A Multi-Activity Distributed Participatory Design Process for Stimulating Creativity in the Specification of Requirements for a Work-Integrated Learning System

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Abstract
We describe the approach to distributed participatory design taken within the APOSDLE project. The process included instances of both synchronous and asynchronous, distributed and non-distributed design activities, and also integrated activities designed to stimulate creative inputs to requirements. We report key lessons learned.

Keywords
Distributed participatory design, process, requirements, creativity.

ACM Classification Keywords
D.2.1 [Software engineering]: Requirements/ Specifications---elicitation methods, methodologies.

Introduction
APOSDLE is an EU funded integrated research project (www.aposdle.org) that demands a distributed approach to participatory design. Furthermore, whereas traditional participatory design has focused on the participation of end users in designing a new system,

an additional challenge in APOSDLE has been the need to encourage all project stakeholders to understand the interests and capabilities of the research partners and the technologies that they are contributing to the project. This is important in the context of a research project, such as APOSDLE, in which the aim is to identify new and creative responses to user needs, based on technologies which will themselves emerge and evolve during the course of the project.

In this paper, we describe, in overview, the process used in the APOSDLE project to develop a high-level functional specification of an innovative system for work-integrated learning. This process is an example of distributed participatory design, which has been carried out in the context of real-world project constraints on time (many participants were involved in other projects, as well as APOSDLE) and cost (there was no budget for purchasing and installing specialized tools for collaboration, and opportunities for travel were limited). The process included instances of both synchronous and asynchronous, distributed and non-distributed design activities [4], and also integrated activities designed to stimulate creative inputs to requirements. It has resulted in the specification of 14 use cases, nearly 500 requirements, a PPT mock-up and a first prototype for a large and complex work-integrated learning system. After describing our process, we briefly present some of the lessons we have learned, and draw conclusions.

Case Study

In this section, we provide further details of the APOSDLE project and the process used to stimulate creative identification of requirements and functionality for the future system. Tools used to support the process were standard tools available in the typical workplace environment and included: email, teleconferencing, word processing and presentation tools common to all partners (in our case, these were Microsoft Word and Powerpoint), and a shared file server to which all stakeholders had access.

The APOSDLE project

The objective of APOSDLE is to support the three roles a knowledge worker interchangeably plays at the workplace: the role of the worker, the role of the learner, and the role of the expert (who helps other people to learn). This is to be achieved through the development of an Advanced Process-Oriented Self-Directed Learning Environment (APOSDLE) [3], which should automatically identify a user's work task and pro-actively provide her with documents, dynamically created instructional material, and links to peers and experts that are relevant to her current work task and adapted to her competency. To provide this functionality, the project must address a number of technological challenges, and discover new ways of applying 'scruffy' technologies, such as statistical analysis, text mining algorithms and heuristics, and probabilistic modeling.

The APOSDLE interdisciplinary consortium consists of eight research partners, each offering different approaches and scruffy technologies, and four application partners. Due to the interdisciplinarity of the research team there is not only a need for the research partners to understand the perspective of the application partners, but also for the application partners (and other research partners) to understand the potential contributions of each of the technologies to their own work. Finally, to add to the challenges of

understanding each other at a conceptual level, partners are distributed over six countries and five languages, and are from organizations of different types, representing large corporations, SMEs, and public organizations, all with different work practices.

APOSDLE's approach to distributed participatory design
In outline, the process involved the following activities:

A use case writing workshop (May 2006), which involved representatives of all user partners coming together in the same location, and in which an initial set of use cases were defined *(synchronous, collocated design activity).*

A creativity workshop [2] (June 2006), which involved representatives of both application and research partners meeting together, and in which creative ideas for the future system were generated *(synchronous, collocated activity).*

Iterative pair writing of individual use cases (July – August 2006), in which each use case was authored by at least one representative of an application partner, and one representative of a research partner, using ideas generated during the creativity workshop. Application and research partners contributed to use case writing while remaining in their own organizations, and made their contributions at different times *(asynchronous, distributed activity).*

Development of a PowerPoint mock-up of the future system (July – August 2006) in which each research partner illustrated what their technologies could add, and one research partner assembled all drafts into one mock-up with a unified design *(asynchronous, distributed activity).*

Generation of creative solutions to social issues in the future system (February 2007), in which stakeholders used creativity triggers together with elements of a requirements model to identify further creative ideas for the future system *(asynchronous, distributed activity).*

A further creativity event (February 2007), where representatives of application and research partners came together to review and develop use case specifications using the mock-up and the creative ideas generated from requirements models *(synchronous, collocated activity).*

Further pair writing of use cases (March 2007) to refine work done in the final creativity event *(asynchronous, distributed activity).*

Scenario walkthroughs (April 2007) in which representatives of application and research partners came together in small teams to review use case specifications and requirements in combination with a first prototype of the APOSDLE system *(synchronous, collocated activity).*

Lessons Learned

Our experience following this process, as well as feedback collected, using questionnaires, at various points in the process indicates that participants were positive about both creativity workshops and pair writing of use cases. However, during the distributed work phases clear assignment of responsibilities became especially important, and in some of the

distributed activities (e.g. pair writing of use cases, development of the mock-up, and generation of creative ideas from requirements models) there was a significant need for co-ordination of the activities of different participants. Although a significant proportion of the design activities were carried out in asynchronous, distributed mode, it was our impression that the collocated, synchronous activities (such as the use case and creativity workshops) carried out early in the process provided a strong foundation of social relationships which supported later distributed, asynchronous work.

Another key lesson is that the basic tools employed in the APOSDLE process (email, Word, Powerpoint and a shared file server) provided good support for the activities described. In particular, the mock-up served as an important 'object to think with' [1]– a medium over which to communicate and to express ideas, objections, clarify assumptions, etc. The visual property of the mock-up nicely complemented the textual representation of the use cases by providing different affordances. It seemed that the written use cases were often interpreted by different partners in different ways. The mock-up allowed to clarify issues and to resolve misunderstandings. This was especially important during distributed work phases.

Conclusions

In the APOSDLE requirements process, we used a mixture of synchronous, collocated and asynchronous, distributed design activities, and also integrated activities designed to stimulate creative inputs to requirements. We would agree with Warr [4] regarding the need to support these kinds of combinations in real design settings. However, we would argue that the use of standard, commonly available tools already provides good support for many activities, and can free participants from significant constraints. Therefore, the answer to supporting participation and collaboration in distributed design teams may lie at least as much in the configuration of an appropriate mix of activities, as in the development of new tools.

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