AMBIENT ASSISTED LIVING, AAL

JOINT PROGRAMME

ICT-BASED SOLUTIONS FOR ADVANCEMENT OF OLDER PERSONS' INDEPENDENCE AND PARTICIPATION IN THE "SELF-SERVE SOCIETY"

D2.1 User Study Framework

Final Version

Project acronym:	**ProMe**
Project full title:	**ProMe – Professional Intergenerational Cooperation and Mentoring**
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1 EXECUTIVE SUMMARY

1.1 Link with the objectives of the project

The following document provides a framework for the user requirements assessment and the iterative evaluation process. We provide information on the central research goals, the methodological approach, a timeline, and resources. The document is structures as follows: Part one provides an overview on the user centred design approach, which we follow throughout the whole project. First, we will briefly describe the different methods that will be applied and give an overview on the central research goals that are going to be addressed (a detailed description of the methodological approach and research questions can be found in the particular internal concepts for the studies). Second, we will briefly describe the overall concept for the iterative evaluation, which is based on the results of our requirements analysis (see D2.2). Moreover, we build on a theoretical model for knowledge sharing (Nahapiet and Ghoshal 1998) that allows us to consider specific requirements with respect to the role development and collaboration on the platform (for a more comprehensive description of this theoretical model and the relation to the user requirements see also the internal document “ProMe Quality Criteria”).

1.2 State of the art

The user study framework defines the central goals and the methodological approach for the iterative evaluation (see D2.3) and the pilot studies (D3.4).

2 THE USER CENTERED DESIGN APPROACH

With respect to the development of the ProMe platform we follow a user centered design (UCD) approach (see **Figure 1**), giving extensive attention to the target group's needs, limitations, etc. throughout the whole design and development process. We distinguish between three phases: 1) Analysis Phase, 2) Design Phase, and 3) Evaluation Phase, which are part of an iterative and cyclic process of analyzing, prototyping, and testing of a system or product.

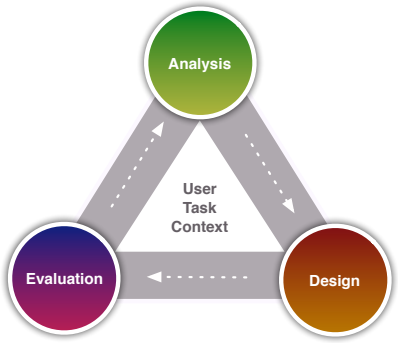

Figure 1: User Centered Design

The analysis phase encompasses activities that aim at gathering background information about our potential end users. It includes a literature research (see section 2.1.1) and the implementation of interviews and workshops (see section 2.1.2 & section 2.1.3). Based on this information first design sketches and prototypes will be developed and iteratively evaluated by means of heuristic evaluations and user studies in the lab (see section 2.1.4 & section 2.1.5) Finally, field studies will be carried out in order to test the ProMe platform in a real-world environment (see section 0). In the following, we will describe the different methods that are going to be applied and a rough timeline, whereby we want to point out that this section only serves as a guideline. Details about the methods and research questions can be found in the corresponding concepts.

2.1 Methodological Approach

The methods we describe in the following are a selection of methodological approaches that are suitable to achieve the defined goals of the ProMe project (see section 3.2). Nevertheless, as the project will apply a user centered design approach, modifications based on preliminary results will be possible.

2.1.1 Desktop Research

Starting point for the development of the ProMe platform is a profound literature research, that aims at investigating how intergenerational collaboration and knowledge transfer can be facilitated. This investigation will be done from two perspectives. From an HCI, i.e., CSCW perspective, we will investigate in what way information and communication technologies (ICTs) can support communication, collaboration, and knowledge transfer. Thereby, we aim at identifying key success factors as well as pitfalls for successful mentoring relationships. This work is done by PLUS. In parallel, motivated from the behavioral sciences, the mentoring concept will be developed by KH Leuven (see D2.5). Beside the literature research, we aim at identifying user needs and expectations towards an online mentoring platform, whereby we intend to apply a variety of different methods, such as interviews, expert discussions, workshops, and an online survey. These different methods as well as the central scope are described in the following sections.

2.1.2 Workshops

A workshop can be considered as a certain form of group discussion, whereby participants are given small tasks. The workshops will be carried out in the early beginning of the project in order to gain first insights in potential end user's (Mentor & Mentee) needs when sharing knowledge via an online platform. We will investigate what potential users expect of being a Mentor/being a Mentee (e.g., what kind of information they would be wiling to share/they expect when searching for a supervisor), what they consider as success factors or as pitfalls for successful mentoring relationships, and what would motivate them to get and stay active.

The method will also be applied at a later time in the project (e.g., in terms of design workshops). Based on the first insights, ideas how the system can meet the expectations of the potential end users will be developed. Participants will be, for example, encouraged to elaborate first ideas how functionalities on the ProMe platform could be visualized in order to support them to share knowledge (i.e., Mentor) or to acquire support within a certain situation (i.e., Mentee).

2.1.3 Interviews & Focus Groups

Interviews are a research method from Social Sciences that aim at gathering information in a one-to-one communication. A guideline is used in order to keep focused on the central topics. A focus group is a form of qualitative research that aims at gathering in-depth information about a certain topic. It is mainly applied in social sciences and can be considered as a certain form of a group discussion. A group of people is asked about perceptions, beliefs or attitudes, based on a semi-structured guideline, developed by the researcher.

Two different target groups are addressed within the interviews and the focus groups. On the one hand, interviews/focus groups will be carried out as follow up studies to the workshops in order to gain more detailed information about potential end users' perceptions, attitudes, and expectations of sharing knowledge via an online platform. These interviews will take place at the EUO's sides in Austria, the Netherlands, and Romania. On the other hand, it is also planned to interview experts, i.e., people who are already active as a Mentor or Coach in a professional way. This part will be taken over by PLUS in cooperation with the KH Leuven.

