Participatory Organizational and Technological Innovation in Fragmented Work Environments

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Abstract
In this contribution we are addressing issues of participatory processes to the development and introduction of computer applications in non-traditional work environments. The background is provided by the case descriptions of two quite different work environments with network features. According to the characteristics of these work environments we propose participatory measures for organizational-technological innovation including participatory design (PD). The suggestions we are offering are different for the two work environments; and they differ in part from common PD suggestions. There is reason to assume that common PD suggestions are suited only for a special sort of organization. Hence, we argue for an extension of the PD repertoire to encompass more forms of organizations.

1. Introduction

This contribution is partly a report on the work of two projects, the InKoNetz and the OrgTech projects and an attempt to integrate experiences and results. The integrated organization and technology development framework (OTD, cf. Wulf & Rohde 1995; Wulf et al. 1999) served as a set of guidelines for these projects: The OTD process is characterized by a parallel development of workplace, organizational and technical systems, the management of (existing) conflicts by means of discourse and negotiation and by immediate participation of the organization members affected. The change process is thought to be an ongoing one. Both projects have had the objective of improving cooperative work by improving the codevelopment of individual work processes, organizational structures and technical infrastructures. One target environment of the OrgTech project, which we are reporting on here, has been the inter-organizational collaboration.
between a steel mill and two engineering offices. One of the target organizations of the InKoNetz project, our second case in this contribution, has been a service network; the improvement of the internal cooperation by improving the organizational groupware has been the focus of the project work (cf. Rittenbruch et al. 1998, Törpel 2000).

For the work toward viable organizational-technological solutions in the application organizations of the OrgTech and InKoNetz projects we recommended procedures and principles successfully employed in participatory processes of organizational-technical innovation. After a while we realized that some of these suggestions did not apply to the work environments in our projects.

In this contribution we are drawing on observations and experiences that support the hypothesis that common PD suggestions presuppose a number of prerequisites that are absent in our application areas as well as in other areas. Even though they are unsuited for common PD suggestions we think that these work environments could be target environments for participatory organizational-technological innovations as well. Hence we suggest that the repertoire of PD be extended. For the two work environments we are presenting ideas of how to proceed.

We are first introducing common PD suggestions and principles (chapter 2). A closer look reveals that these measures and principles presuppose organizational features most of which are present in unionized traditional organizations (chapter 3). Even most of the small organizations do not have these characteristics (chapter 4) and hence the participation of their members in technological innovation processes has to take different forms (chapter 5). When business relations between organizations in the context of outsourcing become tight inter-organizational working units in their own right can result. We describe one case of close inter-organizational collaboration where the need for participation in (inter-) organizational-technological innovation emerged (chapter 6). Conventional PD measures are not applicable in this work environment without additional steps. One way to make the constellation amenable to PD is to take preliminary organizational steps; from the experience in the OrgTech project we mainly suggest forming an inter-organizational semi-autonomous group (chapter 7). Our second case of a fragmented work environment is a network organization (chapter 8). Fragmentation is present with respect to locality, work content, work means and interests (chapter 9). Traditional PD suggestions are hardly applicable here. Our suggestion for a participatory approach to organizational-technological innovation in this organization is close to practices already performed. It consists of parallel local experimentation and integration at the organizational level on the basis of delegates.

2. Common PD Suggestions and Principles

Participatory approaches to the development and introduction of computer applications have recently gained relevance. A variety of methods has been developed and successfully applied in practice. Reports of and comparisons between participatory design (PD) projects, collections of suggested and suitable methods, and compilations of criteria for successful participatory processes are abundant in the literature. In this section we will first introduce a number of
Among the approved PD techniques that have been applied and reported on in the literature are:

- **Visiting workplaces**: As a means to enhance real-life knowledge about the organization, the workplaces, the work practices and the existing problems, interests and conflicts, participants of PD processes spend time with members of potentially affected work environments, engaging in all kinds of activities that seem suited, like observing, inquiring, interviewing or scrutinizing relevant artifacts (see for example Bødker et al., 1993).

- **Elaborating work scenarios**: Different typical work practices are reconstructed and integrated into an overall picture of the work tasks, the division of work and the cooperative structure to be supported by computer applications (see Holtzblatt & Jones 1993).

- **The future workshop and organizational games**: Originally developed by Jungk & Müllert (1987) the future workshop was adapted to the special situation of gathering requirements in participatory processes for the design of computer applications at work (see Kensing & Halskov Madsen 1993). It is a means for brainstorming, for identifying shortcomings of the current state and for developing visions; it proceeds by the steps of critique (present), fantasy (future) and feasible next steps (back to reality in the form of real-life solutions and action plans); the elaboration is structured by techniques of interaction. With a structure analog to the future workshop, design work is acted out as a theatrical play in organizational games (see Ehn & Sjögren 1991).

