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Abstract

This paper is concerned with two approaches to designing spaces for knowledge work. The central concern of the first approach is with the use of fictional descriptions of the workplace, in order to stimulate creative thought about new workspaces. The second approach draws on the emerging potential of three dimensional virtual reality as a tool to develop shared visions and to stimulate creativity. The paper ends by summarising findings in three important dimensions of knowledge management in business:

(a)   The nature of knowledge work and its workspace requirements
(b)   Specific processes for developing creatively shared insights and understandings by potential users about future knowledge spaces
(c)   The overall philosophy of design of such spaces

Introduction: The design problem

There is a rapidly increasing interest in the principles of design of spaces for knowledge work. These have tended to examine the desirable end states sought for those spaces. However, in practice the process of design of such spaces is often problematic. The classic processes of architectural design tend to work best at making evolutionary adaptations of well-established formulas of space. But spaces for knowledge work, often searching for innovative and original configurations, lack such well-established formulas. This suggests that the classic design processes may be of limited relevance in this context (Brand, 1994).

In carrying out our researches into the relationships between knowledge and physical space, we have studied a wide variety of office environments internationally, both from research and from consultancy perspectives. We have, however, often found it difficult to communicate either the detail or the strategy of these environments to third parties. Floor plans are difficult to understand for the uninitiated. Photos are two dimensional as, ultimately, are videos. More significantly the photos and videos of real offices rarely provide sufficient significant insights into the organisational reality and organisational culture involved. So this has often caused difficulties in establishing a shared understanding of what is possible when designing new offices, and of situating that understanding in the critical area of organisational culture.

We therefore began to explore methods which could more quickly generate a shared understanding, and situate office design within some realistic assessment of specific organisational culture. We discovered firstly, almost by accident, that one of the most fruitful approaches has been to draw not on real-life office spaces, but on fictional offices. Subsequent study has unearthed at least two precedents. The first was the extremely impressive work carried out for the French exhibition "L'Empire du Bureaux" (Centre National des Arts Plastiques, 1984) Secondly is a strand within both architectural and film criticism that draws parallels between real and fictional architecture. (Fear, 2000). We follow in these traditions of searching out and reviewing fictional offices.

We describe later a method developed for interacting particularly with executives. This is to set up an exercise whereby they identify themselves fictional offices they have seen or read about, and use these to identify or envision their likes and dislikes. In pilot interviews, we found it rare indeed for participants to be unable to recall any fictional office whatsoever. And even if they can only immediately recall one, this can often quickly spark off metaphors, associations, ideas, likes and dislikes. The fictional office can 'unfreeze' (Schein, 1992) thinking dominated by current or recent experiences. Using fictional examples enables at least some level of shared understanding of the office under discussion, though this does depend on most participants being aware of the fictional example.

Fictional representations have a number of potential advantages over factual representations (Brawer, 1999; Czarniawaska-Joerges and de Montheux, (1994)). Firstly, they are readily available, often in a well produced form (Penz, 1997). Secondly, fiction routinely abstracts from reality rather than describing it (Grey,1996; McAdams and Koppensteiner, 1992)). Thirdly, fiction can readily represent the unreal and the non-real. The hypothesis was that film, fine art and literature are transitional objects (Winnicott, 1971) that present us with a form of heightened or abstracted reality that enables us to stand back and form opinions on office space more easily than going to see real offices. Many people are also interested in fiction and can readily bring fictional experiences to bear on what is a quite abstract area of reality. The approach developed involves workshops utilising a mixture of both factual and fictional representations of the office.

In the second approach, we draw on the emerging potential of three dimensional virtual reality (VR). This approach examines the use of VR as a tool to develop shared visions and to stimulate creativity. VR may be deployed to visualise and discuss different design ideas, to enable creative work place changes and to design new spaces. *Design@Work* is a multidisciplinary research programme about workplace design integrating information- and communication technology (ICT), work organisation and architecture. The full-scale laboratory at the Lund School of Architecture provides excellent premises for experimental participatory design work, which allow actual users develop their ideas by using different models and mock-ups, with a case-oriented research approach (e.g. Hornyánszky Dalholm 1998; Davies 1999; Wikstrom 1998).

