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ARCHITECTS AND END USERS: BOUNDARY OBJECTS IN PARTICIPATORY BRIEFING AND DESIGN

KARI HOVIN KJØLLE AND SIRI HUNNES BLAKSTAD

Abstract

This paper addresses the tools of interaction between architects and end users in briefing and design. The empirical basis is a case study conducted as action research in a briefing process related to a new office solution in a Norwegian context. The first part addresses the tools that act as boundary objects within the community of end users and across the community of architect-researchers. There is a specific focus on the development of a functional brief. The second part explores how the functional brief is perceived as an obstacle by the architect-designers. The description of the users' demands became a residual category. The boundary objects were not stable, but dependent on context, time and the actors involved. Our conclusion is that a toolbox of different artefacts and methods will not facilitate a process alone. In order to cross the boundaries between the different social communities of practice, the users' collective self-knowledge must be effectively communicated to the designers. Our experience is that the architects' use of their own experience as a source of knowledge can result in a lack of interest in the users' functional brief and generate designs that are less usable for the purpose. An interesting issue for further research would be the architects' role and attitude towards interaction and collaboration with clients and users.

Keywords:

boundary objects, participative processes, briefing, interaction, communication

1. Introduction

[...]we got less space [than expected], ... we had to look at the premises with new eyes, and to utilize the space better ... And I then thought that this is a complicated process, and I saw that if one should be able to motivate employees to go from one office solution to something new, without defining what it was, or ... in a way, change their workplace solutions, it was a good idea to hire a professional ... to run such a process, and to help me with it.... It could be very useful.

(The Head of the OpCentre)

Inspired by new thoughts from a seminar about workplaces and change as well as new ways of working, the Head of OpCentre realized that an extension and redesign of the office solution represented an organizational change as well as an environmental change – an organizational change caused by the influence of new workplaces on everyday work at the office.

The process of identifying and expressing user needs is commonly referred to as briefing. In most writings on briefing, it is stressed that briefing should not only be seen as a product (the brief), but also as a process (e.g. Blyth and Worthington, 2010). However, little attention has been given to studying this process and the actual interaction between the designer and the users in developing the brief into a design. In order to facilitate this interaction, we decided to experiment with a way of briefing that does not view the brief as a static document, but as an object that enables users and architects to share and develop the project together. Our proposition was that such objects may ease communication and facilitate the translation of user experiences into demands and articulation of needs, and later into briefs and design.

In a participatory process of briefing and design, visual objects, tools and instruments were developed and used. They acted as boundary objects within the community of end users and between users, researchers and the architects. A boundary object is a concept introduced in order to analyse interaction in cooperative work between groups or communities of practice (Star, 2010; Star and Griesemer, 1989). In our work we have applied an operational definition of boundary objects as artefacts, visual objects and models, which facilitated the collection of data, the concretizing of user needs and the translation of the brief into architectural design. We have reported the description and classification of the boundary objects in a separate research paper (Kjølle and Blakstad, 2011), and the results of an evaluation of the redesigned workplace in another research paper (Blakstad and Kjølle, 2013). The aim of this paper is to explore:

- under what circumstances tools become boundary objects and act as important means of communication within the communities of end users and across the communities of architects and end users

- enablers and obstacles for tools to become boundary objects in participatory processes between architects and end users

2. Theory: tools as interactive instruments

The office is an enabler for work, facilitating the activities of knowledge workers. Fuelled by the last few decades of development in ICT, globalization of work and new ideas in knowledge management, office design and management have received more attention. There is a focus on the office as a support function where the main purpose is to assist work processes, contribute to the realization of strategic goals in the users' organization and deliver value to its users.

Effort has been made to understand knowledge work, management and work processes (e.g. Davenport and Prusak, 2000; Newell, et al., 2009) as well as activities of knowledge workers (Brill, Weidemann and BOSTI Associates, 2001) and to relate this to workplace design and management (Gjersvik and Blakstad, 2004a). It has been argued that it is important to understand what office users do (their activities and work processes) and how they are affected by their physical environment, in order to design and manage workplaces that add value to individual users and user organizations (e.g. Becker, 1990; Becker and Steel, 1995; Becker, 2004; Harrison, Wheeler and Whitehead, 2004; Kampschroer and Heerwagen, 2005; Elsbach and Pratt, 2007; Haynes, 2007a, 2007b).

2.1 The architects' contribution: translation from brief to design

In the workplace, work processes, technology and space are related. When an organization's work processes change, this might lead to a demand for change in the physical environment. How space supports an organization's goals and objectives is the key focus in some studies in the field of architecture (e.g. Duffy and Hutton, 1998; Blyth and Worthington, 2010; Peña and Parshall, 2001; Mosbech, 2004). However, the empirical evidence on how architecture is linked to organizational performance is rather limited. In order to enable the architects to translate organizational demands and objectives into demands on the physical environment, the client's requirements must be expressed. This can be done in a brief. Traditionally, the brief is formulated in a written document, which serves as a means of communication in the interaction between the client and the architect. The brief is thus a carrier of the client's demands (Ryd, 2004).

According to the review of literature on briefing in Bogers, Meel and Voordt (2008), architects express that the brief is a crucial document. They spend time analysing the brief in order to understand the nature of the client's demands. However, Bogers et al. conclude that architects often find that the brief is incomplete, lacking the client's ambitions and missing clear financial information. In their literature review, Bogers,

Meel and Voordt (2008) highlight that relatively little has been said about innovation in briefing. They argue that even if briefing has received a lot of attention in practice and research over the last few decades, surprisingly little attention has been given to how architects «receive» the information formulated in the brief.

Furthermore, they state that the clients tend to find the brief is disregarded by the architect and suspect that it restricts the architect in their work. Another finding was that the brief can be perceived by some architects as limiting their creativity. Bogers, Meel and Voordt (2008) formulated some recommendations in order to improve the briefing processes and the brief document. Amongst other elements, they recommend a *dialogue phase* between the architect and the client, and clarifying and prioritizing the requirements.