- **Using mock-ups**: Instead of using specification documents mock-ups can serve as a means of experimenting with and evaluating potential organizational-technological alternatives in real-life settings. Even though mock-ups are non-computer artifacts that serve to imagine computer system functionality - like cardboard screens or flipcharts with menus or file contents - they are means for designing computer-related artifacts. They were developed in the context of the Utopia project (see Ehn & Kyng 1991). They allow for real-life experience, are easy to understand and inexpensive, enhance imagination of future solutions and are fun to work with.

- **Cooperative Prototyping**: As revisable technical realizations of the functionality represented in the mock-ups, prototypes can serve as means for cooperative experimentation and modification with the potential functionality and realization of the prospective system (see Bødker. & Grønbaek 1991).

- **Continued design of computer applications, work practice and organization**: Often, continued design is equated with tailoring as adapting or modifying technical solutions in use. Tailorable systems leave space for a variety of appropriations by providing the users with options to further design them in use. Continued design can also comprise more comprehensive activities (see for example Henderson & Kyng 1991). The ongoing improvement of means, processes, structures, rules etc. can be described in terms of spiral-like change processes, often called evolutionary (Floyd et al. 1989). The affected organization members receive the opportunity to suggest and/or make changes in the form of feedback loops instead of being subject to linear processes (like the sequence of requirements definition, design, implementation, test, introduction, use, maintenance).
Some of the principles guiding participatory design are:

- Acknowledging diversity: Different perspectives, differences and interests should be explicitly articulated. In negotiations all interests should count.
- Impact of those who will work with the product: All perspectives and interests should have an impact on the innovation, independently from power structures and hierarchies. This often means that the powerless (usually workers) have more impact than usually.
- Impact instead of token participation: Real impact should be granted in core areas instead of token participation in minor decisions with the major issues predefined by the powerful.
- Exchange and education: Mutual learning should be promoted on all levels. Mutual learning between the different interest groups (hierarchy level, content areas, design vs. content, capital vs. labor,...) is especially encouraged. The participants should become qualified in the course of the participatory change process. For example the workers who are the »work content specialists« will undergo steps qualifying them for technology design and development; and the technology specialists will undergo steps helping them understand the work content and context in question.
- Separation of interest groups: For certain phases interest groups of the participatory process might have to be separated. It is often stressed that fruitful work, for example in future workshops and organizational games, may rely on a homogeneity or compatibility of interests of the participants. Mostly workers and management are separated (see Bødker et al. 1993, 165).
- Protection of the participants: Participation should not be a disadvantage. Participants should get compensation for the work in the project. The normal work should be done without anybody doing extra work. The participants' statements should not endanger their status in the organization.

3. The Implicit Target Environment for Common PD Suggestions

In order to meaningfully apply or realize single or combinations of these suggestions and principles the setting has to have certain features.

Measures like the future workshop or organizational games require the possibility to (often, regularly) meet somewhere. Locations have to be available and it has to be possible to meet on a regular basis or to schedule meetings in advance. A certain continuity of participants is beneficial.

In order to elicit honest and to-the-point statements and contributions from the participants regulations have to be present so that the participatory activities do not result in a danger for the participating person. This requires regulations within the organization including employment contracts that protect workers. Often this is the case in unionized organizations, at least in organizations that have structures that represent worker interests. Sometimes this can be warranted because of the public attention devoted to large and well-known organizations.
In order to elaborate typical work scenarios at least some aspects of the work (content, means, procedures, collaboration) must be generalizeable.

The separation of interest groups presupposes that these interest groups have to be identifiable and present. In order to settle certain conflicts these conflicts have to be present. In the PD literature the conflicts of capital vs. labor, management vs. workers, design vs. use are often assumed. This presupposes an organization with a vertical and a horizontal division of work. Overall, this often means a division in a board of directors, various levels of management, and white collar and blue collar workers. With the different levels of the formal hierarchy different perspectives and interests are then associated. The most important of these interest groups (like »capital« and »labor«) have superregional organizations with regional and/or organizational branches that represent their interests. Within the organization their local representatives have a voice. National legislation warrants structures within the organization like committees in which the representatives negotiate relevant issues regarding matters of the organization and work.

Real impact requires that the results of the participatory process become implemented and that traditional power structures cannot overrule the conclusions arrived at in the participatory process.

