When Survival is an Issue: PD in support of landscape architecture

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ABSTRACT
This paper reports on an ongoing project involving researchers from Lancaster University and a branch of a landscape architecture firm. It explores some of the possibilities pursued in the project as well as the conditions they encountered. Specifically, it describes the introduction of support for graphic work and electronic communication in a context characterised by continuous financial pressure, downsizing, and the need for short term gains. It seeks to contribute to the accumulation of experience within the participatory design community by reporting on an ongoing project as regards its objectives in relationship to its context.

Keywords
Design, possibilities, conditions, landscape architecture

INTRODUCTION

Researchers have now reported on participatory design projects undertaken in various settings, under different circumstances, and with a range of results (CACM, 1993; Greenbaum & Kyng, 1991; Kuhn, Muller, & Meskill, 1992; Schuler & Namioka , 1993; Trigg, Anderson, & Dykstra-Erickson, 1994). As one would expect, they report a mixture of joys and sorrows: relationships and objectives achieved, frustrations and failures endured, hybrid experiences hard to categorise (Blomberg, Suchman, & Trigg, 1995). Usually, a major purpose is to make implicit or explicit comparisons with other paradigms of design.

One clear example in which the relationship of a project to its context is explored is the study by Blomberg et al. of document handling and indexing by litigation support workers in a large law firm (Blomberg, et al., 1995). A key aim for them was to create situations where different kinds of knowledges could find expression, leading to two highly ambitious linked objectives: co-designing a useful system together with the litigation support workers; and working together with product organizations to build corresponding prototypes and integrate them into everyday practices. Much of the point of their paper is to describe the ways in which the larger context impeded these objectives. Thus, they succeeded in forging alliances with the litigation support workers, and in developing relevant prototypes. But they, and the workers themselves, were powerless to overcome the larger context of management orientation, and in particular the simplistic orientation to cost-cutting, which devalued the nature of the indexers' work. They succeeded in enlisting the support and interest of different teams of product developers. But they were in no position to overcome the counter-productive structures and orientations within the developer organizations, or alter their priorities or modes of calculation sufficiently to bring any of the design possibilities to an appropriate conclusion. An improved system for indexing documents was implemented within the law firm. But it was developed in-house and largely independently of the research team and their prototypes.

As experience of PD projects accumulates, it may be worth trying to consider systematically the relationship between differing contextual constraints and the opportunities for design. This paper does not attempt this. Rather, it seeks to contribute to the accumulation of experience by reporting on a project which is, as regards its relationship to its context, in some ways a mirror image of that reported by Blomberg et al, though no less problematic for that. The main features of the context are: that is is very constrained in terms of finance, of time, and of the time-scale within which technical changes must justfify themselves; that design therefore took the form of the assembly and configuration of "bits and pieces" of software and hardware rather than the creation of new software; and hence that the challenge was to find a balance between demands for flexibility, suitability, and power on the one hand, and low cost, availability, and simplicity on the other.

SUPPORTING LANDSCAPE ARCHITECTURE

The project involves a practice of landscape architects, one of eight branches of 'SGS Environment', based in Kendal

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in the Lake District of north west England. Ideally each of these branches is a self contained unit which includes all the relevant competencies, but in practice about three of the branches are too small for this and draw upon expertise from other branches. SGS Environment employs around 100 people and its landscape architecture activities are of two main types. Landscape *design* involves creating visualisations of, and drawings and plans for, a specific change to a specific site. This is often to be used in applications and negotiations for planning consent, e.g. to a local authority or at a public inquiry. It may also involve overseeing construction. Landscape *planning* involves a more strategic assessment of larger areas of landscape, regarding such issues as quality, character and appropriate uses. This can be used, for example, in drawing up a local authority's strategic land use plan.