2.2 Briefing and participatory processes

Briefing is traditionally seen as a way of addressing the client's requirements and needs at an early stage in the construction process (Barrett and Stanley, 1999; Blyth and Worthington, 2010; Ryd, 2004; Elf and Malmquist, 2009). Today more focus is on briefing as an iterative process that continues throughout the project's development (Barrett and Stanley, 1999; Blyth and Worthington, 2010). Blyth and Worthington (2010, p. 3) define the briefing process as «an evolutionary process of understanding an organization's needs and resources, and matching these to its objectives and its mission». The iterative briefing process shifts between phases, activities and actors, as expressed by Markus (1998, p. 41):

We are used to calling briefing ... that process of analysis, research, ordering of concepts, specification, definition and problem clarification which proceeds and often continues alongside and accompanies the process of developing a design solution in terms of a spatial and material proposition. This process involves discussion between developers, owners, users, local authorities and a design team.

Briefing can even be seen as a process that continues into use and operation, from a facilities' management perspective (Nutt, 1993; Kelly, et al., 2005). Peña and Parshall (2001) focus on briefing as a separate process aimed at problem seeking, not problem solving. They view briefing as analysis, requiring specialized programmers or trained architects with skills to sort things out in an «objective» manner. Design is described as synthesis requiring specialists in designing. They describe both briefing and design as a two-phased process. The schematic programme (brief) must be developed prior to the more detailed programme, which in turn may overlap with the first phase of design, the schematic design.

This is consistent with another commonly used distinction between the strategic brief and the project brief/functional brief (Blyth and Worth-

ington, 2010; Ryd and Fristedt, 2007; Elf and Malmquist, 2009). Blyth and Worthington (2010, p. 17) emphasize that the strategic brief is «written in the language of the client and its business», while «the functional brief is described in the language of construction». McLaren (2010) even defines a more detailed level of brief for the internal building spaces, the «fit-out brief», as having detailed information about the space required, with sketches and/or showing materials or samples using materials to prescribe requirements.

Kelly, MacPherson and Male (1992) identify that the skills needed in the briefing process require different individuals/competences in different stages of the process. In order to address the purpose of the office as a support to work processes, most theory and practice in workplace briefing and design highlight the importance of involving the user organization, both management and end users (e.g. Kernohan, et al., 1992). Users are seen as important for defining needs and as a source of information about the organization. User involvement, however, is also regarded as preparation, or even as an organizational development process, in order to make the most of the new facilities in use (e.g. Duffy and Worthington, 2004; Gjersvik and Blakstad, 2004a and 2004b; Kaya, 2004; Våland, 2009 and 2010). Participatory processes have been promoted in order to introduce organizational change and create new workplaces (e.g. Horgen, et al., 1999). Another argument for user involvement is that it serves as a tool to achieve democracy in the workplace (Trist and Bamforth, 1951; Emery and Thorsrud, 1976). In recent writings about the experience economy, user involvement is perceived as important for both empowerment and democracy in the workplace, and as beneficial to organizational performance (e.g. Pine II and Gilmore, 1999; Marling and Zerlang, 2007).

End-user participation may also be important as a foundation process for the employees and management, creating ownership and engagement in the process (Fristedt and Ryd, 2004). The end-users' perception of their own work and environment is modified or matured during the process, as a result of communication and interaction in the iterative process (Våland, 2009 and 2010). In a more conscious way, users are able to contribute to clarifying their requirements and demands, as well as negotiate their own work setting.

2.3 Boundary objects as means of communication

Through participatory processes, users partake innovatively and creatively in the making of their own office. Bogers, Meel and Voordt (2008) demonstrate that at the same time as users make their way into the design process, architects would like to be actively involved in the briefing process, participating in the development of the brief and its contents. They find that many architects prefer not to be main author or producer of the brief, which is consistent with the experiences of Blyth and Worthington (2010).

Due to cultural differences between the professional architect and the clients or end users, words and arguments may be perceived and interpreted differently. Consequently, the architectural translation process may result in failure to meet essential needs in design. To ensure meaningful translation, the content of the brief must be communicated, preferably in face-to-face dialogue between architects and end users or clients (Horgen, et al., 1999). In this perspective, tools becoming boundary objects are useful for bridging the gap between the actors in the briefing and design processes by assisting the translation process and assembling the human and non-human elements (Bendixen and Koch, 2007).

Star (2010; Star and Griesemer, 1989) is credited for introducing the concept of boundary objects. Her passion was to understand the invisible work and the tacit knowledge that lie within research communities, and which lead to misinterpretation for those who stand outside these communities (Star, 1991). Important for the concept of boundary objects is how language emerges and how it structures social worlds. The concept makes it possible to analyse the collective efforts that raise equality and stabilize relationships between participants (Star, 2010). The focus is on balancing the power that often exists between participants from different social worlds (Fujimura, 1992), as distinguished from the focus on the imbalance of power within the actor network theory (e.g. Latour, 1987 and 1999).

Both concepts draw attention to translation, transformation and movements encompassing objects in order to enhance richer meaning. On the basis of different forms of action and cooperation the objects might take, Star and Griesemer (1989) suggest four preliminary types or forms of boundary objects: 1) repositories; 2) standardized forms; 3) ideal types; and 4) coincident boundaries. Many other forms of boundary objects have since been suggested, such as various aspects of design, performances and textbooks (Star, 2010).

Initially, there was a critical set of dynamics and three dimensions in the model of boundary objects (Star, 2010; Star and Griesemer, 1989). One dimension is that of «*interpretive flexibility*», something that is a property in every object. Interpretive flexibility is important in the «*constructivist*» approach (Bijker, Hughes and Pinch, 1987). An even more important element of this property of boundary objects is that it is «*at once temporal, based in action, subject to reflection and local tailoring, and distributed throughout all of these dimensions*» (Star, 2010, p. 603). Another dimension is the «*material/organizational structure*» of different types of boundary objects, which arise due to «*information and work requirements*». The last dimension is the question of «*scale/granularity*».