2.1.4 Heuristic Evaluation

A heuristic evaluation is a method that investigates the usability of a user interface. Based on a list of heuristics, a small group of experts try to find out usability problems potential users might have with an interface. First, the identified problems are assigned to the heuristics. Second, the identified problems are rated in order to identify substantive errors/problems. Heuristic evaluations will be carried out in order to evaluate first prototypes of the platform within the design phase and also later within the evaluation phase in order to guarantee a good usability of the system. Heuristic evaluations will be carried out by PLUS. Moreover, the EUOs, being experts with respect to potential end users, will be included in this process.

2.1.5 User Studies in the laboratory

A user study in the laboratory is an experimental design in which the researcher manipulates the independent variable in order to control and identify effects on the dependent variable. The advantage of the method is that potential interfering factors can be avoided. User studies will be carried out during the evaluation phase and will take place at the Center for HCI (PLUS). Potential end users of the platform (i.e., Mentors and Mentees) will be invited to test the system.

2.1.6 Field Studies

A field study is a structured (self) observation that aims at investigating issues in a “natural environment”. In comparison to experiments or user studies in the lab, the researcher does not manipulate the independent variable. At the end of the project we will carry out field studies in order to evaluate the system in a “real-world” setting. It is intended to carry out field studies in Austria, The Netherlands, and Romania involving potential Mentors as well as Mentees.

3 THEORETICAL BASIS FOR THE EVALUATION PROCESS

Based on the results of our requirements analysis (see D2.2) we will now define the central scope within the evaluation process. In order to assess the requirements of potential end users, we carried out a desktop research, workshops, interviews, and an online survey. Subsequently, we derived implications and defined the most important functionalities, which were the basis for the first mock ups (see Figure 2).

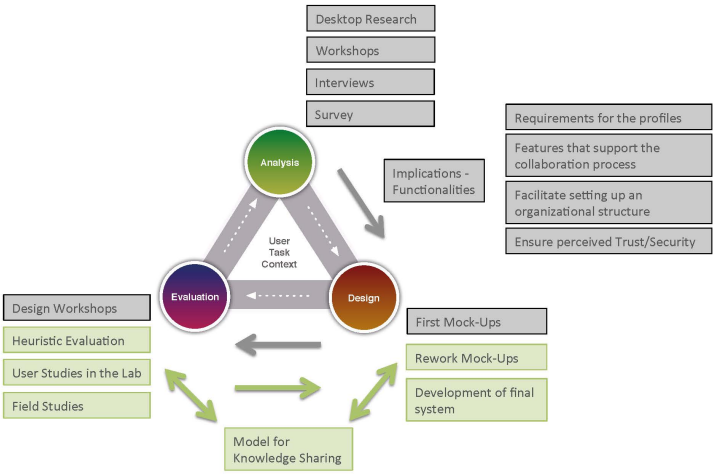

Figure 2: User Centered Design Process for ProMe

During the requirements analysis we came to understand that it was hardly possible to categorize our participants according to the roles we had initially defined (see the mentoring concept D2.5), i.e., the Coach, the Mentor, and the Network Facilitator, but that the time one is willing to invest and the degree of engagement someone is willing to enter, might influence the "role" one is taking over on the platform. In the context of mentoring, roles may be considered from two different perspectives, i.e., ascribed roles (roles and respective responsibilities that are attached to an official status such as, for example, the role of a medical doctor) and emergent roles (roles that are formed throughout social interaction). As relationships and the role someone takes within the relationship are developing over time (i.e., they are emergent), we decided that users on our platform should not decide beforehand what kind of different "role" they would like to take over but to reflect upon their willingness to engage with each other, i.e., binding or more non-binding (i.e., simply providing advice once). However, we aim at investigating possible roles one can take over, based on the users' activities on the platform, i.e., how long they are active or what kind of different tools they are willing to use.

Thus, we put emphasize on the negotiation phase in the beginning of the relationship, when users talk about their expectations and when they need to define obligations within the relationship, thereby constituting the basis for the emergence of roles. In order to better understand how we can support a beneficial relationship in

terms of knowledge sharing we build on the theoretical concept from Nahapiet and Ghoshal (1998), who emphasize the role of social capital in term of knowledge sharing, i.e., the development of new intellectual capital. This model supports, on one hand, the revision of the mock-ups and will, on the other hand, shape future studies as part of the evaluation process, i.e., user studies in the lab, the heuristic evaluation as well as the field studies at the end of the project. In the following subsection we will describe the concept and will point out selected topics and research foci, which we consider relevant and important within the evaluation process.

3.1 Social Capital in the Creation of Intellectual Capital

The theory of social capital is based on the idea that social relationships have got value, i.e., provide benefits. A friend, for example, will never let you down, when you need help. Thus, the actual benefit is practical support and emotional well-being (e.g., knowing that you have somebody you can rely on). Such relationships also provide access to knowledge and can have an impact on the development of intellectual capital, i.e., collective knowledge that is established through the *exchange* of knowledge. Nahapiet and Ghoshal (1998) define it as *"the knowledge and knowing capability of a social collectivity, such as an organization, intellectual community, or professional practice"* (p. 245). This, in turn, allows individuals to act in new ways. Consequently, intellectual capital is created through social interaction. Relationships that are characterized by trust and reciprocity hold potential for social capital, facilitate the exchange of knowledge and thus allow the creation of new knowledge, i.e., intellectual capital. Nahapiet and Ghoshal (1998) distinguish between three dimensions of social capital, i.e., the structural, the relational, and the cognitive dimension (see Figure 3).