First approach: fiction and the knowledge office

There are at least four separate domains of the fictional office:

> Fine Art including Sculpture and Murals
> Literature
> Movies and TV
> Plays and Musical Theatre

Based on our experiences in dealing with middle to senior managers, there appears to be a small but distinct minority who have ready mental access to images of the office from fine art, plays or literature. For the great majority, their stimulus is provided by moving images, typically overwhelmingly from TV. This can sometimes by problematic, as the most readily cited TV office spaces seem to be detectives' offices, military, hospitals or law firms. These four locations face special design issues in real life, and TV representations tend to simplify or exaggerate reality. Nevertheless, they still have useful roles to play as a result of their accessibility and breadth of viewer base.

There is a very substantial literature in relation to architecture and film. In part, this is because film often itself depends heavily on built structures. Therefore architectural skills can be deployed in the creation of films, but with the great advantage of not having to conform to the constraints of a contemporary real-life building. The architecture in film can therefore be a legitimate area of study by architectural researchers. Secondly, architectural statements made in films can at least be seen as a commentary or criticism of the state of real world architecture which the film may, for example, be parodying. The analysis of such statements is therefore of interest to media, critical or cultural studies researchers concerned with the societal role and context of media such as film.

Thirdly, the architecture used in film is one of the important variables which can be deployed for artistic effect in the creation of the film, and is therefore an important area of analysis for those involved in educating and training the various craft groups needed in the film industry. Fourthly, the examination of the intersection between two intersecting areas of artistic endeavour can simply be an interesting area of study in its own right, without the need to fulfil any higher or broader purpose.

Finally there can be a range of other reasons. In our particular case, for example, we are not primarily concerned with any of the above areas, although our interests do overlap with the first two categories above – the architectural and cultural researchers respectively. Our focus is on the use of fictional representations of offices as a device to improve general management interest in, and awareness of, the 'real' office. We are specifically concerned with the use of fiction as a device to stimulate greater reflection about current configurations of offices, as well as to provide a framework for supporting the planning of new office spaces.

Fictional Office

It has not proved as straightforward as initially expected to delineate between the 'real' and the 'fictional' office. Some (Geertz, 1988) believe that:
"there is no clear difference between fact and fiction. There are varieties of realism, and there are many textual strategies available to an alert author. Does it mean that we should all become novelists?"

Our dividing line between the two relates essentially to intention on behalf of the creator or designer. Our boundary is at the point where the author clearly intends the office displayed to be fictional rather than real, even if that office is not actually and may never be real.

One example we chose to define as non-fictional are entries in architectural competitions. Even though most of these will never be built, and even though some are designed to surprise rather than win, their creators are at least normally constrained by the possibility their creation may need to be constructed. Where competition entries are, however, deliberately speculative and not intended for construction, these can be treated as fictional.

A second non-fictional category is the use of conventional plans, illustrations, 3D models and electronic virtual reality models of office environments, whether for competition, or for proposed or actual offices. In some sense any model only stands for a real object, and is not the same as the object itself. Some drafts of real projects may be totally revised and/or abandoned, but their intention remains in our view non-fictional.

A third non-fictional category are images of actual office buildings (literary, photo or video) which treat those buildings as real. Some real offices may be used as backdrops to fictional events – we call these fiction even though the same offices could have been used almost identically in a non-fictional context. For example, the offices in Alphaville are wholly real offices, but are clearly used by Godard fictionally. A very difficult area relates to paintings and photos which, while manifestly of real offices, manage to abstract features of those offices to the point of fiction. In the case of photos this may not even require filters or special effects, but could reflect e.g. very unusual camera angles or close ups. In paintings, a level of abstraction is almost inevitable, but some painters did and do genuinely intend to create a "realistic" painting rather than a fictional work.

Categories of Office

In our general study of offices we have developed one broad categorisation which distinguishes between spaces needed primarily for information work, or what Kidd (1994) helpfully calls 'procedural' work, and those primarily needed for knowledge work. We have then been interested in special purpose office spaces, particularly for the strongly differentiated spaces needed for control and for creativity respectively.

In TV and film media there is a heavy domination of a narrow range of sectors, namely:

-     legal/detective/police offices
-     medical/hospital offices
-     newspaper and TV offices
-     military offices

Our initial inclination was to exclude these stereotypes from consideration, partly because their fictional representation has often become so trite and hackneyed. However this would then exclude such a significant proportion of TV and movie offices, that our own task could itself become constrained.

