating the scene to own practice	Participants describe situations in which they experienced the scene in practice and how relevant the scene is for their practice.	‘When and how often have you been in this situation and what did you do? Please tell a story.’
Finding solutions/actions for scene	Participants reflect on each other’s stories/descriptions and find agreed upon solutions/actions to be taken in the scene.	‘Please discuss your stories, identify good reactions and tell me why they are good.’

Table 3 - Conduction of debriefing workshop for CLinIC at NBN.

³ Former founder of the Serious Games Institute, Coventry University

4.2.3 Off-Site data collection with other groups

As it took some time to organise these studies within the testbed organisations, in order to be able to collect further data, the questionnaire investigating flow during a serious games experience (see Annex B) was administered between end of April and May 2011 to other groups of adult workers outside of the MIRROR consortium. Due to time constraints it was not possible to involve a very large user group; nevertheless 9 questionnaires were collected, which give some interesting results useful to better understand the relationship between serious games, motivation and reflection.

4.2.4 On-site data collection with the MIRROR testbed

On-site studies require face-to-face interaction with potential future users of the MIRROR apps. For this reason on May 18th, 2011, a focus group with 10 volunteers of the 118 emergency service took place in Turin in order to investigate their motivation to adopt serious games as a learning and reflection tool. The volunteers that participated to this focus group were well distributed among gender, work experience and age. This supports a potential generalization of this discussion for this kind of target.

4.2.5 On-site data collection with other groups

On-site studies were conducted also during the LUDUS conference: serious games, Education and Economic Development (SGEED-2011), held in Milan in May 25-26-27, 2011. In this context IMA organized a workshop where participants could play with the two MIRROR serious games, discuss and confront each other about the experience they had and motivating elements they found in the games. Besides the informal feedback collection, the quantitative part of the questionnaire was also distributed and filled out by 8 participants.

4.2.6 Think better CARE and CLinIC: a first app for WP7 design studies

Preparation of the serious games

Building the two prototypes of the MIRROR serious games, 'CLinIC' for NBN and 'Think better CARE' for RNHA, was a very intensive activity distributed over a long period and characterized by a high interaction with the testbeds.

These serious games are both focused on difficult communication between nursing/carer staff and patients/residents and aim to foster reflection around different dialogues, as already described in sections 3.1 and 3.2. From a methodological point of view 'CLinIC' and 'Think better CARE' are twin games; to catch the two specific situations, different content and graphics have been created specifically for each of the two testbeds, according to their needs and expectations.

With regard to NBN, the collection of ideas and contents started around November 2010 after the workshop (for further information about this see section 4.1.2) that was conducted there by IMA. During this first work-session the main topic of the serious game was decided: 'difficult dialogues'. Nurses, in fact, underlined the necessity to improve their ability to deal with complex situations and reflect about their own work behaviours having a possibility to experiment different approaches and to share experiences with peers. Serious games were evaluated as a useful, interesting tool with strong potential to support learning and reflective processes both from an individual perspective (during the game play) and from a team perspective (thereafter with a debriefing). From that moment, for the next months an intensive bilateral exchange of ideas and contents from IMA to NBN permitted to create a storyboard of the 'CLinIC' serious game.

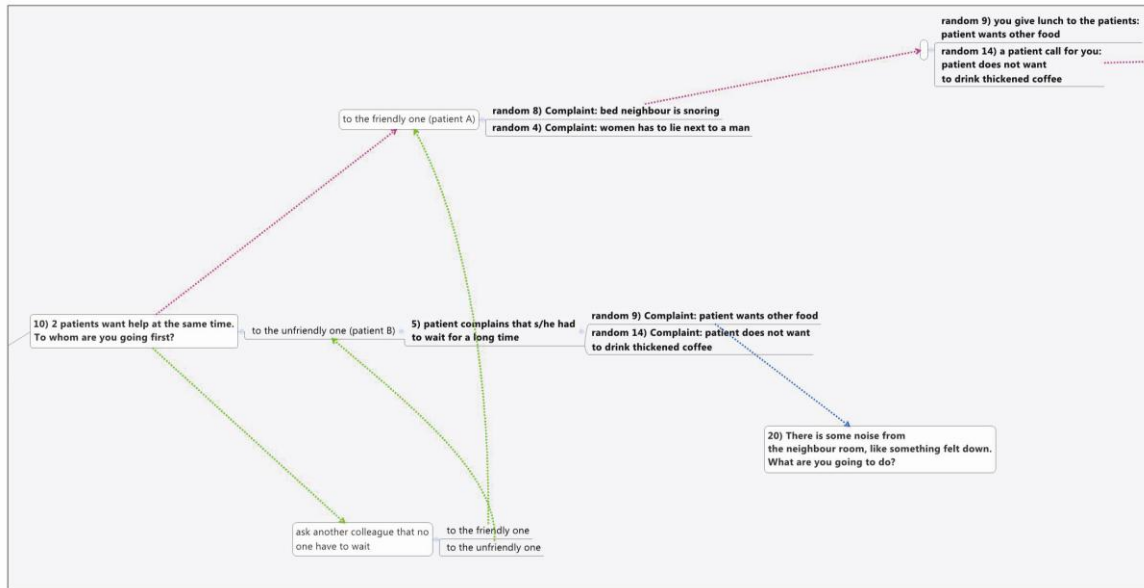


Figure 4 - Particular of the CLinIC mind-map

As is shown in figure 4, the structure of the serious game is based on a branching story, that was designed with a so-called 'mind-map' (representing the structure of the contents graphically). The game consists of 23 different scenes, 2 of which are descriptive and 21 of which ask the player to make a decision between different options, which are never obvious or evident. Overall there are 71 different options. Every scene is determined by the previous choice and sometimes randomly picked from a poll of possibilities, to make the user engage with the story even when playing again. For the graphics of this serious game NBN wanted to have a realistic environment as the adequate frame for a realistic virtual experience. Therefore they asked a professional photographer to take pictures of their hospital. About 100 pictures were taken and sent to IMA. Some of these were chosen for the game and had to be graphically treated to be embedded as gaming scenario.

For RNHA, procedure, time and effort to create the serious game 'Think better CARE' were more or less the same as for NBN. The same topic of difficult dialogues was chosen as the first one to deal with and all the contents were built together with RNHA starting from a bilateral meeting in Milan (aside the first GA, November 2010). From November 2010 to January 2011 an intensive exchange of ideas and information took place with several virtual meetings in order to prepare realistic contents. The game consists of 23 different scenes, 3 of which are descriptive and 20 of which ask the player to make a decision between different options. Overall there are 59 different options. About the graphical design, for internal reasons, taking pictures was not possible; thus a realistic, but 'comics' style was chosen.

After some months of intensive work both for IMA and NBN and RNHA the two twin serious game prototypes 'CLinIC' and 'Think better CARE' were ready around the end of April 2011.