Most PD measures are time-consuming and require the presence of resources (time, money) and negotiation structures to allocate these resources. For example, participants will only be motivated to contribute to the process if they receive compensation for their work and if their ordinary work gets done while they are absent. In order to be able to meaningfully contribute to the process the participants need to be qualified which also requires resources (money, time, educators,...). There are good chances that this can be provided if a clear border with defined channels for exchange, especially incoming and outgoing orders, separates the organization from the »outside world«. If organization provides a strong buffer between the market and the individual working within the organization, the outcomes of individual efforts do not have to compete in the market but contribute to the overall competitive strength of the organization. The relation between individual contributions to the organization and benefits from the organization are then largely regulated by the structure of the organization itself, contracts, rules and other »official« results of negotiations and sometimes the ownership of shares. If this is true, the organization might allocate resources for participatory measures regarding technology development, introduction and maintenance.

Many of these organizational prerequisites were present in projects reported on in the literature. Bødker (1996) states that, even in »traditional« organizations the feasibility of PD agendas is not always warranted; for example the results of PD core groups often do not become sufficiently disseminated, the PD efforts lack continuity, management overrules PD decisions, the participants are not sufficiently compensated or the participants do not get sufficient resources for measures qualifying them for the participation (p. 217). In the rest of this paper we are exploring the possibilities of participatory organizational-technological innovation for organizational environments that do not meet the organizational assumptions of traditional PD.
4. Small Organizations

Some crucial presuppositions for traditional PD are not in effect in many small organizations. Rather, besides being small, many small enterprises, especially in the high-end service sector, can be characterized as follows.

Usually each member of the organization is the only specialist for a particular field in the firm. The necessity to survive as an enterprise is obvious to everybody. Therefore, everybody usually feels a strong obligation to contribute to the success of the firm. Due to its small size the organization can hardly serve as a buffer between the individual organization members and the «outside world». Rather, the market is always visible to everybody. Members who do not visibly contribute to the success of the organization have to leave the organization. Many small organizations are highly dependent on incoming orders. In the face of outsourcing on the side of large organizations, the dependence on large organizations takes different forms. One of these forms is stable inter-organizational collaboration (see below), another is the formation of networks of small companies. The ability to form and maintain flexible and mutually supportive professional networks of small and medium-size organizations has become a crucial success factor for small and medium-size enterprises.

The relation between contributions to and benefits from the organization is regulated by the internal division of work. Usually small organizations try to keep administrative overhead low. In small organizations, capital or labor organizations are usually absent. Accordingly, the individual employees' interests are not represented by unions, interest groups or negotiation structures of any kind. The decision to introduce technical means depends on the frequently low purchasing power of the firm, and the risks taken by purchasing new means have to be kept small. There are also egalitarian small organizations, but many small organizations have a clear top-down organizational command structure with powerful managing directors (usually the owners) and compliant employees (cf. Nett et al. 2000).

5. Participatory Shopping and Tailoring as an Alternative to Conventional PD in Small Organizations

The measures suggested in the PD literature - like workplace visits, future workshops, organizational games, elaboration of work scenarios, mock-ups and prototypes are too expensive and time-consuming for small enterprises. Robertson (1998) concludes on the basis of a sample of small organizations in the field of design (not the design of information technology):
"None of the companies studied enjoyed the resources to engage in [...] the canonical case of Participatory Design - where 'users and designers work together over a long period to craft a system uniquely suited to the tasks, practices and environment of its users'..." (210).
Rather, "small companies are purchasers of off-the-shelf technology and lack the infrastructure, and the economic means and justification, to design their own systems from scratch. They must
make do with what is available within the marketplace and within their invariably tight budgets." (209).
"For the designers of systems within small companies, the challenge is selecting the best fit technology from what is available in the marketplace and adapting it to the local conditions. User participation in this process is crucial to the quality of purchasing decisions and the effectiveness of the adaptations." (218).
"For people employed in design companies, participation in the shaping of their systems is rarely a question of the nature of their involvement in the development of software. Instead they rely on off-the-shelf-applications that have been developed somewhere else... (U)ser participation in small companies focuses on such issues as shopping decisions, consumer rights and protection and the compatibility, tailoring and reliability of off-the-shelf applications." (207/208).

Some of these organizations want to be as much participatory as possible in the development, introduction and appropriation processes of their computer applications. Principles of traditional PD approaches can guide participatory shopping and tailoring. In small organizations it is possible that the diverse individual interests, perspectives and work constellations are taken into account and that everybody has an impact on core decisions. Members can learn from each other and qualify themselves and each other in the processes of shopping and tailoring. The bottleneck is certainly resources; small offices have tight budgets and schedules. In hierarchically structured small organizations the managers will hardly accept participatory processes at all.

6. Case: The Inter-organizational Collaboration between MeltIt, Techno and Doku

In this section we will introduce the case of the collaboration between three companies: MeltIt, a large steel mill and Techno and Doku, two engineering offices (names of companies have been changed). All three companies are located in the German Ruhr area. MeltIt is a large unionized organization and hence meets most of the above-mentioned criteria that are implicit standards of traditional PD suggestions.