Dimensions of fiction and reality

Because we have examined a large number of fictional representations of the office, we have felt it important to develop some method of structuring or analysing these diverse representations. This is particularly so we can begin to search for patterns or for gaps.
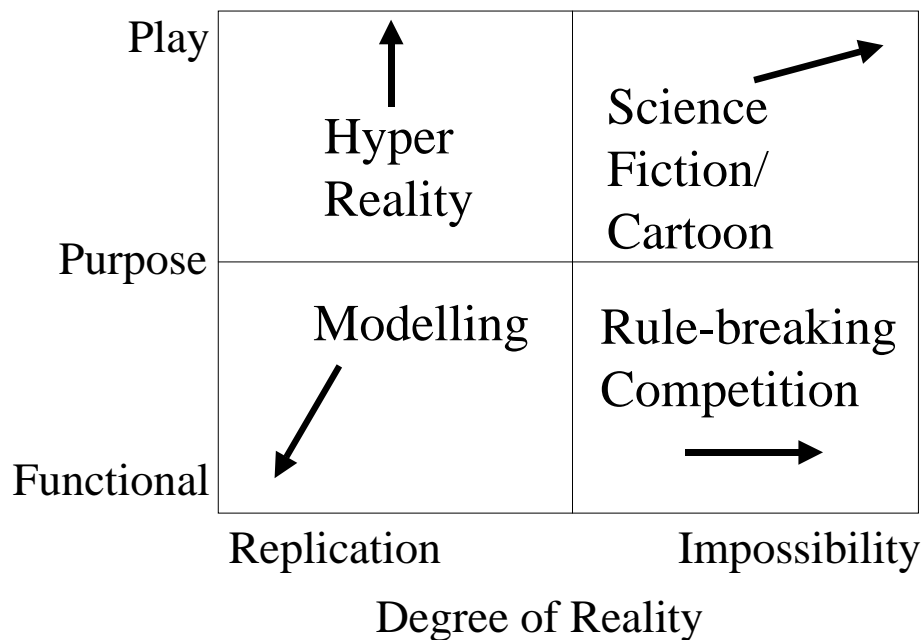
Figure 1

Our framework for initial analysis (Figure 1) takes account of what we have come to believe are important dimensions. These are "Degree of Reality" and "Purpose" respectively. In the reality dimension, it is not difficult to characterise the two extreme positions. One form of art attempts to replicate the real world in a naturalistic or photographic fashion. At the other extremes are the art forms that set out with the opposite objective – to create wholly fictional representations, that would be impossible to create under any practical circumstances. Having set out these two extremities, there are a very wide range of intermediate positions which can be less straightforward to plot on a scale than the extremities themselves.

The second dimension relates to "purpose". We have conceived of this primarily from the perspective of the artistic creators themselves. However, we also need to recognise that the "users" of the artistic work can utilise the art work for purposes that were never within the original conception of the artistic creator. Focusing for the moment on the creator perspective, our two end points are 'functional' and 'play' respectively. At the functional end, the artistic purpose is, for example, to inform or stimulate. An advertising agency creates a fictional storyboard or advertising video in order to sell a product. At the 'play' end, the artist is making no necessary attempt to serve any specific purpose, let alone a functional one. They may well be seeking to challenge, criticise or parody reality itself, or the functional representation of reality. Some play examples require scrupulous attention to reality to heighten the effect of the unreality elsewhere. For example "Fawlty Towers" or "Mr. Bean" represent a particular brand of anarchic British comedy. Yet each uses realistic sets – in the case of Mr. Bean actually mostly real locations themselves. We would characterise the quadrant of 'high play and high reality' as hyper-reality. 'High play and Impossible Reality' would most commonly be found in science fiction on the one hand, or cartoons on the other (e.g. Dilbert's management consultant as dog – Dogbert).

It is possible to have artistic endeavours in the 'Functional Purpose/Impossible Reality' category. We would particularly identify design or architecture competitions which actually solicit rule-breaking entries which explicitly seek to extend our understanding of the real world through at least at yet physically impossible creations. The final quadrant is 'high reality/functional purpose'. This is the domain of realistic modelling of reality; perhaps to record reality (as in a painting or photograph) or to simulate it, as in an architectural model.