Boundary objects are means of communication, allowing different groups to work together without consensus. The criteria or limits of boundary objects concern ill-structured objects in shared space within communities, as «*a set of work arrangements that are at once material and processual*» (Star, 2010, p. 604). The quality of boundary objects lies in the plasticity, which makes it possible to adapt to local and individual needs while they persist robustly enough to con-

tain a shared identity across social worlds. Star has a pragmatic view of the boundary objects (2010), as objects people act towards and with. A pragmatic view is also taken by Carlile (2002, 2004), who has developed a framework to analyse the political and practical mismatches that may occur when actors share and assess the knowledge from each other's social worlds. He developed the framework of characteristics to discuss three complex boundaries around domain-specific knowledge: 1) a syntactic capacity – for transferring; 2) a semantic capacity – for translation; and 3) a pragmatic capacity – for transformation. There is a further characteristic, not within the framework, which is that the pragmatic boundary requires multiple iterations.

Henderson develops the concept of boundary object in a study of how engineers related to the different visual representations of their work (1999). In one case, the sketches and drawings helped to capture concepts and rendered it possible to share visual thoughts in a non-linear design production of a machine. During the process, she observed a lot of «*back and forth communication and interaction*». The visual representations formed a certain type of visual culture. By being an underlying understanding of the engineers' work contribution, the visual representations also imposed criteria of being an «insider» with the same expertise, or an «outsider» lacking it. New visual documents were made to follow the machine after production.

According to Henderson, the visual representations function flexibly as boundary objects or as conscription devices, which are «*receptacles of knowledge that is created and adjusted through group interaction with a common goal*» (1999, p. 53). Participants focus their communications in reference to the visual object. Hence, her focus is that visible representations as boundary objects are not stable. The visual representations serve as «*conscription devices*» or as boundary objects, depending on which design community one is a member of (1999, p. 53). The dimension of boundary objects as unstable is also discussed by Star (2010, pp. 614–615), reflecting the relationship between «*standardization and residual categories*». She points to the continuous battles between «*the formal and the informal, the ill-structured and well-structured*».

The battles are sometimes beneficial or even very helpful for the involved actors, but some methodological considerations must be taken to avoid «over-standardization». However, according to Star, over time standardized objects move from being standardized and well-structured to being residual categories in communities of practice of actors who lack the same expertise or participation in the development of the objects. Among actors within these communities and across new social worlds, other boundary objects may be developed. Hence, a cycle has arisen.

Due to the process of translation and transformation into design, the concept of boundary objects can be useful as an analytical tool in studying interaction within and between social worlds, whether it is among the end users or in collaboration between architects and end users. In this case, boundary objects are used to gather rich and detailed information as input to briefing and design. Because boundary objects can be regarded as adaptable, they are able to guide all divergent actors equally, and enable the actors to communicate without consensus, to negotiate and achieve a shared notion (e.g. Star and Griesemer, 1989; Fujimura, 1992; Bowker and Star, 1999; Carlile, 2002, 2004; Kjølle and Gustafsson, 2010).

3. Methods

For this study, we have been involved in action research, collecting data by using methods such as interviews and surveys. In the present study, both the researchers and participants among the end users acted as action researchers. Our action research approach is based on balancing (Greenwood and Levin, 2007):

- «*Action*»: solving the problem at hand, developing the brief for the new workplace concept;
- «*Research*»: multiple research techniques aimed at enhancing change and generating data for scientific knowledge production; and
- «*Participation*»: involvement of users in participatory processes in which everyone involved takes some responsibility.

This means that the main purposes of action research are to generate action, change and «*learning by doing*» as well as cogeneration of knowledge. In action research, one highlights the importance of learning and reflection both for the «action researchers» and for the «users» (Greenwood and Levin, 2007). The scope and focus of this study was thus always twofold: to develop the brief for the new office, as well as to develop and test instruments for briefing in order to generate new knowledge for practice and research.

Kurt Lewin's model for change (1951), as a three-stage process (unfreezing, changing, freezing), fits well with the traditional understanding of a building process, where you move the users out, change the premises and move the users back in. In this work, we try to take it one step further: to move beyond short-term interventions and initiate a process where the user organization is involved in the entire process and is also able to continue the learning process after moving into the new premises. This fits well with Susman and Evered's (1978) representation of the action research process as a cyclical process from (1) diagnosis; (2) planning of actions; (3) taking actions; (4) evaluation; and, finally, (5) specifying learning and new knowledge that can later be used for improved diagnosis.

Greenwood and Levin (2007) highlight the democratic and participatory foundations of action research, and prescribe involving all stakeholders in all parts of the process in order to facilitate ongoing reflection and change of practice.

The OpCentre case study was conducted from December 2007 to November 2009. The researchers were mainly involved in the briefing and pre-project phase, which finished in September 2008. The diagnosis and problem definition were developed together with the different stakeholders, and the actual interventions were planned and conducted together with the case organization. Finally, data collection, evaluation and specification of learning, described as the last phase of the cyclical process in action research (Susman and Evered, 1978; Greenwood and Levin, 2007), were conducted mainly in 2009 and 2010.

In the first phase of the case, the end users and we as architect-researchers were the main actors in the participatory briefing process. On one hand, our background as architects was important in order to select methods and tools to manage the briefing process, and to initiate visual representations developed in collaboration with the end users. On the other hand, to avoid mixing roles, as researchers we decided not to deliver ordinary architectural services such as drawings, but rather to act as «process agents» or «catalysts». During the briefing process, we facilitated workshops and activities conducted by the end users. We participated in meetings with the focus group and in meetings with the focus group and the architect-designers.

