

# The development of the work environment in knowledge intensive companies with new office and knowledge management – a pilot project

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## **Abstract**

*This report presents the results of an investigation, based on empirical studies and a study of relevant literature, into the work environment of companies who have combined a strategy of Knowledge Management with the introduction of a so-called New Office. Two Danish companies were studied through observations and interviews. Specifically, the effects on knowledge sharing and –development, effectiveness and the physical and psychological environment were examined. The investigation showed that the development of an organisation through Knowledge Management and a New Office is associated with, not only an increase in the level of information and support and a sense of belonging, but also with many difficulties and dilemmas. Problems with the indoor climate, a high level of interruptions and noise, surveillance and a lack of confidentiality, a small number of breaks, a lack of personal space and territory and challenges of impression management were among the liabilities found. Pros, cons, dilemmas, and possible solutions are discussed, and a list of advice and suggestions for further research are presented.*

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## **Introduction**

These days several companies with extensive administrative, service oriented and financial tasks are developing their organisations through such concepts as “New Office” and “Knowledge Management”. In this way they try to integrate strategies of management and organisational development with considerations of work localities; the space for work. Such companies are commonly referred to as “knowledge intensive”. The systematic focus is said to be on knowledge sharing and – development through a strengthened interaction between members of staff and management. Investments are aimed at education and the development of competencies, but also at methods of measuring the element of knowledge among other aspects. The New Office concept is said to focus on the design of offices for the support of innovation, teamwork and collaborative problem solving. The interior design of the New Offices is aimed directly at supporting those activities that the knowledge sharing and –development are to contain.

The combination of New Office and Knowledge Management strategies is likely to affect the work environment in many ways. This report is the result of a preliminary inquiry, based on empirical studies and a study of relevant literature, into the effects of the combination of knowledge management and New Office on knowledge sharing and -development, effectiveness and the psychological and physical work environment.

After an introduction of the theories and methods used, the results and the discussion of these results will be presented, consistent with the above-mentioned aspects, in sections relating to the following research questions:

- How are the intentions of Knowledge Management and New Office carried out?
- How does the combination of Knowledge Management and New Office affect the physical environment?
- How does the combination of Knowledge Management and New Office affect the psychological environment?

- How does the combination of Knowledge Management and New Office affect effectiveness?

In the conclusion, we present a list of advice based on our findings and suggest future research challenges.

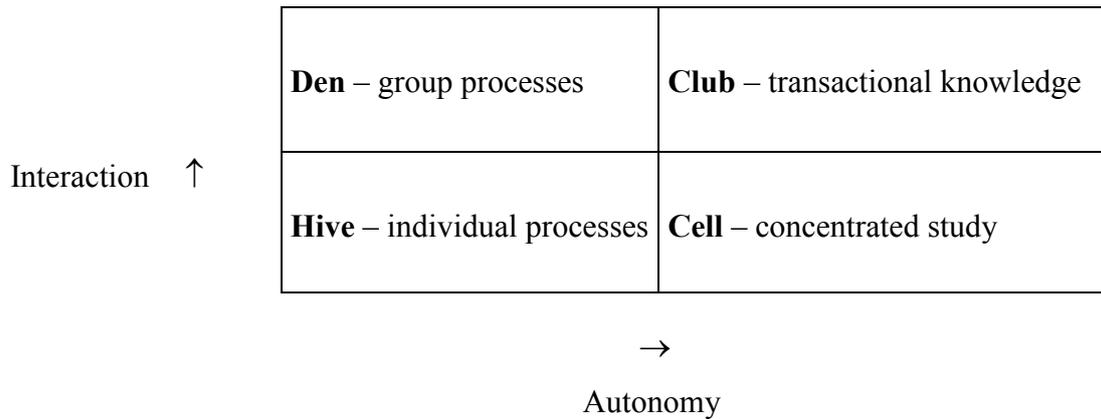
## **Theory**

### **The New Office and Knowledge Management**

The typical New Office can roughly be characterised as groups of desks in large open spaces shared by managers and members of staff. The office design is often non-territorial and apparently egalitarian, which means there is an emphasis on the possibility of sharing desks and changing places across previous hierarchies (Meel 2000). In addition to the open settings, small one-man offices are often built to accommodate concentrated work, and separate areas for breaks or informal meetings are also part of the typical picture.