Within MeltIt, different departments compete for resources; for example the operating units and central units are in a constant struggle with each other. In the case of the OrgTech project, this meant that it was not possible to integrate MeltIt's plant operators into the project with the consequence that an important group of actors did not contribute to the processes initiated by the project.

Both Techno and Doku are »traditional« hierarchical small organizations. In workshop discussions of the OrgTech project the employees of Techno and Doku were often unsure of whether to articulate individual positions (as opposed to »the official policy«) or not.

Techno and Doku have done subcontractual work for MeltIt in the field of maintenance engineering, e. g. the construction of and documentation for steel furnace components. These business relationships have been kept since more than a decade on different levels of intensity.
When the OrgTech-project started, the cooperation had intensified after the steel mill had decided to outsource most of its maintenance engineering work.

A construction department within MeltIt coordinates the maintenance engineering activities and manages the relations with the external engineering offices. The construction department is a central organizational unit. It is responsible for all maintenance activities of the mill and belongs to the mill's department of central services. This resembles the business cooperation between independent organizations. Typically, an order is created by the plant operator, who controls the production equipment and machinery in his plant and who is in charge of the production of the plant. Should a maintenance measure be necessary, the plant operator sends a request to the company-internal construction department for further processing. The transaction is either handled internally or referred to an external engineering office.

In the case of external subcontracting, an order will then be prepared by the internal construction department. The necessary information, documents and drawings are transferred to the engineering office for further processing. Since order specifications can contain errors and sometimes need further clarification from the beginning, inquiries, further discussions and extensive reordering of drawings are often necessary. Drawings and documents have to be found, coordination work has to be done and contacts to other departments have to be initiated. This process of realignment of orders is tedious and time-consuming and requires special knowledge in technical domains and knowledge related to the structure of MeltIt's physical and electronic archives (cf. Iacucci et al. 1998, Hinrichs 2000).

There is a mutual dependency: At the beginning of the project the bulk of the incoming orders of Techno and Doku were commissioned by MeltIt; on the other hand the tasks to be performed for MeltIt are so special and require so much knowledge related to MeltIt's equipment - especially its archives of technical drawings - that it would be more expensive and time-consuming to commission an order to anyone else than Techno and Doku. Due to its volume of orders MeltIt has been able to determine the conditions of the collaboration, for example in terms of the legal agreements, definition of work processes and technical arrangements. This may be illustrated in the following. The amount of work done within the inter-organizational structure has changed over time. How much of the maintenance construction is sourced out into engineering offices instead of being done within the steel mill has mainly depended on the policy of the steel mill and has been unpredictable for the engineering offices. At the beginning of the project, the steel mill tried to source out as much work as possible in order to reduce its fixed costs. Later on, the steel mill drastically changed its policy by trying to limit the amount of maintenance engineering in general and hence save short-term costs. The background for this policy was their initiative to replace old plants by new ones. The remaining maintenance engineering work was supposed to be carried out by the internal construction department.

In an inter-organizational collaboration long-term company strategies can be diverse and conflicting. In the case of the collaboration between MeltIt, Techno and Doku this even led to the introduction of incompatible technical applications endangering the cooperation. For instance, the director of one of the engineering offices decided to introduce an incompatible 3D CAD application because he believed that its functionality would open new markets for the engineering office. It became obvious that both engineering offices simultaneously have the
interests of working with MeltIt and collaborating with other business partners. These interests have sometimes been conflicting.

The perspectives of the different actors within the inter-organizational engineering processes differ considerably on how to define the relevant work processes and what appropriate quality measures are. From the perspective of the engineering offices, the work process ends as soon as the final sketches are delivered. Hence, they are hardly aware of the production processes and their specific requirements.

Inter-organizational collaborations are nothing new but belong to the defined interfaces between traditional organizations and the »outside world«, especially in the context of incoming and outgoing orders. Yet, in this case we observed that the collaboration can get the status of a work environment in its own right, with an extreme interdependence among the performed work tasks, a stable collaborative objective, regulation by legal means like contracts, streamlined by a set of computer work means and with relative independence from other work environments.

There is not much of formal (inter-) organizational structure supporting the inter-organizational collaboration. The resources for the cooperation and for process improvements have to be provided by the individual organizations. A framework of contracts developed by the legal department of the steel mill provides the legal setting for the inter-organizational cooperation.

In general, the steel mill has more resources than the engineering offices. For PD processes which are meant to improve the working conditions for all parties involved, the inequality in terms of resources poses problems. The employees at Techno and Doku, for example, did not have enough resources (time, money) for participatory.