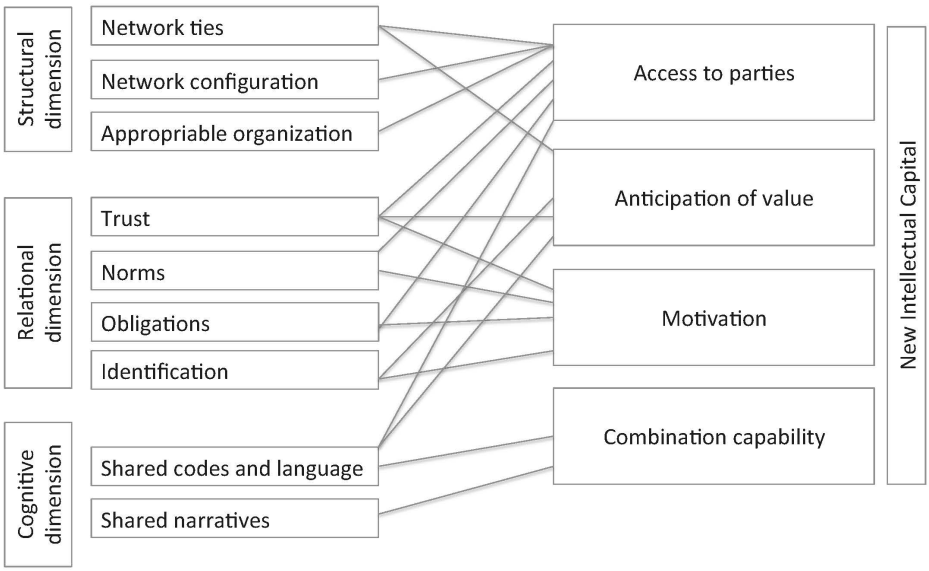

Figure 3: Social Capital in the Creation of Intellectual Capital (adapted from Nahapiet & Ghoshal 1998)

The **structural dimension** of social capital refers to the properties of a social system as a whole, i.e., standards of connections like density or stability of a social network. It describes impersonal aspects of social connections, i.e., the way we connect to others and to whom we connect. The authors also refer to patterns of linkages such as a hierarchy. With respect to the platform development it is important to enable access to certain parties to exchange knowledge. The channels that are provided (e.g., devices, tools), i.e., the infrastructure that is given to get in contact and to develop overall patterns of connections, influence the development of intellectual capital.

The **relational dimension** describes the character of social relationships that emerges through constantly recurring interactions and results in *"relational embeddedness",* characterized by *"interpersonal trust and trustworthiness, overlapping identities, and feelings of closeness or interpersonal solidarity"* (Moran 2005, p. 1132). Thus, besides the infrastructure, i.e., the given opportunities for cooperation (e.g., email, video-chat), it is important to consider how a system can support or facilitate trust and reciprocity. Of course this depends on the given infrastructure. A system that provides a variety of non-verbal cues that are important in human communication (Rettie 2003) might evoke more closeness and a feeling of presence than a system that lacks non-verbal cues and only allows, for example, communication via text messages (Dalzel-Job et al. 2011). However, it encompasses also norms of communication, expectations or obligations with respect to collaborative relationships. Norms, for example, define patterns of behavior and regulate social actions through sanctions. Obligations allow collaboration partners to anticipate the behavior of others, which in turn has, for example, a positive effect on the motivation of the collaboration partners to engage with each other (Nahapiet and Ghoshal 1998).

Finally, the **cognitive dimension** of social capital concerns resources that allow a shared understanding among two or more parties. Such resources include, for example, a shared language (Nahapiet and Ghoshal 1998). Considering, that the platform allows cooperation across geographical boundaries, not only the language but also cultural differences might play a central role to allow a shared understanding.

3.2 Research Foci during the evaluation

Based on the theoretical model from Nahapiet and Ghoshal (1998) we describe in the following the major components, i.e., research goals (RG) and sub-research goals (SRG), we pursue and consider important during the evaluation phase (see Figure 4). The corresponding research questions can be found in the particular concepts for the (user) studies.

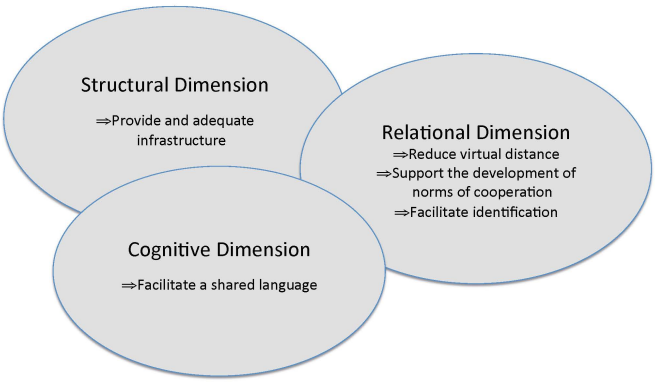

Figure 4: Research goals with respect to the theoretical model

3.2.1 Providing an adequate infrastructure

According to Nahapiet and Ghoshal (1998) the structural dimension describes ***impersonal aspects of social connections,*** i.e., the way we connect to others and to whom we connect. The authors point out that network structures represent the channels for information transmission. In this context density, connectivity, and hierarchy are properties that play an important role. With respect to the ProMe platform we consider the channels that are provided to get in contact and to exchange knowledge as the ***infrastructure*** for the development of network ties and network configuration. Accordingly, the following main research goal is defined:

RG1: Investigate, what the different features/tools on the platform need to provide to actually allow users to successfully share their knowledge with each other.

In order to reach this goal, we focus on two different aspects: 1) context and 2) usability. Considering that mentoring/coaching is a process, we assume that users need to be supported with respect to the different "stages" within their relationship, i.e., the ***context*** (see Figure 5). Considering, that different tools provide different qualities, we assume that specifically in the initial phase (i.e., when Mentor and Mentee meet each other for the first time) when it is important to establish trust and get to know each other, tools are required that support mutual disclosure and reciprocity, which are important preconditions for any successful negotiation (Mc Ginn 2004). Accordingly, we defined the following sub research goal: **SRG 1.1** Investigate, what tools need to be provided in which stage of the relationship.

Second, we consider the ***usability*** important, i.e., a user's subjective experience in terms of effectiveness, efficiency, and satisfaction when interacting with the ProMe platform. Consequently, we will investigate to what extend the tools that are provided actually allow users to exchange knowledge with each other, which leads us to **SRG 1.2** Evaluate how users estimate the usability of the system. The usability will be evaluated by means of an expert evaluation (i.e., heuristic evaluation) and within the user studies in the lab and during the

field, using the system usability scale (SUS) (Brooke 1996), a ten-item scale ranging from “strongly agree” to “strongly disagree”.

