

The Festival Checklist: Design as the transformation of artefacts

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ABSTRACT

The idea that computer systems should be designed through abstract representations of the use domain has been systematically challenged in the Scandinavian tradition of user involvement in design. In this paper it is suggested that ideal design should happen as a transformation of artefacts rather than through abstract representations of domains. Thus the paper emphasises that design and design representations have to be tied to concrete material reality. The transformation idea is based on notions of secondary artefacts and boundary objects. The general ideas in the paper are introduced through a case story about a design project involving a music festival organisation and a group of university researchers, aiming at developing computer support for the planning and production of the festival.

Keywords

Transformation, representations, design artefacts, user involvement, secondary artefacts, boundary objects, case story.

INTRODUCTION

Traditionally, methods for development of computer artefacts have consisted of a, possibly iterative, sequence of the following steps. First, the considered domain of the future system is analysed, then abstract representations of the domain are constructed, which in turn are the basis for abstract representations of the system to be. Finally, the system is implemented by constructing material artefacts based on the abstract representation, and then introducing these artefacts into the considered domain. However, e.g. in the UTOPIA project (Bødker et al., 1987), it turned out that abstract representations are very difficult for users to understand, thus there was a need for methods offering a more concrete way of investigating the future, past, and present. This paper aims at a further investigation of this theme by introducing the notion of transformation of artefacts as an alternative to the traditional emphasis on the

representational aspects of design.

The first half of the paper reports on an action research project together with a music festival organisation. It tells a story about an artefact, the festival checklist, which emerged in a corner of an organisation as crystallised work praxis, and then made its way to other parts of the organisation. At a point the checklist made its way into a design project, in form of a database interface proposal. This proposal became the central document in the design of a new computer artefact which, among other things, was able to print out checklists. In the second half of the paper the transformation idea is developed based on activity theory (Engeström 1987), secondary artefacts (Wartofsky 1973), and boundary objects (Star 1989).

THE FESTIVAL

The Festival is a non-profit organisation with the production of an annual music festival as its main objective. In 1995 the festival took place during 4 days, with concerts on 8 different stages, presenting a total of more than 140 different acts. Making a music festival involves many different tasks: engaging the artists, establishing camping areas for the audience, selling tickets, selling foods, controlling access to the festival site, informing the press, building the festival site, etc. The volunteers working in The Festival are organised in 35 operation groups, 150 persons are working throughout the year and during the festival additional 2500 volunteers are enrolled. 9000 members of external organisations (e.g. boy scouts and sports clubs) are working during the festival. 10 people have a regular, paid job at The Festival.

The focus of the project was on technical production and pre-production, involving people from the Booking group, Sound and Light group, Transit group, Catering group, and the eight stage groups (Green, Red, etc.). The Booking group is responsible for deciding which artists are going to play at the festival, and for negotiating the conditions and prices with the agents. The Sound and Light group is responsible for the technical side of the artists' performances. They are responsible for making arrangements with sub-contractors running the basic sound (PA) and light equipment on the individual stages, and for making sure that all the artists will have the conditions needed for their performances, equipment-wise, including

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instrument amplifiers, piano tuners, and help with special effects. In addition, the Sound and Light group has a coordinating role in the pre-production. The Transit group is responsible for the transportation of the artists from airport to hotels to festival, etc., and the booking of hotel rooms. The Catering group is responsible for dressing rooms, meals, and other backstage facilities for the artists. The festival takes place at eight different stages. The stage groups are responsible for the production at the stages including establishing the facilities at the backstage area, e.g. stage and production offices, stage hands, etc.

The Project

The project took place during the first half of 1995, and involved a group of five researchers from a university, and various members of operation groups from a music Festival organisation. In the fall of 1994 The Festival decided that they needed an IT-strategy: an internal IT group was formed, and The Festival contacted the researchers to initiate a project eliciting the possible advantages of introducing IT in the planning and production of the festival. The project was initiated by the festival, because of a widespread expectation in the organisation to the possible benefits of the introduction of computer support. E.g. smoother coordination of work between different groups, and the possibility of getting rid of tedious manual routines.