7. A Participatory Approach to Organizational–Technological Innovation for the Collaboration between MeltIt, Techno and Doku

So far, it has been unusual to suggest PD measures beyond one single organizational context. For the collaboration between MeltIt, Techno and Doku PD suggestions would have to consider the combined status of a collaboration and a work environment with qualities traditionally restricted to organizations. Especially, since this kind of collaboration can remain stable over long periods of time, we think that attempts to apply PD techniques so used in single organizations so far, make sense. In order to make this a realistic scenario it has to be acknowledged that the inter-organizational collaboration forms a relatively stable working environment with regard to the exchanged services and the division of labor between the partners.

However, as long as the current status of the collaboration between MeltIt, Techno and Doku remains unchanged, traditional PD measures are not applicable: In a constellation where one organization dominates the scene and where local decisions can be overruled by formally superordinate structures, participatory approaches cannot reach very far. The prerequisite for
employing PD measures might be an organizational step. We think that in order to install practices allowing all potentially affected individuals to determine decisions and processes of organizational-technological innovation one way is to first enforce a status of relative autonomy of the inter-organizational network. This could be realized by giving the group of individuals, involved in the inter-organizational collaboration, the status of an inter-organizational semi-autonomous team (cf. Brödner 1985). A binding agreement should secure the semi-autonomous status. The semi-autonomous status means that the group has its own budget, defined areas of sovereign decision making and a contact person mediating between the group and the three enterprises. Decision-making regarding the inter-organizational structure of the group and technological innovation should be in the hands of the group. Special resources for enabling processes of organizational-technological innovation have to be allocated, and it also has to be granted that the processes and outcomes are widely determined by the members of the semi-autonomous group (cf. Nett et al. 2000).

The formation of a semi-autonomous team would allow for participatory processes regarding the structure of the collaboration and technological changes. Especially, an ongoing process of negotiation and improvement regarding work processes, structural-(inter-)organizational changes and suitable technology (continuous improvement process) makes sense. We think that the traditional PD measures are applicable in this kind of constellation, even though this context does not fit to the implicit standards for PD projects. For example, the oppositions of management vs. workers or capital vs. labor will probably play a subordinate role. We think that the semi-autonomous group should also be amenable to other approaches to organizational-technological innovation beyond the scope of traditional PD.

8. Case: SIGMA – A Network Organization

SIGMA (name changed) is a network of about 200 freelancers in the service area. The members of the network live and work in locations throughout Germany. The founders established the enterprise in 1992 and are now its managing directors. The enterprise and its services are structured along the lines of projects, with each project having its specific objective, a specific time limit and a specific composition of team members differing from project to project. Projects last only for a limited period of time, sometimes lasting a few months or longer, but typically not lasting more than a few days. After finishing a training or consulting measure, SIGMA's members turn to new tasks and often form new teams.

Apart from a few employees whose work contributes to the infrastructure of the network (for example administration or office work), the network does not employ members on the basis of employment contracts. Instead, the individual members are freelancers. They pay a fixed percentage of their incomes from their training and consulting activities to the network in turn for infrastructure (like finance, legal and tax-related advice, contact to customers, organizational intranet software).

Working with SIGMA means to provide one's own workplace, typically a home office with telephone, personal computer, internet access, a variety of software programs, fax and other technical equipment. The managing directors on the one hand and the freelancing trainers and
consultants who work within the network and hold shares on the other hand have a fundamentally different status as innovative entrepreneurs is fundamentally: the directors manage a workforce of freelancers, while the freelancers manage their working capacity (Voß & Pongratz 1998).

SIGMA stresses its strength of being flexible. This means that the network is often able to quickly, unbureaucratically, imaginatively, and appropriately react to market changes with innovative services and products. As an organization, SIGMA reacts to the »global« market with ongoing changes in its spectrum of products and services. The organization reacts to the external market by creating an internal market. The individual organization members have to compete and succeed on both; they rely on finding customers or job offers. For most SIGMA members this means that they continuously extend their portfolios and offer their skills and potentials to a twofold (labor) market: the market within SIGMA and the »global« market outside. Both markets constantly change, and hence the portfolios of the SIGMA members. Organizations like SIGMA rather are the contrary of a buffer between the individual organization member and the outside market. So, organizations like SIGMA reinforce market forces with the effect that individual work contents, incomes and lifestyles directly and heavily rely on the market. The correspondence between request and individual portfolios can change rapidly.

Another enabling factor regarding the flexibility of the organization is the flat hierarchy with the levels of managing directors, project managers and regular project members, with the two latter positions varying over time. Informal relations of power, dependency and subordination strongly structure the organization and the activities of its members. They exist along the lines of access to information, position in the flow of communication within and beyond the network (e. g. with customers), skills related to the commissioning of projects and winning grants, contact to potential customers, membership in certain circles, domain of business activity (IT knowledge has had high status), extent to which the network relies on a person, or promotion from the side of the management. The criteria for the status of organization members keep changing, are constantly (re-) negotiated and are the objective of interpersonal and structural struggles. Hierarchy, subdivisions and departments are partly replaced by »locality«: coexisting, often partly overlapping units and circles keep developing and changing.

