BOUNDARY OBJECTS FOR DESIGN OF KNOWLEDGE WORKPLACES

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Abstract
Professional service providers and knowledge intensive organisations are constantly searching for ways to improve and add value to their business. This has led to an increased attention to space and to the physical settings in which knowledge work is carried out. Much attention has been directed onto the possible gains by using office design as a tool to achieve organisational goals, such as change and innovation, learning, teamwork, e.g. This paper, based on cases in the R&D-project "The KUNNE workplace", explores the relationship between the *business' goals* (and ambitions formulated by the organisation's management), the briefing process (end-user participation, and formulations of needs and intentions), and the final design. It focuses on the *translation* from business needs, stated in a business language, into briefing, and different ways to describe user requirements in order to aid the later translation by the architect into design. We will explore the different *boundary objects* which are used in this translation, as well as different techniques and *participatory processes* used in order to develop, understand, and describe user needs.

Keywords: Briefing, user participation, knowledge workplaces, communicating design

"WHAT DO YOU WANT YOUR OFFICES TO DO FOR YOU?"
The traditional Norwegian office building used to be inhabited by knowledge workers in individual cellular or combi-offices. During the 1990s, new trends and new office solutions challenged that norm, and faced organisations with questions of how more open space could be used strategically. They started to consider how their facilities are affecting their efficiency and effectiveness. In general there are at least two kinds of motivation to change space use and office solutions: space efficiency and cost reductions, and improved productivity, satisfaction and learning by innovative use of space. Earlier studies have shown that focusing on the possible strategic benefits to the organisation's value creation tends to increase the organisation's benefits from new office environments (Arge et al., 2000).

With more emphasis on the strategic value of the building project, more focus has to be given to briefing and the translation of needs to a physical solution. This paper describes experiences of briefing processes in the R&D-project "The KUNNE workplace", which is a 4 year project, financed by the participating companies as well as the Norwegian Research Council. In the project we study the relationship between space and use, combining knowledge from architecture, briefing, and facilities management with knowledge management and organisation development. The aim is to develop knowledge of knowledge workplace making; briefing, design, and use; and to research the relationship between knowledge work and the physical environment. The KUNNE project has used an action research methodology, and has carried out case studies together with the 7 participating organisations.

An important finding is that offices can be an important tool. In order to succeed, one must be able to translate the visions and objectives of the organisation, to understand its needs, and to challenge the organisation to state and redefine its assumptions of what space can do for it. Then this must be transformed into a brief and a design for new offices. In most of our case studies, the translation from needs to brief to design has proven to be the most difficult task. That is why we have decided to pay special attention to methods and tools which can serve as facilitators in the transformation process. In this paper, we have focused on the translation of the users' or organisations' needs to actual designs, and on tools to aid development and translation: Boundary objects. In our work we have applied an operational definition of boundary objects as objects, methods, and processes which can facilitate development of user needs (the process of briefing), and aid the translation of the brief into architectural designs by engaging different actors in different parts of the process.

THE BRIEFING AND DESIGN PROCESSES

In the traditional picture of the building process, and thus also the briefing, one development phase has to be completed before entering the next phase. In early planning there is a tradition for developing and discussing the needs of the stakeholders/users, and to summarize this in a written document: the brief. Most architectural competitions are based on this understanding of the process. In other cases, the awareness, formulation, and statements of needs are parts of an iterative process, which cannot be separated from the organisational development and context, or from the architect's growing understanding of the problems the design will answer to.

> "Design and briefing are integral parts of the same process with much of briefing carried through the process of design. During this process the language used by the organisation is translated into the language of building" (Blyth et al., 2001, page 21).

In order to understand the client's and the user's needs and wants, briefing is a process in which all factors related and connected to the organisation's visions and goals are purposely compared. The process is an 'iterative, reflective and interactive process', where ideas are tried out, rejected or adapted, or gradually developed and detailed (Blyth et al., 2001). In the process, within several participants involved, and hence dissimilar expectations which must be managed, communication depends on the interaction and cooperation between them, as well as how information is structured and managed (Blyth et al., 2001).

To ensure success in briefing, some complications must be avoided. A crucial factor often revealed in building projects is that the decisions are taken on unexpressed, diffuse, or unexperienced visions about the organisation's future. If the input to the design team is deliberately vague and ambiguous, it can deceive the designers and conceal the organisation's real intentions, just as the suggestions from the design team can make the organisation and the users confused by not matching their expectations. This can result in an iterative process that ends with a less than optimal solution. Hence, a wide and highly effective system of communication is important when briefing (Blyth et al., 2001).