Structure of the games to trigger reflection

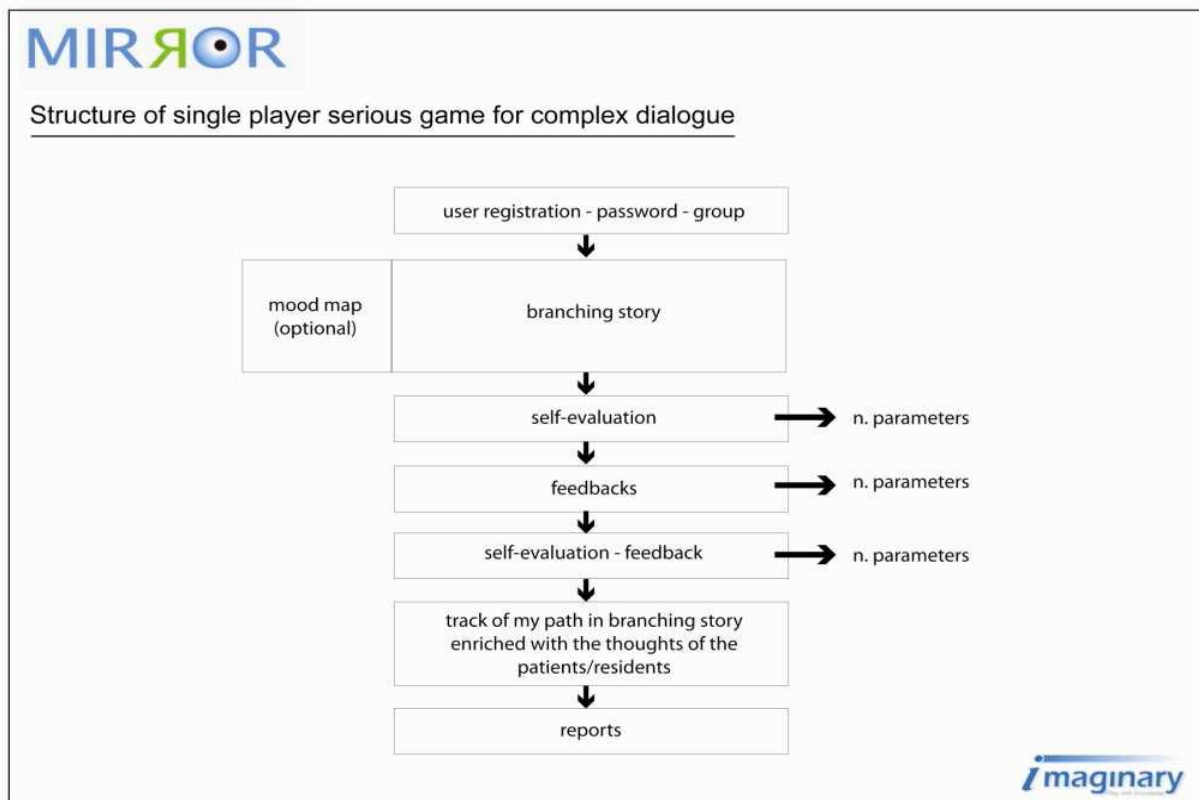


Figure 5 - Structure of the MIRROR serious game about complex dialogues

The previous picture shows the structure of the two twin games, in which users have the possibility to experience scenes of daily life at work. Nurses in a hospital as well as carers at the care homes will have to deal with different patients, choosing how to react to strange requests and how to balance their time and interventions among concurrent calls and needs. A 'mood map' (starting from an input for a MIRROR app by FZI, when ideas for apps were collected by all partners), based on the 'Circumplex model of affect' (Russel, 1989) was introduced into the serious games to capture the mood of players at some moments in time, typically at the beginning and at the end of the game. According to the chosen model, emotional experiences depend on two major dimensions, the degree of arousal and the degree of pleasure. During the game, whenever users feel it is relevant, they can record their emotional state (an icon to access the mood map is always disposable). Furthermore, in a couple of carefully chosen key situations of the game (see above) users are invited to record their emotions in those specific moments, allowing to develop a user 'emotional path' (see Fig.13). The mood map works as an element able to trigger reflection: breaking for a short while the flow experience users are able to be aware of their emotional state and starting to reflect why they are experiencing that emotional state and how it relates to the ongoing situation. It is fundamental to record users' emotions in WP7 for three reasons at least:

- the flow experience is strictly linked to positive emotions;
- revising the experience together with the emotions connected to the specific action is a trigger for reflection after the game experience;
- reflecting on the emotional path allows to analyse relationships between emotions and behaviours.

Due to lack of an automatic system to recognise users' emotions, this tool was chosen as the least invasive towards the flow. To keep the flow, in these games the choice has been to avoid reflection sessions interleaved with the dialogues, for example in form of intermediate

feedbacks on specific choices taken by the player. It was rather decided to have a larger reflection session when the dialogue comes to an end. The reflection session is organised as follows.

Reflection session after the game play

After playing users will have to do a self-evaluation, based on pre-defined parameters (e.g. for NBN *Patient satisfaction, Quality of response, Response in relation to the patient, Time management*) to state how they think they have performed. Furthermore a feedback based on the same parameters comes then from the system and a spider-web graph comparing the two is displayed. Finally, in order to be able to better reflect on the differences and on the experience, users will be able to review the dialogues, where the thoughts of the counterpart are shown as well (these are not displayed while playing the game).

This structure contains different elements which facilitate the reflective process:

- through feedbacks, users can check their behaviour during the game experience and reflect on it (see Annex C);
- with self-evaluation processes users are motivated to reflect on their actions and reactions during the game (see Annex C);
- the possibility to see the thoughts of the counterpart allows users to compare different points of view (see Annex C);
- through several data, e.g. coming from the mood map, users can check their behaviour and reflect on it (see Annex C);
- final reports facilitate users to reflect on the whole experience they had during the game (see Annex C).



Figure 6 - A screenshot from CLinIC



Figure 7 - A screenshot from Think better CARE

4.2.7 Technological Framework for the creative gaming environment

The serious games framework must be designed in line with WP2 'Interoperability framework'. This means that this framework must follow the principles describing the MIRROR AppSphere and the MIRROR technological framework, such as intent routing, common data model, caching mechanism on mobile devices, etc.

The serious game is seen as an application supporting a particular phase of reflective learning and is used combined with other applications. To do this, the serious games framework must exchange data with other applications of the AppSphere and maintain data synchronization. The communication protocol is defined in WP2 (see D2.1 for details about the draft definition), so the framework must have a sort of interface used to send and receive data from others Apps, based on this communication protocol.

The framework must allow to create a serious game and new games can be added later as they are needed.

The MIRROR AppSphere is designed to run on different platforms, such as web browser or mobile device, and also on different kinds of mobile devices. In the context of serious games, this means that the framework must allow final users to play serious games from a browser or from a smart phone.

Work in WP2 was started with a so-called 'Sprint 1' phase (see D2.1 - Annex A). As the Sprint 1 phase, the technical aim of which is to develop a common infrastructure with a bottom-up approach, has not yet defined all technical details of the MIRROR AppSphere, the serious games framework could not be built yet.

Nevertheless some design and development of services and functionalities already took place. Experiments and design around app to app connections and communication protocols took place within the Sprint 1 activities. As at the same time practical work around the research question with the testbeds had to be organized and take place in WP7 (as described in detail in this deliverable), the decision was taken to base this work (both technical and practical) on an internal proprietary serious games system: the so-called Imaplatform. This system, which was already extended with the afore mentioned communication protocols and is based on open-source technologies such as Spring and Hibernate Framework and is running on Apache Tomcat application server, allowed also already the development of the two extended prototypes described in this document (see also Annex C). Thus data exchange with external apps is guaranteed and the two serious games are able to send data to other apps.

In particular the following experiments were already carried out:

relying on already up and running web services to send and receive data, Imaplatform can send user notes (notes and comments taken by the user during the game play) to the Annotation App and moods data (recorded via the Mood Map described in this document) to

the Timeline App (see D2.1 – Annex A for the apps descriptions). Imaplatform can also export user results as it exposes web services.

In order to better align this system with the MIRROR AppSphere, the Imaplatform will be extended by adding more services and components as they are needed, proceeding together with the development of the MIRROR framework in WP2.

One extension could be to allow Single Sign-On authentication to let the user to log-in with the entire MIRROR AppSphere.

A first re-design of the Imaplatform to allow playing also from mobile devices (Android smartphones) has already taken place and some experiments were already successfully carried out. A refinement of the design is still to come in order to be able to include mobile access on a more extended level (e.g. to include iPhones).

5 DATA ANALYSIS AND RESULTS

As already described in the previous sections, different methods had to be used to conduct the user and design studies. All aim at investigating relationships between motivation, reflection and serious games and strive to contribute to answer the research question, that is the core of the whole work described in this deliverable.

In the following paragraphs the different methods and the derivable results of each are described; finally all the results are brought together to contribute to answer the question about motivation of adults to learn and reflect with games.

