Participatory design methods for learning and knowledge sharing activities in networked organizations

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Abstract—Engagement in collaborative knowledge sharing and knowledge building activities is still a big challenge for many workplace learning designers and researchers. Especially in highly competitive environments people might be reluctant to give away too much of their tacit knowledge. Ownership and involvement of the individual in the planning of the learning activities are important motivational factors. In an international research project called Intelleo – Intelligent Learning Extended Organization we intend to follow a participatory design approach involving individual workers from the very beginning of the development process, from the first conceptual design through the different development stages until the final validation of the system in order to increase their motivation for collaborative learning and knowledge building activities.

Index Terms—participatory design, collaborative learning, extended organization, self-direction.

I. INTRODUCTION

Motivation is one of the key success factors for adult engagement in learning and knowledge sharing activities. In his theoretical work on andragogy M. Knowles [1] pointed out the importance of involving adults in the planning and evaluation phase of learning activities in order to enhance motivation. An advanced theory of Knowles andragogical concept, called heutagogy puts even a stronger focus on self-determined learning and recognizes the need to be flexible in the learning where the teacher provides resources but the learner designs the actual course he or she might take by negotiating the learning. [2] Still, it remains a challenge for educational experts to successfully involve individuals at workplace in collaborative learning and knowledge sharing activities. Senge [3] assumes that organizations learn only through individuals who learn, however individual learning is not the guarantee but just the prerequisite of organizational learning and thus essential for any learning organization.

In an international research project we are tackling this problem by harmonizing personal objectives with objectives at organizational and group level and by providing a learning landscape for the individual that supports this harmonization. An additional challenge in the project is the fact that we are designing learning and knowledge sharing activities and its according technological support infrastructure in Intelligent Learning Extended Organizations – IntelLEOs. An INTELLEO represents a community that emerges as a temporary integration of two or more different business and educational institutions with different organizational cultures (industrial, research and educational). Thus we are not looking at a closed system, but at rather transitory networked constellations for learning and knowledge building.

In the following we will present the context of this research and development project, we will elaborate some of the basic concepts that shape our approach for user involvement, we will describe some first steps that have been initiated in implementing a participatory design approach and we will give a short outlook as to how we plan to continue this process during the course of the project. Some very initial feedback from the user involvement will be outlined as well.

II. RESEARCH CONTEXT

The project IntelLEO aims to support learning and knowledge building activities of adult learners that act under specific temporal conditions and in specific contexts. An IntelLEO is defined as a community that emerges as a temporal integration of two or more different business, educational communities and organisational cultures (industrial, research and educational) and leverages ICT technologies to support Learning and Knowledge Building (LKB) Activities.

Figure 1. IntelLEO Concept
The objective of the research and development endeavours in Intelleo is to explore supportive technologies for cross-organisational collaborative learning and knowledge building activities. The technological developments will be embedded in a pedagogical framework that puts a special focus on the harmonisation of individual and organisational objectives.

For successful collaborative learning and knowledge building activities the motivation of the individual is crucial [4]. Important motivational factors for collaborative activities and knowledge sharing are ownership, autonomy, positive feedback, trust, personal contact, etc. Ownership of proactive learning and knowledge building behaviour is more willingly obtained if the employees are involved in grounding their personal perception of the organizational objectives and goals, of the organisation as a whole and of their own roles when planning and developing their learning activities [5]. Thus, the project’s research design builds on participatory design practice.

The pedagogical experts in Intelleo will define a framework of activities and processes that take these factors into account and will create an environment where the individual as well as the organisational needs are equally considered.

The envisioned services that the Intelleo technological frame will support are currently: management of social interactions, management and provision of learning resources across organizational boundaries, provision of appropriate learning and knowledge building activities for individuals and groups, scaffolding of the learning process of individuals in accordance with organisation objectives and policy.

The new services will be validated within three different Intelleo environments each involving various actors from business and educational organisations. Since the three contexts for validation are very heterogeneous a main challenge for Intelleo will be to identify a set of common services that will be enhanced by specific customisations for each specific case.

Finally, the project will also take a look at the broader socio-economic context – beyond the context of the three specific cases – in order to identify the possible applicability and usefulness of the proposed Intelleo approach.

Within the context of this research project we will follow a participatory design approach in order to involve the learners from the beginning in the design of the intended interventions and continue the dialogue with all involved actors during all phases of the project, from the conceptual phase through the design and development phase until the final evaluation. Compared to other international research projects that claim to follow a participatory design approach [6] [7] [8] we depart from three distinct, but very specific cases, each with a clear problem definition. Thus a successful interplay between the participatory activities and the Intelleo framework design is essential for the project.

III. Concepts

In the following we would like to discuss some of the theoretical concepts that are relevant for our approach.