The first meeting between The Festival and the researchers took place in the middle of January 1995, in the beginning of February the researchers decided to engage in the project, and an agreement for the project was formed. The first project meeting at The Festival took place at the end of February. The Sound and Light group told the researchers about The Festival from their perspective, and about their work. The researchers demonstrated some of their own software as inspiration for the Sound and Light activists. The Sound and Light group had prepared for the meeting, by making two descriptions on paper, one describing the "flow of information" to and from the Sound and Light group during pre-production, the other a sketch of a database for pre-production represented as a screen layout (figure 2).

During March a series of interviews with two of the stage groups, the Catering group, the group responsible for access to the festival area, the Transit group, the Booking group, festival management, and a secretary, were conducted. On the first of April a workshop with Sound and Light, Transit, Catering, and the Yellow stage groups took place. After the workshop the researchers decided to use a database management system (hereafter The DBMS) to have a prototype ready before the big rush of the pre-production activities. During April the researchers designed and implemented a first prototype of a system for Pre-production.

In the middle of April, the Festival management became nervous about the project, fearing that too much information would flow too freely around in the organisation, therefore they dictated that the project could

only continue with the Sound and Light group. As a consequence the second and third planned workshops with the operation groups had to be cancelled. This breach of the original agreement, made it difficult for the researchers to continue the work in a decent manner, especially it became impossible to confront their understanding of the festival with the actual reality.

During May, the first version of the prototype were installed at the Sound and Light office, and some of the existing data was entered into the system by the researchers. This version was never used by the Sound and Light group. At the end of May, a revised (simplified) version of the prototype more suited for the situation with Sound and Light as the only users was installed. At this time, Sound and Light had not made the checklists as they did it during the previous year's pre-production, some of the data were entered into the database, but most information were only available on faxes, and ad hoc notes. The final result was low quality checklists delivered to the stage groups.

During the last week of June, Festival 95 took place. The researchers conducted field studies at the Festival site. On the 25th of August the researchers sent the first version of a report on ways to improve the work of The Festival by the use of IT.

Pre-Production Work

During the spring, the head of the Sound and Light group is employed at The Festival to take care of the technical pre-production, and to distribute relevant information to other operation groups. The most important means of communication throughout this process is telefax, and to some extent telephone. Pre-production work is a kind of detective's work; when an artist is booked for the Festival and pre-production starts, the normal situation is that the only information the Sound and Light group has, is the name of an artist agent somewhere. Thus the first difficult task in pre-production is to find somebody who actually knows something about the artist and then to convince this person that The Festival needs up-to-date information as soon as possible. Pre-production work is complicated by several factors. People in the music business are always late with everything; it can be hard to make people understand that The Festival needs information in advance. Also, it is very important for especially the bigger artists to show off by demanding specific resources for their appearance at the Festival, these demands then have to be negotiated in some way. Finally, information about the Festival program, and information about arrival times and hotels of the artists has to be treated confidentially, both to maintain the advertising value of a coordinated release of program information to the public, and to protect the artists during the booking negotiations and during the festival. The general understanding in the Sound and Light group is that the festival could be produced without pre-production, but that it then would be more chaotic. Thus, for the Sound and Light group, the purpose of pre-production is to facilitate a smooth production with a relaxed and friendly atmosphere.

**Check list
for artists at Festival**

LOGO

Preproduction:

Name of artist: _____

Stage: _____

Date: _____

Time: _____

Tour/production manager: _____

Phone/fax: _____

Sound/light/monitor engineer: _____

Phone/fax: _____

Stage plan: _____ date _____ Sent to F-sound company: _____

Light plot: _____ date _____ Sent to F-light company: _____

Backline required: _____ Sent to Soundforce: _____ Confirmed: _____

Price: _____ We pay: _____ Artist pay: _____

Risers required: _____

Piano tuner: _____ Time: _____

Specials: _____

STAGE PRODUCTION: TURN PAGE.....