Landscape architecture is concerned with æsthetic production. It is creative, open-ended and craft-based; but also professional, technical and quantitative. It unpacks into a wide range of overlapping practices. While in one sense the work comprises a seamless web of connected practices, the terrain also has a marked topography. The output of the work takes a number of different forms. It might involve giving expert evidence at a planning inquiry, or overseeing the work of a landscape contractor. But in the vast majority of cases the output is in the form of *documents*, which might comprise a report with a mixture of text and graphics, or a set of plans, or a contract tender specification, or a sketch of the overall concept for a project. The work is organized around the achievement of these material outputs.

Landscape architecture is æsthetic production also in the sense that its outputs must do 'æsthetic work'. For some purposes a graphic must be precise and photo-realistic – for example, a photomontage for planning consent showing the change to a landscape resulting from the introduction of a building. For other purposes, a graphic must be 'painterly', sketch-like and not too fussy – for example, the master-plan showing the concept for a development. The same set of plans will traditionally be in monochrome with a patterned key for contractors (reflecting the importance of being able to copy them), but a coloured set may be required for the client.

When the project started in October 1995, almost all the production of material was paper based. Coloured maps, photomontages, sketches, master plans, and construction drawings were all drawn on paper and photocopied. Exceptions to this rule were text processing (WordPerfect) and intermediate steps in creating the above mentioned drawings and maps: contour maps and wirelines were both created in AutoCAD and plotted on transparent sheets for use as "layers" in the construction of maps and drawings.

The computer support consisted of four PCs: one 286 and two 386s mainly used for text processing, and a 486 used for AutoCAD. Kendal had recently bought a scanner, but it was not yet brought into use.

When the project started SGS Environment in general, and the Kendal branch in particular, were facing major financial difficulties, and Kendal had recently reduced the number of staff from 11 to 9. Although the project initially had quite ambitious objectives in terms of work practices and technology to investigate (e.g. video links between branches), we adapted to the situation and took on an approach much more directed towards technological and organizational measures which (hopefully) would prove beneficial in the short term and not only in the long term. Some of the more ambitious objectives remain, but it was soon apparent that they were not the appropriate place to start.

Two of the areas chosen were enhanced computer support for graphical work, initially the production of photomontages, and the establishment of electronic communication to the outside world. The account given below focuses on the process, for further descriptions of the work practices involved, see (Büscher, Gill, Mogensen, & Shapiro, In Preparation).

Mode of cooperation

The way of working envisaged for the project is one that involves a meeting between different competencies: ethnography, PD, and various competencies within landscape architecture. The mode of cooperation for this encounter is therefore not so much concentrated around established PD techniques such as prototyping sessions, workshops, organizational games and the like. Rather, it is characterised by a continuing presence (on average, something like one day a week in the case of the 'designer', and more variable periods for the ethnographers) in which the effort shifts fairly smoothly between implementing or adjusting previously decided possibilities, picking up on the host of small problems that arise during work, coping with the unanticipated consequences of previous actions, talking to individuals, and occasionally setting up larger meetings for important decisions.

This participation runs both ways in a manner which, at least at the margins, dissolves some of the boundaries between the competencies. The landscape architects join in on design through discussions, trying out possibilities, coming up with their own suggestions, etc. We, sometimes, 'participate' in landscape architecture (e.g. the production of photomontages) to get the measure of a problem, and in doing so picking up some 'hands-on' experience of some of their practices. In the intermediate period in which a new practice-technology combination is forming, it is less clear just who is which kind of expert.