One of the proponents of the New Office, the architect Francis Duffy, makes a classification of four types of office settings: The *hive* is characterized by individual, routine-process work with low autonomy. *Cell* offices accommodate individual, concentrated and highly autonomous work. The *hive* and the *cell* are characterized by little or no interaction among individuals, whereas *Den* offices are associated with group work, typically highly interactive but not necessarily highly autonomous. Work in *Club* organizations is both highly autonomous and highly interactive and designed for knowledge work (see figure 1). Duffy expects that, as information technology changes work, cells and dens will converge into clubs (“transactional offices”). (Duffy 1997, Duffy *et al.* 1998).

Figure 1



Source: Duffy (1997:61) and Duffy et al. (1998:98).

The point about the club being the ideal setting for knowledge work should not be taken too literally. The New Office is more of a *strategy* than a particular *setting*, in the sense that all four types may be relevant depending on the particular pattern of work in the organization (Duffy *et al.* 1998). The Danish consultant Ole Nielsen (2001) states a similar point in claiming that the core of the New Office is the relation between organizational change and the physical setting of the office. In general many consultants seem to see the new office is an office for knowledge work in which the setting, through IT and interior design, is as flexible as possible to allow for an increase in interaction and autonomy and the saving of time and space. In 1997 Francis Duffy made the following propositions about what the New Office would express:

- 1) Greater attention to the economic importance of better use of time – leading to moves towards intensifying the use of space,
- 2) Impatience with boundaries,
- 3) Little love of hierarchies,
- 4) A tendency towards smaller, more rapidly changing organizational units,
- 5) The importance of group activity,
- 6) The obsolescence of clerks and clerical ways,
- 7) Total confidence in the creative use of information technology, and

- 8) A new flexibility, with an ever-wider range of work settings in response to choice in the timing of work and in the ways in which it is carried out. (Duffy, 1997:56-57).

The strategy of knowledge management often focuses on the ability to adjust to the knowledge economy by the use of information technology, organisation, human resource management and an overarching strategy and monitoring (Davenport & Prusak 1998). An important motivation of companies to change to a New Office is the prospect of facilitating the sharing of information and the creation of knowledge in order to achieve a competitive advantage. In other words, the New office is often thought of as an environment for innovation.

### **Work environment and the space of work**

To study the physical environment of the New Office we have used the guidelines of the Danish Work Environment Authority as our theoretical background (see “Arbejdsmiljøvejviser 27” of the Danish Work Environment Authority). This means that we have been interested in such aspects as:

- Symptoms
- High or low heat and draught
- Ventilation
- Gassing
- Many people
- Cleaning
- Passive smoking
- Dampness
- Lighting
- Noise and acoustics
- Static electricity

The ergonomic aspects were also investigated using the guidelines of the Danish Work Environment Authority:

- Can the office furniture be adjusted to fit the individual and the work task?
- Is there enough room on the desk to keep the screen at an appropriate distance (50-70 cm), and to rest the hands in front of the keyboard?
- Is there sufficient support of the underarm for mouse work?
- Enough space on and under the table, and behind the chair?
- Appropriate level of the screen (upper line of text below eye height)?
- The quality of the screen picture?
- Reflections in the screen picture?

- Are workers blinded by any light sources?
- Are there any excessive routine work tasks (repeated every ½ minute, for more than 50% of observed period, and/or more than 3-4 hours a day?)

The guidelines of the Danish Work Environment Authority were also used to investigate the psychological work environment. However, in addition to such factors as a minimum of interruptions, an appropriate amount of breaks, social support, information and autonomy (see also Agervold 1998, Gardell 1976, Karasek & Theörell, 1990), other aspects were investigated on the basis of the theories referred to below.

The setting of the New Office represents an interesting environment for studying empirically the meaning and relevance of some traditional psychological and sociological concepts. Of special interest are theories about the importance of ‘personal space’, theories about the challenge of ‘impression management’ and about ‘territoriality’.