STAGE PRODUCTION

Band: _____

Tour/production manager: _____

Get-in time: Crew: _____ Number: _____

Get-in time: Band: _____ Number: _____

Minutes on stage incl. encores: _____

Dressing rooms: Number: _____ Time: _____

" " " " " " _____

" " " " " " _____

Special agreements about photographers: _____

Special agreements about security: _____

Merchandise sale: Yes: _____ No: _____

If yes: agreement has to be made: _____

If yes: merchandise sold by: _____

Special agreement about TV/Radio: _____

List for KODA: _____

Transportation: _____

Flight: Arrival/departure: _____

Staying at hotel (name & phone): _____

Figure 1: The Sound and Light 94 checklist

During pre-production Sound and Light builds a band file, a plastic folder enclosing documents, for each performance. These files are kept in a matrix of cardboard boxes, with one column per stage and one row per day. The first document in the file would normally be the checklist (see: below). One sheet of paper with the total plan of performances, the performance plan, organised in the same way is used both as a tool for locating the files in the cardboard boxes, and for recording central information about the specific performances, e.g. the state of the information gathering, and the need for special equipment. The performance plan is always situated on the desk in the Sound and Light office; when someone calls on the phone the Sound and Light person will look at the performance plan, locate the artist in question, and examine the state of the pre-production for this performance; then he will take the file in the cardboard box while continuing the discussion on the phone.

The checklist

The checklist is a sheet of paper with pre-printed fields for information related to a specific artist's performance at the festival (see figure 1). It was originally invented by members of the Green stage group. This list contained fields for all the information that should be available or collected when an artist arrived at the backstage area at the Festival site. The checklist was filled in when the Sound and Light group handed information from the pre-production over to the stage groups, and it was later used when the

artist arrived. Subsequently, it was adopted by the Sound and Light group, and used during the pre-production process as the central overview of the individual artists. From 1993 the Sound and Light group produced a common checklist for all the stages, and filled in the available information about the artists before carrying the complete files over to the stage groups. Thus the checklist had three functions: as a tool for the collection of information during pre-production, secondly as a medium for forwarding information from the Sound and Light group to the stage groups and, finally, as a tool at the stages when receiving the artists and carrying out the performances.

Constructing the computer artefact

The checklist became the central point in the design process. The most important reason for that was that the Sound and Light group already had a vision about a relational database that was far stronger than the technological visions about hyper-linking, etc. the researchers tried to introduce. The Sound and Light group's technological vision originated from a member who had experience with computer support from the pre-production of an other music festival. This support was implemented by means of a relational database management system, and looked very much like a "smart checklist". The Sound and Light group had discussed this concept and made a sketch of a relational database screen layout as they would like it (figure 2). This database sketch was basically a slightly expanded transformation of the paper based checklist.

