Feasibility of iterative design as a challenge in distributed participatory design lifecycle

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INTRODUCTION

The focusing of traditional PD approaches and methods to the prior design phase of application has recently aroused discussion and demands for the more life-cycle aware PD, which extends the contribution of participatory design approach to cover the whole life-cycle of systems implementation, usage, development and redesign in user organisations (Dittrich, Eriksén & Hansson 2002; Hartswood, Procter, Rouncefield, & Sharpe 2000; Voß, Procter, Williams, 2000).

The claim of empowering users from consumers to developers who lead the development work after initial design and implementation of application is related also to the progress in the adaptability of technologies. The concepts of tailoring, customization, adaptation and end-user development of applications have gathered new content and interpretation in the era of component-based web applications which can be modified even (at least in principle) by average end-user without extensive programming skills (Mørch, Stevens, Won, Klann, Dittrich, & Wulf 2004; Fischer, Giaccardi, Ye, Sutcliffe & Mehandjiev 2004). The phenomenon of end-user development has gathered new momentum, when the types and methods of end-user driven development have broadened.

In our on-going action research project (Sampo) the ideas of extending participatory design process to cover also implementation phase and concrete work practice migration were applied. The concurrent co-design of customisable intranet portal application, work practices supported by the portal and portal implementation process were carried out involving user groups of the two schools, IT-specialists of the municipality, application architects and designers from technology providers, and action researchers as intermediaries (see figure 1.).

Parallel to the Sampo action research project focusing on ICT supported operations model of the upper secondary school, the educational department of the City of Tampere founded an ICT project concentrating on building the new ICT environment, a web-based intranet portal, and offering the installation environment for the new portal.

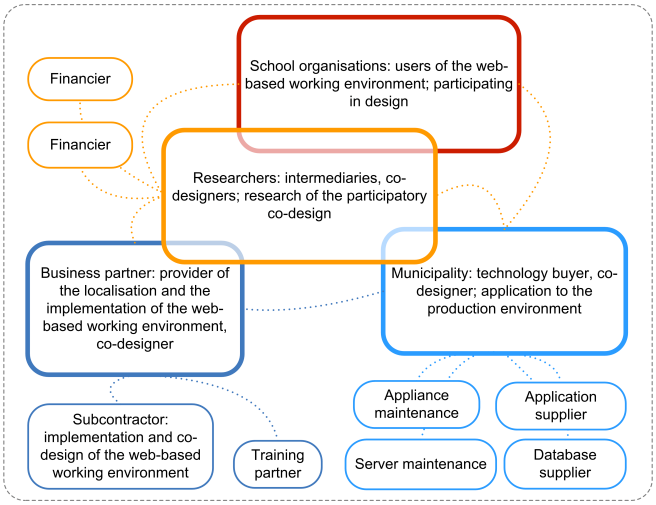

Figure 1. Sampo action research project network.

Microsoft Finland supported both the Sampo action research project and the ICT project of the city by providing tailoring partner for the ICT environment, training partner for the implementation and expertise in installation.

DISTRIBUTED PARTICIPATORY DESIGN OF AN INTRANET PORTAL FOR UPPER SECONDARY SCHOOL

Since the mid 1990s basic Internet technologies have been used to rapidly build local and global networks of the firms. Adoption and use of intranet technologies have grown since intranet technologies have become more accessible to organisation members, who in turn have acquired more advanced technology development skills, and more user experience of different web-based services and environments (Lamb & Davidson 2005). Educational organisations at basic and secondary level haven't widely adopted web-based groupware other than learning environments. School communities utilise other means to communicate: formal and informal meetings, sheets, email and student administration system. Intranets or similar socio-technical systems have been more common in business and industry domains and in higher education in Finland. The National information society strategy of

education with revised core curricula steers, however, towards the integration of ICT into pedagogical practices and organisational culture in the schools.