The concept of personal space is used to describe the tendency to guard against the intrusion of a certain physical region around oneself. Hull (1966) found that within a certain culture there are more or less implicit rules as to the distances that people wish to keep between themselves and others. The theory of impression management (Goffman 1959; see also Schlenker 1980) concerns the challenge of maintaining a certain image that goes along with social or professional roles. A group of people in a certain context mostly act in accordance with certain rules of appropriate behaviour. Thus within a social context, much work is done on creating and maintaining these rules in order for everyone to be able to save face; and across social contexts, the challenge of impression management is to maintain one image in one context and replace it in another, in which it would be inappropriate. Regarding the concept of territoriality, some writers have argued that humans, like animals, have a tendency to preserve and defend a certain region. According to Ardrey (1966), we do this as response to a “territorial imperative” that is part of our genetic ancestry and cannot be disobeyed.

The open spaces and flexibility of the New Office are likely to impose threats to people’s wishes and needs with regard to personal space and territory and increase the challenges of impression management.

## Method

We have chosen companies who have had their new office for a reasonably long time (at least one year) in order to be able to study the effects of working in the new environment, and not just the effects of relocation.

The Danish study is based on observations and interviews in two companies who have had their new offices (both a rebuilding of the old) for approximately 1½ years. The first is Birch & Krogboe (B&K), a consulting engineering company with 500 employees in which the fieldwork took place over a period of two weeks. The second is PBS, an IT-company specializing in electronic payment processing with just under 1000 employees. The fieldwork in PBS lasted for four weeks. In both companies one office of about 30 employees was chosen for the observation and interviews.

The primary research activity was observation of the ways knowledge was shared and the employees' use of space, furniture and technology in the office and other areas of the company. Along with written notes about the observations, mappings of the employees' movements and their sharing of knowledge were carried out.

In each company, 14 employees were interviewed for an average of about half an hour about their views on the potentials and threats for knowledge work, effectiveness and the physical and psychological work environment of their New Office. Furthermore focus-group interviews were carried out, one with employees at B&K and four with employees of different departments at PBS and one with managers at PBS, all with an average of six participants and an average duration of 1½ hours.

Around the time of our investigation, PBS conducted their own questionnaire survey (n=684) to evaluate the influence of the rebuilding on the employees' ways of working. The results were kindly placed at our disposal.

For the psychological part of the study, three different methodological strategies were utilized. First of all an ethnographically inspired approach (see Schwartzman 1993) was employed in order to be open to results with more nuances than what can be expected if research questions are too narrowly formulated beforehand. This was done through an attempt to "blend in" and the carrying out of ethnographic interviews (see Spradley 1979). Secondly in the focus-group interviews, the technique of semi-structured interviewing (Kvale 1996) was used to explore hypothesis about the

psychological effects of working in a New Office; hypothesis such as ‘the lack of personal space might influence the level of stress’ or ‘the fact that the manager is sitting among employees might result in a more tight control’ or ‘the required flexibility and mobility of employees might lead to territorial disputes or rather the pleasure of freedom of movement’ and so on. Thirdly, a structured and more normative approach (similar to the method used by the Danish work environment Authority) was used on the basis of work psychological findings regarding the importance of such factors as autonomy, social support, information, breaks and interruptions.

## **Results**

### **A brief literature review**

Studies of how the New Office and Knowledge Management affects the work environment are relatively scarce. In a Dutch study, de-Jonge & Rutte (1999) made a quasi-experimental field-investigation into the psychological effects of a non-territorial office concept. Their longitudinal study using tests 9 months and 2 years after the implementation of the new office revealed increased autonomy, collaboration and contact opportunities but no significant changes in communication, concentration, or participation. After 2 years 91% reported being accustomed to the new office design.

In another study of changes in the work environment of companies integrating architecture, organisational development and information systems, Rosenblatt (1995) found that proponents of the three domains tend to agree that the productive efficiencies obtained depend not only on technological issues such as new office environments or computer systems, but more on a company’s readiness to encourage its employees to work in teams.

As noted earlier, our study has been made in companies who have had their new office for a reasonably long time in order to be able to study the effects of working in the new environment, and not the effects of relocation. For a study of employee’s reactions to office relocation, see Brennan & Kline (2000).