5.1 User studies

The first two questions⁴ of the questionnaire (described in section 4.2.1 as part of the toolbox in D1.1) were common to all the 5 testbeds and were administered to 113 users: 50 from RHNA, 4 from BT, 3 from Infoman, 17 from Regola and 39 from NBN. These questions aim to investigate what users know about serious games.

All the other information about willingness to use serious games to learn and reflect were collected with a reduced sample of 63 users: 4 from BT, 3 from Infoman, 17 from Regola and 39 from NBN.

The most relevant information arising from the analysis of these data concerns the knowledge of serious games: the majority of users (54,9%) state that they don't know what serious games are, and that they (83,2%) have never played with them.

Thereafter, answering a question about the willingness to use serious games as an instrument to learn and reflect, the average of the sample (63 users) is of 3.6 on a scale from 1 (strongly disagree) to 5 (strongly agree). The investigation if they would like to use this instrument even if it is not mandatory, obtains a very similar result: mean 3.5.

Finally, another important finding is closely related to the social dimension of serious games: nearly half of the sample (49.2%) underlines that they would prefer to play a serious game with others (46% would prefer to play alone while 4,8% not answer to this question).

Concluding, serious games seem to be a new technology that needs to be disseminated and explained much more. Notwithstanding this, serious games are perceived as an attractive and motivating tool, potentially useful and efficient to learn and reflect in working environment.

5.2 Design Studies

In this section all the data and results that have been collected from design studies with MIRROR testbeds and with other samples will be described. In particular the following activities were carried on:

- from May 2011 on NBN played with the serious game 'CLinIC' and filled out a short questionnaire;
- in June 2011, RUB and IMA conducted a debriefing workshop for CLinIC testers at NBN;
- in May 2011 IMA conducted a focus group with a group of about 10 '118' volunteers;
- in May 2011 IMA organized a workshop within the LUDUS conference showing the MIRROR serious games to about 30 participants.
- in June 2011 IMA organised an encounter between RNHA and David Wortley, to have an expert view on the game.

⁴ 'Have you ever heard about serious games before?' and 'Have you already played a serious game before?'

5.2.1 Off-Site data collection with the MIRROR testbeds

As already underlined in section 4.2, different strategies for the design studies at NBN and RNHA are being considered, resulting in the availability of data coming from NBN questionnaires only at this moment. Notwithstanding this RNHA collect some qualitative data about the potential use of a serious game in two different care homes. In particular the administration of these care homes evaluated serious game as a 'good approach to staff training and to encourage staff to reflect and think more generally about how they work and the consequences of how they care' and judged 'Think better CARE' in a positive way and in particular 'the option at the end of the game to review your feelings etc. is a great idea'. Both of them underlined the desire to administer this serious game to their employees because they 'find this very interesting and also fun as learning should also be fun!!! Can't wait to get started!!!'. First feedbacks coming from RNHA can be evaluated definitely in a positive way: users are really interesting about potential use of serious game as a tool able to trigger learning and reflection.

Furthermore, in June 2011 it has been organized a meeting with RNHA and David Wortley in order to have an expert view on the serious games world. During this meeting some useful information about serious games were collected and new hypothetical scenarios of application were sketched. In particular, 'Think better CARE' can be also used as a tool for recruiting new carers, giving users the possibility to experiment a new job in a safe virtual environment.

The first part of the questionnaire is about the flow experience: the CLinIC game described before was offered together with two other sample games (one about safety at the workplace and one about goal orientation skills), to avoid that non-expert users perceive the CLinIC game as the only possible type for a serious game (the other 2 games have a very different look&feel, a different interaction and way of presenting information).

In particular this part of the questionnaire is composed of 32 items that aim to investigate the 9 main element of the flow experience (Csikszentmihalyi, 1990), namely:

- Challenge–Skills Balance
- Clear Goals
- Unambiguous Feed-back
- Action-Awareness Merging
- Concentration on task at hand
- Paradox of Control
- Loss of self-consciousness
- Transformation of time
- Autotelic experience

Analysing the collected results, attention was focused particularly on the first three of the nine features, as these three characteristics can be considered key elements in the study of motivation related to serious games. Furthermore, as mentioned in section 4.2.1, as the necessary debriefing session about this experience could not take place yet, evaluation of all the data related to the 'immersive experience' (paradox of Control, transformation of time, loss of self-consciousness, etc.) has to be carried out very carefully.

Analysing the data from our sample of 11 subjects on a scale (see Annex B) of 1 (min flow) to 5 (max flow) the following mean scores emerged:

- Challenge–Skills Balance → $M^5 = 3.16$; $SD^6 = 1.40$
- Clear Goals → $M = 3.39$; $SD = 1.06$
- Unambiguous Feed-back → $M = 3.18$; $SD = 1.10$

⁵ Mean

⁶ Standard deviation

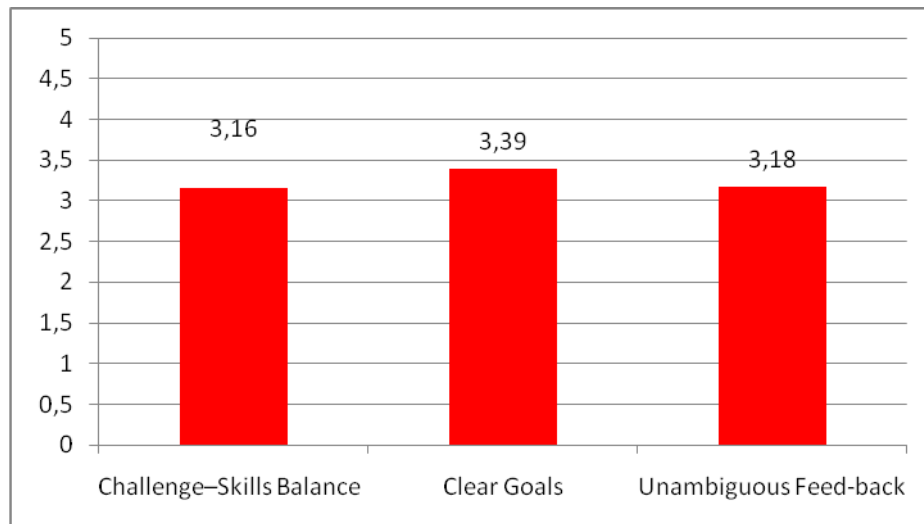


Figure 8 - Average of NBN answers (N=11) in a scale with 1 min flow and 5 max flow

The second part of the questionnaire, consisting of 18 open questions that aim to investigate more in detail the whole experience with the serious game, underline how positive and relevant this experience was: The majority of the users claims to have experienced pleasure regardless of the consequences and the potential rewards for their decisions. Also, almost all of them underline that they prefer to learn with a serious game that is strongly related to their working environment instead of using a metaphorical one with a higher level of abstraction. As far as 'loss of time' and 'loss of consciousness' are concerned, the majority of users underlines that these 'internal states' were impossible to reach.

Another important element relates to the topic 'challenge and skills': all users stated that their skills were enough to face the challenge of the game but most of them underline how a higher challenge would increase the involvement with the game. Some users also feel the need for more support in terms of a clearer feedback as well as for a better introductory explanation of the goals.

In conclusion these data show how users generally tend to evaluate the experience with serious games as positive and pleasant; the scores of the quantitative part of the questionnaire, slightly over average are somehow reinforced by the results of the qualitative part.

The next paragraph shows how a similar analysis was conducted with a different sample of adult learners working in different environments, recruited to enlarge the number of participants and the base of collected data.

5.2.2 Debriefing workshop for CLinIC users

As described in section 4, additional results on the CLinIC game stem from a workshop conducted at NBN to explore whether games have effects on real world reflection. In particular, the aim was to explore whether games may trigger collaborative reflection processes about work and whether reflection then relates solely to the game experience or also to real world practice. In order to derive answers for these questions, participants were asked to conduct fairly simple tasks such as commenting on the practical occurrence of scenes from the CLinIC game, tell stories in which they encountered similar situations, discuss each other's statements and derive solutions or actions to be applied in these situations (see table 3 for the respective questions). To relate the articulations of participants directly to the scenes discussed, the scenes were printed out and pinned to boards in the workshop room. Then, all articulations of participants were written down by them on paper cards and pinned to the scene printout they belonged to (see Fig. 9 for an example).