A. Motivation, ownership and self-management in learning

In the last few years Technology Enhanced Learning (TEL) research in Europe has been putting a strong focus on what we would like to subsume under the term “self-management in learning”. A broad range of literature currently deals with aspects of self-regulation, self-organization, self-direction or self-guidance of learners. [9] [10] [11]. Depending on the context these terms are either used synonymously or have a slightly different connotation. An important characteristic of all these concepts is the shifting locus of control. The learner is taking control and responsibility for his/her learning activities. In his comprehensive meta-analysis of the Anglo-Saxon literature on the topic, Candy [12], for example, offers an overview of the various strands of research that can be found under the label of “self-direction” in human learning, ranging from ideas of programmed instruction, emancipation and citizenship, to autodidactic efforts of adults outside any formal educational system. A relevant distinction that is usually made when it comes to research on this topic is whether one applies a process view, e.g. looking at the autonomous actions that learners take in planning, performing and evaluating their learning, or a product view, where the point of interest lies in the dispositions of learners to direct their own learning [13] [14]. For our work in Intelleo we are interested in both aspects, but clearly the second aspect, namely learners dispositions are extremely relevant when it comes to motivational aspects. In order for adults to engage in a conscious learning process we believe that motivation is still one of the main factors.

As educational researchers and designers we believe in the importance of ownership in technology–rich innovation processes and consider ownership as a driving factor for motivation and support learner autonomy [5]. In this sense we are in line with andragogical and advanced heutagogical concepts [1] [2]. The perception of autonomy and the possibility to get appropriate feedback are supporting the notion of ownership. These two aspects should also be experienced when it comes to the technologies involved.

Motivation is a key to successful knowledge work [4] and in complex knowledge intensive working contexts it is important to define adequate informal learning environments where the individual’s autonomy is respected without interfering with organizational goals. Individuals may take various roles and perspectives in learning and knowledge building processes in different institutions and networks. Participating in the collaborative activities that follow different institutional and group objectives, the individuals need to harmonize their personal objectives in order to stay on track and be intrinsically motivated. Someone’s intrinsic motivation can be increased by giving the perception of autonomy.
with positive feedback about the outcome of their contributions. The feeling of competence grows if individuals feel responsible for the outcome. Training possibilities provided to the individuals and opportunities to get personal contacts across different borders (face-to-face or virtually) are important motivators to stay on the knowledge-creating track.

This is where technologies may have a supportive role. Digital environments enabling social responsiveness may increase the possibility to get appropriate feedback, also over distance. Individuals may be better supported to document, monitor, and self-regulate their cross-institutional activities.

In order to create the feeling of ownership from the very beginning we will involve the individual actors of our learning scenarios in the learning landscape design process. Participatory design practices will be applied in three different business cases. The presentation will report on the first phase of user involvement in the design process of learning landscapes in dynamic networked organizations.

B. Knowledge conversion

A lot of previous work on workplace learning and knowledge generation build on the work of Nonaka et al. [4][15][16] and the concept of knowledge conversion. In the IntelLEO context we also make reference to this model, but are facing the specific extensions beyond organizational boundaries [17]. Thus the knowledge conversion from tacit to explicit knowledge and its spiral progression will be integrated into an innovative IntelLEO context.

Figure 2. Knowledge conversion model

The knowledge conversion model that we will apply in IntelLEO circles around the following four stages:

1. Socialization of tacit knowledge: Individuals are prompted to accumulate knowledge in an apprenticeship manner, through physical proximity with colleagues, and transfer the tacit knowledge they have acquired from others to their own mental frameworks. In this phase it is important that the individual has access to organizational resources, rules, values, objectives that help individuals to direct their efforts. In the case of IntelLEO, where the LKB activities go beyond the borders of one organization, mutual accessibility to this type of learning resources and certain social grounding mechanisms for synchronization need to be supported. Technically, this means that services are needed to support requests for organizational rules and objectives, as well as for relevant content filtering.

2. Externalization of tacit knowledge into explicit: Individuals are prompted to create concepts through abductive thinking, to use metaphors for concept creation, and to use models, diagrams or prototypes to articulate tacit concepts. This is mostly an individual process that can be technologically mediated if the individuals are provided with certain standardized language that aids the externalization processes. This language could be visual and might offer the important elements to describe both people with objectives, their norm- and value-systems and interrelations among people, activities, tools and objects used and created in the activities of knowledge building. Currently, there are a few such attempts. The standardization for externalizing tacit knowledge must not be too rigid and it is important that the individuals maintain control and ownership over their versions of knowledge objects. The former can be supported by personalised services for learning content creation and storing. The latter can be done using portfolio type of software.

3. Group-based combination activities of explicit knowledge: In this stage cross-border group learning/work where individuals with different perspectives gather and negotiate upon the externalized concepts is taking place. Supportive services for this stage range from social information filtering and retrieval for appropriate learning resources, specific learning-monitoring and feedback-generation services as well as human resource discovery (e.g. mentor and learning co-workers), for collaborative learning group composition and collaboration tracing.