Investigations of the indoor climate of the New Office are beginning to emerge showing rather disturbing results. Thus Kjeld Johnsen (2002a; 2002b), senior researcher at Danish Building and Urban Research, reports that although employees generally enjoy the view and the light often associated with New Offices (at least for those who sit by the windows!) both light-, air-, noise- and dust problems get more severe. He is advising everyone in charge of building New Offices to stop or slow down during the next ten years in order not to let the problems grow out of reach.

Moreover, Thomas Witterseh at the Danish Technological Institute has found a significant relation between the noise of New Offices and reduced effectiveness. On the other hand, tele-working, which is often a possibility in New Office organizations, has been shown to increase effectiveness up to 40%, according to chief consultant Jeremy Millard (2002) of the Danish Technological Institute in Århus.

## **Empirical findings**

### *The office setting*

In both of the Danish companies of our investigation, the architectural change was a transition from cell offices to open office settings supplemented by a number of “quiet rooms” for concentrated individual work. The managers responsible for implementing the New Office present various reasons for making the changes. In one company the chief executive expresses the idea of their new office as being ‘a constant reminder that we wish to collaborate’. In the other company a manager lists a number of reasons from ‘the increase of the complexity of tasks’ to ‘the ability to recruit the younger employees’ expressing the idea that ‘we cannot predict the future but *maybe* we can make it possible!’

One of the main means to achieving these ends was the intended flexibility of the new office. However, the hopes for flexibility are reported to have been higher than what the eventual setting could offer. For instance, everyone has their own desk, and the possibility of moving desks to new positions requires the same kind of support from the technical staff as before. This is partly due to such restraints as electrical installations being placed only along the walls, and the requirements of fire regulations on clear escape ways. Another obstacle to the rearrangement of the office setting and the gathering of people in ad hoc work groups is the large number of people in the offices. Furthermore, the many windows on the sides of the room limits

the appropriate positioning of the computer screens because of possible reflection and background lighting.

Another phenomenon common to the two companies is what many respondents refer to as “quiet rooms turning into “noise rooms””. What was intended to be the place for concentrated work is almost exclusively used for meetings and occasionally social gatherings or even as a storage room or testing facility.

Lastly, some deciding difference between the two observed offices should be mentioned. In B&K people are placed according to profession: Electrical engineers together, water and heating engineers together and so on. In PBS, people working on the same project are placed together in the office. The office at B&K was much more silent than the PBS office. There was an agreement that you were to leave the office if the conversation was to last for more than a few minutes. People moved more about within the PBS office than the B&K one, whereas relatively more people were visiting from other departments at B&K than at PBS.

Furthermore, PBS uses mobile phones and B&K uses stationary phones. This makes the employees at PBS more mobile in the sense that they can leave their desk and still be reached. Some employees at PBS complain however about the phones not being connected to each other. You can not answer someone else’s telephone, you can not have telephone conferences and you can not put a call through to someone else. Furthermore, employees are supposed to lock up their phone in their desk drawer when they go home, and if they turn ill the next day, those who call will only get a message from the answering machine.

At PBS there are considerably more ‘quiet rooms’ than at B&K, and contrary to B&K, PBS has a so-called “Club” and a “Café” for breaks and informal as well as formal meetings.

#### *Knowledge sharing and –development*

The following is a portrait of the kind of knowledge exchange that could be observed in one of the companies: John is sitting at his desk working concentrated on his computer correcting errors in a part of a new payment system. After half an hour, Jane comes from the desk behind him and asks him for his opinion on an e-mail she got from Tim in the next-door open office. Tim is responding to a question from Jane about an error message she does not now how to handle. Tim is describing a couple of possible actions to take and John is not quite sure what to think, so they both decide to

go to Tim's desk. Tim logs on to the set of data Jane has been working on and Jane tells him what type of error message she has come across. He shows her what he would suggest for her to do and Jane and John return to their desks. After a short while, Jane says to John that she is not able to do the correction. John picks up his phone to call Tim and after a brief conversation he turns to Jane and tells her that Tim has now disconnected from her set of data so she should be able to perform the correction now. Jane thanks John and they both return to their individual tasks for another half hour.