Like the briefing process the ‘design process is iterative, reflective and interactive’ (Liedtka, 2000). In their book *Managing the Brief*, Blyth and Worthington describe the design process as ‘a process of argumentation and experimentation’, in which the design team has shared information and discussed ideas and several topics for a considerable time, by ‘using sketches, photographs, models, literature’ and sometimes excursion to buildings ‘as a means of communication’ (Blyth et al., 2001). Donald Schön describes the process as ‘a “shaping process” in which the situation talks back continually and each move is a local experiment’ caused by the trial of the redrawn problem, ‘as series of “what if” hypotheses, selecting the most promising one for further inquiry to a more evaluative “if then” sequence’ (Schön et al., 1994). Even if design is a very ‘complex and sophisticated skill’, in which the majority must be trained and practised, design thinking is a knowledge which can be considered, attended, and developed as ‘playing a sport’ (Lawson, 1997). This understanding of the building- and briefing process poses new challenges for architects and designers. As Duffy and Hutton describe in their book *Architectural Knowledge*, architecture is a ‘practical, project-based and site-specific discipline’, in which problem solving is a cycle of planning, doing, checking, and action, which makes it ‘open-ended and systemic’. Architects are naturally ‘idea-hungry and solution-orientated’, anticipated to be capable to connect and reformulate in design, ‘both practical and cultural’ (Duffy et al., 1998). But they are also under ‘social pressure to be creative’, by feeling induced to an expected diversity in methods or solutions in every new project (Peña, 1987). In his analysis, Donald Schön assumed that competent practitioners as architects, engineers, planners, managers, ‘usually know more than they can say’, which means they hold a tacit knowledge, an intuitive knowledge which makes it possible to exercise ‘reflection-in-action’ in the briefing process (Schön, 1995). In order to meet the challenges posed by the strategic perspective on workplace design, architects have to develop their design based on a deeper understanding of the organisation and its needs. We argue that by being more aware of the importance of translation of information and understanding from one stakeholder and one context to the next, and by developing new tools to facilitate discussions to aid these critical translations, architects may be able to design workplaces that better answer to the organisation’s needs.

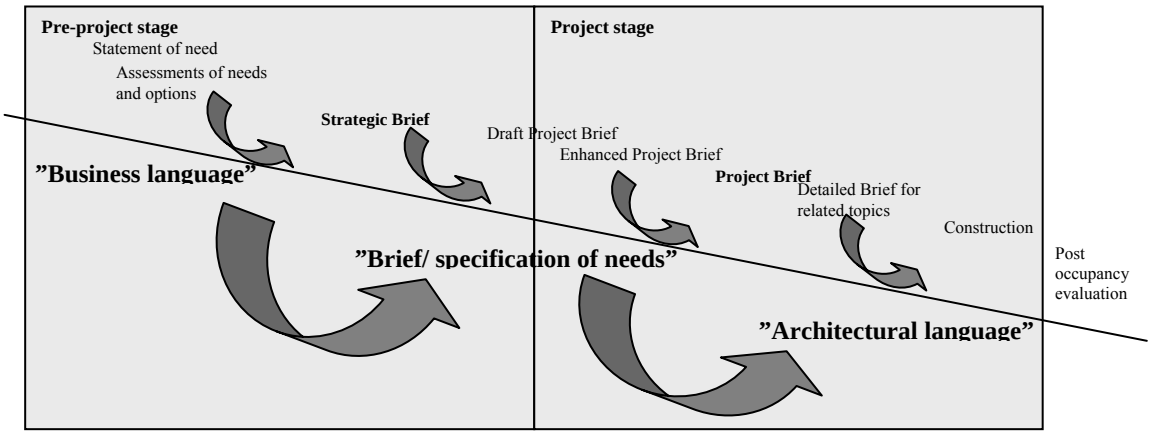

Figure 1. Translations and the stages in the iterative briefing process (Illustration stages based on the work of A. Blyth and J. Worthington (2001)).

LANGUAGES AND TRANSLATION IN BRIEFING AND DESIGN

Briefing and design processes are iterative and creative processes of suggesting and developing ideas and plans, in order to find more appropriate solutions. The effect of

learning from experience through these processes, gives a better achievement. In this picture, it is important that the information supplied is neither more, nor less, but exactly as much is needed, to fulfil each of the participants' duty, structured as **'who** should give and receive **what** information and **when**'. The processes demand a 'horizontal communication' (Blyth et al., 2001) or a mixed mutual and common language, described as multilingual (Sørensen, 2002). Schön claims that 'a transformation is demanded, within a framework of accountability', where the designers manage to facilitate the dialogue with the client performed as a 'reflective conversation'. Methodically using perception, comprehension and representation (Schön, 1995), the designers will produce more insightful solutions.