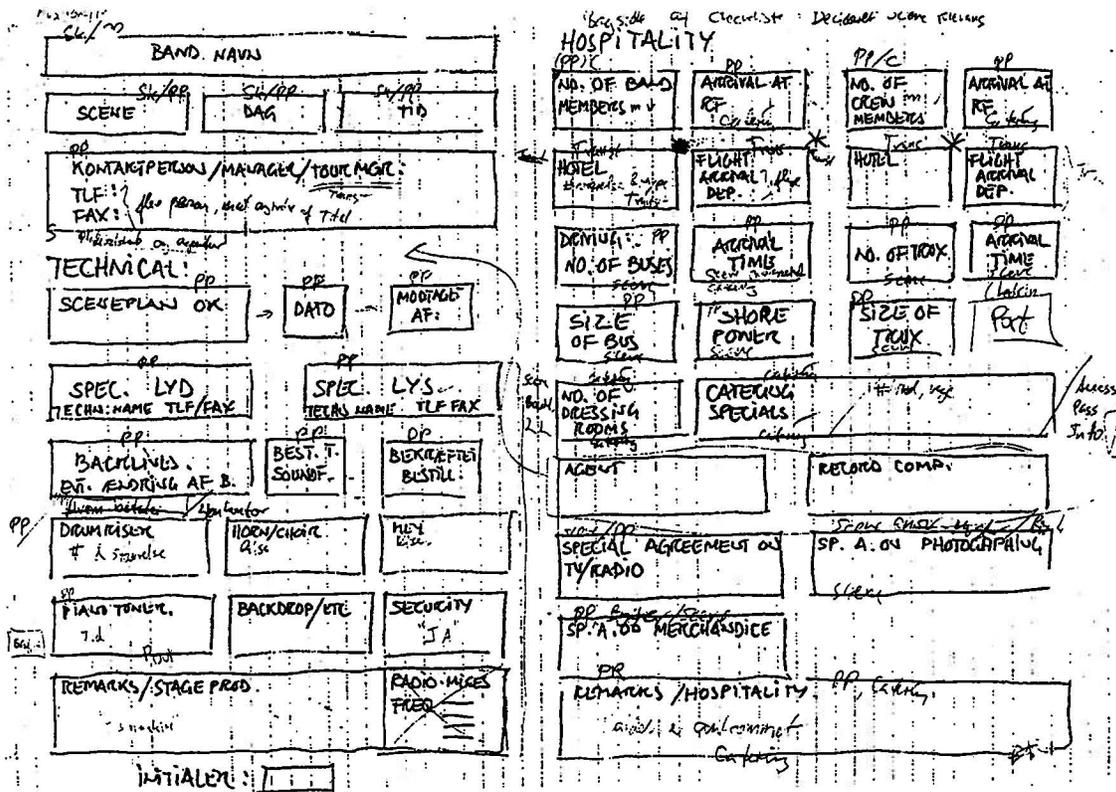


Figure 2: The database sketch

The workshop

It was planned that design should take place together with the users in a series of workshops; unfortunately only one of these was realised. This Workshop took place in The Festival buildings, and was scheduled to 5 hours. The planned participants were members of four festival operation groups: Sound and Light (3 persons), Yellow stage (one person), Catering (one person), and Transit (one person); and five researchers.

The plan for the workshop was to enact or simulate a series of work situations, both routine and problematic, from the planning (pre-production) and production of the festival. The participants were encouraged to bring real or made up situations that they found interesting, "focusing on the exchange of information" and how IT can be used, to the workshop. The idea was furthermore that the researchers would introduce various kinds of technologies into the game to elicit how, e.g. computerised telefax, central and local databases, e-mail, or hypermedia would change work at the festival (Kyng 1995, Ehn & Sjögren 1991).

The workshop took place around a table, on the walls were mounted large pieces of paper. One piece of paper was laid out with columns for various kinds of technologies; local databases, centralised databases, hypermedia, computer integrated telefax, etc. Cardboard lids were available to be used as database mock-ups, and yarn for simulating hyperlinks between documents. Other pieces of wall paper were used to record situations and problems during the workshop. Material from the previous year's Festival was photocopied

in advance together with some made-up ideal typical material produced by the Sound and Light group.

The first problem which the researchers encountered at the workshop was that the participant from the Yellow stage never came, after an hour of waiting and several phone calls his seat was filled out with one of the Sound and Light guys, who had previously worked at the Orange stage group. This changed the balance of the workshop dramatically in a Sound and Light, and planning direction, and it became much harder to generate situations where the stage claimed not to have the information they needed. These situations would probably have arisen if the activist from Yellow stage had participated, because that group emphasised the lack of information during the preceding interviews.

The simulation games ended up focusing on how things were done the previous year; the workshop basically became a discussion repeating the information the researcher already got from the interviews. The cardboard lids and the yarn were never used, and the technology wall paper did not make its way into the situation. The design, or construction related part of the workshop was limited to the last half hour, when the original, database sketch, produced by the Sound and Light group (figure 2) was examined with respect to suppliers and users of the information. This part of the workshop was important for building a prototype, but it did not break the meeting-ness of the workshop.

Building the prototype

The design of the prototype took place right after the workshop. The first step was to make an object oriented description of pre-production and production, based on OMT (Rumbaugh et al. 1991). The main functions of this description became to generate discussions between the researchers about data formats, and to serve as a vehicle for the establishment of a shared understanding of The Festival among the researchers. In this process the understanding of the Festival the researchers got from the interviews was an important resource.

The transformation of the object-oriented description was done by mapping objects to tables in a straightforward manner. The issue of data-ownership and access when the database was to be distributed over several non-networked PC's was already dealt with in the object-oriented model by reflecting the ownership of data in the structure of objects. The construction of the user interface of the prototype started out on paper but the researchers soon agreed that it was easier to program the interface right away without making a specification first. The task was, apart from data format issues, relatively uncomplicated because most of the prototype was specified in the Sound and Light database sketch, and on the pre-printed checklist made by Sound and Light the previous year.