One architect-researcher participated in single meetings with client representatives to clarify information. In the second phase the communication and collaboration between the architect-designers and the end users was the key process of the transformation to design. One of the architect-researchers decided to take a position as a participative observer in the collaboration between the user representatives and the architect-designers. It was important to understand what happened in the communication between the professional architect-designers and the end users as laypersons and the role and form the visual sketches took in the interaction.

Nine follow-up open interviews were conducted with representatives from among the end users after the briefing process was finished and while the case organization was located in a temporary office area. One year later, eight semi-structured interviews were conducted with five end users, two of the architects and the client representative from the parent corporation. The main topics were the finished activities, the briefing and the design process and the outcome, their new office locality and knowledge sharing. Because the interviews were conducted after the briefing (nine interviews), and after moving into the new office (eight

interviews), there is always a risk of ex-post rationalization. Researchers and the interviewed users, managers and architects were involved in the process. The knowledge is therefore produced in the context of application, «*mode 2 knowledge production*» (Nowotny, Scott and Gibbons, 2001).

Interviews were conducted in Norwegian, and quotes have been translated into English by the authors. Results and findings from the action research and the strategic briefing process, together with results from the interviews, are reported and discussed in this paper. A quantitative data collection method, namely a web-based user survey, was conducted before and after the refurbishment. This is not used directly in this paper, but the results from the evaluation before intervention are used to frame the «diagnosis» together with views of employees and management.

4. Case study: the briefing process at OpCentre

The case studied is an operation centre located in mid-Norway that is responsible for safe railway communication on all the national rail lines. To protect its anonymity, it is called OpCentre. It is a department of the national railway corporation with around 30 engineers and technicians at the time the briefing process was conducted. These are denominated users or end users in this paper. The operation centre provides services within so-called ITIL (IT Infrastructure Library) support. It is divided into four groups, namely the Management Unit, the Support Centre, the Network Supervision Centre and the Operations and Maintenance Centre.

When this project started, the number of staff at the operation centre had increased rapidly as the company had only been established three years earlier. The office location was about to become too small, and the OpCentre was expected to continue to expand. Due to the demand for more space, the company had to make a decision to either move to another location or enlarge their existing office. The Head of OpCentre initiated a participative briefing process involving the staff and engaging researchers to guide the process. His aim was to focus on organizational challenges, such as cultural aspects due to stability and recruitment, profile, identity and image. He also wanted to change the physical environment and implement new office layout such as open plan solutions in order to enhance knowledge sharing and growth.

As researchers, we proposed an experimental study testing how and when tools act as boundary objects, and he accepted the offer out of curiosity. We wanted to investigate the impact of boundary objects in participatory briefing and design with architects and end users. In this paper we focus on the boundary objects which proved to be important means of communication and that had a big impact on the final result.

In the following sections, the objects are described based on how they:

- define objectives and meaning for the end users
- enhance awareness and contribute to the development of new objects
- assemble information to develop the brief
- shift from boundary objects to objects that restrict participation
- act in collaboration between architects and end users

4.1 Phase one: boundary objects across communities of end users and architect-researchers

The first phase of the briefing process at OpCentre became an iterative process wherein three main sub-processes were identified: 1) defining objectives, 2) enhancing awareness and 3) assembling information to develop the brief. Several activities were developed in the process and acted as boundary objects among the end users and across the community of architect-researchers (Kjølle and Blakstad, 2011).

Figure 1
Activities and objects that facilitated the participation in the briefing and design process, acting as boundary objects within the community of end users, researchers and/or architects, and that were classified according to the four preliminary forms of boundary objects suggested by Star and Griesemer (1989).

Activities sorted chronologically and defined as different types of boundary objects

Briefing process: participatory process between end users and researchers			
Defining objectives	Background materials		
	Introduction lecture		
	Toy animals: Description of current individual work processes		
	Group activity: Description of current and future collective work processes		
	Image cards: «Characteristics of individual workplace»	Image cards: «Characteristics of collective workplace»	
	Group discussion in steps: «The impact of the building» – for the company	Group discussion in divisions: «The impact of the building» – for the division	
Enhancing awareness	Photographs and catchwords – 6 topics: Pictures from the existing interior	Six posters: Assembling pictures and catchwords about six topics	
	Matrix: Work utilization study		
	Four group interviews		
	Matrix: internal relations and neighbourhood		
Assembling information to develop the brief	Workshops with Focus group: Performing the functional brief		
	Excursion – visiting workplace: An open plan office	Excursion – visiting workplace: A building with several operation centres	
From briefing to design: the process of interpretation			
Architects	The final functional brief:	Delivery of the final functional brief to the architect	
Architects	Architect's sketches and drawings:	Delivery from the architect	
User representatives and researchers	Workshops with usergroup in the division Network Supervision centre:	The users' sketches and drawings	
Design process: collaboration between architects and end users			
Sketches and drawings: Collaborative design			
Repositories – are ordered 'piles of objects' which fit problems of heterogeneity across the communities	Standardized forms – are intended to be method for common communication. the instruments can be transported over a long distance and retain the same information	Coincident boundaries – are common objects having the same boundaries, but with divergent internal contents	Ideal types – are defined as means for communication and cooperating symbolically. They can be regarded as adaptable, since they are able to guide all divergent actors equally.

4.1.1 *Boundary objects that defined objectives and meaning*

A one-day workshop held far away from the office kicked off the process of changing the workplace. Most of OpCentre's employees, managers and researchers participated. Both individual and group activities were carried out, encouraging colleagues to share experiences and discuss and reflect on their work processes and work types. This resulted in enthusiasm among the participants. Further, it created a sense of common agreement about the objectives and the expected outcome of the process. Their new workplace solution was expected to stimulate interaction and increase knowledge sharing within OpCentre, but also to build bridges between them and other departments in the same building. In order to share knowledge, they decided to suggest sharing space with other tenants.