Supporting graphic work

The usual procedure for a photomontage is to start with the photographs of the site – typically 2 or 3 joined side by side to simulate a 'vista'. Next, a transparent sheet is overlain containing an outline of changes to the landscape, new buildings and other structures. Often the buildings are produced using a wire-line diagram, generated by AutoCAD from input measurements, which is precisely located, precisely oriented, and precisely to scale. On new layers of transparent sheet the new buildings, ponds, mounds, trees, bushes etc. are then hand-painted with appropriate colours, features and shading. Sometimes the number of sheets can

become quite large, e.g. when the proposed changes are rather complex (new buildings, earth work, new planting) and when the site has to be visualised after, say, 1, 5 and 10 years. Working with 3-6 overlaid sheets has always been a task requiring both graphical skill and considerable discipline and care, however, the situation has recently become even more demanding. Because of general downsizing, more and more expertise is to be found outside the office and due to increasingly tight deadlines for everyone, intermediate products are increasingly subject to last minute changes. The restoration of a quarry, for example, may involve contractors and consultants from several companies: one designing new or restored buildings, one calculating the earthworks necessary to prevent landslides, one making ecological surveys to ensure that a certain species of fish will be able to thrive in the re-constructed ponds, etc.

When working with photomontages on layers of paper, any changes made by contractors and consultants usually imply starting from scratch, at least on that layer and sometimes on others too. The landscape architects thus face two rather opposing needs: the practical need to reduce the number of layers to make the number of overlapping sheets manageable, and the need to increase the number of layers so as to minimise the work to redo if (when) changes occur.

An obvious candidate for coping with these problems would be to use a graphical package with layers, but only provided that the package adequately supported the graphical work as such. We decided to try out Adobe Photoshop on their existing machines, as Kendal already had it bundled with a scanner, for a small photomontage of changes to an equestrian centre. The idea was to scan in the pictures of the site and use them as the background layer (as with the manual procedure), splice them in photoshop, adjusting for the inevitable variations in brightness levels, import wirelines of the proposed changes created in AutoCAD in a new layer, and draw buildings and new planting in two layers on top. The wirelines would then be removed and the result would be taken on floppies to the local print shop in town for colour printing. As well as coping better with last minute changes, this would allow re-use of earlier work or re-use of elements within a photomontage, eg when painting in 50 almost identical trees. It would also allow the use of colours from the original picture to paint the new construction.

The first attempt failed due to the contradictory demands of picture quality (resolution and number of colours) and current technical limitations – trying to work with pictures up to 60 Mbytes on a 33 MHz 486 with 16 Mbytes of RAM and 200 Mbytes of hard disk space is just not feasible. The next day we borrowed another machine (100 MHz Pentium, 32 Mbytes RAM, reasonably fast video card, and 1Gbyte of hard disk space). With this configuration we (a landscape architect and one of us) produced a surprisingly good first attempt at the photomontage. Quite pleased, we saved it on floppies and sent it down to the local printing shop, only to discover that the printouts from the printing shop proved to be of very bad quality, and it was evident that their colour calibration could not be relied on. As a result the actual photomontage had, after all, to be done in the traditional way on paper. However we pursued the issue of printing by bringing our montage on disk to several suppliers of printers and non-local printing shops to investigate the possibilities.

If Kendal wanted to pursue the option of producing much of their photomontage work with a graphical package, we were left with the following options:

Use: We were all positively surprised at the ease with which the landscape architect learned the tool and likewise with the result actually produced, although it was evident that for more sketch-like work, they would need a pressure sensitive tablet and pen instead of a mouse.

Picture quality: It was obvious that with their current hardware they would have to reduce the resolution of scanned pictures and thus picture quality considerably. Alternatively they would have to invest in a quite powerful PC, at least as powerful as the one we borrowed.

Printing: to acquire the necessary print quality they would either have to print out of town with the drawback of high turn around time, or they would have to invest in their own A3 colour printer (we found satisfactory ones for about $ 1000).

Kendal opted for the investment in a new machine (133MHz Pentium, 32 Mbytes of RAM, 1Gbyte of HD space, and a fast video card) as well as their own A3 colour printer. This "graphics workplace" has now (April 96) been in use for two months and (among other work) around ten photomontages have been produced on it. The work in this period has mainly concentrated on issues of how to use it and for what kind of tasks, although we have conducted a range of smaller technical experiments (e.g. in order to find the optimal combination of scanning and printing resolutions).