In most office innovation literature the importance of defining the contents of workplace terminology is stressed. In *The Office. The whole office and nothing but the office*, the authors claim that a common language is indispensable, owing to the fact that the organizations market their ideas and concepts by creating their own terminology (Vos et al., 1997). Employing "team-work" and "collaboration" as collective terms for every interaction with other people, prevents designers from using them as precise terms that result in more precise responses as they design spaces to support group activities. Designers can serve clients well by first defining these terms in specific ways that help them to understand their real aims (Myerson et al., 1999). In the research project "The KUNNE workplace" (KWP), a typology of workplaces is used as a tool to aid communication when defining and designing knowledge workplaces (Gjersvik et al., 2004). Defining terms and creating a common terminology can be used as one type of boundary object.

BOUNDARY OBJECTS

In the building process, there is a development from the business language of the organisation to spatial requirements (sometimes defined in written text - the brief) and into architectural design. In the constructing process, the architectural design is translated to the constructor's language, and thus transformed and translated into a physical artefact. In all these transformations there is a translation, which is facilitated by using different kinds of boundary objects.

We have used the term *boundary objects* to gain new methodological insight to the process of briefing and design, by connecting to theory developed in knowledge management. In the KUNNE project the term "boundary objects" has been used in order to describe 'objects that become shared foci for the attention and explorative activities of people with initially different interests, expertise and language' (Carlsen et al., 2004, p. 229). The importance of the "half-worked" nature of the objects has been highlighted, allowing participation in development and construction of the boundary object. The building in use, and the organisation using a building, can also use boundary objects in order to evaluate, improve, and learn. Different kinds of boundary objects can thus be used in different phases in the building process, see figure 2.

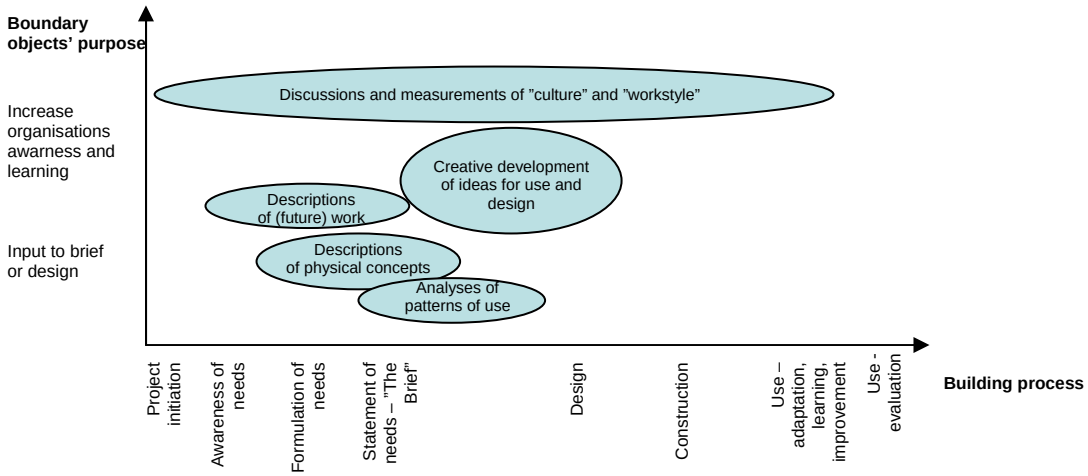

Figure 2. Examples of boundary objects used in briefing and design.

EXAMPLES OF USE OF BOUNDARY OBJECTS AND TRANSLATIONS

In KUNNE researchers have facilitated several briefing processes with different stakeholders involved, and developed different tools and methods in order to facilitate the development of awareness, understanding, and new solutions. The illustration shows some of the boundary objects we have been working with. The different boundary objects have been used in real cases with different organisations. The research has been action based, involving researchers both in the development of the projects and in evaluations and analysis. An open general framework has been used to be able to compare the different case-studies. In the following text, we describe some of the boundary objects which are developed to aid translation from awareness of needs to workplace in use.