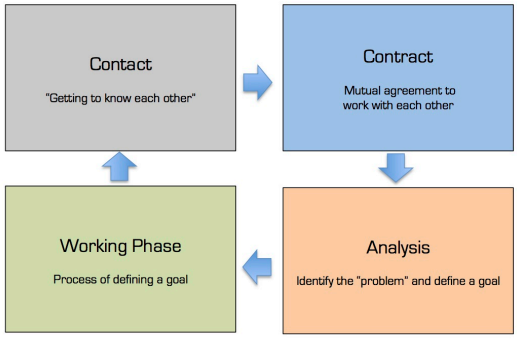

Figure 5: Phases in the mentoring process

3.2.2 Reducing virtual distance

With respect to the relational dimension we consider the ***quality of the personal contacts*** people have with each other to actually share and exchange knowledge. The main challenge we face is reducing the virtual distance that is caused by the absence of regular face-to-face meetings (Lojeski and Reilly 2008) in order to facilitate trust, which positively influences cooperative activities (Putnam 1993).

Specifically, in the context of video-mediated communication we find a variety of approaches to overcome this virtual distance that basically share one common idea: mimicking face-to-face communication by transmitting a variety of non-verbal cues that positively influence trust (e.g., Schoorman, Meyer, and Davies 2007, Bos et al. 2002). Dalzel-Job et al. (2011), for example, point out that rich communication, i.e., providing a variety of non-verbal cues, can enhance social presence and the feeling of being there when communicating over distance. This, in turn, can reduce virtual distance (Lojeski and Reilly 2008) and evoke a sense of connectedness and closeness (Gooch and Watts 2011). We argue that in the context of exchanging knowledge, rich communication also encompasses tools that allow to access the progress within the cooperative relationship, making visible what a receiver has achieved so far and in what way the actions of the provider already supported him/her. We also consider reciprocity as important component. It is based on the principle that people match behaviors they experienced from others with the actions they perform for others (Carr 2006). It is about the extent to which it comes to reciprocal communication between users like chatting or writing emails, but also through responses to shared content. The communication can be direct (e.g., chatting) or indirect (e.g., rating posted comments). We defined the following main research goal:

RG2: Investigate how virtual distance can be reduced via the ProMe platform in order to support cooperative processes.

In order to reduce virtual distance, we consider four aspects important: social awareness, reciprocity, engagement, and social presence.

Social awareness encompasses the idea of knowing the working context of another person, which has been identified as crucial for successful cooperation (Bardram and Hansen 2004). Hence, it is important to provide awareness about, for example, activities, whereby it is not required to show *exactly* what somebody is doing but to provide the most important cues, that allow creating awareness of what is going on (Bardram et al. 2006). Consequently, we aim at investigating what the platform needs to provide to create social awareness for its users and thus support cooperative processes **(SRG2.1).**

Reciprocity is based on the principle that people match behaviors they experienced from others with the actions they perform for others (Carr 2006). It is about the extent to which it comes to reciprocal communication between users like chatting or writing emails, but also through responses to shared content. The communication can be direct (e.g., chatting) or indirect (e.g., rating posted comments). Relationships that are characterized by trust and reciprocity hold potential for social capital, facilitate the exchange of knowledge and thus allow the creation of new knowledge, i.e., intellectual capital (Nahapiet and Ghoshal 1998). Hence, we defined the following **SRG2.2** Investigate how reciprocity can be facilitated via the ProMe platform.

User engagement is *"the emotional, cognitive and behavioral connection that exists, at any point in time and possibly over time, between a user and a resource."* (Attfield et al. 2011). Here, we focus on users' subjective experience of being engaged with each other and aim at investigating what the platform needs to provide to support their subjective experience of engagement, i.e., aim at investigating to what extend the provided features on the platform allow users to actively engage with each other **(SRG2.3).**

Finally, ***social presence,*** the feeling of being together in a mediated communication (Biocca et al. 2003), *will be assessed.* Following Biocca and Harms (2002) the consciousness of the co-presence of another party is important, which can be enhanced, for example, through the system's qualities (e.g., providing visual, auditory cues). Additionally, we consider the "psychological involvement", i.e., the sense of access to the intelligence of the communication partner, as important aspect to reduce virtual distance. Consequently, we aim at investigating how we can enhance social presence **(SRG2.4)** and in which way social presence and social awareness are interrelated to each other **(SRG2.5).**

3.2.3 Support the development of norms of cooperation

According to Nahapiet and Ghoshal (1998) another important aspect regarding the relational dimension are norms and obligations, whereby specifically norms have got an influence on the motivation to engage with each other. Within the requirements analysis we have found out that matching the right collaboration partners is one important aspect with respect to the development of norms of cooperation. The time one is willing to invest and the age have been identified as important components. Within the evaluation phase we aim at identifying most important factors that facilitate the development of norms of cooperation. Thus, the main research goal is:

RG3: Investigate how we can facilitate the development of norms of cooperation through the ProMe platform.

Norms are socially defined rules that control action, i.e., provide limits for social behavior (Nahapiet and Ghoshal 1998). They regulate patterns of behavior and social control, which is enforced by sanctions. Norms that apply within the social network, ensure access to information and facilitate trust as well as norms of

cooperation (Coleman 1988). Nahapiet and Ghoshal (1998) point out that norms have a significant influence on the development of intellectual capital, as they ensure, for example, the motivation to take part in collaboration processes to exchange knowledge. For successful collaboration over time, it is critical to understand the expectations about how to act towards each other (Golder and Donath 2004). Being aware and making use of this inherent knowledge in a Mentor-Mentee relationship, where knowledge is *given* and *received*, facilitates the predictability and organization of collaborative processes, on, for example, the ProMe platform. One important norm of cooperation for the ProMe platform is the development of a mutual agreement that defines goals, expectations, and obligations for the cooperating parties. In relation to expectations and obligations, Dahrendorf (1968), for example, distinguishes between three main types of expectations, i.e., 'can', 'shall', and 'must'. A discriminating characteristic between these types is the kind of sanction (i.e., positive, negative, or both) imposed, if role expectations are (not) satisfactory accomplished (e.g., Dahrendorf, 1986). This is particularly important for the ProMe platform, as negative sanctions (e.g., reducing time investments) may counteract the motivation to be actively engaged on the platform.