Initial Interest

Our initial interest with the office in fiction came as a result of a highly instrumental aim – to find stimulating materials that could be used to inform and challenge executive users of office space, about their own needs. We wanted to provide, as in any educational case study, a shared context for discussion that is probably abstracted from reality but retaining a coherent context. Fiction provides ready-made, visible, tangible and discussible case studies of offices. It also exaggerates and distorts reality, as in parody. Furthermore, fiction can extend reality, as in science fiction. It can enable exploration of the unachievable or the unthinkable.

In our second phase of interest, we moved beyond the highly instrumental, to begin to take an interest in the fictional offices in their own right. We began to look at them not as prototypes or critiques of real offices, but either as fun or as intrinsically an object of study in themselves. As we increasingly used fictional offices for instrumental teaching and learning purposes, it soon became relatively clear that more than a transmissive or didactic learning model was possible. We found that most managers could recall at least one fictional office. And a minority of managers could in fact very quickly reel off a continuous stream of recollections about fictional offices. This then enabled a deeper reflection about the features of current and future 'real' offices. The latter group of managers were often very quick to be able to combine likes and dislikes about real offices, drawing on fictional representations that highlighted these likes and dislikes. We suspect it would have been quite difficult to articulate likes and dislikes in words or even pictures. By referring to already-existing fictional examples, it was much easier to convert opinions into a form that could be examined by third parties.

The Office of the Future Workshop

This workshop was developed for a consortium of organisations, and was aimed to increase the awareness of middle managers about the issues and options faced in implementing the office of the future. The workshop was run three times, with 10-20 different managers at each 2 hour event. The first event (OOTF#1) was run conventionally, using a combination of PowerPoint slides and small group exercises. The subsequent events (OOTF#2 and OOTF3#) had exactly the same published theme. But instead they set out to use primarily fictional representations of the office to stimulate thought, to provoke reactions, and to accelerate thinking about the desirable characteristics of the offices to be implemented in the managers' organisations within the next 24 months.

Three broad methods were evolved to deploy fictional examples:

1.   Free-format: delegates were initially asked to draw on their own recollections of fiction which reflected good and bad practice in knowledge sharing and knowledge creation.

2.   Photographs: delegates were provided with laminated photos of fictional (and some real) offices and asked to analyse, from the perspective of a consultant, how they felt knowledge was managed and space deployed in that organisation.

3.   Videos: Specific video clips were shown as a basis for whole group discussion.

In relation to the choice of fictional examples, a long list of over 30 videos and numerous still images was drawn up. Since the focus of this particular workshop was specifically on knowledge sharing and creation, not all the examples available were relevant. The final selection was then made on the grounds of relevance, on the visual impact, and on ease of rapid interpretation.

Workshop Findings

The free-format questions on fictional offices proved to be much more problematic in the workshops than in the pilot interviews. Indeed a significant minority of delegates claimed not to be TV or film viewers, or book readers:
        "I'm too busy to watch TV"
        "Haven't been to cinema in years"
        "Never read novels"

In relation to the responses to photographs, many of the answers were extremely perceptive. The groups were able to demonstrate very great insights into the way businesses actually worked. Here are some typical analyses:

Clip/Image 4a

Organisation – Non identity, bank, factory, conditioned, self-depreciating

Communications – formal methods

Primary purpose – control

Office layout features liked – spacious not your own space!
Office layout features disliked – no communications, very solitary. Institutional

Notes – Awful

Clip/Image 12b

Organisation – structured open planning

Communication – technology, informal methods

Primary purpose – knowledge creation

Office layout likes – own space of equipment, open planned, team working and knowledge sharing
Office layout dislikes – lack of natural light, own space but too cramped, no provision for private meetings.

Notes – desks need to be separated

Clip/Image 12a

Organisation – NASA, timebomb feel

Communication – technologies
Primary purpose – knowledge sharing

Office layout features liked – no furniture, facing each other
Office layout features disliked – too official, too much plastic, no views, no escape

Comments – use of natural material and surroundings e.g. wood, plants

The emotionally hard part for the organisers was that by mixing examples of real and fictional offices, there were probably somewhat 'better' answers stimulated by the real offices. The groups looked in great detail at the rather fuzzy pictures.   They were extremely opinionated ('no redeeming features') and usually had very sound judgements. They took a lot longer to interpret the first photo than the second and third so they were very quick at learning how to do the exercise.

