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## **Participatory Design for Developing Web Services Supporting Learning in Communities of Practice: the Example of PALETTE**

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### **Key words**

Community of Practice, Participatory design Methodology, Actor-Network Theory, Interoperable services, collaborative learning

### **Abstract**

*The paper aims at showing how Participatory Design contributes to the understanding of learning processes related to Communities of Practice (CoPs) and, at the same time, to the design and implementation of Web Services to support organisational and individual learning in CoPs. This research builds on the European PALETTE project<sup>1</sup>.*

### **The PALETTE context**

The main goal of the PALETTE project is the facilitation and enhancement of both individual and collective learning through Communities of Practice (CoPs) (Wenger, 1998, 2002), which have the potential to become a fundamental ferment for the deployment of learning environments that support professionals, organisations and individuals in the future. Cross-fertilizing pedagogical and technological researches, in order to elaborate, implement and validate new learning environments enhancing knowledge building and sharing in CoPs, are the main challenging issues addressed by the PALETTE project. To reach this goal, a participatory design approach has been adopted for the development of a *palette of services* to improve efficiency of collaborative learning in CoPs, in terms of:

- Expressing, representing and sharing practices as well as authentic problems
- Debating and reflecting about the practices and about the life of the CoP
- Developing, reifying and exploiting knowledge inside and outside the CoP
- Facilitating engagement, participation and learning

The main participatory activity consists in writing activity scenarios supported by Web Services. The acceptability, usability and reusability of such scenarios is targeted for the benefit of various communities.

More and more CoPs have chosen virtual environment and services to support their activities either totally or partially. However, recent research has underlined the lack of adequate scaffolding in terms of technical support and appropriate use of technology for

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<sup>1</sup> PALETTE is an integrated European project aiming at facilitating and augmenting individual and organisational learning in Communities of Practice (CoPs). More information can be found at <http://palette.ercim.org/>

communication and collaboration (including web-based platforms, wireless communications, mobile devices and extensive use of multimedia contents), the lack of tools and virtual community environments supporting real-life problem-solving, the lack of support to reify knowledge and make it accessible to community members and beyond, and finally the inadequacy of the tools (forum, discussion lists, web-based training environments) used by these communities in supporting the individual and organizational learning processes as well as knowledge and identity building of CoPs. CoPs encounter the need for new tools and services to support their specific activities. If these new tools must be usable and efficient, they also have to be acceptable by each CoP and capable of adapting to its existing virtual environment and evolving needs.

The acceptability of a system is a combination of social and practical acceptability. Social acceptability refers to “whether the product will be used in the real world”. Practical acceptability includes usability, but also reliability, compatibility, utility (Nielsen, 1993). Social acceptability is namely related to the degree of the activity transformation induced by the uses of the new tools and services. This activity transformation may be encountered at different levels: aims, actions and operations. In other words, the computer artefacts interact with and change people's work and mind. In return people adapt the artefact to fit their work or transform the artefact and develop their schemata and competence to fit their work (Rabardel, 1995).

To support this acceptability and the adaptation of the services and tools, an iterative and participative process of co-development by developers and CoPs of scenarios of use is proposed. These scenarios can be considered to be “boundary objects” facilitating the negotiation and collaboration between developers and CoPs. This process is experimented in the PALETTE project. In this contribution, we describe the characteristics of such scenarios of use and suggest a methodological approach to progressively design and represent these scenarios. In conclusion, we discuss the questions and issues raised by the implementation of such an approach.

## **Participatory design supported by Actor-Network-Theory**

PALETTE project partners have an active and evolving understanding of PDM. It varies from the succinct expression “It means asking people who developed something ‘do you think you did a good job?’” to the more complex representations involving close collaboration between all actors: researchers and CoPs members, mediation and negotiation through boundary objects and alignment of interests. Both conceptions however refer to the need for cross partnership work and understanding. It implies not only open feedback mechanisms but also a collaborative joint ownership of development. In other words, it is not simply a matter of checking whether or not requirements have been met.

A more limited notion of participatory design can be depicted among PALETTE partners. It raises issues concerning the direct and indirect participation of different stakeholders within this project, the involvement of end users in the development process, and the importance of their opinions and needs. In fact, it is the ‘positioning’ of the different partners in the process that is at stake. For some members at the fringe, up to now, the implementation of participatory design has been limited. They have doubt about the participation of the CoPs in

the actual design of the method, and they have difficulties to see how this collaboration is fruitful for them in terms of learning.

This fact raises the possibility of developing some interesting distinctions between participation, consultation, collaboration and 'taking into account' when project members are attempting to conceptualise participatory design. Developers, for example, seem more likely to see participatory design as 'taking into account' users' needs. The researchers on the other hand, have a more collaborative understanding of the term. The mediations of CoPs practice through scenarios and depictions constructed by mediators and researchers are certainly forms of 'indirect' participation by the CoPs themselves. The authenticities of this kind of involvement will depend on the extent to which the depictions reflect the complexities of the CoPs working practices. Mediations in these cases produce 'boundary objects' which are intended to support the development of tools and services.