It is clear that we have played a hazardous game, I would say, through the workshop we arranged at Røros, where, really, you ask your employees to do some extraordinary things and using toys and so on ... But I think it has helped to contribute to the social community and to the openness, and it has been some fun, really. It will actually become the symbol of the process, it will. (The Head of the OpCentre)

In the architectural profession, the use of metaphors is known as a tool for association and inspiration. They can describe intentions and problems. However, among the end users at OpCentre, the practice of using metaphors to describe work processes was not well known. The first activity they were invited to participate in, was an individual exercise in which they were asked to choose one toy animal as a source of inspiration and recognition to identify the user's own work.

This was done while travelling by train to the workshop. The users also listed some keywords characterizing their own work processes and work style. The toy animals acted as emotional tools that became metaphors. For the users, it was unfamiliar to find keywords to describe themselves and their individual type and method of work. All participants were put in an unknown and non-hierarchical context, solving the problem individually but side by side.

This resulted in a sense of equality, encouraging confidence and social coherence. The presence of other passengers did not seem to embarrass them in their activity. On the contrary, the fellow passengers' wonder and chuckling seemed to stimulate the adult end users in the activity using toy animals that are usually considered suitable for children. On the one hand, in this context they dared as individuals to show a very private side of how they perceived themselves, while on the other hand, the activity was a collective action, with colleagues doing the same thing side by side, on their way to spending time together at the one-day seminar. The collective feeling among the colleagues seemed to be strengthened

by the activity and by the fact that they had a kind of audience. The toy animal they chose was kept in sight on the table in front of them all day long. It enabled them to share their experience and get a common knowledge about the work processes at OpCentre.



4.1.2 Boundary objects that enhanced awareness and contributed to the development of new objects

An internal competition about a slogan for the process closed the workshop. «On rails against new landscape» was chosen. In the next step of the process, another set of activities was tested to define how they worked and utilized space in order to develop the new work settings. More detailed data and knowledge about the present and future work processes and work styles among the groups of end users were collected. All requirements had to be identified to ensure a thorough understanding of their needs.

One of the activities was to encourage the end users to take pictures with their mobile phones (see figure 3). They were given six headlines under which they were asked to write a short description and attach their photos. All headlines expressed positive qualities about their existing office. This resulted in six different posters which were put on the wall close to the coffee machine. The end users were encouraged to reflect on and discuss the content. The intention was threefold. First, it was important to identify qualities and individual preferences, such as their personal workplace, space for concentration and informal meetings. Second, reflections and discussions were supposed to increase the understanding of qualities, differences of opinions and the compromises that had to be made in a collective work space. Third, the reflections and discussions guided which qualities were to be reused in their new office solution.

Figure 2
Activities that acted as boundary objects within the community of end users, enabling discussions and shared knowledge and notion. From left to right: 1. Toy animals: description of current individual work processes; 2. Using images: characteristics of individual and collective workplace, respectively; 3. Defining objectives: «The impact of the building» for the company.



Figure 3
Photographs were taken by the end users and assembled on posters for reflection and discussion. The posters acted as boundary objects within the community of end users and increased their awareness.

Four group interviews made a significant impact on the process, two with representatives from the Network Supervision Centre and two with mixed groups of users. In an individual interview, the interviewee has the advantage of being completely free to say what they may want to, regardless of colleagues' view. However, we decided that semi-structured group interviews were needed as a suitable method for uncovering the information for this project. To a large extent, the interviews focused on interactions and relations between colleagues, both internally within their own division and concerning all colleagues. By sharing individual experiences, reflections and opinions, it became a common reference and knowledge for all participants.

Only one of the eight employees from the Network Supervision Centre participated in the one-day workshop, since many of them were on 24/7 shifts to supervise the network. To compensate for this, two group interviews were conducted to collect data on their specific requirements. The interviews focused mainly on their work processes and work styles. The interviews contributed to bridging the gap between this group of users and their colleagues. Thus, feeling more affiliated, they took part in the process of briefing. Additionally, two mixed groups of representatives from the units were interviewed to bring forth nuanced information and to enrich the data collection.

4.1.3 Boundary objects that assembled information to develop the brief

One focus group was assembled to carry out, formulate and specify the demands to prepare for the brief. The group consisted of seven representatives from the end-user group, the Head of the centre and one of the researchers. Still, no architect-designers were signed up to take part in the briefing process. To synthesize the quantitative and qualitative data, workshops were held at least every second week. Due to the decisions that needed to be made, two excursions were arranged to bring common references to the discussions. The first excursion was arranged for the focus group before the second meeting with a visit to an office building with an open plan layout, guided by the facilities manager at the visited company. Another excursion was organized for all the end users to the national oil company to investigate their different solutions for operations centres.

The demands were discussed, clarified and negotiated throughout seven workshops in the focus group. Decisions were taken and successively assembled into a draft functional brief. Under guidance and pressure from the researchers, a smaller group of end users worked hard on concretizing and specifying the requirements in the days between the workshops. One of these end users took a role as an enthusiastic driving force. He brought some experience from working in an open plan office and contributed positively to the development of the brief.

The creation of the PowerPoint document was based on experiences from the researchers' own practice as architects and particularly from experiences from developing functional briefs in similar projects, further developed in collaboration in the focus group. The first drafts of the functional brief were merely a structure to be filled with information, pictures and concept sketches made by the participants as the process proceeded. Spatial principles and concepts were put in the first part to describe the purpose and explore the general qualities. In the next part, each function was presented on a slide with a short, descriptive text specifying quantities and qualities of this function and space. In order to enrich the text and visualize the intention of use, interior photos were added to enable associations for the determined function or space. Each slide was intended to communicate the fixed information, such as the amount of workplaces and technical installations (e.g. plug sockets for data and video). Moreover, each slide was intended to communicate information about use, or reuse, of materials, installations and furniture.