Under the old manual procedures the production of a photomontage was carried out by a landscape architect. Phil, who has degree-level qualifications in geography and in IT, but whose graphical skills are limited, was responsible specifically for generating the scale wireline diagrams from AutoCAD.

The intention in the project was to bring initially one, later all, of the landscape architects and Phil together in doing computer supported graphics work. For various practical reasons, this has so far not been fulfilled. The first landscape architect that embarked on it was made redundant, and the second left the company for personal reasons. Hence, Phil has taken over much more of the process. His lack of drawing skills is compensated for not only through the graphical support the system provides (e.g. re-use of previous work or scanning in a model), but also through strengthened communication with the partners involved. First drafts of photomontages including wire-lines, colour

samples and rendered surfaces are discussed with landscape architects in Kendal or if, as is increasingly the case, the pictures were taken by another branch, they are sent there and discussed with them.

Supporting external communication

When the project began, the primary means for external communication in Kendal were fax, phone, couriers, and ordinary mail. Drawings from architects, maps from surveyors, coloured maps from other branches, etc. were all sent on paper via ordinary mail (and sometimes reproduced on local computer); text documents were transferred either on floppies via mail or on paper via fax or mail (and then retyped into the local text processing application); smaller sketches, comments, forms, etc. were usually faxed. It seemed apparent to everyone that this process could be improved, and it was decided that we should look into means for electronic communication to other branches as well as outside consultants and contractors.

The work in this period was mainly directed towards two issues: 1) figuring out actual needs for sending and receiving electronic documents, for example how much material is actually converted from electronic versions to paper and back, and how much of this could be avoided with fast file transfers; 2) surveys into the possibilities available both regarding commercially available services and regarding the policies of the rest of SGS Environment.

It was quite clear from the outset that Kendal might benefit from some means of electronic communication. First, it could speed up exchange of documents in general (five minutes, say, for an email compared to one to two days for a letter), and it could support all the last minute exchanges, discussions, amendments, comments, etc. that inevitably occur when deadlines are looming. Second, it would reduce the necessity to convert between media: often, for example, they would receive a print out of a letter or drawing on paper and then either retype it or reconstruct the drawing (e.g. contour map) in AutoCAD. These conversions were, naturally, most frequent when time was tight – with one day to deadline they could not, for example, send floppies by post, the only option was to fax the material in question and reconstruct it on the local computer. Ironically this meant that they had to do a great deal of, at least in principle, unnecessary work exactly when they couldn't afford the time.

Regarding the possibilities available, the main options were, first, modem-to-modem connections which would be the simplest and cheapest way of enabling file transfers. The drawbacks include the need to synchronise the transmission, and that the receiving machine needs to be in a state to receive the file. While such arrangements might come to work reasonably well between branch offices, they could not be expected to work with outside partners. Second, Internet access via modem, which with current technology would enable a 28.8 Kbps connection to an Internet provider. The cost is low – modem, fee to provider (c. $150 annually), and local phone bill. Besides ordinary ftp, it enables a kind of 'asynchronous ftp' mode of file transfer (e.g. files attached to an email), with sender and receiver making the transfers when they are ready to do so. It has the advantages of access to general Internet services, and the reasonable expectation that steadily increasing numbers of potential outside partners will acquire Internet connections. The third option was Internet access via ISDN, which is the most flexible solution and the one providing the most bandwidth (64 Kbps and upwards). Currently, however, it is much more expensive – something like 10 times the capital cost and 20 times the operating cost for only a limited improvement in speed.

We chose the second option. Compared to the option of modem to modem it offered world wide access and the most commonly used networking platform, i.e. the networking platform supported by most applications, for only annually c. $150 more, which most likely would be saved on the phone bill (local calls to the Internet provider compared to long distance calls between modems). Besides the general cost of an ISDN connection, two further issues informed our choice of option two: it allowed us to gain experience with an area in which Kendal had no previous experience for only a capital investment of a modem compared to ISDN Line, IP Router, and an ISDN Terminal Adapter, and it offered the solution that had by far the best chances of being taken up by the other branches of SGS Environment as well.