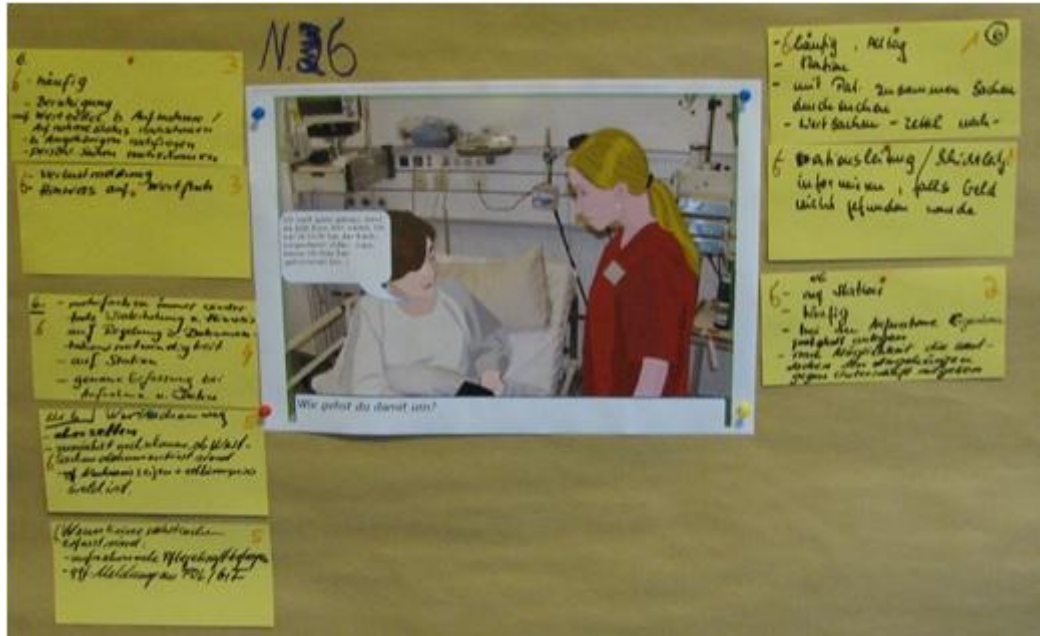


Figure 9 - Results from collaborative reflection on a scene from the CLinIC game.

Results from the workshop indicate that the CLinIC game has potential to trigger and support collaborative reflection. Participants told many stories and – overall – assessed the scenes to be relevant for their daily practice. In addition, each scene was discussed intensively even without the support or trigger of the facilitator. As a result, many new solutions and actions for the scenes were discussed and agreed upon, as table 4 shows.

Scene	Content	Cards written	Stories told	New solutions/actions	Discussion of other issues
1	Swallowing problems	8	-	2	Yes
2	Loud neighbour	8	1	2	No
3	Angry patient	10	3	3	Yes
4	Nurse introduction	5	3	-	Yes
5	Missing valuables	10	6	4	Yes

Table 4 - Results of the debriefing/reflection workshop of CLinIC at NBN.

The number of new solutions and stories related to artificially shown scenes (see Fig. 9) show that the game’s content is highly relevant for workers at NBN and that it can provoke and guide reflection. In particular, relating of real world experiences to these scenes has shown potential to bridge the gap from the virtual ground of games to real life reflection and to trigger reflection by playing a game. Participants at the workshop arrived at many new solutions for the scenes at hand. This shows that there is also an applicable outcome of this reflection.

Moreover, the discussions of scenes were not only focused to the scenes displayed. For four of five scenes, reflection on other issues was triggered as well. For example, during the work on scene 3, participants started to reflect on generally appreciated behaviour on the ward and during the discussion of scene 1, they reflected on how to support patients in asking the right questions during the ward round when a physician is present.

Overall, the observations during the workshop show that games such a CLinIC can trigger and support collaborative reflection of real work processes.

5.2.2 Off-Site data collection with other groups

The whole sample in this case consists of 17 persons coming from two different groups: 9 adults, working in different sectors (psychologists, plumbers, shopping assistants, software developers, etc.) and 8 participants of the LUDUS workshop (see section 5.2.4).

The first part of the questionnaire, common to the two groups, shows a similar result as average of users' answers:

- Challenge–Skills Balance → M = 3.86; SD = 1.2
- Clear Goals → M = 3.56; SD = 1.06
- Unambiguous Feed-back → M = 3.21; SD = 1.00

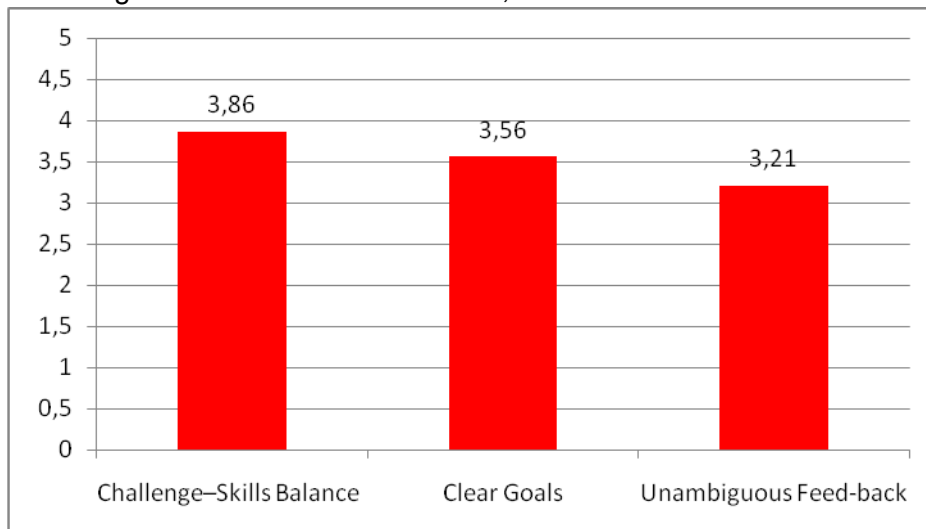


Figure 10 - Average of users' answers (N=17) in a scale with 1 min flow and 5 max flow

The second part of the questionnaire was not administered to the LUDUS workshop participants because during this activity a discussion was carried out to deeply analyse all the aspects presented in the last part.

For this reason, the qualitative part of the questionnaire was administered to a sample of 9 workers. As in the NBN group, the majority of users describe their experience in a positive and pleasant way. Furthermore they underline that they would prefer to learn and reflect through a serious game that is strictly related to own work experiences than with an abstract one. Feedbacks and goals were described as clear and unambiguous and a kind of balance between own skills and the challenges that were presented in the serious games was perceived. In particular 3 users pointed out that their skills were not enough to match the challenges that were presented: this probably can be explained with the fact that CLinIC is a game designed for nurses and some specific knowledge is requested in order to play the game.

As far as 'loss of time' and 'loss of consciousness' are concerned, the majority of users describes in this case their experience as really immersive and as a 'flow' one.

The possibility to integrate data coming from off-site studies with the data coming from on-site studies is a very good opportunity to better understand the feelings and expectations of users confronted with serious games. During interactions in presence it is in fact possible investigate and stress some topics that are really difficult to study and analyse with a questionnaire and furthermore is possible to have some more data coming from the non-verbal system (voice, gesture, proxemic, etc.).

In the following two paragraphs, in order to have more data to analyse the complex relationship between motivation-reflection-learning-serious games, data coming from a focus group with volunteers of the 118 emergency service as well as from the MIRROR workshop organised at the LUDUS conference will be discussed.