Example 1: Statement of vision and goals

In all projects, the business' strategic management was involved in the process. Formulation of the business' objectives by new offices in a new building, or by remodelling existing offices, were discussed and connected to ongoing strategic processes. We found this to be one of the most important phases in the project. It forces the organisation's management team into a discussion of what they want their new workplaces to be. In our experience (Blakstad et. al., 2003a, 2003b, 2004), many managers are not aware of the strategic possibilities in developing new workplaces. A common process, deciding what the main goals should be, should ensure involvement and commitment from top management. It is also important to prioritize between possible and conflicting goals. The output of these strategic discussions, including statements of visions and goals, has been used in the later phases of the project. The process ending with a statement of strategic visions and goals has been the most important means to communicate the main objectives to all actors in the process.

In one project, the main goal developed by the management team was: *"Enhance learning, sharing of knowledge and collaboration in production of knowledge"*. The main goal was specified into general directions for the type of space and technology they wanted, e.g: "Open space workplaces for all employees, including top management". The

statement of vision and goals was communicated to all employees, designers, and major decision makers. When we later evaluated the new office environment, enhanced learning and co-operation were the two most significant improvements (Gjersvik et al., 2005). Other projects have taught us that success is probably not solely due to the quality of the vision statement, but due to the fact that the top management and project management used the statement actively to create a common understanding of what they where trying to achieve. The vision statement served as a boundary object, created by the management team, but later discussed and understood in different phases of the project and between different stakeholders.

Example 2: To increase the user's awareness and learning

The comprehension of the organisation's context, visions and goals, needs and resources, is often rather vague. The awareness of different types of work, organisational and external challenges and possibilities, must be heightened in order to take advantage of the possibilities related to designing new workplaces. In KUNNE, we have developed different techniques for facilitating discussions to increase awareness and learning of individuals, groups and the entire organisation's needs and use of space. The aim is to develop greater consciousness, for use in discussions in briefing and participation processes. In one case, different kinds of boundary objects were used to facilitate these discussions:

- Taking the pulse – the organisation's culture
  Based on a short questionnaire, we developed a profile with two dimensions (flexibility – control and level of bureaucracy). The profile represents the organisation's present culture, and is used to facilitate discussions about how the culture could be developed into the new situation.
- Taking the pulse – the organisation's work types
  A short questionnaire produces a profile along the same dimensions as used by Duffy (Duffy, 1997). The relation between the rate of interaction or autonomy and rate of individual or collective processes produces a picture of the present situation. Again, this is used to facilitate a discussion of what the organisation would like this to develop into.

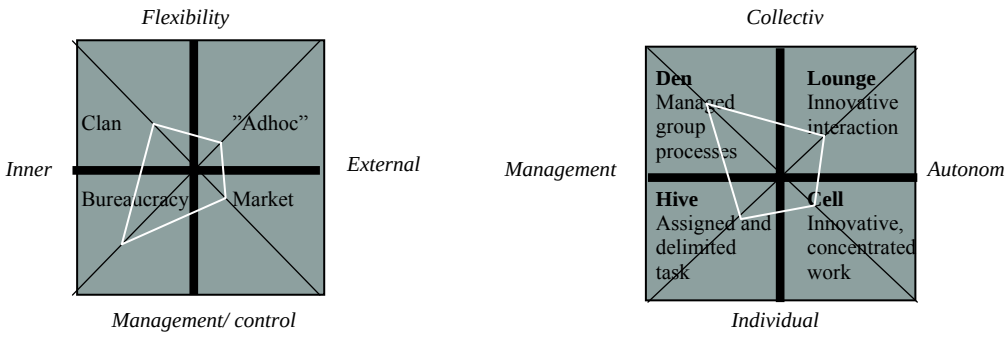

Figure 3. Diagrams of "Culture" and "Work types". (Both methods and diagrams based on the work of M. Hatling and T. Paulsen, SINTEF. From the KUNNE workplace project.)

The purpose of these processes was to open up the users' minds, to help them understand their work activities, their needs, challenges, or possibilities, as well as to understand their

organisation's culture. The researchers participated as facilitators, helping the organisation to learn and to express their needs. The researchers assisted them through their discussions. With metaphors and symbols, the users managed to see the opportunities of changing the physical environment, and were able to ask the substantial questions about who they are, and who they should be as workers in the organisation.

Example 3: Descriptions of (future) work
In most cases, space is only one of several supporting mechanisms at the workplace. Information and communication systems, management and leadership, services and other supportive functions will, together with space, define the physical environment in which knowledge work is performed. In many of the KUNNE projects we have used workshops to develop a typology of knowledge work in that particular organisation. The underlying assumption is that different kinds of knowledge work require different work settings. To each work type, the effect of the physical environment was studied. Some of the typologies in different projects are (Gjersvik et al., 2004): System-based customer support, Project development, Management, Complex problem solving in teams, "Deep diving", individual concentration and "Snorkling", individual concentration.