Consequently we define the following **SRG3.1** Explore how the ProMe platform can support users to define the mutual agreement and **SRG3.2** Investigate how the mutual agreement contributes to the success of the collaborative relationship.

3.2.4 Facilitate Identification

Norms of cooperation have not only a positive effect on the motivation to engage with each other and to exchange knowledge, but also on identification, the process, whereby *"individuals see themselves as one with another person or group of people"* (Nahapiet and Ghoshal, 1998, p. 256). Thereby, identification plays a critical role from both – micro and macro perspectives. On the one hand, within a '1:1' relationship (e.g., Mentor – Mentee), each individual has the fundamental need to identify oneself within this relationship (i.e., can I see myself in this relationship). On the other hand, also within '1:many' relationships (e.g., entire social network on ProMe), each individual part of this network needs to find him-/herself in this larger context. Here, the concept of social roles, i.e., cultural objects that are *"real insofar as they are recognized, accepted, and used to accomplish pragmatic interactive goals in a community"* (Callero, 1994, p. 232), is central. For example, in an online community such as ProMe, an interactive goal may be to mutually provide (i.e., Mentor) and receive (i.e., Mentee) knowledge. Therefore, identifying, characterizing, and understanding the social roles part in these online communities that are forming larger social networks is important to create beneficial relationships for both parties, i.e., as social roles identify how people relate and belong to each other, are responsible for and count on each other (Briddle, 1986). Accordingly, we aim at making users feel part of a larger network but also to facilitate identification on a micro and macro relational dimension within '1:1' relationships. Consequently, we define the two following research goals: **RG4: Investigate how emergent mentoring roles can be characterized** and **RG5: Explore what factors support users in identifying themselves with a larger network or 1:1 relationships.**

3.2.5 Facilitate a "shared language"

With respect to the cognitive dimension we aim at facilitating a shared language, whereby we consider the cultural background as well as pre-experiences users have as important components. The major goal is to establish a set of common understandings, which we consider as part of the mutual agreement, i.e., negotiating a way to achieve the intended goals. Subsequently, we define the following research goal: **RG6: Investigate to what extend the cultural background (e.g., language) influences the negotiation and collaboration process.**

4 TIMELINE AND RESPONSIBILITIES

The following table provides a brief overview on the schedule and responsibilities with respect to the different analysis and evaluation activities. A detailed planning for the iterative evaluation (mainly encompassing the heuristic evaluation and the user studies in the lab as well as the planning for the field studies) will be done based on the results from the analysis and evaluation.

Date	Activity	Responsibility
April – June 2014	Literature Research	PLUS, KH Leuven
June-July 2014	Workshops	PLUS, EUOs (NFE, AGIR, EURAG)
August-September 2014	Interviews/Focus Groups	PLUS, EUOs (NFE, AGIR, EURAG)
October-December 2014	Online Survey	PLUS, EUOs (NFE, AGIR, EURAG)
January/February 2015	Development of Role Profiles/Knowledge Sharing	PLUS
March 2015	Design Workshops with first mock ups	PLUS, EUOs (NFE, AGIR, EURAG)
July 2015	Heuristic Evaluation	PLUS
September 2015	Evaluation/Feedback at the AAL Forum	PLUS
November/December 2015	User studies - evaluation of the following functionalities (mobile and desktop version) • Assessing the portal • Log-in/sign up • Set up a profile • Personal space page • Search • Forward a request • Network	PLUS, EUOs
November/December 2015	Workshop with users for collaboration tools – evaluation of mock-ups – participatory design workshops	PLUS
February/March 2016	Expert Evaluation (Heuristic Evaluation) – Usability Experts and Mentoring/Coaching experts	PLUS, EUOs
Mai/June 2016	User studies in the lab	PLUS
October 2016-February 2017	User studies in the field	All

5 THEORETICAL BACKGROUND AND RELATED WORK

ProMe seeks to provide meaningful opportunities for sharing one's knowledge via an online platform. A variety of different functionalities (e.g., video/text-chat, email, blogs, forums) will allow users to engage in a mutually beneficial relationship. In HCI, the CSCW[1] (computer supported collaborative work) community focuses since the early 1980ies on social and organizational aspects of computing, i.e., how computer technologies can be designed to support collaborative working practices. Collaboration in this context can be defined as "*cooperative arrangement in which two or more parties (which may or may not have any previous relationship) work jointly towards a common goal"* (Business Dictionary Online 2014). In the following section, we will briefly outline relevant concepts that are concerned with aspects of computer supported collaborative learning, which provide useful information for the development of the ProMe platform.

One area that is especially concerned with collaborative aspects in a learning environment is CSCL (computer supported cooperative learning). CSCL takes place via social interacting using a computer or through Internet and is about *sharing and the construction of knowledge.* CSCL stresses collaboration among students. Stahl et al. (2006) point out that it is not simply about "reacting" but about developing knowledge, which requires, for example, students working together towards a common goal. Koschmann (2002) points out that CSCL is mainly concerned with meaning and the practices of meaning-making in the context of joint activity, and the ways in which these practices are mediated through design artifacts. Thus, CSCL follows the idea that learning is constituted by interaction - collaborative learning is not only learning together but about *creating meaning.*

Roschelle and Teasley (1995) define it as follows: *"Collaboration is a process by which individuals negotiate and share meanings relevant to the problem-solving task at hand…. Collaboration is a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem."* (p. 70)

Benefits of a collaborative Learning Environment: An Example

According to Biljani et al. (2011) the emergence of collaborative multimedia-based instructional technology has brought powerful changes to traditional teaching in classrooms. They conducted a case study to investigate the architecture for a collaborative multimedia environment called A-VIEW. A-VIEW is fully decentralized (e.g., it works on different devices like smartphones and PCs) and mimics a real university consisting a number of meeting rooms and a lecture room. It supports collaborative multimedia applications like video chat, sharing of documents or graphics and simulations in real-time, and text. The outcomes of the case study show that through the real-time collaborative multimedia e-learning feature of A-VIEW barriers related to technology, time, skills, etc. are reduced and that marginalized learners (e.g., migrants, people with learning difficulties, unemployed, people with low incomes or low levels of initial education, older people, etc.) benefit from it as well (Biljani et al. 2011). Benefits for marginalized learners, which cannot be reached easily, can be fostered through e-mentoring (see section 5.1).