At this stage of the project, issues of a complex nature, like participatory design, have moved to the centre stage. For project participants' preoccupations, it is not only a matter of implementation but on more profound considerations concerning the way in which different stakeholders might work together to create services and tools for learning.

Participatory Design is a process of negotiation of usefulness (Abreu de Paula, 2004) to be achieved through reconciling the contrasting perspectives of various stakeholders, including users, designers and others. The main difficulty of Participatory Design remains the organization and management of an efficient participation – i.e. a participation that can truly influence the design process. Actors are heterogeneous in respect to their disciplines, preoccupations and interests: they don't speak the same "language". For them to interact necessitates that they construct together a "common ground". This is achieved through participative activities that mediate participation. Examples of such activities include brainstorming meetings, prototype demonstration, scenario performing, role playing, design games,; each of them are actively used within PALETTE.

Using ANT<sup>2</sup> (Callon, 1999; Latour, 1992, 1996, 1999; Law 1992) can help defining a suitable Participatory Design methodology. ANT provides a conceptual framework helping formulating and building a design methodology that sustains efficient participation of heterogeneous actor-networks in participatory activities (Monteiro, 2000)..

Actors' heterogeneity is one of ANT main originalities. An actor is characterized first hand by its capability to act and interact, its influence. ANT thus clearly acknowledges that a lot of "things" - humans and non-humans - do have an influence (McBride). The notion of participation is extended to take into account the participation/influence of non-human actors, such as artefacts and organisations, an obviously interesting feature when describing a socio-technical system.

ANT concepts seem appropriate for preparing design strategies that aim at aligning the interests of the actor-network i.e. having all their influences fit together. The alignment of the network is obtained through processes of translation, *interessment* and enrolment, inscription, and black-boxing. Inscription means that "aligned interests [are] inscribed into durable

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<sup>2</sup> ANT was formerly the acronym for Actor-Network Theory. It is now used as itself, and even one of its first creators, Bruno Latour, recognises that it has become something different, and if it was created now, he would probably not have used the same words, specially the word network that he feels confusing now [Latour 1999]. We will then use ANT as a name and not as an acronym

material" (Law, 1992). Creating boundary-objects (Bowker and Star, 1999; Gasson, 2006) i.e. objects "to-think-with" facilitates mutual understanding and trust among participants with various backgrounds. A mock-up, an intermediate version of the final product, a use-case or a scenario are classical boundary-objects. Finally, ANT introduces the concept of black-boxing. Back-boxes are "sealed actor-networks" (Stalder, 1997) whose alignment has been obtained, whose aligned interests have been inscribed in a stable association that is no longer questionable – except at a heavy cost.

McBride (McBride) suggests a 7 steps methodology where ANT is used as an analytical tool "to identify actions which may speed the social embedding of the technology and the successful take-up of (a) system": identify stakeholders, investigate stakeholders, identify stakeholders' interactions, build actor-network models, identify irreversibility (provisional stabilities), identify inhibitors and promoters, identify actions for aligning the network (participative activities).

In PALETTE, we apply an analogous methodology to implement the Participatory Design process:

- the first steps consist in identifying the various stakeholders, their interests, the inhibitors and the promoters for the enrolment of these actors in the actor-network;
- then, by attempting to "align" these actors' interests, we will build the actor-network and an ANT-based description of the issues related to bootstrapping the participatory approach in Palette;
- finally we will propose a set of actions – mainly participative activities with boundary objects – and select a set of inscription medium with the aim to "enrol" the various actors and promote the social design and acceptance of the new technologies.

The PALETTE actor-network is a dynamic entity which is made of all the heterogeneous actors (meaning human and non human, but also of different granularity<sup>3</sup>) and of all the links that tie dynamically these actors for the purposes of the project (and also for other possible reasons).

Translation and inscription are dual processes. In PALETTE, a successive number of translations are undertaken from CoPs to CoPs observers, then to interviews transcriptions, then to data condensation; the data are finally inscribed in data representation supports available as boundary objects for other actors. Different media are used for inscribing, like documents, story telling, vignettes, and MOT schemas (Paquette et al., 2006). Another example of the translation-inscription process is the activity aiming at clarifying the notion of scenario: what is a scenario, its content, its form, etc., according to the different PALETTE actors. Several participative activities are designed to make explicit the representations/interests of the actors and progressively "inscribe" a definition and typical contents/forms of scenarios useful for all the actors, according to [Iacucci & Kuutti].