After acquiring the necessary hardware, software, and agreement with a suitable Internet provider (e.g. one with a Point of Presence within local call distance) the bulk of the work was concerned with introducing the new tools (ftp, email, news, WWW browser), investigating what they might provide in the area of landscape architecture, and how to organize the use of them in the specific setting.

These experiences, in turn, fed into the discussion among all the branches of the possibilities of Internet access. At one point we held a meeting in Kendal in which representatives from Kendal, the four branches with whom Kendal communicated the most, and we participated. During the meeting, Kendal recounted their experiences with the new possibilities so far, we outlined the requirement for the rest to follow, and we all discussed conditions and possibilities regarding new work practices. The meeting produced two major outcomes: 1) the decision that the other four branches would follow Kendal's example and acquire the necessary hardware and Internet access, and 2) partly due to the general downsizing, partly because of the new possibilities, the five branches began a re-conceptualisation of the organization of work from an organization of 8 rather independent branches to a much closer organization with distributed skill-bases. That would involve, among other things, concentrating individual skills (e.g. photomontages, sketches, specialities in birds, quarry restoration, car-parks, etc.) in a few offices instead of assuming that all skills were present in all offices.

Developments since April 1996

Some further developments have taken place since this paper was submitted. These include the introduction of Macromedia *Freehand*, partly as a tool in its own right for more structured drawings (e.g. construction drawings,

planting plans, and master plans) and partly as an integrating package between Photoshop, AutoCAD, spreadsheet, and text. We have also set up a second "graphics workplace" with a new PC (166 MHz Pentium) and pressure sensitive tablet and pen. This is used by one of the landscape architects for constructing master plans, planting plans and sketches and is still in its introductory period, but with encouraging results. We have recently installed a LAN, now being used for file and printer sharing. We are currently working on setting up email, WWW browsers, ftp, etc. on individual desktops in a way that avoids the need to invest in a new network operating system or a gateway between the LAN and the Internet provider.

Next steps - August 96 onwards

In the longer term we plan to introduce 'shared screens' between the branches, allowing discussions and joint alteration of drawings. We are also thinking about ways to overcome the 'privatisation' problem which has often been observed to accompany the shift to screen-based working. In this case, that arises when visible and accountable work on an A1 or A0 sheet on a drafting table, which often occasions relevant contributions from colleagues, is replaced by a 17-inch upright monitor obscured by its user. We are devising means to use an overhead projector and tablet to project an A1 image at full size of the drawing being worked on.

All of the developments we have described above involve a situated experimentation in which problems and possible solutions are tentatively identified, not only in technical terms but in terms of corresponding practices of work and communication, in which the outcomes, costs and benefits cannot be easily foreseen. We have elsewhere referred to this process as the continuing interlacing of new technology with local and distributed practice (Büscher, et al., In Preparation).

DISCUSSION: SURVIVAL AS CONTEXT

We started out with the issue of the relationship between the context of a PD project and its possibilities. What, more specifically, might that mean? One way to get to grips with it, as represented in Figure 1 below, is to regard it as a constant 'struggle' with and between: current conditions, with their constraints and potentials; and future possibilities, offering opportunities as well as posing risks, see (Bødker & Mogensen, In Preparation; Mogensen, 1994).