The use of The DBMS yielded the possibility of designing the prototype interface directly on the computer without separate specifications, furthermore the design was heavily influenced by the lack of features for distribution in the database tool. In retrospect, this was obviously a dangerous cocktail. The design artefact, and not the obtained knowledge about The Festival, determined design. This was both a result of technical limitations of the DBMS, and a result of the world view, and implicit prescriptions for design embedded in this design artefact. If the world view and prescriptions for design embedded in the design artefact had been more explicit, the conflict between this and the world view of the researchers would have been manifest, and then it would have been easier for the researchers to stick to chosen principles. This points to the general problem of implicit theories determining design (Bertelsen, 1994).

Using the computer generated checklist

As the Sound and Light group expected to get a working system, they did not use the printed paper checklist during the pre-production for Festival 95. Some of the pre-production information was entered into the system, but most of it was only present in the original letters, and telefaxes, and on the performance plan. Thus the Sound and Light group was in a dilemma at the time when they were about to hand the pre-production files over to the stage groups; should they abandon the design project and fill in paper checklists directly, or should they try to enter information into the prototype and print out the checklists. They ended up making the checklist via the prototype, which generated a lot of extra work because it was too late to use the information entered into the prototype for making lists and sum totals of, e.g. equipment requirements.

Possible reasons why the first prototype was never used by the Sound and Light group are that the facilities for getting the information entered into the system out on paper were not ready yet, and that the database was designed to support several groups' work with the pre-production information, thus the database was fragmented into various tables with their own screens, reflecting the ownership (right to update) of information, e.g. only Transit has the right to allocate hotel rooms.

The stage groups were disappointed with the checklists in the band files they got from Sound and Light prior to Festival 95. The 95 checklists did not contain as much information as the checklists from earlier years, but a lot of empty fields were also missing. Thus at least one of the stage groups made their own checklist in which they entered the information they got. This was a surprise for the researchers, because they had seen the checklist exclusively from a pre-production perspective, thus overlooking that the checklist was also a *checklist* used when an artist arrived at the festival, i.e. the original use of the checklist.

This shows how unfortunate The Festival management's reduction of the project was. Had the project proceeded as planned with three workshops during the spring, the stage use of the checklists would have been elicited at a time when it was possible to change the design. A complicating aspect of the project with the festival was that festival work goes on in one-year cycles; thus versioning would take unrealistically long time. In such situations the use of simulated work situations is the only possible solution.

TRANSFORMATION AND DESIGN

In the following sections the notion of design as a transformation process is introduced and exemplified by the Festival case.

Heteropraxiality and design artefacts

Design can be described as an activity where a designing subject designs the design object by means of some design artefacts. This activity is motivated by the artefact being designed, and it can be characterised as an aggregated meta-activity. However, this meta-activity does not exist as a concrete activity because the designing subject does not exist as concrete persons.

Design is basically heteropraxial, i.e., involving groups of people originating from different activity systems, (e.g. the researchers, the Sound and Light group, Festival management) in such a way that the individual activity systems can not be regarded as the basic unit of analysis. This heteropraxial nature of design is an obstacle in basing studies of design on approaches based on the identification of a central activity, e.g. Engeström's (1987) developmental work research. It is possible to get fruitful knowledge about what goes on in design by looking at the involved, often conflicting, activity systems, but it is difficult to identify a "central activity" with a uniform motive to base the study on. In the Festival project the checklist was created and recreated in a number of heterogeneous, and tightly intertwined activity systems, which were not simply ordered as central, instrument producing, consuming, etc.

To comprehend the central aspects of design it is necessary to apply a unit of analysis that transcends the division into activity systems. Thus I will suggest the perspective of the mediating artefacts in understanding design. Design activity is mediated by design artefacts, utilised but not consumed during the process, serving as conditions or environment for the design process, thus opposed to materials. Examples of design artefacts are: object-oriented modelling techniques; principles of relational databases; The DBMS; material from last year's Festival; the concepts "situation", and "problematic situation"; technological visions (hypermedia, systems from other festivals, etc.); the semi-structured interview guide; a workshop layout; CSCW-perspectives, focus on communication and co-ordination, e.g. "shared material" (suggesting that the exchange of information between the operation groups was a bottleneck).