[1] CSCW is an academic field and interdisciplinary research area, which is design oriented and encompasses on the following research areas: social computing, social media, crowdsourcing, technologically-enabled or enhanced communication, CSCL (computer supported collaborative learning) and related educational technologies, multi-user input technologies, collaboration, information sharing, and coordination.

5.1 E-mentoring

When talking about mentoring via technical devices different terms like e-mentoring, online mentoring, or virtual mentoring are used. We will give a brief overview on definitions for e-mentoring in the following.

5.1.1 Definitions of e-mentoring:

Gomez (1996) describes e-mentoring as the *"use of email or computer conferencing systems to support a mentoring relationship when a face-to-face relationship would be impractical."* (p.39). According to Bierema & Merriam (2002) e-mentoring is *„a computer mediated, mutually beneficial relationship between a mentor and a protégé which provides learning, advising, encouraging, promoting that is often boundary less, egalitarian and qualitatively different than traditional face-to-face mentoring"* (p.214). Mueller (2004) states that e-mentoring can support a *"reflective learning environment where mentoring pairs can explore their values, feelings and objectives at their own pace and more freely than in face-to-face communication, which can be pressurized through the need to respond immediately."* (cited in Philippart 2014, p. 17). For Hunt (2005) *"utilizing technology, e-mentoring is the process by which two people assist each other to grow in a safe and supportive relationship."* (cited in Philippart 2014, p.16)

Challenges & Benefits of e-mentoring

Hunt (2005) identified several benefits that e-mentoring can provide in comparison to traditional partnerships, which are highlighted in the following:

- "*The asynchronous nature of email allows people time for reflection before responding.*
- *The need to write out a message drives clarity and greater depth of communication.*
- *Location is not an issue.*
- *Gender, race, power and other barriers are reduced.*
- *Time is easier to manage and virtual meetings are not costly.*
- *A record of discussion often exists for later reflections and learning.*
- *There is opportunity for greater and wider participation.* "

Philippart & Gluesing (2012) emphasize further that a major benefit of e-mentoring is that it allows each partner to bring their experiences and their strengths into the relationship without having too much emphasis on seniority and hierarchical position whereas it brings up some additional challenges to traditional partnerships like the need to have access to technology and the skills to completely utilize it. Hence, according to their study results, they suggest to advice both partners that there is a need for access of technology at home, increase their comfort to use technologies like Skype, and recommend them to have at least one face-to-face meeting in order to establish a successful e-mentoring partnership. According to Bierema & Merriam (2002) *"the possibilities for e-mentoring are as endless as the Internet."* (p. 223). They highlight that e-mentoring is redefining mentoring relationships and that technological advances like, for example, different forms of computer mediated communication (e.g., email, chat groups) carry the potential to enhance the mentoring process and make it available to groups that had limited (or none) access to it in the past.

5.2 Theories in Media Research

In order to provide a deeper look on aspects we consider as being important with respect to the development of the ProMe platform we will now have a look at theories in media research. We will beforehand give a short description of what we mean when talking about social media.

Social Media is a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content. Within this general definition, there are various types of Social Media that need to be distinguished further. However, although most people would probably agree that Wikipedia, YouTube, Facebook, and Second Life are all part of this large group, there is no systematic way in which different Social Media applications can be categorized. Also, new sites appear in cyberspace every day, so it is important that any classification scheme takes into account applications, which may be forthcoming. To create such a classification scheme, and to do so in a systematic manner, we rely on a set of theories in the field of media research (i.e., social presence, media richness) and social processes (i.e., self-presentation, self-disclosure), the two key elements of Social Media.

Regarding the media-related component of Social Media, social presence theory (Short, Williams, and Christie, 1976) states that media differ in the degree of social presence defined as the acoustic, visual, and physical contact that they allow to emerge between two communication partners. Social presence is influenced by the intimacy (i.e., interpersonal vs. mediated) and immediacy (i.e., asynchronous vs. synchronous) of the medium, and can be expected to be lower for mediated (e.g., telephone conversation) than interpersonal (e.g., face-to-face discussion) and for asynchronous (e.g., email) than synchronous (e.g., live chat) communications. The higher the social presence, the larger the social influence that the communication partners have on each others behavior (more detailed information about social presence will be given in section 5.2.1.).

Closely related to the idea of social presence is the concept of media richness. Media richness theory (Daft and Lengel, 1986) is based on the assumption that the goal of any communication is the resolution of ambiguity and the reduction of uncertainty. It states that media differ in the degree of richness they possess that is, the amount of information they allow to be transmitted in a given time interval and that therefore some media are more effective than others in resolving ambiguity and uncertainty. Applied to the context of Social Media, we assume that a first classification can be made based on the richness of the medium and the degree of social presence it allows. With respect to the social dimension of Social Media, the concept of self-presentation states that in any type of social interaction people have the desire to control the impressions other people form of them (Goffman, 1959). On the one hand, this is done with the objective of influencing others to gain rewards (e.g., make a positive impression on your future in-laws); on the other hand, it is driven by a wish to create an image that is consistent with ones personal identity (e.g., wearing a fashionable outfit in order to be perceived as young and trendy). The key reason why people decide to create a personal webpage is, for example, the wish to present themselves in cyberspace (Schau & Gilly, 2003). Usually, such a presentation is done through self-disclosure; that is, the conscious or unconscious revelation of personal information (e.g., thoughts, feelings, likes, dislikes) that is consistent with the image one would like to give. Self-disclosure is a critical step in the development of close relationships (e.g., during dating) but can also occur between complete strangers; for example, when speaking about personal problems with the person seated next to you on an airplane. Applied to the context of Social Media, we assume that a second classification can be made based on the degree of self-disclosure it requires and the type of self-presentation it allows. Combining both dimensions leads to a classification of Social Media, visualized in Table 1. With respect to social presence and media richness, applications such as collaborative projects (e.g., Wikipedia) and blogs score lowest, as they are often text-based and hence only allow for a relatively simple exchange. On the next level are content communities

(e.g., YouTube) and social networking sites (e.g., Facebook), which, in addition to text-based communication, enable the sharing of pictures, videos, and other forms of media. On the highest level are virtual games and social worlds (e.g., World of Warcraft, Second Life), which try to replicate all dimensions of face-to-face interactions in a virtual environment. Regarding self-presentation and self-disclosure, blogs usually score higher than collaborative projects, as the latter tend to be focused on specific content domains. In a similar spirit, social networking sites allow for more self-disclosure than content communities. Finally, virtual social worlds require a higher level of self-disclosure than virtual game worlds, as the latter are ruled by strict guidelines that force users to behave in a certain way (e.g., as warriors in an imaginary fantasy land) (Kaplan, Haenlein, 2010).