5.2.3 On-site data collection with the MIRROR testbed

On May 18, 2011, a focus group with 10 volunteers of the 118 emergency service took place in Turin in order to investigate their motivation to adopt serious games as a learning and reflection tool. The volunteers that participated to this focus group were well distributed among gender, work experience and age. This supports a potential generalization of this discussion for this kind of target.

During this focus group IMA presented some screenshots of the two twin prototypes of serious games developed for NBN and RHNA ('CLinIC' and 'Think better CARE'). The users were able to freely discuss about positive and negative elements perceived in these serious games. The impression about these two games was generally positive; in particular the volunteers of the 118 EMS service evaluated the possibilities to self-evaluate their own behaviour and the possibility to see the discrepancy between the self-evaluation and the feedbacks coming from the system as precious elements for learning and reflection. Furthermore they appreciated the possibilities to re-live the story with in addition the thoughts of the counterpart very much. The discussion was then turned to better understand which elements can increase the engagement in this kind of games. In general users pointed out the following elements as the ones able to increase motivation to learn and reflect through serious games:

- Interaction → the more a serious game is interactive the more the users will feel active players able to 'leaning by doing'
- Changing role → the possibility to live and experience another point of view is seen as one of the main elements to engage players
- Team interaction (multiplayer-game) → the possibility to play with other users gives a strong sense of 'social group' that increases intrinsic motivation to play a serious game
- Briefing/Debriefing → for this special target group a tool is intrinsically motivating if it is considered a support in terms of briefing or debriefing of a field activity.

Finally the participants evaluated serious game as a potentially useful tool for training. In particular in the frame of their work in the 118 EMS service, they underlined the following situations to use serious games:

- every day after the work shift to reflect on their behaviours during the shift;
- every day after the work shift to implement the database of critical situations that occur during their service;
- at home as a training tool (especially for new volunteers);
- during training sessions with all volunteers, integrated with traditional procedures, to experiment new situations in a 'safe' environment.

5.2.4 On-site data collection with other groups

On May 27, 2011, a MIRROR workshop with about 30 participants was organised at the LUDUS conference (for further information see section 3.4). As occurred in the focus group with volunteers of the 118 emergency service, attention was focused on the elements of serious games able to increase the adult workers' motivation to learn and reflect through these tools.

Participants were split in two groups: one groups played with 'CLinIC' while the other one played with 'Think better CARE'. At the end of this first 'practical session' each group was asked to discuss about the experience that they had already tried to underline all the positive and negative elements that they perceived in the serious games. In particular it was asked to focus and stress the discussion on three major features:

- strengths and weaknesses

- usability
- reflection and motivation

In the second part of this workshop each group chose a 'leader' to present to the audience the evaluation of the serious games that they played.

The impression about these two games was generally positive; in both cases the realism of contents and scenario were considered as an effective element able to motivate the users and keep them curious and attentive. The majority of the participants described in fact as positive elements the way used in both serious games to describe the stories ('complex dialogue') and for this reason they judged interesting the contents even if no one of them was actually a nurse or a carer. Another key aspect that arose during the presentation was the possibility to adapt the serious game to the users: different contents and options for different kind of users were strictly recommended.

Concerning usability, both the serious games were described as user-friendly: interaction was in fact evaluated as simple and easy. The graphic style was considered attractive even if in 2D.

Furthermore the possibility to self-evaluate their own behaviours as well as the possibility to re-live the story with in addition the thoughts of the counterpart were considered as the major elements able to trigger reflection in the users.

Concerning motivation instead some users underlined a discrepancy between the 'fun elements' (briefly introduced in section 2.3) and the 'learning elements': they asked for more fun elements in order to feel more engaged with the serious game. In addition they underlined the importance of explicit scores: users want to know how well they are performing. The feedback given by the system is not perceived as sufficient and sometimes users would like to have a sort of feedback step-by-step.

Furthermore during this workshop the questionnaire (see Annex B) was administered to the participants to collect some more data to better understand the relationship between motivation, reflection and serious game. As already mentioned before, only the first part was administered to participants.

Summarizing the collected contents allow to define which aspects of the games need to be enhanced as shown in the following table:

Discussion topic	Comment	Evaluation
Link to reflection	Very relevant	++
Graphics	OK as is (even 2D)	+
Fun-learning	Fun element should be enhanced	-
Usability	Generally user friendly and simple	+
	Mood map not user friendly enough	--
Contents/scenario	Realism is important	++
Motivation	Ok due to realism; with more fun even more motivation (e.g. to repeat experience)	+
Feedback	Explicit scores would be appreciated (sometimes monitoring their values continuously)	-
Choice of options	Better to offer different content to different users	-

Table 5 – Evaluation of different aspects of the MIRROR serious games

6 DISCUSSION

6.1 Summary

It is particularly complex to carry out studies with technologies that are so innovative that the very concept is unknown to the target groups. This makes the work of WP7 somehow different from the work carried out in other WPs, but the high interest shown also by other WPs to study possible integrations and synergies (see e.g. section 6.3 for a short overview of planned further activities) clearly shows that serious games are perceived as high-potential solutions adding value to other activities and techniques.

Putting together these considerations, with the results collected with both user and design studies in all three involved test beds as well as in the further observations that were carried out, it is possible to assume that users are in general motivated to experiment learning with serious games in several working scenarios and to reflect upon them both as individuals and in a team, particularly if a strong link between the game is clearly put in the front.

In general also, interactions with serious games were evaluated as a 'flow' experience to a certain extent. What seems to be the expectations to raise motivation as well as the 'flow' experience is a higher stress on the entertainment and on the 'fun' part, probably meaning that adding some creativity dimension to the interaction might easily lead to observing situations from a different angle and therefore might raise the stimulus to learning and reflecting. This is clearly indicating an area of cooperation that will need to be analysed in-depth together with WP5.

The developed games provide examples of how reflection can be promoted in the testbeds. The games also allow to play multiple times in order to experience with different patterns of behaviour. The discrepancies among experiences in different games might act as a trigger for reflection. During the second year WP7 will investigate more systematically how multiple experiences can be compared and possibly shared with others to improve the support that is provided in the current version of the games. The games also witness the possibility to support different types of reflection sessions, from short reflection session integrated IN the game, e.g. by asking the user why he made a certain choice, to richer reflection session AFTER the game has ended, e.g. as described in section 4.2.6. Summarizing, in Y1 WP7 has illustrated how serious games can provide different triggers for reflection, support different reflection sessions, and provide different feedbacks based on the needs of the specific testbeds.

6.2 Implications

At a general level, the experiences during the first year have confirmed the potential of serious games for supporting reflection. WP7 has shown how serious games can support players in living virtual experiences, providing therefore data for reflection when a real experience is not possible or not sufficient. As reflection about virtual experiences is currently not covered by the reflection model, in the next period WP7 will work very closely with WP1 on the development of the MIRROR theoretical framework. Thanks to their specific nature (as explained in section 2.3), serious games provide an important perspective on reflective learning and how it can be supported with innovative tools. The initial experience with serious games and their conceptualization as reflection tools will therefore be used in Y2 to challenge the state-of-the-art understanding of reflection, allowing the project to develop a model of computer supported reflection that takes into account the characteristics of a wide spectrum of technological support. In particular, the joint WP1-7 team expects that the experience with design and usage of serious games will help to better understand the multi-

faceted relationship between an experience and the corresponding reflection as supported by MIRROR apps. There are three main issues that were identified as central during this year. First, expecting that the experience with serious games will help to investigate better the relation between an experience and reflection on that experience, extending the model to capture virtual experiences. Second, by making possible paths of actions explicit to players when they have to choose the next move, serious games might support reflection by thinking forward on the consequences of one's action. The focus of MIRROR is on reflection on past experiences, however, it might be beneficial for building a more complete model of reflection to compare backward and forward reflection. Third, the work of WP7 in Y1 has focused on motivation and how to trigger motivation to learning. Motivation is important also for other tools and the understanding gained in WP7 will be transferred into the model, using the lessons learned for serious games also to other types of reflection tools.