The functional brief developed in the process became a well-structured and locally tailored object. To the end users, particularly the representatives in the focus group, the functional brief became a boundary object bringing shared information and knowledge and common understanding to all the end users. It was intended to be a sufficiently detailed description carrying the OpCentre's demands in order to avoid a mismatch in design. On the one hand, the purpose was to differentiate between what was non-negotiable and what was open for interpretation and further development through the transformation process into design. On the other hand, the aim was not to bring too many restrictions to the design process, but rather to design an open device encouraging innovation and creation suitable for the architect-designers.

4.2 Phase two: boundary objects across communities of end users and architect-designers


The second phase of the briefing process and the first phase of the design process at OpCentre were carried out in a way that was different from the one planned. Initially, for the purpose of this particular briefing and design process, the plan was to invite the architect-designers to participate in most of the briefing process, at least in the iterative meetings with the end users wherein the outcome of the activities was summed up, but also to be participants that collaborated in the focus group. But the architect-designers were engaged by the parent company and entered the process later than expected.


4.2.1 *The change of the functional brief from boundary object to residual category*



The senior architect-designer was invited to participate in the focus group meetings early on, but because of some unexpected confusions and the late assignment he did not choose to participate before the fifth

meeting. In this workshop he was introduced to a well-developed draft version of the functional brief, but given the possibility to take part in the discussion for the purpose of shaping information and knowledge about requirements and needs.

Små flexirom





Små flexirom for prosjektmøter, samhandling grupper, telefonmøter etc. – eller som "privat" møteplass for ad hoc uformelt faglig/ sosialt møte.

Behov og krav

Teknologi:
Strømuttak for arbeids-stasjoner / terminaler (på vegg og i bord) – min 3 stk
uttak banenett, OPM-nett, telefoni
konferanse- telefon

Kapasitet: 1-3 personer (ca 10 m2)

Antall: 5 stk (på sikt 7 stk)

Fast/løst inventar, møblering:
Whiteboard, plass for opphenging av kart mm; ett rom m/ kritt-tavle (rom dedikert sekretær)
Fleksible møbler: heve/-senke møtebord m/ "brønn", justerbare stoler

Back at his office, the senior architect communicated the information to a junior architect and handed over the draft functional brief to her. Nevertheless, to a large extent, the junior's primary sketches were based on the senior's oral transfer of perception and translation of the demand. Sketches were developed and transformed into architectural CAD drawings of the ground floor and the first floor and delivered to the focus group before the sixth focus meeting. However, the end users found that the first proposal of the new office solution was not closely related to the content of the functional brief. Instead, the proposals represented to a high degree the architects' interpretation based on their own expertise relating to what a new office solution in this location could bring.

Before the sixth focus group meeting, a complementary document to the draft functional brief was prepared by the architect-researchers in collaboration with the management and a few selected user represent-

Figure 4
The functional brief was developed as a PowerPoint document with a rich description of the clarified requirements. Each slide acted as a boundary object in interactions between end users and researchers, enabling communication and retaining coherence and agreements.

atives at OpCentre. This document was a summary of estimated space (in square meters) of all the required rooms and spatial functions. It was handed over to the architect-designers as a supplement to the final functional brief that was completed within this meeting with the focus group. Additionally, the end users' representatives reiterated the description of the spatial principles and explained once more what was important for them regarding the new office solution. But the functional brief was received and perceived as a document that belonged to the end users and their process, and appeared complicated to use.

It is perhaps to bring out the needs in a very neat and instantly understandable way then. I think maybe this [functional brief] was a little too much in a sense ... There aren't many words on each page, so the reason could be that it is the number of sheets that initially scares – that is what makes us not want to read through, from cover to cover ... Actually, I feel that this [functional brief] is more for their sake and their process in advance, to make them more prepared for the negotiations and tacking back and forth. (The junior architect)

The junior argued that the document was too long to read, even though the word count was low. The final brief in print was a 23-page document with PowerPoint slides in pairs on each page. Moreover, the junior argued that the end users would communicate the necessary information during their meetings. She saw negotiations as part of the design process and thus the end users' awareness was seen as an advantage in the negotiations.

The architect-designers did not find the functional brief interesting or useful in their work, and thus it became a residual category. One important part of the functional brief was the description of the concepts. The overall office solution was defined and further details were provided regarding functional zones (e.g. individual work place and collective work space). Furthermore, zones for support functions were defined, including facilities such as coffee machines and a kitchen, formal and informal meeting rooms, space for project work and space for creativity and concentration. Moreover, the concept of flexibility was defined as significant for growth and change. Flexibility was to be achieved by multipurpose space and combined zones for different functions. Contrary to the brief, the architects' perception of the concept was that flexibility called for more space. Their notion of the concept did not change during the design process and, hence, the concept of flexibility as defined in the functional brief was not adapted even in the final design.

The architects visited the existing office when the seventh meeting was over. In particular, the junior architect expressed the importance of this walkthrough for her follow-up development of a new proposal. She emphasized that it enabled her to understand the kind of work processes

at OpCentre. Nonetheless, the junior architect based much of her work on the list of spaces and square metres, and her walk-through in the existing office, and not on the content of the functional brief as a whole. A second proposal was made and presented in the seventh focus group meeting, but still the proposed solution correlated weakly with the functional brief.

The end users became disappointed after this proposal of the new office solution, but decided to be proactive and initiated workshops in collaboration with the architect-designers.

4.2.2 Boundary objects in collaboration between architects and end users

On the end users' initiative, three workshops were carried out at the architects' office. One of the architect-researchers was present at the second and third meetings for the purpose of understanding and learning from the communication and interaction across those two social worlds. Before the meetings and in between them, the user representatives transformed their interpretations of the functional brief into sketches partly based on the architectural drawings. In the workshops, two end user representatives provided the visual representations and explained their proposal to the two architect-designers. In this context, the end users took part in the architectural practice where sketches and drawings are the most important instruments used, individually and collectively, to test, talk about and develop ideas. The designers met the end users as peers. Then the representatives from the two groups collaborated by negotiating and discussing each other's proposals and ideas. They drew on the sketches and developed ideas for a new proposal based on a big print of the architectural drawing on the table between them. The visual representations of sketches and drawings served as a basis and a supplement for the conversation and for sharing data. They became a method that affected equality in the interplay. Further, they played a temporary role in bridging the gap between the end users and the designers. These material objects became boundary objects as means of translation, common enough to make them recognizable across the two social worlds, maintaining coherence.