SIGMA does not have a clear border to the »outside world«. Rather, the boundaries between SIGMA and the »outside world« are blurred. For example, customers or participants of training or consulting measures easily change their status and become SIGMA members. The criteria for membership in SIGMA are often unclear.

Communication within and beyond the network in general and personal relationships between network members in particular are crucial factors for the work within SIGMA. Meetings of various levels of exclusivity and dedication of SIGMA members in their areas or of groups with overlapping interests take place frequently, typically in bars or restaurants. These meetings serve purposes like establishing relationships, exchange and developing new business objectives.

For the network members, flexibility often means working conditions in accordance with their individual preferences and constraints (e. g. time budgets), having more responsibility for the projects they work in than »ordinary employees« and work based on motivation and self-
determination. However, they trade this off for disadvantages like less security concerning their future incomes or in cases of inability to work and the absence of contracts and formal codetermination possibilities. They work in a hybrid situation between being dependently employed and being autonomous freelancers.

As a legal form, SIGMA is a private liability company with a shareholder structure. The shareholders are the freelancers within SIGMA or associated individuals, and they participate in the business successes.

Capital and labor organizations, representatives, negotiation partners, structures for decision making and negotiating are not present and would not be appropriate for the structures and problems in SIGMA: They do not fit into the organizational agenda, the organizational forms of decision-making and the interest spectrum of the freelancers.

SIGMA is an attempt to replace the command structure of »traditional« enterprises by self-organization, motivation and the individual reactions to market forces. It is often said that it requires a high level of motivation and self-determination to succeed within a network like SIGMA. It can never be ruled out that self-determination subliminally turns into "outside-determined self-determination" (Voß & Pongratz 1998, Törpel 2000).

In traditional organizations, laws, rights and explicit rules serve to regulate the internal cooperation; in SIGMA this is done by ever (re-) negotiable statements, agreements, commitments and rules, many of which are implicit, »locally« different and subject to a permanent change process. They are specific for (subdivisions of) SIGMA and mostly beyond the scope of national legislation.

With an internal market and constantly changing roles (project director, normal team member, seeking a job, offering jobs) perspectives and interests are not easy to identify, neither for outsiders nor for organization members. Instead, perspectives and interests are typically changing fast, fragmented and contradictory in themselves and sometimes subject to conflicts (e. g. conflicts of loyalty toward the directors, the organization as a whole, customers, potential project commissioners and project partners). The clear and polar interests of capital vs. labor have become replaced by a differentiated spectrum of individual interests, sometimes conflicting inter- and intra-individually. The opposition of capital and labor, »traditionally« an opposition between classes, for SIGMA members takes place in their "souls and hearts" (cf. Voß & Pongratz 1998, p. 152).

In organizations like SIGMA, some problems are due to the coexistence of non-traditional and traditional concepts. In SIGMA, this has been the case for the development and maintenance of their organizational groupware. SIGMA itself has an organizational approach and culture which rests on virtues like self-organization, flexibility, local responsibility, trust, transparency and participation-orientation whereas the provider of their organizational groupware is a hierarchical and small enterprise, has followed a traditional (non-participatory) approach to systems development and has delivered an inflexible, top-down maintained system. The groupware is basically an online-offline e-mail and bulletin board system. It has to be maintained centrally; all changes and bug-fixing have to be done at the office of the software provider; there is no local
support for quick non-bureaucratic help; adaptation and tailoring of the system cannot be done by the users themselves; even smaller changes have to be exclusively carried out by the maintenance personnel at the provider’s site. The development and introduction of the groupware was basically not a participatory process. The centralized approach caused problems and discontent, especially until individuals and groups were able to purchase individual and local solutions as more affordable and easy-to-use solutions became available on the market.

For the future, it is likely that SIGMA will buy an off-the-shelf groupware system. The adaptation of this system to SIGMA’s specific needs would then be the task of the provider of the current groupware and some of SIGMA’s IT specialists.

9. Participatory Approaches To Organizational-Technological Innovation in SIGMA

The past and current approaches to the procedure and to SIGMA's groupware system do not fit into SIGMA's approach of flexibility and self-organization. Communications with SIGMA members confirm our impression that SIGMA would benefit from a participatory approach to groupware development/purchase, adaptation, introduction, design-in-use etc. Yet, the feasibility of participatory measures in the face of internal and external pressure (especially related to the market) is often doubted. A participatory procedure for SIGMA would have to be a special one with an impact on distribution and integration.