In order to be able to carry out this joint work both with a top-down but also with a bottom-up approach, a joint mobile game for augmented reality will be developed by IMA and NTNU. Some preliminary analysis and studies for this game were already carried out by NTNU resulting in a first proposal of interface for reflection tool to be used during an event by experts to record real facts and happenings that can then be used as the base for volunteer training. The proposal for the interface of this mobile game is shown in figure 11.



Figure 11 - Interface for the mobile game

In Y2 one of the objectives will be to build on the gained experience to improve the types of triggers that can be provided within the game to support reflection, keeping the difficult balance between preserving the flow and creating breakdowns that can promote reflection. Suitable and effective ways to provide feedbacks will be also investigated.

In Y1 the focus has been on individual games. In Y2 the game will be extended to take into account different forms of collaborative reflection.

6.3 Outlook and further activities

In conclusion, the described serious games are the first of the several gaming apps that will be developed in the frame of MIRROR. Ideally a rough roadmap sketched with the three

testbeds RNHA, NBN and REG foresees to end with the realization of a virtual environment (virtual care home, virtual hospital), hosting several game apps, characterized by:

- Exciting graphics
- Missions with objectives to be achieved
- Obstacles to be overcome as tests to move up levels.
- Tasks to be completed resulting in accumulation of goods/resources/professional knowledge and understanding, which are required to pass the test and move up a level.

Such a virtual environment would be 'explorable' and different game-based games apps will be activated in different places according to local circumstances. This whole environment will serve as the base to research further how serious games relate to reflection and can serve as a trigger for it. This roadmap will entail strong collaboration with RUB and NTNU for aspects involving collaborative reflection (WP6); CITY to integrate and foster creativity (WP5); NTNU to always check that the reflection model is respected (WP1) and possibly also KNOW to stress individual reflection (WP4) and FZI to analyse players (learners) reaction with the help of some sensors (WP3).

As seen before, some phases still need to be carried out in order to verify motivation of adults to learn and reflect with games. Therefore this activity will be carried out continuously, while addressing already the second research question in year 2, namely 'How can the Zone of Proximal Development be maximized' with reference to Vygotskian theory. To enhance this research, some joint activities have already been planned in collaboration with other partners, particularly RUB, CITY and NTNU. This close collaboration will foster the produced apps, that will show how serious games can work in synergy with collaborative and creative learning techniques, respecting the chosen reflection model. In the scope of these activities, some concrete actions have already been taken. Particularly three are interesting to mention:

1. IMA is co-sponsor of a PhD post at CITY University for a student to research creativity, serious games and dementia care from September 2011 for three years.
2. IMA joined the work group organised by CITY about 'challenging behaviour'.
3. IMA is organising a researcher exchange with NTNU to study a mobile game solution for reflective learning with augmented reality in collaboration with REG.
4. IMA is the promoter of an ECTEL workshop about 'Augmenting the Learning Experience with Collaborative Reflection' (<http://www.i-maginary.it/ectel2011>) which foresees joint forces from the MIRROR and the ImREAL projects. The morning session is organised by NTNU with a call for papers to select the 6 most interesting papers about how collaborative reflection can augment and improve individual learning and the afternoon session will be hands on activity organised by IMA with contributions by CITY and RUB.

Annex A: Suggestions for the creation of a new serious game by 'civil protection' volunteers

1) Which values or rules would you like to pass on to those who want to start this path or who have recently become volunteers?

- Respect for the rules;
- Do not prevaricate team leaders;
- Predisposition to listening;
- Care for people in need;
- Not a SECURITY work but LOGISTICS work;
- Accept the 'cost' of their working shift;
- Desire to create a team, a "club".

2) Are you motivated to use serious games to learn and reflect about your working experience?

- Yes, we think that this tool can be a good opportunity to improve the training about our work.
- In particular serious games represent a good opportunity for us to reflect about our past behaviour occurred during our work for civil protection.

3) What can be done to increase this motivation?

- Organize a debriefing within the group after each playing session, to share our experiences, comments and ideas which arose during the interaction with the serious games.

Annex B: Questionnaire on Flow experience

The following questionnaires are about the relationship between serious games and adult workers.

Please follow the detailed instructions and remember that there are no right or wrong answers, but it is extremely important to give an answer to every question.

Before starting, we ask you some personal data that will be used only for scientific purposes:

gender: _____

age: _____

job: _____

INSTRUCTION USERS STUDY

- A. Every user plays all the three serious games in the following order:
CLinIC;
Skill up;
The Health and Safety Game.⁷
- B. After the first serious game (CLinIC) every user has to fill in Questionnaire 1.
- C. After the first questionnaire users have to play the other two serious games (Skill up, The Health and Safety Game).
- D. At the end of the third serious games users must fill in Questionnaire 2.

SUMMARIZING STEP BY STEP

1/5 Play the 1st serious game: CLinIC

2/5 Fill in Questionnaire 1

3/5 Play the 2nd serious game: Skill up

4/5 Play the 3th serious game: The Health and Safety Game

5/5 Fill in Questionnaire 2

STEP 1/5 CLinIC

Click here to play: <http://service.i-maginary.eu/nbnClinic/login.jsp>

Username: user4

Password: 6aabf4ad

⁷ Users studies identified users' lack of awareness about the concept of serious games. To deal with this situation, and to avoid users identifying serious games with just the one example produced by MIRROR so far, two very different serious games prototypes, that were already disposable at imaginary, were introduced in the design studies.

STEP 2/5 Questionnaire 1

*This questionnaire is about the **serious game that you have just played before (CLinIC)**. Thinking about the experience you have just had playing the serious game, please give a score to express your agree with the following sentences.*

	Strongly disagreed	Not agreed	Neutral	Agreed	Strongly Agreed
	(1)	(2)	(3)	(4)	(5)
1. I enjoyed the experience	1	2	3	4	5
2. The challenges presented in the game were balanced with my skills	1	2	3	4	5
3. The experience left me feeling great	1	2	3	4	5
4. I knew what I had to do during the game	1	2	3	4	5
5. The experience was extremely rewarding	1	2	3	4	5
6. In the game there were clearly defined goals	1	2	3	4	5
7. I knew what I wanted to achieve during the game	1	2	3	4	5
8. I felt competent during the game to meet demands	1	2	3	4	5
9. I wanted to record the feelings that I felt during the game	1	2	3	4	5
10. I had the feelings during the game that my abilities matched the challenges	1	2	3	4	5
11. I was totally concentrated while I was playing the game	1	2	3	4	5
12. I felt to have the total control of my feelings during the game	1	2	3	4	5
13. I took my decisions automatically during the game	1	2	3	4	5
14. While I was playing I had the feeling of total control on what was happening in the game	1	2	3	4	5
15. I knew how well I was doing by the way I was performing	1	2	3	4	5
16. I had the feeling to take a 'correct' decision without thinking during the game	1	2	3	4	5

- | | | | | | |
|--|---|---|---|---|---|
| 17. While I was playing I kept my mind on what was happening in the game | 1 | 2 | 3 | 4 | 5 |
| 18. I had a strong sense of what I had to do during the game | 1 | 2 | 3 | 4 | 5 |
| 19. I was completely focused on tasks | 1 | 2 | 3 | 4 | 5 |
| 20. While I was playing I could control what I was doing | 1 | 2 | 3 | 4 | 5 |
| 21. During the game I was not concerned with others around me | 1 | 2 | 3 | 4 | 5 |
| 22. During the game I behaved spontaneously | 1 | 2 | 3 | 4 | 5 |
| 23. I was not worried about performance during the game | 1 | 2 | 3 | 4 | 5 |
| 24. During the game I had the feeling the time was stopped | 1 | 2 | 3 | 4 | 5 |
| 25. While I was playing I had a total control of myself | 1 | 2 | 3 | 4 | 5 |
| 26. My attention was focused to reach my aims | 1 | 2 | 3 | 4 | 5 |
| 27. I knew how well I was doing while performing in the game | 1 | 2 | 3 | 4 | 5 |
| 28. Feedbacks during the game were clear for me | 1 | 2 | 3 | 4 | 5 |
| 29. During the game I performed automatically without thinking | 1 | 2 | 3 | 4 | 5 |
| 30. While I was playing I had a feeling of altered time | 1 | 2 | 3 | 4 | 5 |
| 31. I was aware of how well I was performing during the game | 1 | 2 | 3 | 4 | 5 |
| 32. I was not worried about others during the game | 1 | 2 | 3 | 4 | 5 |