The aim of the Sampo action research project was to provide the school actors with time, place and extra support in strategising and planning ICT issues of the school, and give possibilities for guided, communal exploration and interpretation of both the technology affordances and new actor roles and operation models in design process. The intranet portal was built on component-based portal technologies with a visible component layer which consists of rather explicable elements such as calendars, address and contact lists, announcements and events lists, document and picture libraries, and discussion boards that are included in each workspace. Adding user groups or single users from active directory to the group workspaces enabled role-based and personal adaptivity of the portal. In both schools, principals, school secretaries and guidance counsellors operate in administrator's role and they are able to tailor the functionalities, add and remove users and user groups and adapt their user rights in shared work spaces. They can also create new workspaces according to emerging new requirements. Teachers administer their course sites accordingly. In other words, the possibilities for modification, customization and redesigning of the system were rather high. It was assumed, that since the school actors already had experiences of web services and learning environments they would more easily participate in school portal design process, express development ideas matching to school's work practices, evaluate design propositions e.g. on the basis of the paper prototypes and take over the limited local administration tasks after implementation and training with the support of the main user.

Positive value in such end-user development is to empower users to design and create without the need for trained programmers or IT departments. Motivators come from being able to complete a job more effectively, from speed of development, and form flexibility and local control (Fischer et al. 2004). Potential miscommunications of requirements to specialists are eliminated. End-users may also play a central part when systems have to be redesigned or evolved as a result of changing requirements (Mørch et al. 2004). Downside is outsourcing development efforts to end-users who have to put up with learning to use the software extensively. (Sutcliffe & Mehandjiev 2004.)

During the distributed participatory design of the intranet portal, the conventional participatory design methods including individual and group interviews with users, observations of working context, existing and future work process modelling workshops, and iterative requirements auditing and paper prototype testing rounds were applied. Approximately 10 out of the 100 employees of the schools were actively involved in the participatory design efforts. The work practice adjustments experienced by different user groups were explicitly modeled and discussed in the workshops. The features, new role allocations, pros and cons of altered steps of doing certain tasks with the new application were visualized and their feasibility discussed.

With the technology partners and IT-specialists of the municipality requirements lists and paper prototypes were audited and negotiated in an iterative manner before actual implementation of the intranet portal and installation environment. Requirements lists, paper prototypes, usability inspections and other documentations were shared and commented in project's intranet portal and via email.

In this paper we analyse the challenges of the distributed participatory approach experienced on organisational assimilation level and primary authority adoption level (Gallivan 2001) when the participatory design efforts were extended beyond prior application design.

EVOLVING CHALLENGES OF DPD

Organisational Assimilation Level

The approach of a participatory workplace design is not completely new to school organisations since teachers are mostly organised in teams in order to plan e.g. events, ICT strategy or curriculum of the school. As technology design has been a new territory to conquest, the mantle of a designer and decision maker has not been easy to move to the participating representatives of the school organisations. But there are also political and cultural constraints in managing participatory design activities. Although development of organisational culture is encouraged in the core curriculum of the upper secondary education, it may be difficult to correspond to this top-down call by bottom-up realisation on the school level because of a relatively short tradition of information technology design in schools and little time allocated for this kind of tasks in personnel's working hours. Moreover, ability to see the relevance of the ICTs from the viewpoint of the core tasks, i.e. class room teaching, varies a lot among teachers (Franssila & Pehkonen 2004; Lehtinen, Ilomäki, Hakkarainen 2003).

Among the promises of PD the better user satisfaction through expectation management, increased sense of ownership and commitment, and overall usability of a product through understanding the context of use and task integration are mentioned (Namioka & Rao 1996; Preece, Rogers & Sharp 2002). Still the produced design solutions can not please every user. The skill levels in ICT use and experiences of different web services and learning environments among teachers vary greatly which affects experienced quality of the portal, more precisely, experience of its usability and utility. Together experienced ease of use and utility shape attitudes towards the ICT use and affect will to use it (see e.g. Davis' technology acceptance model). The biggest motivator, however, is that the system substantially facilitates work processes and resolves experienced problems (Venkatesh, Morris, Davis and Davis 2003).