The difference is that they had been through the preliminary phase, learned to read drawings and have a comprehension of what the different rooms would be for, how they should be used, how large they should be, and how much space they utilized and [how] their routines and work were ... So therefore they became much stronger than others, in the discussion ... This meant that one got an answer much faster. Against that background, the cooperation with OpCentre became a lot easier ... And it would have been much harder if they hadn't had that process in advance, because then we would have had to sit down and discuss.

(The senior architect)

The junior architect stated that the end users at OpCentre were different from users in other projects. In this case, both the senior and the junior architect experienced that the end users were more aware than users generally are.

5. Discussion

The Head of OpCentre initiated a briefing process with a goal that was twofold: an organizational change in ways of working as well as a change in the office solution. Realizing that this could be a demanding process, he hired professionals, both for briefing and for design, to ensure a successful outcome. His objectives were fulfilled, and the process produced working environments that function flexibly and enable teamwork. The end users were quite satisfied with their new office environment (Blakstad and Kjølle, 2013). However, the processes of briefing and design proved to be challenging in unexpected ways.

5.1 Boundaries at play: enablers and obstacles

Through different activities or «working arrangements», discussions were facilitated about present and future work processes across individual users' tacit and explicit knowledge and across boundaries between groups of end users. The activities acted as boundary objects in the three main sub-processes. The outcome was a shared notion of the content of needs and requirements within the end users' community of practice and the practice that runs across that of the architect-researchers. The boundary objects became forms of «*reification*» (Wenger, 1998) wherein users and researchers interconnected, shaping maturity and comprehension of what was needed in the new office.

The use of artefacts and material objects had a significant impact on the involvement and the responsibility of the end users, one of Greenwood and Levin's (2007) criteria in action research. The participative briefing process and development of the functional brief became a learning process for the end users and enabled them to take part equally with the architect-researchers. As experts on their own work processes, the repeated actions carried out in order to shape the knowledge and clarify and define the requirements increased their awareness and strengthened them as participants.

Across the communities of end users and architect-researchers the collected data was transferred, translated and transformed iteratively according to the four characteristics of «*pragmatic boundary capability*» (Carlile, 2004). But for the purpose of transferring, translation and transformation of data across the boundaries of the community of architect-designers, the functional brief failed. Even though the functional brief was developed in a visual language familiar to architect-designers and their visual thinking, the boundaries between the users' expres-

sion of their needs and the designers' acceptance of this input were maintained and not crossed. Despite the fact that many architects ask for clearly expressed demands such as a brief or a programme, the designers in this case found it difficult to use the functional brief. It was well-structured, but with open ends. It collapsed as a boundary object and barely became a description to the designers. It was perceived as a «*conscriptio device*» (Henderson, 1999), an obstacle embedded with knowledge, reflections and discussions they had not shared. Hence, it deepened rather than bridged the gap between the architect-designers' professional and cultural practice and that of the end users.

In addition, the participation of architect-researchers as a kind of «agents for translation» from business language to architectural language seemed to restrict and limit the community of architect-designers rather than encourage them. First, although invited, the architect-designers did not choose to collaborate with the end users and the researchers in the process of refinement of the formulated needs and requirements, but rather participated in the focus group as «outsiders». They entered the focus group meetings late and in the final development of the functional brief. Second, the architect-designers preferred to interpret the demands on the basis of the quantitative data such as the square metreage of each room or function. Third, they preferred to use their own experience as the main source of knowledge for creation. The first two proposals delivered did not correlate with the end users' concepts and principles. Nor was the end users' concept of flexibility adapted and transformed. The end users' experience conveyed in the functional brief did not influence the designers' perception of how the office was intended to be used.

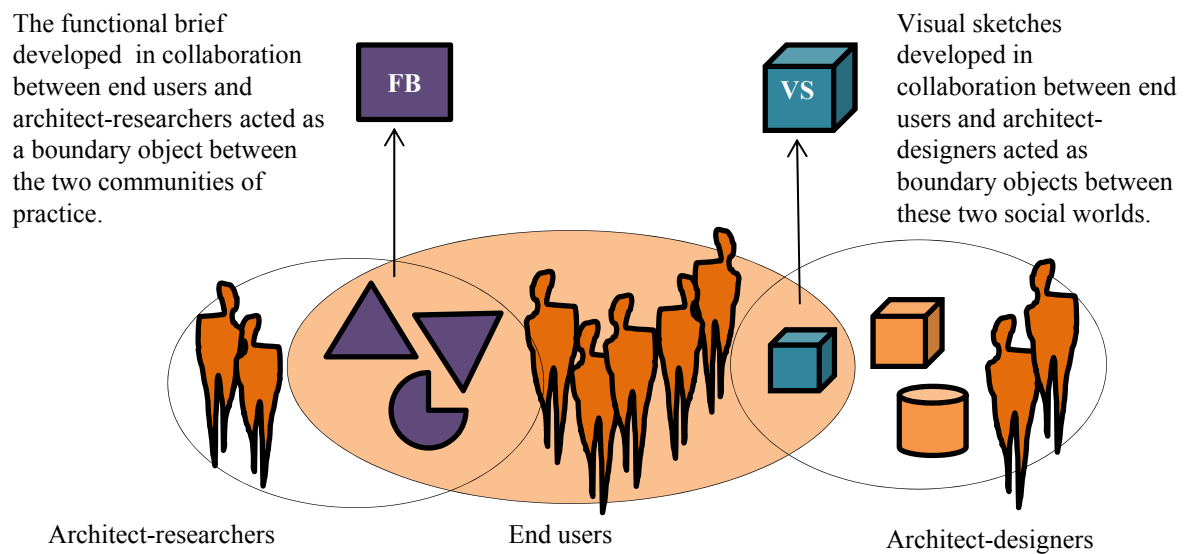
A shift occurred when the end users invited the architect-designers to collaborate and sketch together. The end users took on a new role as «outsiders», who actively initiated the role as «insiders», thus entering the community of the architect-designers' practice (Henderson, 1999). The end users had increased their knowledge about and awareness of the demands for their future workplace solution. The briefing process affected them so that they as laypersons felt equality with the professional architects, and they invited themselves to the architects' office to collaborate. In contrast, the architect-designers did not actively invite the end users, but accepted collaboration with them.