Our hypothesis that fiction would in itself "unlock" and unfreeze mindsets was not really proven. Delegates related well to real and to fictional offices – but they responded particularly well to the realistic detail in the real offices. It may have been that the use of visibly famous actors such as Michael Douglas made delegates discount the value of some of the fictional examples. However fiction did make the exercise more fun. It also enabled use of unusual images (hot bath/locker room especially) and enabled interesting video to be used. It felt more stimulating as presenters using the mix of fact and fiction. Finally there was also a game element in delegates guessing what was fact and fiction. We have continued to actively use fictional examples subsequently for these reasons, but the feedback has shown that a mix of real and fictional examples is probably more useful in stimulating ideas than using only fictional examples.

Second Approach: Virtual reality as fictional descriptions

Technology helps us creating places, both real and virtual in which we can perform. These phenomena have significance for how we can use place as a point of view for understanding and reasoning about human activity. Through computer technology, we can give a person the ability to move their centre of perception and to act within that place. This technology is called virtual reality (VR) and the model inside the computer a virtual environment (VE). Design@Work is a multidisciplinary research programme about workplace design integrating information- and communication technology (ICT), work organisation and architecture. New methods and tools for participatory design are developed to strengthen the user role in the design process and to facilitate the interaction between users and designers of buildings and ICT. The full-scale laboratory at the School of Architecture provides excellent premises for experimental participatory design work, which allow actual users develop their ideas by using different

models and mock-ups. In order to develop conceptual tools for the understanding of new conditions of work the uses of ICT and architecture are studied in their daily life contexts, with a case-oriented research approach (e.g. Hornyánszky Dalholm 1998; Davies 1999; Wikstrom 1998).

The context of the studies are the Envisionment Workshop, in which groups of workers use different envisionment techniques in designing work places, including full-scale modelling, pedagogical drama, democratic meetings and VR technology. The Envisionment Workshop is a design methodology based around participatory design through visualisation and user involvement (Ehn et al 1996). It is a collection of techniques aimed at assisting in participatory design in connection to changes of work places and it covers aspects from the physical to the organisational level. The techniques are combined in order to visualise and discuss ideas. To enable creative workplace changes these techniques are used as means to establish a common language and communicate design ideas among the participants. The goal is to enhance the possibilities for design, visualisation and communication within a group. Our way of using VR as a visualisation tool has been developed and described by Davies (2000). These studies were part of the efforts to investigate whether VR technology could complement the other envisionment techniques as a useful tool. The purpose was to determine the usability of VR technology. It was vital to test the tool using real design situations to provide high ecological validity; thus the exploratory case-study approach was most appropriate.

The studies were carried out over approximately four years, between 1996 and 2000. Eight studies that included VR usage has been reported in detail (Davies et al 2000) and is here discussed a bit further from a visualisation point of view. This for the purpose of comparing it with the other visualisation approach to create fictional descriptions for workspaces described in this paper. A set of tools was used in sequence, parallel or integrated, and combined into an Envisionment Workshop. The series of studies performed were a combination of real design situations and more artificial situations, as well as technical tests of VR usage for a group-design situation. VR was used both as an active design tool and as a passive visualisation tool, and also, used at different stages in the design processes. Standard desktop VR was mainly used, with a simplified interface, to allow design by novices.

Workers have tacit knowledge about their work environment that is necessary to bring forward. This task forms the basis for the work of the multidisciplinary team. The object here was specifically to explore the usage of VR as an envisionment tool in the process of workplace change. Participatory design differs from design-by-consultants in that it actively includes the actual workers in the whole design process. The primary aim is not to model reality, but rather to awaken thoughts and associations, to promote the creative process and to consolidate ideas about spaces, people and activities within those spaces. These ideas are then in turn fed back to cause further alterations in the design of the spaces (Davies et al 2000). The studies included design of a new university in the region, redesign of two reception areas, refurbishing an existing workplace, testing the methods and tools on psychology students as well as architecture students, and finally two technical tests of collaborative use of VR over a network with several participants, one of them described below.