		Social presence/ Media richness		
		Low	Medium	High
Self-presentation/ Self-disclosure	High	Blogs	Social networking sites (e.g., Facebook)	Virtual social worlds (e.g., Second Life)
	Low	Collaborative projects (e.g., Wikipedia)	Content communities (e.g., YouTube)	Virtual game worlds (e.g., World of Warcraft)

Table 1: Classification of Social Media

5.2.1 Social Presence

First approaches for a definition of social presence originate from the work of Short and Christie (1976), who define it as *"the degree of salience of the other person in a mediated communication and the consequent salience of their interpersonal interactions."* (p.65)

The medium's qualities are decisive to experience social presence within a mediated communication.

Biocca & Harms define social presence as the *"sense of being with another in a mediated environment"* and more detailed as "*the moment-to-moment awareness of co-presence of a mediated body and the sense of accessibility of the other being's psychological, emotional, and intentional states"* (p. 10).

The fundamental characteristic of all mediated interactions is interacting with spaces and people that are not immediately present in our physical environment. People merely interact with mediated embodiments of minds, representations made of pixels, ink, stone, paper, etc. The authors distinguish between three different levels of social presence (see Figure 6): Level 1 is the perceptual level, which is primarily the detection and awareness of the co-presence of the other's mediated body. Level 2 is the subjective level and entails the sense that the user has of the awareness of the other, and the level of accessibility to the others attentional engagement, emotional state, comprehension, and behavioral interaction. Finally, level 3 is the dynamic, inter-subjective level, i.e. the perceived symmetry of social presence.

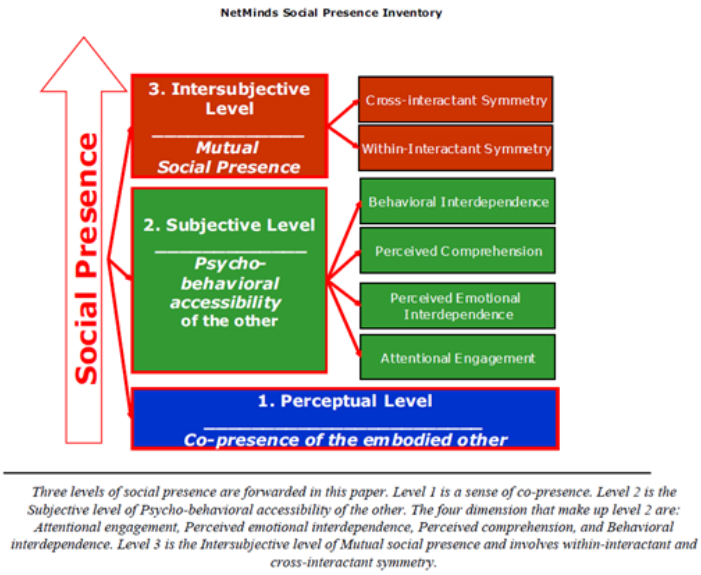

Figure 6: Levels of Social Presence

Level 1 is characterized by the perception of the co-presence of the embodied other. There is a threshold moment, when the form of a medium (e.g., light reflecting, inks, pixels, or marble) moves from being a thing, to being social. Psychological mechanisms decide if the counterpart is perceived as a living being or not. The authors consider selective responses to biological forms and selective responses to biological motion as important for perception of co-presence. Selective responses to biological forms are forms around the "vertical axis", which are more likely to be interpreted as representations of biological, sentient entities. Horizontal forms are more likely to be interpreted as an object. Selective responses to biological motion are, for example, when stationary, certain forms can be perceived very ambiguous, but when moving, human observers can immediately detect biological motion and report the presence of a human form.

At the moment, when co-presence of the embodied other is perceived, a higher cognitive process is triggered: attentional awareness, which is the sense to which the observer is peripherally or focally aware that the other is in the same space and the sense that the other is aware of him/her. The observer´s awareness to other´s activity within the mediated environment is necessary and indicative of the movement to higher levels of co-presence (Level 2).

Level 2 is characterized by psycho-behavioral accessibility of the other. Determining that another is co-present (Level 1) is a necessary, but not a sufficient condition for social presence. People develop and use models of other minds during their face-to-face or mediated interaction. These include the feeling of a cognitive accessibility to the other, called psychological involvement by the authors. Additionally, people adjust own responses/behavior to the behavior of the perceived other, called behavioral engagement. Both aspects, psychological involvement and behavioral engagement, are sub-levels of the psycho-behavioral accessibility of the other, which further can be divided to behavioral, comprehension, emotional, and attentional sub-components (see Figure 6).

Level 3 is an inter-subjective level and characterized by mutual social presence. Mutual social presence is given to that extent to which the perceptions of communication partner and the other are symmetrical both, within either ones´ mind, as well as across both minds: Within-interactant symmetry is the degree of symmetry or correlation between the user´s (A) sense of social presence and their perception of their partner´s (B) sense of social presence (A→B). Cross-interactant symmetry is the degree of symmetry or correlation between the user´s (A) sense of social presence and their partner´s (B) perception of user´s social presence (A ←→ B). There is an interdependence that exists between the two interactants and thus a symmetric synergy is developed. This occurrence can exist in face-to-face interactions as well as in mediated interactions.