4. Internalization of explicit knowledge: self-reflection and internalization of the personal experiences gained via the interaction with others takes place in stage 4. Self-reflection can be supported e.g. via portfolio-services. These systems could support personal planning of learning objectives that can be monitored and scaffolded via conversational activities. Services to support this include learning path creation and monitoring, feedback generation, human resource discovery, and (personalised) learning path creation.

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Although we present the knowledge conversion model expanded by the IntelLEO characteristics of an extended organisation we would like to stress that we are not considering this to be a linear process. The described stages shall help to understand the shift from tacit to external knowledge, but this is a continuous process that is taking place continuously in its various stages.

In IntelLEO we plan to provide means for learners to become aware of how the LKB process develops, who are involved actors and resources, how interaction takes place, which values and rules are involved, etc. The technological support shall make this more convenient and more transparent.

IV. APPROACH

Based on andragogical and heutagogical principles combined with knowledge conversion models we will involve the individual actors in the different business cases of IntelLEO from the very beginning in the design process. Our hypothesis is that by an active engagement of the workers from the very beginning the feeling of ownership may be positively influenced. Motivational aspects can be addressed from the very beginning. A co-design of all involved actors, namely users, educational designers, researchers, managers, etc. implies that all actors are learners and may benefit from this close cooperation.

For the envisioned co-design we will apply participatory research methods as well as some more standardized ways of describing system requirements. The whole approach is summarized in Figure 3, the Intelleo Design Conversion.

Figure 3: Intelleo Design Conversion

The participatory design approach is circulating around the following stages:

1. Socialization of individual experiences: in stage 1 the individual experience of the involved actors and their vision on the processes are documented. Individuals socialize with each other across organizational boundaries, they find stakeholders, identify issues that need harmonization as they might diverge on the organizational and individual level, etc. It is their very individualistic view that they try to socialize. This process should be applied on different hierarchical levels with the organizations and across the organizational boundaries in order to get a divers picture. At the same time, the researcher provides some external vision or norm to the design process that guides this socialization and later the externalization. Thus this stage combines a very individualistic view of the involved actors with some guiding design norms that provide a more objective frame to socialize and externalize tacit knowledge.

2. Externalization of processes: In stage 2, independent researchers apply ethnographic methods in order to expand the subjective views gathered in stage 1. Following similar approaches [18] we apply some ethnographic methods without performing a full-scale ethnographic study that would be too time-intensive and costly. The aim of this stage is to gather a more neutral view on the processes and experiences from an outsider. An immersion in the context is important for the researchers and developers in order to better understand the actors, the system, the processes, the context and its constraints. Apart from observations we also plan to perform exploratory interviews. The externalization stage is important for defining a common design language amongst the different stakeholders, horizontally and vertically across organizations. The common externalization language constitutes the core of the Intelleo design model as it is a co-product of the involved actors and will be related to UML (Unified Modeling Language) use cases, which provide a unified description for the developers.

3. Combination, Interaction, Generalization: Stage 3 combines both views – the individualistic from stage 1 and the collective from stage 2, analyses the interaction and deduces requirements. Current shortcomings and potentials from improvements in terms of process optimization as well as technological support will be defined. The tacit knowledge should be transferred into the system design knowledge. Again, researchers, and users should be involved in this process, e.g. via workshops. The usage of UML case descriptions across the different organizations will enable a generalization of the Intelleo model requirements. During this stage discursive co-development and formative evaluation to validate these externalized constructs are part of the participatory design model.

4. Internalization: Finally, in stage 4 the interaction, design and development process shall take place. Similar to all other stages, all
actors shall be involved in this stage. Users shall be involved e.g. via workshops where mock-up demos can be presented and discussed. Since we create a temporary Intelleo context during this design process that is presumably more supportive to collaborative learning and knowledge building activities then the previous working context the users across the organizations need to internalize this situation. Continuing the cyclic approach they should then be able to socialize their individual experience in the enhanced environment.

The important innovation in this approach, which can be interpreted as a spiral process, is the fact that the employees/users are involved in all stages and are thus designers of their learning activities, the involved processes and the technological support system. The researchers and developers play an important role in this interaction as they provide some norms and guidelines to the different stakeholders, how form a temporary extended learning organization. They are mediators of a conversational translation from tacit knowledge to explicit context knowledge to some more formalized use case descriptions, requirements definition and system design. The cyclic movement between an individualistic view and a collective view during the design, development and evaluation phase shapes the Intelleo framework as well as the design process itself.

V. CONCLUSIONS

Since we have started the participatory design process only recently, there are currently not decisive conclusions that we can draw from. In this paper we wanted to outline our innovative approach in involving users in all stages in the design process including technological environments for knowledge sharing and collaborative learning. The empirical work only started recently and will hopefully contribute to a more elaborate model of co-design. What has already become clear during this first phase is that this approach requires a strong commitment from all involved actors and is a rather time-consuming process that will hopefully conduct to better results and an increased motivation on the learner’s side.

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