Design artefacts can be either general or local to a project. General design artefacts exist before the project, and are brought into, and utilised during the design process; generating a contradiction between what the design artefacts prescribe, and the praxis they induce (e.g. as a result of the contradiction between the central, and the instrument producing activities); and emphasising the role of basic assumptions (world views), and of explicit ideological statements. Local design artefacts are created inside a project, the database sketch is one example. Local design artefacts are often representations - descriptions or models - mediating the transformation of artefacts in the domain.

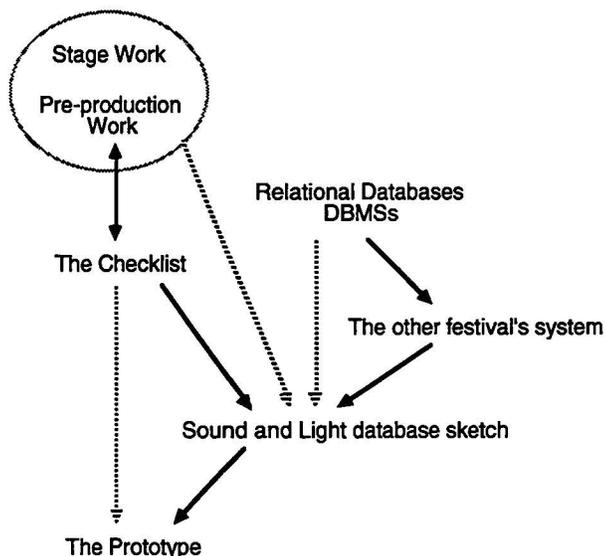


Figure 3: Influences in the development of the checklist. Solid arrows material transformation, dashed arrows indicate mediated relations.

Often the creation of local design artefacts is mediated by a general design artefact, e.g. the creation of the database sketch was mediated by general relational database concepts. In the festival case, the general relational database concepts were mediated by the actual system from the other festival, in the creation of the database sketch. This kind of multiple mediation is illustrated in figure 3.

Design as transformation

Most system development methods put strong emphasis on representations, by basing design on descriptions of the domain of the future system (e.g. Jackson 1983, Mathiassen 1981, Rumbaugh 1991, Yourdon 1982). The fundamental difficulty in verifying the sanity of such representations before the system is implemented, was one of the driving forces in the early development of participatory design within, e.g. the UTOPIA project (see e.g. Ehn 1988). However, during the last years the issue of representations has got renewed attention among researchers in the field of user sensitive design of computer artefacts. (e.g. Suchman (ed.) 1995). The project with the festival can be analysed as a gradual transformation of the checklist. This will emphasise that representations are objects and that these objects are related to the considered praxis; that representations are material.

In general, artefacts are crystallisations of the use of an earlier artefact (Bærentsen 1989, Bannon and Bødker 1991). The original checklist as it was made by the Green stage group was a crystallisation of festival work. They were doing the same things every year when they received the files from pre-production, and when the artists arrived at the festival. They made notes on sheets of paper and these notes gradually became more standardised and, in the end, the pre-printed checklist was made. Thus knowledge about how to receive the artists and what to look out for was embedded in the checklist. The use of the files without checklists was crystallised into the new artefact, the pre-printed checklist.

When the Sound and Light group took over the checklist, it was transformed from a local artefact supporting work in the Green stage group, into a general artefact used across different groups in the festival organisation. In this "new" form the checklist served a broader range of functions, it became a planning tool and a media for information exchange. The checklist became a boundary object (Star 1989, see below).

In the design process, the checklist was first transformed into the database sketch by the Sound and Light group; the checklist became a local design artefact. For Sound and Light it was an incarnation of a technological vision, and it was a reminder of pre-production work, and of how this work supports the production at the stages. For the researchers the database sketch was first a too narrow technical vision, but later, during the last part of the workshop, it became the specification for the prototype. The object oriented descriptions made by the researchers were transformations of the checklist in the sense that they were a step in the definition of the relational tables in the prototype. For the researchers the prototype was the new checklist, with which the Sound and Light group could do everything they previously did with the paper checklist. An important aspect of the paper based checklist was that it was handed over to, and used by the stage groups. The way this was done with the prototype was that the information in the database was printed out on paper and attached to the band file. In this way, the reincarnated checklist returned to the stage groups, but for them it was not a checklist

anymore, because it had become a mere printout of the pre-production database.