5.3 Social Roles Empowering Collaboration

The concept of social roles has long been a topic of discussion within Sociology and Social Psychology. Different definitions and approaches exist to study social roles (Briddle 1986). Building upon the symbolic interactionist tradition of role theory (e.g., Callero 1994), roles are defined as cultural objects that are *"real insofar as they are recognized, accepted, and used to accomplish pragmatic interactive goals in a community"* (Callero 1994, p. 232). This perspective on role theory stresses the roles of *individual* actors, the evolution of roles through *social interaction* (such as e.g., intended interactions on the ProMe platform), but also cognitive concepts that provide actors the basis for understanding and interpreting their own and others actions (Briddle 1986), which is of particular importance for online communities such as ProMe, to avoid ambiguities concerning the goals and expectations of the collaborating parties. This interactionist perspective on role theory is particularly valuable for our research, since it's micro-perspective particularly reflects on role emergence through social interaction and negotiation as it is carried out in knowledge exchange practices, as intended on ProMe.

Individual's behavior in social situations is not random and completely unpredictable, nor is it uniformly the same in each situation (e.g., Briddle 1986, Fisher et al. 2006). What unites symbolic interactionist, as well as most other versions of role theory, is that they presume *expectations* to be the major generators of roles and that these expectations are learned by individuals through experiences (Briddle 1986). Expectations of behavior and action are useful, as they imply knowledge about how to act towards others (Golder and Donath 2004). On basis of this assumption, investigating role expectations in the context of ProMe allows us to examine collaborative qualities that are needed in order to facilitate valuable Mentor-Mentee relationships, i.e., Mentors and Mentees know what they can expect from each other in these relationships, thereby counteracting disappointments when expectations are not accordingly met. According to Dahrendorf (1968) who is a pioneer in social role theory; three main types can be distinguished (i.e., 'can', 'shall', and 'must' expectations). A discriminating characteristic between these types is the kind of sanction (positive, negative, or both) imposed if role expectations are (not) satisfactory accomplished.

5.4 Social Capital in the creation of intellectual capital

Regarding the idea of sharing professional knowledge in terms of coaching and mentoring, we have already elaborated a profound concept (see D2.5). However, we would like to specifically address the role of social relationships in the creation of new capital, i.e., intellectual capital. The term social capital first appeared in the

beginning of the 20th century and relates to a special form of resources, i.e., resources that are embedded in social structures (Coleman 1990, Bourdieu 1986). These resources *"are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition"* (Bourdieu 1986 p. 243). To better understand the concept, Coleman (1990) refers to the term human capital. Whereas physical capital is embodied in tools or machines, human capital is created by individuals by acquiring skills or knowledge.

Accordingly, social capital *"is created when the relations among persons change in ways that facilitate action"* [Coleman 1990, p. 304]. Defining social capital by its functional character, the resources (e.g., benefits) individuals gain, allow actors to assert their own interest and influence their freedom of action and quality of life (Coleman 1990). *"Holding a certain position leads to better performance, and better connected actors enjoy higher returns"* (Cyert 2004, p. 102). The volume or amount of social capital is highly dependent on the size of ones social network, which is the product of so called *"investment strategies"* (Bourdieu 1986, p. 249]. Coleman (1990) describes different forms of social capital, i.e., characters of social relationships that provide useful resources for individuals. Some examples are described in the following.

Obligations and expectations that arise from a relationship (e.g., a friendship) shape social capital. For example, Susan provides support to Robert and expects that Robert, in turn, supports her in the future. By providing the support, an obligation is put on Robert creating at the same time a kind of 'credit slip' for Susan. This form of social capital relies on trust and has a reciprocal character. Through the process of giving and taking social relationships and social capital are produced and reproduced (Bourdieu 1986). This reciprocal process supports the development of mutual trust, which is an important prerequisite for social capital (Diekmann 2007).

Another form of social capital is information potential, providing the basis for social action. If we want to be up-to-date in our field of research we often rely on information of work colleagues (if we can depend that they are actually up-to-date). In this sense, these relationships constitute capital. Coleman (1990) points out that in contrast to the relations that are valuable due to the credit slip they provide, these social relations are only valuable for the information they provide.

Moreover, social norms and corresponding sanctions create a powerful form of social capital. In this case, the social norms that apply (e.g., for a certain social organization) facilitate action in a certain way. For example, a charitable organization works for the interests of the general public (social norm). The social capital that arises from the norm that shapes this action is honor or status within the organization.

Accordingly, the main forces creating and maintaining social capital are: closure, stability, and ideology (Coleman 1990). Closure refers to internal cohesion within a group and is characterized by common norms, sanctions, and reputation, as becoming visible in the aforementioned example of the charity organization. Stability within a group, i.e., with respect to roles and expectations, has positive effects on social capital. Coming back to the initial example, the stability of the relationship between Susan and Robert clearly defines the expectations and obligations. Finally, ideology encompasses the idea to work for the interest of something or someone. It creates an invisible connection between individuals within a group.

With respect to knowledge sharing, Nahapiet and Ghoshal (1998) suggest that it is useful to distinguish between three dimensions of social capital, recognizing that the different facets are highly interrelated with each other: structural, relational, and cognitive dimensions. The structural dimension refers to presence or absence of network ties and can be described by the density or hierarchy. The relational dimension reflects

more the personal and emotional attachments between individuals developing over time. The key components are, for example, trust, obligations, and expectations. Finally, the cognitive dimension encompasses resources that provide shared interpretations, for example, a common language (Nahapiet and Ghoshal 1998) (see section 3.1).

6 SUMMARY

This framework serves as a guideline for the user requirements assessment and the design and evaluation phase. It provides an overview on the methods that are applied and the central research goals. Hereby, we build on the theoretical model from Nahapiet and Ghoshal (1998) that helps to understand how knowledge sharing can be supported best, facilitating beneficial outcomes for all involved parties, i.e., social capital. Our main focus is not on forcing a specific pre-defined role as initially planned (Coach, Mentor, etc.), but on encouraging users to *develop* their own role, based on their needs. On the basis of the requirements we identified and the model we build upon we focus on 1) providing an adequate infrastructure, 2) reducing virtual distance, 3) supporting the development of norms of cooperation, 4) facilitating identification, and 5) facilitating a "shared language". As the project is build up on an iterative process, modifications will be made based on the insights that are gained within the different studies.

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