In any case, the traditional PD measures and principles are hardly applicable to SIGMA. Workplace visits would have to take place quite often and in many different locations since the temporary micro-settings differ from each other and change over time. Future workshops, organizational games, gathering work practices and working with mock-ups and prototypes are probably hardly feasible in a situation where members work in different locations and meeting space does not belong to the infrastructure provided by the organization. With possibly hundreds of permanently changing teams and tasks the elaboration of work scenarios and the experimental cooperative use of mock-ups and prototypes would not only be tedious but their results would be outdated before they have even been yielded.

Not all principles of traditional PD are entirely applicable to SIGMA. Different interests and perspectives are present. But the interests are fragmented not only within SIGMA and its temporary groups but also within the freelancers themselves (cf. Voß & Pongratz 1998, Törpel 2000). Real impact cannot be guaranteed in an organization without formal employee rights and in the absence of formal rules. The realization of some principles relying on resources - like compensation necessity or learning/qualification - would have to be the objective of extensive negotiations (see below). For freelancers, the motivation to contribute to the network beyond the immediate customer-paid tasks is low as long as they are not compensated for the network-related work. The prevention of disadvantages from individual activities and statements cannot be guaranteed in SIGMA because of the absence of an organizational buffer in favor of a double market. Most likely, it would be difficult to tell if the statements and activities of the individuals
involved in a participatory process are honest and to-the-point or merely strategic in relation to the double market as perceived by the participants. Cyclical processes might be useful in new forms (see below).

We think that the current practice regarding organizational-technological innovation provides useful hints for participatory approaches suited for SIGMA.

One fact regarding organizational-technological innovation that deserves special attention in SIGMA is the diversity in the work means: almost every group, team, region and individual has its own composition of devices and systems. Everything, including technology, is subject to informal inconsistent rules, relations, negotiations and decisions and can be (re-) negotiated at any time. Sometimes the outcomes have only regional validity, sometimes they have organization-wide impact. The current practice of technological innovation is local development and/or a combination of purchase and adaptation. The organizational groupware has become an addition only used because an organizational guideline to use it for the internal communication had been enforced. Often the used systems are not entirely compatible with the consequence of communication barriers.

Our following suggestions for one kind of participatory approach to organizational-technical innovation in SIGMA is based on the already existing localized practice.

Given that the individual members of SIGMA own their work means including computer applications, design processes are only necessary for purposes that are potentially of concern for more than one local work environment. By local work environments we mean all work environments that are part of the network but not the network itself, local work environments may themselves be distributed.

We recommend a continuous process of parallel local experimentation and network-wide collection of experiences, feedback and integration into an overarching infrastructure consisting of a variety of local substructures. Instead of a project with time constraints and a limited number of participants an ongoing process of contributions, discussion and integration would be installed. We envision parallel local micro-processes of participatory systems development and introduction, network-wide possibilities for the exchange of local experiences and results and network-wide consequences from the interplay between local experimentation and network-wide exchange.

Locally, the members of the work environments identify areas in which they need technical support and analyze their requirements in these areas. In some settings, new means will be designed and implemented; in others, off-the-shelf products will be purchased and adapted to the special local needs. In any case, the new product will be introduced, used for a while and then evaluated, for example regarding its suitedness for local and network-wide work, or its usability. The local experiences are put into a communicable form.

The participants of the local experimentation select themselves, nobody is excluded or discouraged; individuals from all fields of knowledge or experience are encouraged to participate. Locally, the participants are encouraged to mutually qualify each other for the
process; Non-IT professionals get the opportunity to learn approaches to systems (development), modeling, design etc., IT professionals get the opportunity to learn more about the work environments in which the systems are to be integrated. For all participants the acquisition of knowledge relevant for the local development/introduction processes is encouraged.

Delegates from the local work environments exchange on a regular basis, either in person or by technical means. The delegates exchange issues like
- work environments within the organization in need of computer support,
- aspects of work in need of support,
- the kind of computer support that might be needed,
- off-the-shelf solutions already on the market,
- solutions developed and/or introduced in working environments of the organization,
- possibilities for the generalization of these solutions, regarding the network as a whole or regarding the introduction in more than one local setting within the organization, or
- network concerns like standards, network architectures, security and bandwidths.

Maybe the delegates could play a role comparable to the role of the user advocates described in Mambrey et al. (1998). Having the background enabling them to take both the user and the designer perspective, user advocates serve as intermediaries between the users' needs and the designers' ideas. The delegates might have to switch between the user and designer (or shopper/tailor) perspectives as well. Additionally, their task would be to mediate between the worm's eye view of the micro-setting and the bird's eye view of the network regarding technological equipment.