## Interoperable Web-services

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<sup>3</sup> A workpackage, or an institution, or a project is made of a lot of persons and other elements; thus a person and a group of person are actors of a different level of granularity

Collaboration, communication, knowledge management, document exchange, problem solving are activities that cannot be accomplished without a strong support from technology enabled tools, all the more so because communities members are scattered in different locations and even across different organizations. Thus a community of practice needs tools that share some common features, among which:

- being available anywhere;
- allowing flexible use, depending of the skills of the members regarding technology;
- covering a range of document management functions;
- covering a range of information representation and modelling functions providing a mean for creating a common ground within the community;
- covering a range of knowledge management functions, related to the practice and the identity of the community, and the learning activities within the community;
- enabling communication, collaboration and cooperation in the way that is useful for the community, both inside the community and between the community and its environment;
- and allowing to understand, represent, enrich, share members' expertise.

Such tools are merely based on new technologies, open-source or "open-source minded" (the usefulness and quality of which are qualified by users, not by proprietary developers). They have to be interoperable, evolutionary, flexible *and truly* collaborative.

In order to operationalise Participatory Design, the full actor-network of PALETTE has been subdivided into three sub-networks called teams. Each team deal with a part of the CoPs and a part of the services only. These teams have two major focuses: to create specific scenarios of use for the CoPs involved in the team and to support the interoperability of services concerned within the team.

A first categorisation of CoPs needs was done, which evidences four relevant kinds of groups:

- support of participation
- constitution of common resources
- support of commitment
- support of activities

For each category, a set of services are identified among PALETTE services, as well as the necessary interaction between these services in order to fulfil the needs. Three kinds of interaction are taken into account:

- information exchange: transmission of data and metadata between two or more services
- integration: direct call to a service function from another service
- composition: a service may be built from a composition of functions belonging to other services.

For all three kinds of interaction, a lot of technical challenges occur.

The way data and meta-data will be shared and accessed by services is an important issue that raises several questions. In particular, is a common data repository needed? Do metadata and data need to be replicated in the different storage environments a CoP uses? Should all data and metadata be stored on the web to improve accessibility and sharing?

The integration at the user interface level will require specific coding, and semantic alignments between the terms and data structure used by both parties. Reaching a high

interoperability level between PALETTE services, to avoid as much as possible specific coding, could possibly be solved by securing interoperability at the semantic level. In other words, an adequate solution might be to define a common meta-model or ontology.

## **Organisational and individual learning in CoPs**

PALETTE aims at revisiting learning processes in the light of what is observable within the different Cops which partner with the project. There are between ten and fifteen CoPs which interact at some moments with the research process. The largest part of them is within the Education domain (Cops of teachers, teachers' trainers, and even learning communities); some concern other activities and domain (Information technology professionals, local economic developers, engineers, NGO members and animators, etc.). The observation of how knowledge is created, reified, capitalized, made available within these different CoPs is analyzed starting from different source of information (such as interviews of CoPs members), and also by direct observation from specific actors named CoPs mediators; they are in charge of materializing the links between the CoPs, CoPs members, project members, Tools and Services, etc.; they are key actors in the enrolment, alignment, inscription, process and in the realisation and validation of the scenarios of use.

PALETTE is currently in the process of analysing and formalising the outcomes of all the observations and data collection.

So far, the interaction between learning processes and Communities of Practice may be analyzed along three dimensions:

The first dimension is related to studying learning processes in CoPs to enhance the understanding and improve the efficiency of Life Long Learning: learning might be something radically different depending of the learning situation during one's life. Learning at school, in the University, in vocational programs, or at the workplace mobilize different kinds of scenarios, different activities, different evaluation process, and answer to different motivations. Embedding "real life" situation in academic learning, relying more strongly on team work in classrooms, multiply blended learning situations where participants are alternatively in class, on professional sites and at distance, rethinking pedagogical processes both in initial, vocational and continuing education in order to develop common features and common environments could be a step taken to facilitate the creation of life-long learning processes

The second dimension is related to using Communities of Practice for fostering, sustaining and tutoring authentic learning activities: when it happens that a Community of Practice (CoP) exists for a given job, it may be of great value to have the teaching/training interact with the CoP. For example, students may be integrated in real activities - like knowledge reification processes in the CoP - and learning activities may be based upon real life case studies tutored by CoP's members. Students and CoP's members are joining in collaborative activities which then may benefit to both.

The third dimension is related to including Communities of Practice awareness in training to foster the further building of Communities of Practice: including the awareness upon the

advantages of CoP building and animation in the training of future professionals might be a good way of promoting the role of CoPs in professional life and improving their functioning.

## **Conclusion and further developments**

PALETTE started in early 2006. Though a great amount of job has already been done to build the actor network and operationalise the Participatory Design Methodology, only the first results are coming into light.

We have gathered information about more than ten Communities of Practice about how they function and especially how people learn within them. We have analysed their needs and produced scenarios of use in order to try to integrate the PALETTE developed service in the activities of the CoPs. We are in the course of integrating new Cops in the project in order to validate more situations.

We are currently developing and stabilizing services according to the Open Source world and its standards, in order to provide our CoPs with te support they need to achieve their activities, capitalize their knowledge and improve their members' competences.

We hope to be able to exploit more results during the second half of the roject.



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