Third Generation Participatory Design – making participation applicable to large-scale information system projects

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ABSTRACT
Participatory Design (PD) methods have traditionally been oriented towards small, local workplaces with homogeneous user groups and thereby on a subset of IT applications. This study presents a renewed PD framework suited to the context of large organisations and the design of comprehensive IS, using design data from an IT project in the Swedish Trade Union Confederation and the participative design of an information system for all its 225 000 trade union shop stewards. The framework was developed in response to six major obstacles for success in PD projects, identified by participatory action research methods.

Categories and Subject Descriptors
D.2.2 [**Software tools and techniques**]: Evolutionary prototyping, User interfaces.

General Terms
Design, Economics, Human Factors Theory.

Keywords
Participatory Design, System Development Methods, Participatory Action Research, Design Rationale.

1. INTRODUCTION
In a historical perspective, a *first generation of PD* can be distinguished that was focussed on the ideology behind 'Collective Systems Design' [1]. This generation of methods was typically concentrated on blue-collar workers, production and individual workplaces, and the stated objective was to enhance workplace democracy and increase worker autonomy, skill and task variety. Users were to be given direct influence on the design through their participation in design groups where they contribute with organisational and work task knowledge. Collective Systems Design used tools that are easy-to-learn and put low demand on the users' beforehand knowledge. Mock-ups and future Workshops were commonly applied to the formulation, visualisation and realisation of design solutions [1]. But criticism was also directed towards Collective Systems Design's prolonged focus on consensus reaching and democratic processes, which sometimes tended to hamper efficiency and a coherent architecture. Additional identified problems included gaining access to and motivating users to participate, and in the collaborative process itself where studies have shown that full-user participation when it comes to, e.g., project initiation and information flow analysis, is neither effective nor appreciated by the users [2].

A *second generation of PD* emerged in response to this criticism. It was characterised by a shift towards the commercial setting and by embracing teamwork, finding points of contact with the area of Computer Supported Cooperative Work. Since the early 1990ies, the approach has been developed in parallel to Collective Systems Design, both gathered under the umbrella term *Participatory Design*. It was argued that the second generation PD resulted in generally more usable systems since these are designed together with the users. Several authors have still recently pointed out that also this PD generation is seldom used in large, concrete, product-oriented projects and that, once it is applied, it only results in small-scale, stand-alone IT-applications [3].

As a result, there are few large systems developed by PD methods in use, and products are almost exclusively stand-alone applications. In particular, it has been pointed out a need for renewal of conceptual frameworks as well as methods of PD, if they are to extend beyond single workplaces or lab-like settings, to large-scale strategic projects [3]. A *third generation of PD* seems thus to demand adaptation to prevalent organisational trends, e.g., to large organisations, inter-organisational collaboration and networking, and that increased consideration is given to the third parties in the systems development process.

The aim of this study is to extend and modify PD methods to be applicable in comprehensive projects in large, networked, organisational contexts. Specifically, the objectives are to determine which particular restrictions and modifications are needed in order to make the design methodology applicable in general, and to large organisations in particular; and thereafter to integrate the findings in a framework for a third generation of PD.

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2. METHODS

The design method development and evaluation was performed with reference to the application of the second generation PD method Action Design [4]. The research methods were based on Participatory Action Research [5], in which participant observation and fieldnotes were complemented by video documentation in the collection of data, i.e. the systems developers assumed the additional role of participant observers. The study was performed in the Distance learning for Local Knowledge development (DLK) project, where the aim was to develop an information system for the 225.000 shop stewards in the Swedish trade union federation. The design group originally comprised two systems developers, one pedagogue, and 10 user representatives. The latter included four shop stewards, two full-time ombudsmen, two representatives from the DLK project management, and two local union management representatives. Six affiliations were originally represented. The group held 20 half-day meetings for a period of two years, resulting in a requirements specification and a prototype of an information system to be accessed by all union shop stewards. During each design meeting notes were taken down by the systems developers as well as by a third person that participated in the meetings explicitly for this purpose. In the data analysis, the major difficulties experienced in relation to the categories were integrated in a small-scale theory. The theory was then used to identify appropriate change measures to overcome these difficulties. Finally, with a basis in the change measures, a renewed PD framework was constructed.

3. RESULTS

The case study project resulted in a requirements specification and a prototype displaying the system functionality. These were handed over to the union affiliations as a basis for IS implementations. The prototype was designed with consideration to content, interface, technology, administration, security, ethical and organisational consequences issues. It outlines a Web-based system intended to be compatible with the structure of the union organisation with respect to diversity as regards geographical distribution, platforms, and PC computers access.

3.1 System design experiences

PD has traditionally presumed a certain degree of homogeneity as regards the IS target group. In the present case, the intended user group was 225 000 and the entire organisation consisting of several layers, e.g., union departments and affiliation offices, which were going to be stakeholders in the emerging system through administration and implementation responsibility.