We have often used the work typologies together with the next example of boundary objects: descriptions of physical concepts. It is crucial that the architect takes an active part in these discussions in order to understand the implications for the final design. The descriptions of work are worthless if they are not followed by a design that answers to some of the challenges discussed in the process.

Example 4: Descriptions of physical concepts
Another assumption in KUNNE, is that organisations should focus on what they "want their space to do for them". This will better facilitate a process that leads to solutions that fulfil the underlying objectives compared to a discussion starting with the users "what should the workspace look like". This has resulted in a workplace typology based on function (Gjersvik et al., 2004):

- Space for learning, communication and co-ordination in projects: Project rooms of different sizes and shapes. Enclosed, shared team space with individual, temporary workplaces.
- Space for change: Flexible size and furniture in order to rearrange project rooms as projects and teams change.
- Space for creativity and communication: "Process rooms" for active, team-based work and discussions. Enclosed space equipped with the necessary technology.
- Space for concentration: Some cellular offices for people with special functions, "library", quiet space for people with their workplace in project rooms.
- Space for bringing the right people together: Includes external consultants in teams – workplaces for guests in project rooms.

We have also developed "catalogues" of different functions and the spatial requirements related to them. The workplace typologies form the basis for these guidelines, intended for use by different organisations in planning of new workplaces.

Example 5: Creative development of ideas for use and design
As a result of the lessons described above, we have experimented with other kinds of processes in order to prepare the organisation for new workspace and to make them aware of the possibilities they are facing. In one case, a new office for architects/researchers, some of them researchers in the KUNNE projects, we were both users and designers in a participatory process to change our own office. A schematic space plan was developed based on the experiences with office innovations and research. The main goal was to enhance co-operation and to show a distinctive identity. It was decided that the collective space should be prioritised on the expense of individual space. It was also decided that we should reuse most of the furniture and equipment, both to keep cost down, but also to reuse resources for environmental reasons.

As a method during the briefing processes, a creative process was arranged as a day-long workshop directed by Oasen, a "physical-surroundings lab" at the Norwegian University of Science and Technology (http://www.idefondet.ntnu.no/oasen.htm). Different methods were used, encouraging people to write, draw and build metaphorical models to develop and test ideas collectively. Different tools and boundary objects were used together, as translation from the users' ideas, needs and dreams both as individuals and as part of the same team. Some of the tools used in the creative process were: metaphors, e.g. illustrations and words, toys, e.g. animals, stickers to write words and thoughts on, paper, e.g. a paper reel, colour-pencils and crayons, and strips of different kind of cloth.

DISCUSSION
In this paper we have focused on the translation of user needs to knowledge workplace design. We have based the translation between the pre-project stage and the project stage on a commonly used (at least theoretically) understanding of the building process as an iterative process. The iterative process ranges from formulation of needs, requirement and constraints from strategy to project and detailed brief in workplace planning and design. Based on previous work developing typologies for workplace design (Gjersvik et al., 2003) , and description of physical concepts, we have based our case-studies on the boundary objects developed in the KUNNE project. The boundary objects are 'objects that become shared foci for the attention and explorative activities of people with initially different interests, expertise and language' (Carlsen et al., 2004, p. 229). Our findings in several action research-based case-studies, show that a better translation of user needs is attained by the use of boundary objects as:

- Discussions and measurements of "culture" and "work-style"
- Descriptions of (future) work
- Descriptions of physical concepts
- Analyses of patterns of use
- Creative development of ideas for use and design

From our experiences with using boundary objects in the KUNNE project, we have learned that it increases the user's awareness and knowledge of themselves. Using boundary objects in the project helps the user to better understand the work types and their distinctive character, and creates a better environment in which different actors work and co-operate. Finally, boundary objects makes the translation to environmental design/architecture easier.

A well-described set of work types and required functions will not automatically ensure that you get a design that fit your descriptions. The translation may not be performed correctly. This may be due to the fact that the architects' problem solving is triggered by other types of information, and that describing too much in detail may be counterproductive. One way to avoid this problem is that the architect or designer takes part in developing the solutions – which means that you do not separate the development of descriptions and the first development of spatial concepts. The purpose of briefing may also be development of the organisations' awareness in order to make them demanding and productive clients. This will usually also make them able to use the new environments to their advantage, because awareness of their use of space has been heightened. Tools to facilitate discussion and to enhance self-awareness and visions and goals are, in our experience, the most efficient and effective tools when working with the user organisation.

Acknowledgements
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