The transformation of the checklist is illustrated in figure 4. The big arrow is the checklist transformed over time, the ovals are the main actors in the transformation. The horizontal arrows at the left side indicate important general design artefacts. The grey cross indicates where the transformation was broken

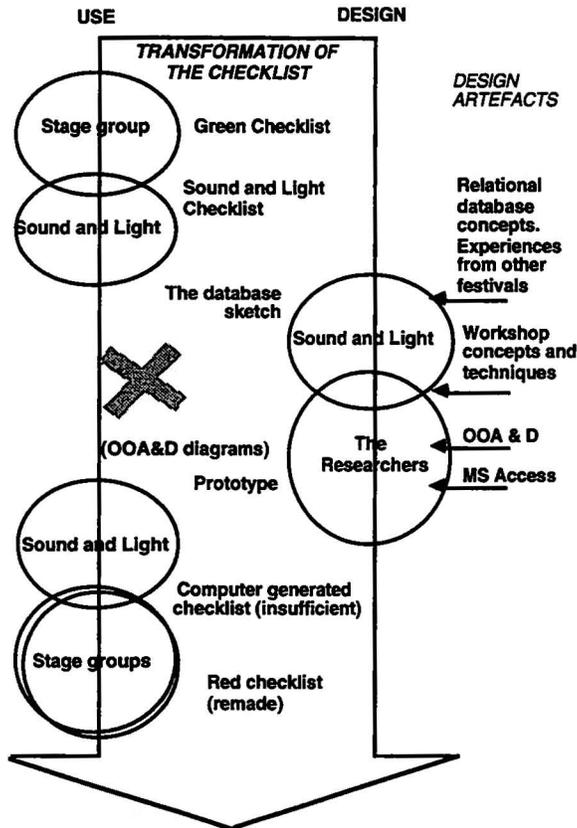


Figure 4: The checklist transformation history

Representations: secondary artefacts and Boundary objects

In understanding design the role of representations—how they are related in general to human praxis—is central

“...what constitutes a distinctively human form of action is the creation and use of artifacts, as tools, in the production of the means of existence and in the reproduction of the species. *Primary* artifacts are those directly used in this production; *secondary* artifacts are those used in the preservation and transmission of the acquired skills or modes of action or praxis by which this production is carried out. Secondary artifacts are therefore *representations* of such modes of action, and in this sense they are *mimetic*, not simply of the *objects* of an environment which are of interest or use in this production, but of those objects as they are acted upon, or of the modes of operation or action involving such objects.” (Wartofsky 1973, p.202)

Representations and images are secondary artefacts, but secondary artefacts also exist in our heads related to our use of primary artefacts. Thus all artefacts have an element of

secondary-ness. Design artefacts are both primary and secondary artefacts. As primary artefacts, design artefacts like CASE-tools and debuggers are very similar to hammers and spectacles. The specific features of design artefacts are tied to their representational function in design but, in general, design artefacts have a double role of being both primary and secondary artefacts. System descriptions are both specification of the new to be refined and filled out (primary artefact) and a place holder for knowledge and learning about the new (secondary artefact).

In the project, The DBMS served the double role as both mediating the production of machine executable code and as vehicle for the establishment of secondary artefacts, i.e. the relational tables as they were used for understanding the festival. In general, this double character is a problem in the design of computer artefacts, because the plasticity of secondary artefacts is obstructing or obstructed by the naturalism and formalisation of primary artefactness. In some situations, the formalised features are weak enough to allow the formalised description to acquire other meanings, in other situations, the models are so complicated that they are impossible to transcend because all attention is used in making sense of the formal contents of the figure. In some situations, formal descriptions offer openings into a poetic world of new possibilities, whereas in others they only offer the frustrating experiences of trying to understand the technical formalism the description is based on.

Star (1989) introduces the concept of boundary objects in trying to understand how people with completely different backgrounds working on different locations are actually able to work on the solution of the same scientific problem. This is very similar to the heteropraxiality of design work.

“Boundary objects are objects that are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual-site use. [...] a boundary object “sits in the middle” of a group of actors with divergent viewpoints. Crucially, however, there are different types of boundary objects depending on the characteristics of the heterogeneous information being joined to create them. The combination of different time horizons produces one kind of boundary objects; joining concrete and abstract representations of the same data produces another” (Star 1989, pp. 46-47).