Thus, the designers became participants in the last phase of the briefing process, and the end users participants in the first phase of the design process. The architects' denial of the functional brief was replaced by interaction and collaboration with the end users, based on the drawings, which was their preferred mode of communication. The visual sketches made in the iterative collaborations between end users and the designers allowed boundaries to be crossed between the two communities and encouraged discussion and shared knowledge needed for the transfor-

mation. They cooperated equally «back and forth» without consensus. For the architect-designers, this became a second part of the translation and transformation of the client's demands. In order not to distract, restrict or limit this collaboration, one architect-researcher decided to participate as an observer.

5.2 Boundary objects at play: conditions for objects to become boundary objects

The functional brief characterized a shared representation, locally tailored in collaboration, and became a boundary object to the end users and the researchers. Contrary to this, the functional brief became an obstacle to the architect-designers, who did not participate in the development of it. It hindered rather than enabled their work. As a boundary object it was not stable. It was perceived as a residual category by the architect-designers. The visual sketches developed by end users and architect-designers became the boundary objects that crossed their social worlds, encouraging transfer, translation and transformation from defined requirements to design.



We have observed that abstract or concrete objects, such as different tools or activities for collecting data, the functional brief and visual sketches, became boundary objects in the two phases of the briefing and design process. The objects enabled participants to get a common knowledge across a divisional level and across different disciplinary communities. Furthermore, they affected the participants' understanding, and consequently the participants grew in their maturity about the work processes and the demands on the workplace.

The objects became boundary objects when they:

- acted as «working arrangements» by facilitating and encouraging communication and sharing knowledge between different social worlds such as those of end users, architect-researchers and architect-designers

Figure 5
The functional brief was locally tailored as an open device and a boundary object between end users and architect-researchers. It was not stable as a boundary object, but was perceived as a residual category by the architect-designers. The visual sketches developed by end users and architect-designers became boundary objects within their interactions, encouraging transformation to design. The figure is based on Star (2010). Her figure shows the relationship between the different forms that objects or analytical tools can take when tacking back and forth between open and embedded categories in a cycle over time.

- arose over time, allowing different communities of practice to work together without consensus in equality between the participants
- were means of communication and interaction between the communities represented
- satisfied the informational requirements of each of the communities
- were plastic enough to adapt to local needs

5.3 Boundary objects as enablers

We investigated how different tools enabled end users and architects in briefing and design. We examined objects as boundary objects that became enablers within the community of end users and in interactions between end users, architect-researchers and architect-designers, when the:

- users became decontextualized when they were put in a new setting using the toy animals as metaphors in order to describe their work processes and work style. This happened in a setting with an audience, but for the community of users in an equal and non-hierarchical context.
- pictures of qualities in the existing office were assembled on posters for reflection and discussion between the users and the researchers. The group interviews were conducted and contributed to bridging the gap between the divisions at OpCentre. The shared experiences, reflections and opinions became a common reference for the users and the researchers. The architect-researchers became enablers, encouraging the users from different divisions to share experiences and to work together towards a common understanding.
- functional brief was further developed iteratively by the user focus group and the researchers, in defiance of the architect-researchers' prior knowledge. The performance of the functional brief enabled the users and the researchers to gain a common knowledge.
- sketches made in collaboration between architect-designers and user representatives became enablers, bridging the gap between them, encouraging the development of common knowledge and the transformation to design

6. Conclusions

Basing our research on the case study of the briefing and design process at OpCentre, we have explored under which circumstances tools become boundary objects and act as means of communication within communities of end users and across communities of architects and end users. We have explored enablers and obstacles for objects to become boundary objects in participatory processes between architects and end users.

We, as the architect-researchers, expected the functional brief to act as a means of communication for the architect-designers. It was intended

to be an open device ready to be implemented, translated and transformed in an innovative and creative design process. We experienced that boundary objects changed form when the scope changed and architect-designers as new actors entered into interdisciplinary interactions with the end users and architect-researchers. In this case we have seen that a boundary object can never be stable, because the problem is local and the boundary object is dependent on context, time and the actors involved. A toolbox with standardized artefacts and methods will not facilitate a briefing and design process alone. Boundaries between individuals and communities are a set of fault lines with a strong social dimension.

In the development of a functional brief, a mix of boundaries and social relations evolve. In order to create benefit, active boundary management must be performed at each stage. At first, boundaries between the individual users' tacit and explicit knowledge must be crossed. Further, boundaries between groups of users' knowledge about needs and requirements related to their work processes must be crossed. The users' awareness increases. Next, the users' collective self-knowledge must be effectively communicated to the designers in order to cross the boundaries between the different social communities of practice.

Our experience in this case is that the architects' use of their own experience as a source of knowledge can result in a lack of interest in users' functional brief, and thus generates designs that are less usable for the purpose. Moreover, in our case the architect-designers find it challenging to engage in common modes of communication. There is a requirement for more research and discussion about the architect's role and attitude towards interaction and collaboration with clients and users. Further, more research is needed to gain knowledge about the duality between ownership in creative processes and sharing knowledge and collaboration.

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