Obstacle 1: *Entire user group and stakeholders in the system cannot be represented in a design group.*

Change Measure 1: *Dealing with the scale of the target user group by means of data collection outside the design group.*

The design group participants thus had the double functions of *designers and argument analysts*. These double functions remained evident throughout the design process and related, e.g., to modification of problem pictures emerging from a survey on shop stewards' situation.

Obstacle 2: *Difficulties to integrate different perspectives of heterogeneous user group into local design work.*

Change Measure 2: *Introduction of a repository for design arguments into the design process.*

Another difficulty concerned the permanence of the group. The shop steward assignment is held on a period basis. Several shop stewards had to leave the group when they left their union assignments. The first was replaced, but the other two were not, as this occurred late in the design process. Further, the two representatives from DLK project management left the entire project for other union assignments after half the design process. In the design group, their predecessors replaced them.

Obstacle 3: *Difficulties to retain group stability.*

Change Measure 3: *Increasing structural flexibility of the PD group.*

The project contract was never signed by everyone, because re-negotiating it with new group participants was regarded to take too much time. Neither was the project plan written together with the user representatives but prepared beforehand and modified according to their suggestions. Further, initial plans for a separate organisational/IS goal analysis was abandoned.

Obstacle 4: Time-consuming pre-design group procedures resulting in inefficient use of time.

Table 1. *The change measures displayed by their arguments.*

	Collective Systems Design principles	
Scarce design resources	**Equity** (broad influence on design issues)	**Use value** (highly functional tool for users)
Productivity increase (efficient PD group)	*Data collection outside design group* *Repository of design arguments (ArD)*	*Structural flexibility in design group*
Downsizing design process (focussed design process)	*Outsourcing of administration* *'Lean design'*	*Focus on hands-on technologies*

Change Measure 4: Reducing user participation in pre-design tasks to attain a leaner early design process.

According to AD, the group participants take turns being the meeting chairperson and jointly formulate the meeting agendas. However, the user representatives wanted the researchers to take sole responsibility for the chairmanship, and exclusively propose items for the agendas themselves.

Obstacle 5: *Inefficient design procedures relating to user participation in administrative tasks.*

Change Measure 5: *Outsourcing of administrative tasks from the PD process.*

The intial impatience also led to the decision that potential technological solutions were to be worked with in parallel to the establishment of user needs, i.e., a kind of simultaneous bottom-up/top-down approach. This would provide hands-on experience as a complement to the otherwise somewhat abstract character of some of the work. In particular, existing "over-the-counter" technologies that might be of use in shop stewards' work were evaluated.

Obstacle 6: *Technologies remain abstract in design process.*
Change Measure 6: *Introduction of early evaluation of existing technologies in contextual settings.*
The experience of the design group thus highlighted several obstacles with applying PD, in general, and in the specific context of a large organisation. These obstacles can be described as being contingent on two orthogonal sets of demands on the design process, i.e., the wish to retain the principles of PD while having to deal with management of scarce design resources (Table 1). These difficulties informed successive modification of the approach, before and during the design process.

4.2 An emerging third generation Participatory Design framework

Integration of the change measures into the second generation PD framework resulted in a substantial revision of the design method. The renewed design framework is based on three modules, where the second module contains three sub-modules (Figure 2). The first module contains activities that are performed before the actual PD is started. It should be noted that even though only the second module contains the core PD process, also the first and third module include elements of active user participation, e.g. by providing feedback on the outline of the project plan to the pre-design group and by evaluation of implemented prototypes during the post-design.

The second module, which includes the core PD process, is based on collective systems design meetings. Each meeting is used to address several issues and may include several design practices. Argumentative Design (ArD) [6], a method for documentation of the rationale behind design decisions, is introduced to support flexibility, negotiations and consensus reaching throughout the remainder of the design process. The last part of each meeting is devoted to integration of the latest issues and decision made with the emerging ArD documentation, which both serves as the documentation of the design work and a collective memory for the group and its potential newcomers. The embedded analysis modules include design practices that are performed iteratively. The three sub-modules are invoked from, and reported back to, the PD module. The IS analysis sub-module requires that an organisational analysis has been performed at least one time, and the technology analysis sub-module requires that an IS analysis has been performed at least one time.
The third module, post-design, entails the final documentation of the work in the form of a requirement specification and implementation of a prototype and a formative evaluation.

Module 1: ***Pre-design***
Prerequisites: A clearly stated mission and allocation of resources to complete that mission.
Activities: Pre-design scheduling, i.e., setting of project goals, project planning and establishment of efficient principles for the design process.
Participants: Systems developers and external stakeholders.
Outcome: Preliminary project plan and project contract.
Module 2: ***Participatory design***
Prerequisites: Preliminary project plan and project contract.
Activities: At the first design meeting, the preliminary project plan and project contract are presented to the user representatives. A negotiation about these documents takes place, and modifications are made if necessary. Thereafter, the documents are signed. In the ensuing PD process, analysis modules are evoked upon decision taken in the PD group, using ArD documentation as a basis.