STEP 3/5 Skill up

Click here to play: <http://service.i-maginary.eu/skillup>

Username: user4

Password: rdw40pbz

STEP 4/5 The Health and Safety Game

Click here to play: <http://service.i-maginary.eu/wordpress/play-the-game>

Username: user4

Password: mvw16r4a

STEP 5/5 Questionnaire 2

*This questionnaire is about the **whole experience** that you had playing with all the three serious games. Feel free to answer whatever you want: there aren't right or wrong answers.*

1. Did you take pleasure in this activity regardless of the consequences and the potential rewards of the same?
2. While doing the activity did you feel completely immersed to lose consciousness about the world around the game?
3. While doing the activity did you lose track of time?
4. While doing the activity did you feel that action matched the objectives you had?
5. Did you receive, at the end of activity, clear and unambiguous feedbacks?
6. While doing the activity did you feel a sense of losing control of yourself?
7. While doing the activity were you totally focused on the task?
8. Did you have in mind the clear objective to be achieved?
9. While doing the activity did you feel a balance between challenges and your personal capacity?
10. Which of these serious games generated the best feelings for you? Try to explain the main reason (i.e. ludic aspects, involvement, positive emotions, ability to motivate, clear goals etc...)?
11. While considering soft skills and behaviours, would you prefer to learn with a serious game strongly related to your working environment, or with one that has a higher level of abstraction and is linked to reality through a metaphor?

THANK YOU FOR YOUR TIME!!!

Annex C: Description of serious games elements

In this section the most important elements of the serious games developed for the NBN and RHNA testbeds, are presented.

The structure of the serious game is set up according to the structure of a branching story (which in mathematical terms is a directed graph), as this is particularly indicated to simulate dialogues: in each step users interact with the situation choosing between a set of possibilities. The choice they make determines the next step; thus users go through different paths and get different feedbacks about their interaction according to the sequence of choices they made.

In order to stress reflection around this interactive experience, this structure was enriched with several modules. The following paragraphs describe some highlights of these:

Think better CARE: mood map

Using the mood map, users can describe and record their emotional state (specifying arousal and pleasure) in specific parts of the game (sometimes it is mandatory) and whenever they wish to. At the end of the game, users can see a map that shows their emotional path. This information can be used coupled with results and the story of the interaction to reflect on one's emotional state and one's reactions.