Much of the time in the offices of both Danish companies is spent on individual problem solving at the computer and when the employees interact, it is mainly to seek coaching, guidance or information. The coordination and planning of work is mostly carried out at scheduled meetings.

In both offices, no radical innovative knowledge work was observed. B&K has created an innovation team of executives whose challenge it is to create and implement new ideas. In the office observed the communicative interaction is characterized by the sharing of knowledge rather than actual knowledge creation. Also at PBS, the more radical innovative processes reside elsewhere than in the office observed. The innovative aspects of the project everyone is working on (the development of a new system for a new type of credit card) are done with, and now the work is characterized by gathering the relevant information from all interested parties and, from that, making the proper testing and error correction of the new system.

Regarding the use of IT for the sharing of information, both companies use Lotus Notes as the base for their intranet and have a variety of extensive databases of information about previous project, IT-tools, corporate policies etc. as well as various newsgroups. Many use it but most employees seem to be looking forward to a revised and user-friendlier version.

#### *The physical work environment*

Both Danish companies had problems with their heating- and ventilation system. A vast majority of the respondents complained about the indoor climate, whether it be draft, dry air or a too cool temperature. Some reported having problems with headaches and flues and many felt irritated that nothing effective seemed to be done.

The questionnaire at PBS did not contain questions regarding the indoor climate. Since the severity of the problems was known to the management of the company, and initiatives were taken to find out how to deal with them, questions about the influence of the indoor climate on the employees' ways of working were not included. The ergonomic conditions of the two Danish New Offices are in general good. The office furniture can be adjusted to fit the individual and the work task. There is enough room on the desk to keep the screen at an appropriate distance, and to rest the hands in front of the keyboard. There is sufficient support of the underarm for mouse work and enough space on and under the table. Some employees complain however about a lack of space behind their chair. Computer screens are placed at an appropriate level and the quality of the screen picture is good. Lastly, routine work is limited to an appropriate level.

#### *The psychological work environment*

Three common positive factors, of the offices in the Danish companies studied, influencing the psychological work environment were found:

- 1) A high level of information,
- 2) A sense of belonging and
- 3) A high level of support.

Firstly, the high level of information was observed and reported in various forms. In the New Office you get a lot of indirect information; information you do not actively seek. Sometimes it is information relevant to your own task that you can use immediately, or it is something you just notice, which becomes relevant at a later stage. At other times, it may be that you hear other people talking about something that makes you feel obligated to take part and offer your assistance.

Secondly, many employees express a sense of belonging partly to the company as a whole and especially to their colleagues. Although fun was occasionally made of the corporate vision statements, a certain pride in being part of the company was clearly expressed. The new office setting was reported to be facilitating with regard to the possibility of knowing more about the colleagues; how they feel, what they look like, what they are doing and so on, leading to a strengthened sense of belonging.

Thirdly, a vast majority of the respondents report that they get the support they need from both managers and colleagues. A result that is clearly supported by the observations. The office setting is reported to assist in this by making it easier to take

notice of where and for whom support is needed. For example as a manager you can see and hear the occasional outbursts of frustration and take immediate action when necessary instead of at a meeting later during the week, at which it might have grown or is forgotten.

When it comes to the negative aspects of the psychological work environment of the New Offices, three other factors are obvious in the collected data:

- 1) Interruptions and problems of concentrating,
- 2) Surveillance and lacking confidentiality and
- 3) The lack of personal space and territory.

Firstly, the most evident liability of the two offices is the many interruptions that make it hard for the employees to concentrate. For some it is the constant noise of people talking, which at some points gets self-reinforcing in the sense that when one group of people talks louder another talks even louder and so on. A phenomenon the respondents referred to as the “kindergarten effect”. For others it is the experience that much more people seek contact because they can see that you are there, and that in another setting they would have made an appointment more often, instead of just approaching someone. One manager estimated that he was contacted at an average of about 25 times a day. For some the mere fact that people are passing their field of vision is a source of interruption. The many interruptions are reported to be a source of stress and of taking care not to disturb others. Many use the possibility of working at home when they need to concentrate.