Boundary objects depend on the plasticity of secondary artefacts related to the objects. But according to Wartofsky (op. cit.) representations are potential productive action. In the design of computer artefacts this relation between representation and action is more direct, or mechanical, because the representations in design can very often be turned into running programs in a formalised manner.

Design artefacts are boundary objects because they traverse the heterogeneous activity systems involved in the design process. When designers and users work together on a system specification, designers tend to perceive the specification as a sketch of the future program code,

whereas the users may understand the specification in a less formalised, more open way.

Design artefacts do not only take different shapes or serve different purposes in different groups, they also change within one group, during the design process, and in the different rooms of a specific groups praxis. Thus a system development method is a boundary object in the sense that it has one function in the project organisation's internal education prior to a project, and a totally different function during the project. Working in accordance with the method means two different things in the two project rooms. In a similar way, the checklist was a boundary object not only across different groups in the festival organisation, but also across the different stages of the transformation process.

In the project, the checklist existed both in the domain and in the design process (database sketch). It was a boundary object in the sense that it existed in different activity systems, and tied these together; across different activity groups; across the different, incommensurable stages of the individual groups cycle of the year; and across the transition from use to design. However, the checklist was not robust enough to be carried from the Festival, to the researchers and back into the Festival. In the transformation of the checklist from paper-based checklist into computer-based pre-production support it lost its checklist-ness. The researchers saw the checklist as a medium for the transfer of the information gathered together during pre-production, for them it was an incomplete, non-computer version of the future computer system; but for the people working at the stages, the checklist had its main function as a tool for the preparation and reception of the individual artists. (Because of management's sabotage of the project this was not realised during the project)

The jungle is an artefact for the Natives living there, a crack of twig becomes the image of an animal to hunt and eat (Wartofsky op. cit.). The jungle is also a boundary object; for the Native it is, among other things, a source of food; for the tourist it is an adventure. However, this boundary objectness breaks down when the paper industry represents the jungle as paper pulp. In the same way, the boundary objectness of the checklist broke down during the project, it lost the features that gave it meaning for the stage groups, the crystallised stage work was lost.

The researchers believed that the fields on the checklist, both paper- and computer-based, were place holders for the information filled in by Sound and Light, instead of understanding it in terms of the work crystallised into it.

The grey cross on the checklist transformation figure (figure 4) indicates that the design proposals were never confronted with actual festival work. The Sound and Light group was familiar with work in the stage groups, and the database sketch initially represented support for this work. However, without anchoring the representations attached to the database sketch all the relevant parts of festival work, they lost their boundary objectness.

For the transformation process to be successful, the artefacts must maintain their boundary objectness across

both sites, and across design phases; and representations must remain representations of these artefacts or the activity crystallised into them. The cancelled workshops were intended to ensure this anchoring through the application of scenarios (e.g. Kyng 1995) and organisational games (Ehn & Sjøgreen 1991).

DISCUSSION

Understanding design as transformation of artefacts is to emphasise material praxis, and that representations have to be understood in terms of the productive praxis they are aiming at. Thus, the transformation view becomes an ideal for the use of representations in design. In relation to object oriented methods, the transformation view rejects the idea that it is possible to base design on a general representation of the domain, e.g. a full description of The Festival (e.g. Coad & Yourdon 1990), and supports accounts focusing on modelling of artefacts like the checklist (e.g. Sørgaard 1988).

However, understanding design as transformation of artefacts also limits the innovative aspects of design. In future works, the innovative or creative side will be emphasised by introducing another class of design artefacts, generators as a complementary to the transformers dealt with in this paper. Examples of generators are future workshops (Jungk & Müllert 1987), and springboards (Engeström 1987). Generators will have an element of tertiary artefactness (Wartofsky op. cit.), i.e. mediate the creation of autonome rooms for authentic creation, not related to the productive praxis in an obvious way.

The main shortcoming of the transformation perspective presented in this paper is that it does not incorporate an understanding of politics and power relations. In the project with the festival exactly such issues must be taken into account to fully understand why the transformation of the checklist broke down (Bertelsen 1996).

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