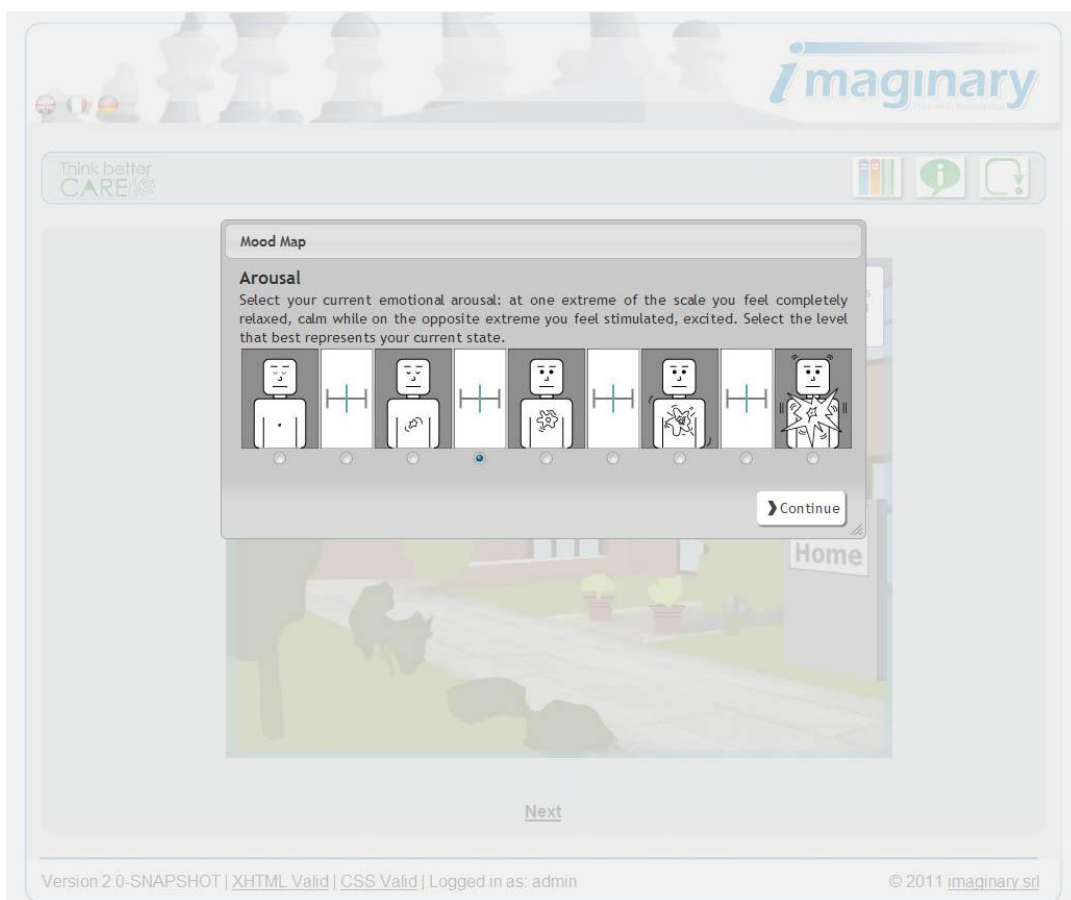


Figure 12 - Think better CARE: mood map

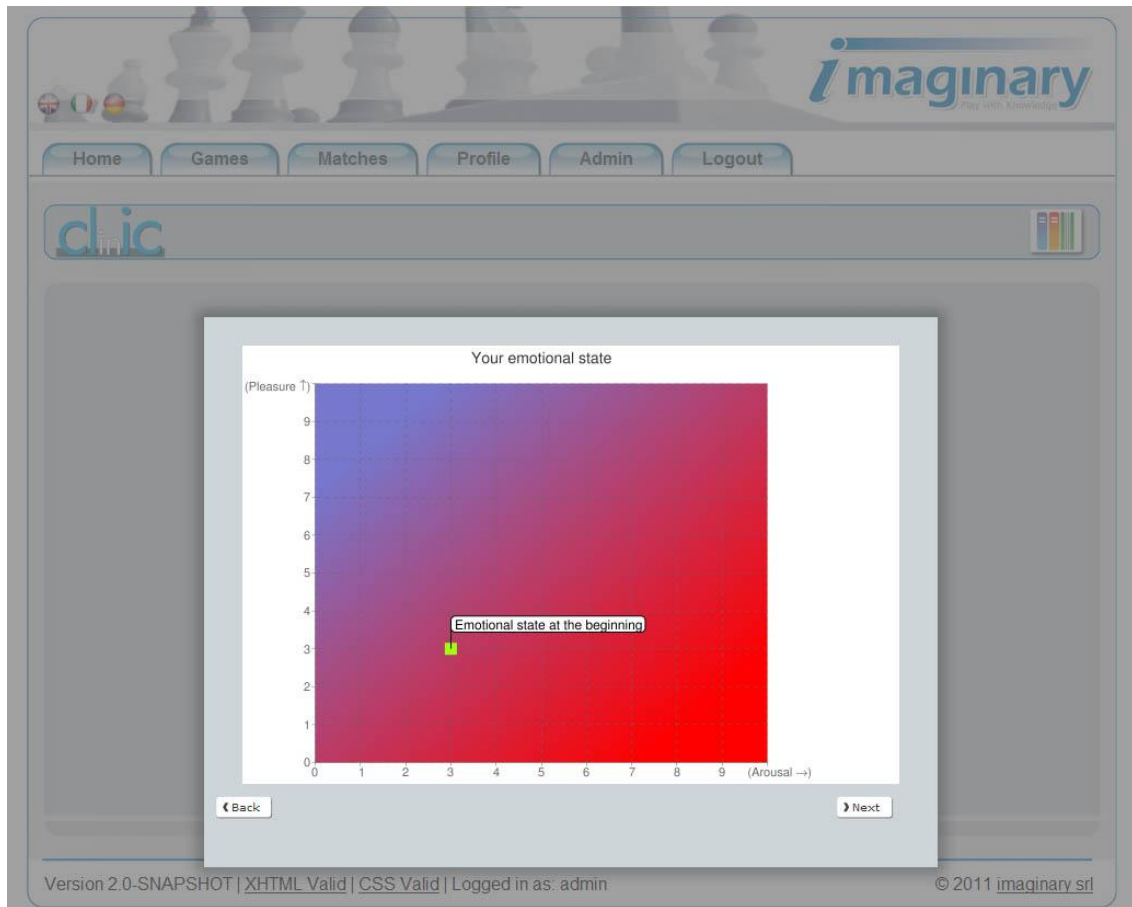


Figure 13 - CLiNIC: mood map graph

Think better CARE: self-evaluation

At the end of the game users should reflect on their decisions and as a support to this activity they have to self-evaluate each of the measured variables via a Likert scale.

Think better CARE - Self-evaluation

It's time to evaluate the choices you made during the game: give a score from 1 (completely disagree) to 5 (completely agree) to the following responses.

1. Completely disagree
2. Disagree
3. Neutral
4. Agree
5. Completely agree

Variable	1	2	3	4	5
Resident Satisfaction I think the resident was completely satisfied with the answers I gave and my behaviour.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quality of Response I answered the residents' questions and demands fully and honestly.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sensitivity of Response I adjusted my response according to resident behaviour.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time management I managed my time well, balancing care for each resident against my other tasks.	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Figure 14 - Think better CARE: self-evaluation

Think better CARE: graph self-evaluation vs system evaluation

After interacting with the simulated dialogue, users are asked to self-evaluate their performance, before they get the system evaluation. To reflect on the differences, through this chart users can compare the two. The distance between their evaluation and their real performance is shown along all four variables measured during the game.

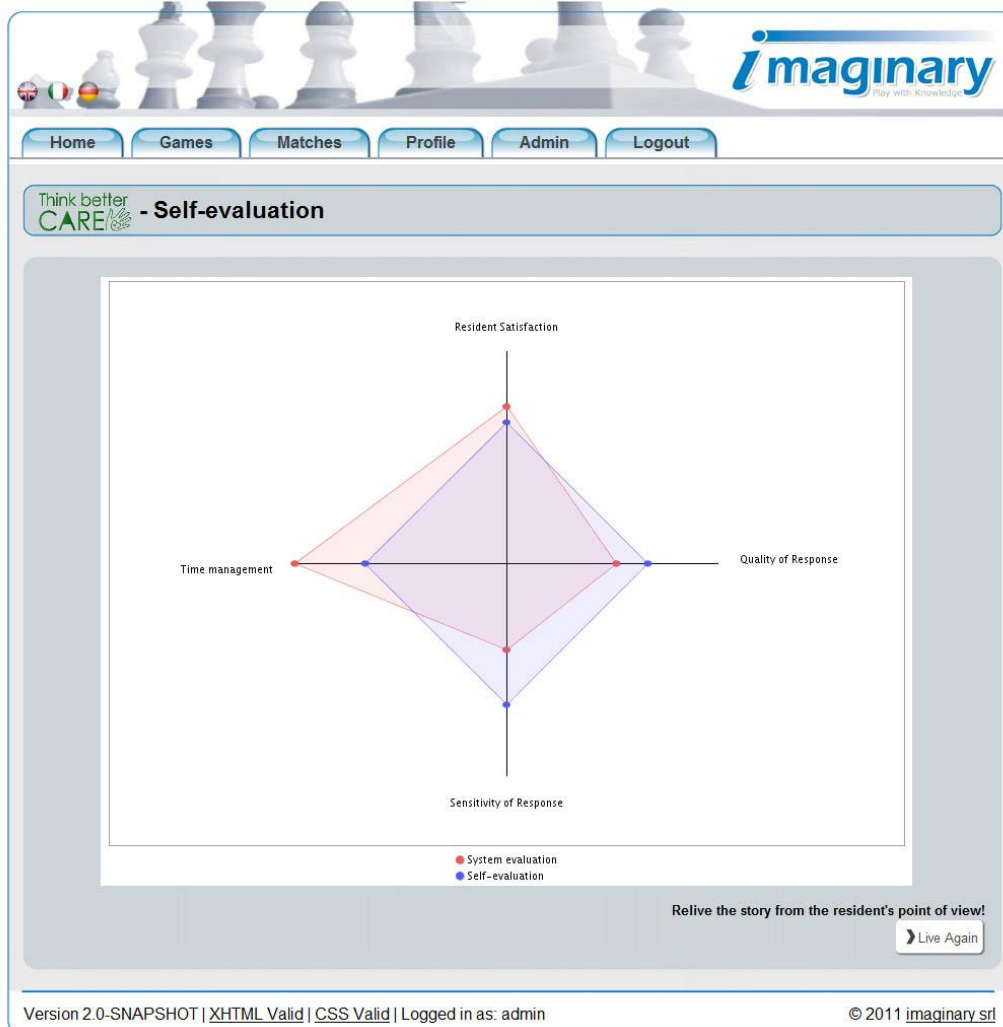


Figure 15 - Think better CARE: Self-evaluation graph

CLinIC: re-living the virtual experience with characters' thoughts

Especially when self-evaluation and system evaluation do not match, it is good to be able to understand what exactly went on during the dialogue. Thus, living again the experience can be useful to reflect on what happened, particularly if users can find out about the effect that their decisions had on the interlocutor, 'reading' the thoughts of their counterparts:



Figure 16 - CLinIC: characters' thoughts

CLinIC: feedback

Users can read a feedback for each decision they took during the game. The pictures help to understand how accurate these decisions (distance from the bull's eye) were:

The screenshot displays the 'CLinIC - Feedback' interface. At the top, there is a navigation bar with 'Home', 'Games', 'Matches', 'Profile', 'Admin', and 'Logout'. The main content area is titled 'CLinIC - Feedback' and contains four feedback entries, each with a target icon on the right. The target icons are bullseyes with a red 'X' in the center, indicating the accuracy of the user's response. The entries are:

- Relation of Response:** Your response according to the behaviour of the patient. Feedback: You could be a bit more friendly with the patients! Watch out next time! Target icon: Bullseye with a red 'X' in the center.
- Quality of Response:** This parameter shows how qualified your response is and in which way and how much information the patient gets. Feedback: Patients have to guess the meaning of your answers. Take better care of their needs and give them the information they need. Target icon: Bullseye with a red 'X' in the center.
- Patient Satisfaction:** This is the parameter how satisfied the patient is, according to your answer and behaviour. Feedback: Your patient is dissatisfied. Try to put yourself more into the shoes of the patient and try to show more interest in their needs and wishes. Target icon: Bullseye with a red 'X' in the center.
- Time management:** The way you managed time, it is the balance in care well about the patients and not let other tasks suffer. Feedback: You take your time for your patients, but sometimes other tasks come off badly. Think about where you could save time without letting the other parameters suffer. Target icon: Bullseye with a red 'X' in the center.

At the bottom right of the feedback area, there is a 'Save' button. The footer of the page includes 'Version 2.0-SNAPSHOT | XHTML Valid | CSS Valid | Logged in as: admin' and '© 2011 imaginary srl'.

Figure 17 - CLinIC: feedback

]

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