Future opportunities might identify where we want to go – for example in terms of improving efficiency, being more usable or pleasant, or offering new or improved conditions. Future risks might identify outcomes that we want to avoid – such as introducing (more) overhead, the loss of previous skills, or disrupting work routines. Current constraints identify obstacles or limits to attaining a given future possibility – such as lack of financial resources, lack of skills, conflicts among a number of groups in the praxis, or lack of commitment. Current potentials identify factors which enable or resource a future possibility – for example, possession of necessary resources, strong commitment, necessary skills, or possibilities for improving current ones. Possibilities (both opportunities and risks) are not relevant in the abstract, but are always possibilities for someone in a given situation or set of conditions. Similarly, constraints and potentials are always constraining or furthering in relation to some particular possibility. The actual work of the project inhabits a space in between present conditions and future possibilities. It is to do with realising possibilities (both in the sense of concretising and in the sense of implementing), with exploring how far one can get along a chosen route.

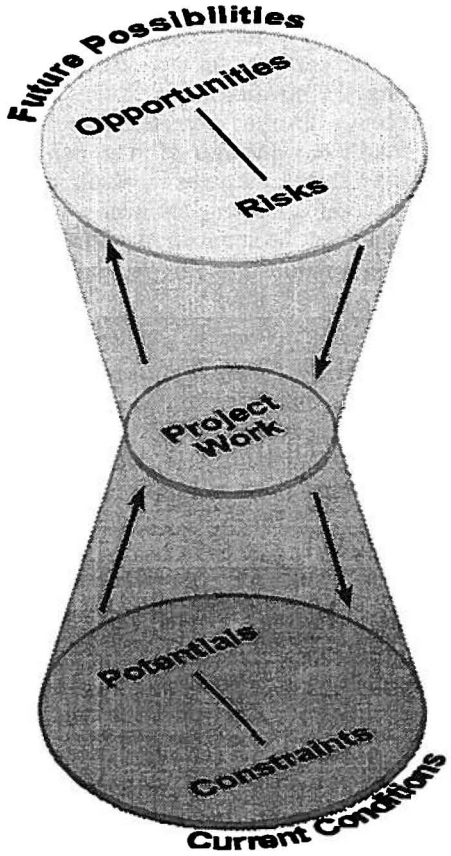

Figure 1: Working in between current conditions and future possibilities

In considering this specifically in the circumstances of our project, we identify five areas, which would obtain in some form in any project, but in which ours is in some way distinctive. These are: its commercial environment; the relationships between researchers and practitioners; the roles adopted by researchers and practitioners; the project objectives; and the dissemination of practices developed within it. Each of these can be considered in relation to the struggles, introduced in Figure 1, between constraints, potentials, opportunities and risks. While it would be over-mechanical to do this literally, in a 5 by 4 grid, it

nevertheless offers some useful perspectives on the setting, which we dip into below.

Commercial environment

SGS Environment is now owned by a large multinational firm, and this does afford it some opportunities and a degree of protection. It could, for example, survive an isolated bad debt or bad judgement where an independent small firm would go under. While it is therefore technically not a 'small or medium enterprise' (SME), that remains by far the most appropriate light in which to regard it. It operates independently, and if it cannot show ongoing profitability its owners will not maintain it. In better economic times work was plentiful and the company spun off several branches in other parts of the country. Now, as we have said, there is intense competition for a reduced volume of work and strong downward pressure on prices. It is necessary to accept ever more demanding constraints, for example on deadlines. Though all the offices are in difficulties to some extent, the areas in which several of the branch offices are located are generating more work than the Kendal 'core', which has been forced to reduce its staff. It is therefore no exaggeration that the very survival of the operation hovers near the brink.

That is far from unusual for the SME sector, on the contrary it is rather typical. But we believe it is unusual for PD projects, and it brings a heavy responsibility. A difference with the situation of the litigation support workers described by Blomberg et al. is that, with the best will in the world, none of the participants have the power to change it at all. There are no parties involved who could, even in principle, have it demonstrated to them that their 'rationalisation' is irrational, or who could organize to resist it without pushing the company under immediately.

The opportunities which that affords are, among others, to achieve organizational and technical shifts which will make them more competitive, both through supporting the work at each site, and through developing towards a 'distributed organization'. The risks, evidently, are of financial failure, either because the solutions do not work well enough, or because they absorb too much time and energy or too much money, or because the competitive pressures overwhelm them anyway.