Possibly the delegates elect a committee that selects good solutions and awards them according to the criteria like good design or choice, appropriateness of the solution (for the local environment or for the network), usability, potential for integration into the IT infrastructure of the network, suitedness for bridging individual/local work environments or involvement of a range of different perspectives/qualifications. Small systems which do not have much functionality besides integrating otherwise disparate solutions should especially be encouraged. The awards should be significant.

The exchanges of the delegates should result in communicable suggestions for generalization, either regarding use in more than one local setting or regarding the integration into the network-wide infrastructure (systems, guidelines for use, organizational structures, rules). This also includes suggestions for the introduction and/or integration in the existing technical and organizational and local structures and infrastructures.

These suggestions should be fed back to the members of the local work environments. In case of approval (approval criteria are to be negotiated) the solutions become generalized.

The result is a network-wide architecture with a variety of coexisting local applications, possibly with overlapping functionality, ideally artfully integrated (Suchman 1994).
The network provides resources for local developments, education of local participants, network-wide exchange of the local delegates and feedback loops between network delegates and local network members.

10. Conclusion

So far in this contribution we have looked at »traditional« large and small organizations and at two new forms of collaboration, between organizations of different size and status as in the technical collaboration between MeltIt, Techno and Doku and between individuals as in the network organization SIGMA.

What used to be mere business relations between largely independent business partners (sometimes with severe power differences of the involved enterprises) seems to turn into inter-organizational work environments with qualities of »cross-section organizations«. In the case of the collaboration between MeltIt, Techno and Doku the collaborative work environment has become rather stable in terms of the contents and in terms of the persons and groups involved, and the work processes in the hands of the different enterprises are strongly intertwined.

In collaborations like those within and beyond SIGMA, the contents and the involved individuals often keep changing. Sometimes the collaborations last longer, but mostly they are short. From the individuals' point of view, collaborations like in SIGMA mean that they are part of various micro-settings or »cross-section collaborations«.

In inter-organizational collaborations like the one between MeltIt, Techno and Doku, PD efforts might benefit from acknowledging the relative stability of the working environment even though the involved units belong to different enterprises. The organizational measure suggested by the OrgTech project is the establishment of an inter-organizational semi-autonomous team. This constellation would be amenable to traditional PD measures and other participatory approaches to organizational-technological innovation.

Participatory approaches in organizations like SIGMA might benefit from the diversity of the local environments plus from the fact that these local environments still form an organization. Therefore, for SIGMA we suggest replacing the notion of PD projects by the notion of a continuous process of local experimentation and organization-wide integration of local results. Bødker (1996, p. 220) extracts the historical stages of 1. traditional non-participatory design, 2. participatory, experience-based design and 3. participatory, experience-based design, partly applying and tailoring standard technologies with experimental »pilot« groups. A fourth approach might be suited for network organizations like SIGMA: an ongoing process of parallel local experimentation and network-wide collection of experiences, feedback and integration into an overarching infrastructure consisting of a variety of local substructures.
From the experiences and results presented in this contribution we conclude that it would be beneficial to reconsider central notions incorporated in traditional PD, for example the notions of organization, interests, design, projects.

The scope of the participatory approaches to organizational-technological innovation in both application environments reported here has been limited (see Törpel, 2000, Fuchs-Frohnhofen et al. 2000). Certainly there are organizational factors and power issues that have kept relevant actors from engaging in participatory design practices. But it might also be true that PD becomes even more attractive as soon as more feasible varieties suited for the emerging new organizational environments are available.

Notes

1. InKoNetz means "Integrated Cooperation Management in Network Organizations" (Integriertes Kooperationsmanagement in Netzwerkorganisationen); OrgTech means "Integrated Organization and Technology Development in Concurrent Engineering". Both projects have been funded by the ADAPT Initiative of the Commission of the European Union and the State Government of NRW.

2. See for example Greenbaum & Kyng, 1991; Schuler & Namioka, 1993; Kuhn & Muller 1993, a special issue on Participatory Design in the Communications of the ACM; Trigg & Anderson 1996, a special issue on Participatory Design in the Journal "Human-Computer Interaction"; or the proceedings of the biannual "Conference on Participatory Design" PDC; for historical accounts and overviews see e. g. Floyd et al. 1989 or Clement & Van den Besselaar 1993. We realize that we largely equate PD with experiences, approaches and suggestions from Scandinavia.

3. These lists are necessarily selective and cannot represent the entire range of methods ever employed. We are well aware that sensitivity for target organizations has been a serious topic in the PD community (see e. g. Clement et al. 1994, Bjerknes & Bratteteig 1995).

4. The presupposition of identifiable interests may seem superfluous at this point, but as will become obvious later, even individual consistency of interests cannot be taken for granted, left alone consistent group interests.

5. For a description and discussion of the approach of SIGMA, especially regarding the relation between internal communication and groupware, see Rittenbruch et al. (1998).

References