Secondly, for some employees it is a source of strain, that everyone can see you and hear what you are talking about. Many choose to leave the office to make private phone calls and some have an annoying feeling that someone might be watching over their shoulder as they do their job. As one of the respondents reports, it was a bit of a struggle to decide who should get the places where you have your back against the wall. No one reported an experience of a tightening of the control from superiors, now that they were sitting among the members of staff, and no change in behaviour was observed when managers were around in comparison to when they were not. One said that maybe he used less foul language when the manager was around.

Along with the experience of surveillance come the difficulties regarding confidentiality. Many managers have experienced situations where a relatively unproblematic conversation at an employee’s desk has developed into something that

had better be settled in private. Deciding when to move the conversation to somewhere private is almost impossible, and still, if a manager would be able to do so, it is the feeling of many managers that the move would very likely seem too dramatic and thus create other problems to be handled. In addition, employees may find it difficult to approach their manager with certain issues such as a delicate personal problem.

Thirdly, the lack of personal space and territory is a liability, though probably not so much so as the ones mentioned so far. Still, some find it irritating that you, for instance, have to keep your children's drawings in the drawer, and as one stated: 'the only door you can close is the toilet door'. Others are dissatisfied with the uniformity of the furniture and interior decoration and want better opportunities to leave a personal mark on their surroundings. Some have found new ways of dealing with this, like having their family photos under a transparent desk cover or a picture of their dog as their screen saver. A few miss the personal space of their previous office, and when asked whether they want to turn back to what they had, the respondents give different replies. Most of them state that 'you get used to it'.

Many report that they have the feeling of being "on". Not only have the small "natural" breaks decreased in number but a few also report a feeling of discomfort when going to another office to find a colleague: 'Everyone is watching' and 'you are afraid you will disturb everyone'.

A fourth strain factor (a very significant one but unrelated to the office setting) is tight deadlines. The level of autonomy is high but a deadline is a deadline and very often the employees have set them themselves, which is reported to make them even more stressful. The high level of autonomy can be seen as connected to the breaking down of hierarchies, which, on the other hand, is evidently expressed in the office setting where managers and staff are placed in the same room with the same type of furniture.

In addition to the strain factors mentioned above, a couple of other findings are relevant from a psychological standpoint. First of all, the experience of the New Office is influenced by the *expectations* of what was understood to be the prospects. The decision to make open offices was made at the top management level, whereas the employees were consulted and gathered in voluntary workshops to express their wishes and come up with ideas when it came to the interior design and policies regarding their future work place. Many of the involved employees had their

expectations up high but they are disappointed with the result, especially regarding the flexibility that some employees thought the new office would bring. As described in a previous section the actual office setting contains limitations to the movement of furniture, and, for some employees, moving themselves is limited by the amount of paper, books and computer software that they need to take with them to do their job. Also at the management level disappointment with the lacking flexibility is expressed. Managers recognise the limitations inherent in the architecture but a few are also surprised to see how strong the need is for some employees to have a place they can call their own.

Secondly, many employees in the new office do not take an appropriate amount of *breaks*. Some report that when you know that 30 people are watching, you do not lean back and stare out the window too often. To give an example of the difficulties of taking breaks, one respondent tells a story of a time when she took a short break to look at a book that someone had recommended to her. Later the same day she took another look and a colleague who passed her desk said: “tell me, are you still reading that book?” Another respondent tells about a time when someone close to her had died and how she, on top of her sorrows, struggled to find somewhere to take a deep breath or maybe shed a tear. On the other hand, smokers seem to get the breaks they need because they have to leave the office to have a cigarette.

Other interesting findings are what might be called “*mental walls*” and “*virtual walls*”. Although the physical walls are removed, some of the behaviour of the employees indicates that some walls are maintained mentally and behaviourally. One manager had noticed that he was very rarely approached through the passage diagonally behind him but rather across bookshelves or by walking around the desk opposite to his. He said it was as if he had a virtual wall next to him. When the physical walls are gone, mental walls can be seen in the behavioural manifestations of groupings. An example of mental walls was noticed at a breakfast meeting for everyone working on the same project: At what seemed to be a big communal gathering, people on the same sub task shared their own bread, butter and jam.