Another paradox in participatory design approach is that it seldom reaches the personnel in a whole. During intranet

portal design members of the school communities were informed on the design process but only few participated in the design actively. According to Malhotra and Galletta (1999) social influences generating a positive internalization of the use of the new system may however have a stronger influence on attitudes toward the use of the new information system than perceived ease of use and perceived usefulness. Herein those who participated in design process and gained insights in portal use and its planned benefits become central actors in realising its gains in work organisation and propelling organisational learning. Their role together with management (principals who have also participated in design) as opinion leaders and examples promoting best practices can not be underestimated in deploying and developing consistent practices of use.

Gallivan (2001) states that the non-voluntary organisational adoption process of innovations require modifications to frameworks such as TAM model explaining adoption and implementation behaviour. Strong, top-down organisation and heavy resource commitment facilitate early stages of innovation assimilation but a strong, top-down organisational culture and highly centralised planning may constrain later stages of innovation assimilation like adaptation. According to Venkatesh, Morris, Davis and Davis (2003) social influence appears to be significant only in the early stages of individual experience with the technology when its use is mandated. Normative pressure however diminishes when experience provides a more instrumental basis for individual use.

Other means for creating an understandable and cohesive way of using groupware are continual training and information, rewarding, participatory appropriation of the ways of use and end-user development processes, establishing a development team in organisation to implement end-user development and coordination of work practices, or planning the development efforts of application and its use as a part of organisations information management team's regular tasks. As participatory design of operations model has been in the centre of the whole Sampo action research project, appropriation and textualisation of the operations model – roles, tasks, aims and responsibilities of different user groups – has taken place after implementation phase of the school portal. Also processes of the end user development and system maintenance have been articulated in work organisation. However, naming the responsible administrator in the school organisation has not been self-evident. Although there are capable people for administering the system, the thread of increased workload may be too big. Also the motivation and responsibility to search, collect, evaluate and realise even the modifications possible to implement locally was a task which was not easy to allocate and execute to a local school staff. The school organisations had an institutional tradition to behave as a customer-style information application receiver, wishing the new information applications to be purchased in a turnkey basis without need to make any local modifications or appropriation. Thus the design-in-use philosophy was rather difficult to cultivate in these organisations, even though there were plenty of modification proposals unofficially recognised and announced.

Collective responsibility was found more convenient way of settling the issue in another school than distinct and individualised developer roles. Management also hoped for a stronger push from the municipal collaborators and administration in deployment of application which reflects rather young tradition of knowledge management among school management but also difficulties in strategic decision making in ICT acquirement as a whole. Now, after six months of deployment, school portal is in use in both organisations and there are differences both in most popular workspaces and in organisational communication practices. Both school organisations have also "matured" to design in use or adjusting and modifying portal's workspaces and tools according to the evolving user requirements and development ideas.

Primary Authority Adoption Level

In municipal school services in our case there has been a goal to utilise as much as possible centralized user account management services which support several other applications where user identification and allocation of services according the user profile is needed. As a user directory was utilised the directory of the school information system. Directory was populated by the students and staff members of the whole municipality. Email services and information security services were also provided centrally, serving multiple applications. Intranet application was dependent on these centralised services. User account management, school information system, email and information security service applications were administered outside the school organisation in the central IT administration unit of the municipality.

This diverse ecosystem of interrelated services and applications serving as a supporting infrastructure for the intranet application challenged the effectiveness and feasibility of the rapid ongoing iterative design-in-use after the implementation. The development and modification of supporting architecture applications required interventions of the provider firms. The software specialists of these firms able to make changes to the applications were difficult to reach and contact, they had lack of time to analyse change proposals, and they could have their centralized service desks even in another country.