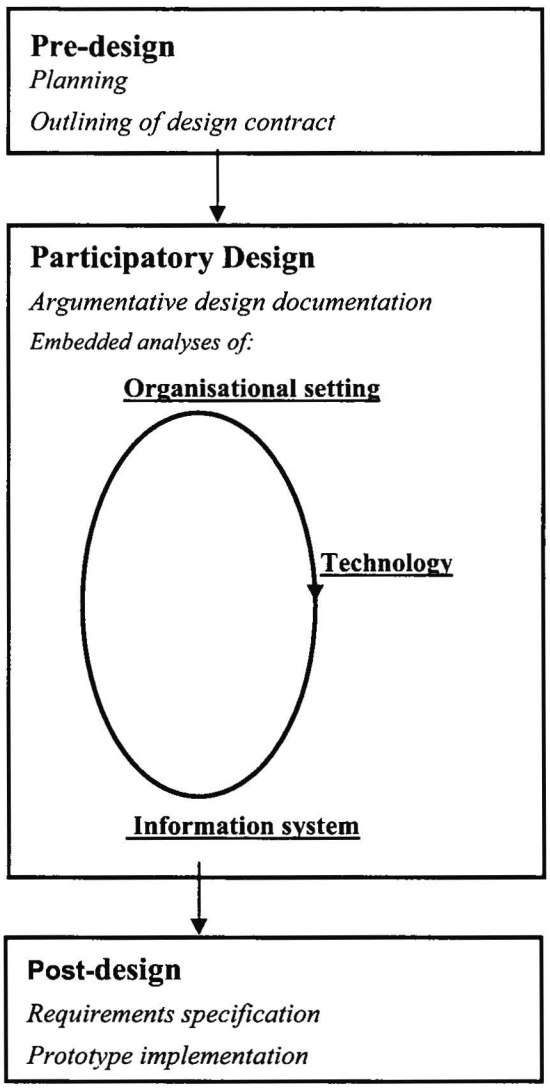

Figure 2. *The third generation PD framework*

Participants: Systems developers, engineers, and user representatives.
Outcome: ArD documentation of the design and prototype based on the interplay between organisation analysis, IS analysis/prototyping and technology. All sub-modules thus produce input for the prototype.
Sub-module 2a: *Analysis: Organisational setting*
Prerequisites: Final project plan and project contract
Activities: The organisational context analysis proceeds during the PD work. External data collection takes place throughout the design process, and the ArD is used to bring structure to the external voices and ensure that the organisational focus is not lost in local design work. Iteration takes place between organisational analysis and concrete design practices.

Participants: Systems developers and user representatives
Outcome: Updated ArD documentation concerning the organisational prerequisites.
Sub-module 2b: *Analysis: Information systems*
Prerequisites: ArD documentation including issues resulting from an organisational analysis.
Activities: Prototyping of the system architecture is performed, with a point of departure in the organisational analysis. During design meetings prototypes are demonstrated and commented upon. In between meetings the implementation of the prototype is updated. Iteration takes place between development of prototype versions and organisational analysis and technology analysis. The ArD documentation is updated.
Participants: Systems developers and user representatives
Outcome: Updated version of the prototype and ArD documentation concerning the system architecture.
Sub-module 2c: *Analysis: Technology*
Prerequisites: ArD documentation including issues from the IS analysis.
Activities: During design meetings evaluations of existing technologies are performed. What technologies that are selected for the evaluation is determined based on the outcome of the system analysis. The ArD documentation is updated based on the results from the evaluations.
Participants: Systems developers, user representatives, and engineers.
Outcome: Update of ArD documentation with the findings from evaluations of technologies.
Module 3: ***Post-design***
Prerequisites: A completed ArD documentation of the design.
Activities: The prototype, implemented in the system analysis, and the requirements specification are completed based on the final ArD documentation. The fulfillment of contract goals is evalutaed.
Participants: Systems developers and engineers. User representatives through "final" evaluation.
Outcome: Requirements specification and prototype.

4. DISCUSSION

The aim of this study was to extend and modify PD to be applicable in comprehensive IS projects in large, networked, organisational contexts. It has previously been argued that PD should be merged with other design approaches, and technology evaluation methods [7]. This study has reported an attempt to formalise such a merge using experiences from a large systems development project into a framework for the third generation of PD.

It must be kept in mind that the proposed framework is intended to enhance, not revolutionise, the practise and understanding of participation in design. PD was, from the beginning, a loose approach comprising a variety of available techniques, even if several groups have organised their practices into a coherent approach [8]. This provided for flexibility. Further, iterative prototyping is becoming an integrated part of systems development in general, including PD, which presently much evolves around an artefact. What the study contributes with is systemising theoretical fundamentals and empirical experience into a framework providing systems developers and external stakeholders with a design agenda that with a reasonable certainty leads to the expected results. The framework proposed has thus several important managerial and research implications for IS practitioners and academia. Future work should incorporate the testing of the framework in concrete systems development projects taking place in organisations designing comprehensive IS.

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