The main constraint, therefore, is one of resources. The research project has a small budget for site equipment, and a working presumption has been reached that the costs of equipment relevant to the project will be equally shared, to ensure that both parties consider purchases very carefully, and to reflect their mixed research and commercial use. But there is certainly no funding, and no time, to develop prototypes or use experimental high-bandwidth communications. For that reason we adopted what we have termed the 'bricolage' approach, and which others have termed the 'toolbelt' approach (Summer & Stolze, 1995). We are seeking the maximum effect from limited resources, through situated experimentation with integrating and customising standard software, hardware and network technologies.

But the setting also has its potentials. It is characterised by urgency and commitment rather than just tolerance. Changes happen, and their consequences can be explored, far faster than would usually take place. And the project is involved right from the start in continuing implementation rather than just analysis, demonstration and prototyping.

Researcher-practitioner relations

We described earlier the way in which, to a certain extent, competencies become shared among the various participants and specialists. As a result, and a major benefit, knowledge of the practices involved is much more intimate. Another consequence is that participants become engaged in, and to some degree 'responsible for' each others' work, and the parties acquire new obligations towards each other. Thus the researchers can be drawn into helping to solve any problem that arises for which they might possibly be competent, independently of its relation to the research; and the practitioners, over time, come to invest some faith in experiments and arrangements, even if the benefit is not immediately apparent, while also investing some work to re-interpret their activities in ways intended to cast light on the researchers' issues.

Researcher-practitioner roles: expert, facilitator or goad?

If, metaphorically, we regard this situated experimentation as a journey, then we can consider the expert as "standing in front" saying which way to go; the facilitator as "standing beside" assisting in exploration of current conditions and possibilities; and the goad as "standing behind" urging people onward, cf. (Mogensen, 1994). We as researchers are usually to be regarded as facilitators, presenting analysis of current problems or possibilities for future action, leaving the decision to the practitioners or making it jointly. Especially regarding technical matters, we often act as experts (e.g. hardware specifications, what protocols should the Internet provider support, what is needed to set up a connection, etc.). But regarding implementation of their own decisions or following through on consequences of them, we have on occasion acted as goads. An example would be where we feel they have fallen into the trap of believing that buying the hard and software will in itself solve the problems without shuffling the corresponding pieces and practices into shape. Often – as with all of us – they are committed to change, but they are too busy or too 'frantic' to take the necessary action. It can literally be a case of not being able to find the half day which would save weeks.

It is difficult in this to judge where one's responsibilities lie. On the one hand it is an affront to arrogate that role to oneself, and very high risk to presume to know the consequences. On the other hand, if one does have some confidence in a course of action, we must also take into account that they can hardly afford to "learn the hard way". It seems that the price of not being entirely powerless can all too easily be to find oneself hijacking a 'managerial' role.

It would be wrong, however, to see these as roles only ever adopted by the researchers. To a degree they are reciprocal,

so that when we are acting as 'experts' it is often in response to their 'goading'; whereas for us to 'goad' implies that matters cannot move forward without their 'expertise'.

Project objectives: design as a puzzle

At the broadest level, the project objectives with which we started out still obtain: to achieve a more thorough admixture of systems design with the analysis of the social organization of work; to explore the mutual contribution of ethnographic and participatory approaches to design; to support CSCW 'in practice', deploying modest and readily-available technology in a real working context; to explore some of the characteristics of 'æsthetic production' as a substantive domain.

But when it comes to translating these into specific technological project objectives, it could almost be said, with slight exaggeration, that there haven't been any – at least no firm ones and none that have survived the first six months except in the vaguest form. Few of our preconceptions of the work setting have remained intact, and with them have gone our presumptions about appropriate designs.