In the fall of 1999 the group carried out an experimental study to gain some initial experiences of using a virtual reality tool for collaborative modelling. Several case studies have earlier been carried out to investigate if a simple and intuitive VR based tool could be built to support participatory design (Davies 1999). The aim of this particular experiment was to investigate the possibilities of long distance collaborative design in a virtual environment. The task was to collaboratively design a virtual work place in the shared virtual space on the screen. The three Silicon Graphics Octane MXE computers with the VR program dVise (from division Inc.), with a spaceball, a mouse and 3D crystal-eyes, were located in different institutions in southern Sweden. There was one group of researchers in front of each computer at the three locations. The researchers communicated through voice via an Internet conference system (SGIinperson) and through a 'chat' whiteboard program (SGImeeting). In the virtual environment the groups could see each other as so-called avatars. In the experimental study the virtual environment represented a real work place quite satisfactory. The participants apprehended the virtual place as an interaction space for designing and communicating ideas in a smooth and unconstrained way (Rosander 2000). Even though, there were some technical difficulties and also some problems in relating closely to those located at the long distance sites.

In much the same way as role-play can be used for trying out a full-scale environment, scenarios can be used to testing a virtual environment. The participants agreed that the physical environment has a large effect on how people can work and co-operate. Henceforth, it was vital to test how possible situations would be effected by the design suggestion at hand. The scenarios should include ordinary as well as more unusual events that can occur within the work practice, in order to catch as many perspectives as possible. Acting out the different scenarios in the virtual environment helped the participants to visualise daily work procedures and hereby also getting alternative suggestions about how to perform their work.

So far VR has foremost been used as a tool for visualisation in the design field. But, the technology offers wider possibilities in helping constructing new and innovative visions for workspaces. It is a fruitful media to visualise and discuss a suggested design. The results from the eight studies indicated that VR could play an important role in the consolidation of ideas about a workplace, but that it works best as part of a toolbox of envisionment tools. The combinations are needed in order to activate tacit knowledge, appreciate space and test an environment's functionality (Davies et al 2000). The suggestion is that VR has beneficial potential for especially context visualisation when designing workspaces. The main conclusion was that a variety of tools helped in giving opportunities for ideas to develop and tacit knowledge to be elicited. In regard to VR, it seems be more important that objects act real rather than look real, and that a VR model preferably should look like a model as a too perfect virtual environment makes the participants somewhat reluctant to make changes in it (Davies et al 2000).

With VR, fictional descriptions of workspaces can easily be created, that seems to engage people in actively participating as well as stimulating creative ideas and suggestions. The emerging potential of VR becomes evident especially when designing new workspaces for knowledge workers. It enables innovative configurations on a solid basis that encourages playfulness and engagement. From a technical point of view the advantages are that changes is easy to make and also the extended portability of the models. The disadvantages are foremost the hard-to-operate technique for novices and technical constraints like the inability to quickly create realistic complex models.

Future Work

One UK consultant in workspace design rejects both the above visual-based representations, instead preferring to build up via purely oral discussion what knowledge workers require from their future workspaces. We believe there will be merit in comparing this method with the two described above.

At the beginning of the workshops it had been hoped that delegates would be able to carry out a brief self-assessment of their learning style in order to allocate them to teams, which would have been deliberately mixed. This did not prove practical for time reasons. We feel it would still be important in order to establish how for the fiction-based approach was attractive or not to those with different learning styles.

Conclusion

We can summarise our findings in relation to three important dimensions of knowledge management in business. Firstly, in relation to the nature of knowledge work and its workspace requirements, we have found continued support for the special significance of space for knowledge work as opposed to information or procedural work. Secondly, in view of the relative neglect of the requirements of knowledge space, specific processes are needed for developing creatively shared insights and understandings by potential users about future knowledge spaces. We have outlined two here. The more modest approach is based on workshops using photographs and videos of both real and fictional offices. The more elaborate approach uses virtual reality in allowing users and designers to assess the likely impact of space configurations. We conclude that both are of considerable potential value for the initial objectives stated. Thirdly, the overall philosophy of design of spaces for knowledge work should, in our view, take on board much more both the knowledge dimension and the participative dimension.

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