When the end-user driven intranet application development proposals had some technical interdependencies related to the supporting infrastructure applications, the implementation of these proposals was often getting cumbersome. For example the school information system

provider firm, which had several customer organisations was rather slow and selective in the implementation of change proposals coming from single customer organisation. If only similar proposals cumulated from several customers, consideration of implementation of proposal in the provider firm started. If only the proposal was free of modification demands related to these infrastructure applications, it was possible to be implemented internally in the schools in a reasonable time frame. The functional interdependencies between intranet and infrastructure applications were not always easy to recognise for the end-users willing to modify intranet features independently, and design artefacts of the earlier design phases (requirements lists and paper prototypes) were not communicating the infrastructure related design constraints. This created sometimes feelings of having done design evaluations and change proposals to no purpose when the technical feasibility of proposals were finally evaluated and often partly rejected by technical experts as too costly, too laborious or technically impossible. A challenge in the development of future distributed design practices and supporting design artefacts is how to communicate efficiently those underlying technical constraints which may limit the feasibility of certain end-user –driven deigns change proposals (compare Kyng 1995).

CONCLUSIONS - BUILDING FEASIBLE DISTRIBUTED PARTICIPATORY DESIGN ITERATION PRACTICES

Designing, implementing and utilising effectively socio-technical systems like intranet portals in our case study requires multiple ways of conceptualising, communicating and evaluating evolving design proposals and design realisations. The idea of distributed tasks and roles in design lifecycle for end-users, and for designers from diverse areas of expertise (technical architecture, application assembly, user interface, usability, task-technology-integration) makes sense, but according our results and experiences it is rather hard to proceed time-efficiently and without serious interruptions. Distribution of efficient working time among multiple projects and other tasks makes iterative or parallel working rather difficult to organise among design stakeholders.

As long as fully functional prototype or first release of intranet application integrated into the context of other applications was not available for the whole user community, appropriateness of the application to support the work practices stays at least partly unclear. The concrete shift from the old practices to the new practices designed in participatory manner started only after the application is in the hands of users. Even for those users having participated actively into the modelling new work practices and iterating and auditing design proposals and paper-prototypes, the final deployment of application illustrates the fact that design can always incorporate only incomplete interpretation of the complexity of actual work practices and their modification options.

Even though end-user development by exploiting the tailoring and customization capabilities of for example component-based web-applications has made iterative design-in-use more accessible to an average user, it is still a rather unconventional approach at least among municipal end-users in our case schools.

Shared organisational understanding the scope of the application customisation possibilities and also the technical and conceptual skills needed to fully exploit the possibilities of customisation does not evolve without special attention and training.

End-user development as a personal customisation and as an organisation-level practice of modifying applications to better fit with evolving shared tasks differs radically. Responsibility to manage in a participatory fashion the process of identifying, integrating, prioritising and finally implementing both local and infrastructural application development needs requires certain legitimate role and working methods to be allocated for the employee accomplishing these tasks especially in smaller organisations. Without legitimate negotiation mandate as a representative of the user organisation especially when communicating the development needs to the infrastructure applications provider firms, the ongoing user-designer interaction does not proceed in equal fashion.

The difficulties in proceeding in the development tasks where IT-designers capable of implementing changes to the applications are both organisationally and geographically distant are partly result of power asymmetry between customer and supplier organisations. Rather often public municipal organisations as customers of technology provider firms experience different service level than private customer organisations. This asymmetry of power can serve as a springboard for smaller (public or private) customer organisations to form interest or pressure groups to negotiate about implementation changes with the technology provider. This in turn requires trust and ability to make compromises between possible conflicting development proposals within the interest group.

ACKNOWLEDGEMENTS

We thank participating and partner organisations of Sampo action research project for openness and inspiration. The Finnish Work Environment Fund and Microsoft have financed Sampo action research project in 2005-2006. Microsoft and Information Society Institute supported the preparation of the project in fall 2004.

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