The orientation we are adopting is almost wholly in response to what we have found. This includes rapidly getting experience with and implementing sensible organizational and technological changes, and getting experience regarding what it actually takes to introduce new technology in Kendal in particular and to some extent SMEs in general.

This open ended approach is a response to the fact that we (and most other system development projects) are, in a sense, perpetually situated between ever changing current conditions and future possibilities. The possibilities change, for example, due to new developments in hardware and software, price fluctuations, and what we actually learn in the work setting. The conditions change due to market shifts, decisions regarding both policies and work practices taken in the parent organization, our own attempts to improve matters, etc. Our approach tries to take seriously the work of design as inhabiting the space between current conditions and future possibilities.

Design becomes the enterprise of investigating what 'bits and pieces' should be brought into use; how the bits integrate; what they should be used for, and how; and, crucially, whether they enable or confine future developments. This amounts to the design of (organizational and technical) solutions rather than the design of applications, with design extremely closely tied to organizational changes – implementing software solutions also implies implementing who should use them, when, and for what purposes. In that respect, our situation resembles the ones reported on in (Bødker, Christiansen, Ehn, Markussen, Mogensen, & Trigg, 1993; Simonsen & Kensing, 1994; Summer & Stolze, 1995).

Dissemination: stones-in-the-water

We have so far primarily discussed the work setting of the Kendal branch itself. But the other eight branches are also central to their work. We therefore face the dilemma that the project is tied to the Kendal branch but changes either affect or presuppose changes in various of the other branches as well. From the Kendal perspective, an opportunity of the project was to enable communication and file transfer to the other branches as well as the rest of the Internet. We had the local resources necessary to implement it: their commitment, our presence, and enough funding to get going. The constraints were the lack of resources for implementing the connections organization-wide, and lack of 'say' or standing in the larger context. This posed the risk that the rest of the branches would not join in. The problem, then, is how to be able to act 'beyond' the setting, while only having the direct capacity to act 'in' the setting; but where successful action in the setting is itself dependent on corresponding actions outside it.

We did not try to argue for organization-wide (top-down) changes. We were not in a position to do so, and arguing for substantial investment with only "ideas" as to what benefits it might bring would probably fail. Instead, our "argument" took the form of trying to provide "good examples" – thus throwing a stone in the water and hoping for some ripple effects. As proposed by Mike Hales,

"..., we were willing sometimes just to 'do something' (and take the responsibility) without any possibility of explicit agreement with affected parties; then, by virtue of having *shown* something (having unilaterally put something into the public sphere) it might become possible to publicly address the previously unaddressable." (Hales, 1995, 123).

What actually happened was that when representatives from the other branches could see that the communication set-up worked, was rather inexpensive, and offered quite a number of opportunities, it *became* an organization-wide issue and they found resources to implement it.

CONCLUDING REMARKS

What have we learned, then? That doing participatory design with private enterprises may be a quite frustrating endeavour? People are working under continuous pressure from potential downsizing and the people you work with may have to leave the company; one has ideas about how to improve the situation, but few financial resources to back them; in any action you take, you have to show short term gains with very little room for more ambitious and longer term experimentation; and objectives are constantly changing in response to changing situations - provocatively stated, our only lasting objective seems to be that we 'will play along and do what it takes'. Indeed, these are lessons learned (but then, who promised it would be easy?) Looked at from a broader perspective, it is a different instance of the observation that the constraints operating in a setting will be far more powerful determinants of what happens within it than the application of a particular set of designs or design techniques.

However, we have also learned that (even) in these circumstances, participatory design can make a difference.

Despite current constraints, changes for the better have actually been accomplished. Furthermore, the project is characterised by urgency and commitment, changes take place, and their consequences can be explored, far faster than would usually be possible. We are involved right from the start in continuing implementation rather than just analysis, demonstration and prototyping, and we learn a great deal about what it actually takes to implement organizational and technological changes in small and medium sized enterprises.

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