Lastly, it should be mentioned that a *conflict* in an open office has certain drawbacks. On the one hand, conflicts have a good chance of being discovered and dealt with in time, when managers and employees can see each other at all times. On the other hand, if a conflict endures, having to be together without the possibility of shutting the door behind you can make it more stressful.

### *Effectiveness*

At the interviews in both Danish companies, several respondents reported a clear feeling of being less effective in their new office. A finding confirmed in the questionnaire survey done at PBS: Asked whether they agree with the statement “My effectiveness has increased in the new environment,” 68% respond that they disagree or strongly disagree. 15% respond “don’t know”. Also regarding the statement “The quality of my work has increased after the rebuilding,” 68% respond that they disagree or strongly disagree and 24% “don’t know”. As an apparent contradiction to these results, the chief executive of B&K reports that the company’s accounts bear witness to a marked increase in corporate effectiveness.

## **Discussion**

### **From intentions to New Offices**

When looking at the propositions made by Francis Duffy about what the New Office will express, some are confirmed by the results from the studies of the two Danish companies, while others are not. In both companies, the use of space has intensified, but whether this is related to a better use of time, is hard to say. What we *can* say however is that the intensified use of space can contribute to the obstruction of flexibility and mobility of the work force.

The lack of flexibility within the open office setting has resulted in an increased need for meeting rooms. People then use ‘quiet rooms’ for meetings, and even if the employees are able to find a place in the open setting, many feel obliged to find a place where they do not disturb everyone else. Thus, both companies seem to have underestimated this need for more meeting rooms. This might be because the companies and their architects had failed to acknowledge the amount of formal and especially the more informal and spontaneous meetings previously held in the small offices. In PBS though, the club and café seem to work quite well as a substitute for the lack of meeting rooms, only here you are not alone and some refuse to use it because of tobacco smoke.

Duffy's propositions 2 through 5 are largely confirmed. Many boundaries between employees have been broken down and a lot of the physical manifestations of hierarchical differences are gone. Still, as the collected data shows, the physical boundaries may have vanished but mental walls and virtual walls can still be observed. Both Danish companies are focussing on the ability to change organizational units more rapidly and on the importance of group activity. These intensions are however embarrassed by the lacking flexibility.

There are not many clerks in the New Offices observed, but to say that clerical ways can be deemed obsolete is an overstatement. It seems more to be the case that more and more staff members have become their own clerks, so to speak. Administrative tasks are in some areas every employee's own responsibility. The individual estimation of deadlines serves as an example.

Confidence in the creative use of information technology is obvious in the two Danish cases. Getting the most out of the possibilities inherent in IT is certainly an ambition of the companies and improvements are continuously attempted, although not all implementations of tools and databases are successful.

The eighth of Duffy's propositions is clearly the one that falls shortest in the results of our inquiry. To recapitulate, it says: A new flexibility, with an ever-wider range of work settings in response to choice in the timing of work and in the ways in which it is carried out. As noted earlier, the moving of employees and furniture requires the same support from the technical staff as before and attempts to create a wide range of settings are scarce and not very successful (except for the rather well functioning Club and Café at PBS). The intensified use of space makes the flexibility suffer even more and the few armchairs and sofas placed in the open office are rarely used because of the potential disturbance of others.

Both of the Danish companies are trying to carry out intensions of the kind proposed by New Office proponents like Francis Duffy. However, in addition to the difficulties mentioned above, there are differences between the two companies in how this is done and thus, in the advantages they gain and in the kind of difficulties they encounter.

Firstly, B&K are lacking the flexibility and mobility that the use of mobile phones would bring about. On the other hand, at PBS where they do have mobile phones, they experience the disadvantages of the phones not being connected to each other. A

solution where mobile phones are connected in a local net seems to be a suitable alternative.

Secondly, at PBS people working on the same project are placed together in the office. At B&K, people are placed according to profession. It is likely that the relative silence of the B&K office is a cause of this disposition. In the PBS office, one employee sometimes joined another to provide guidance or to collaborate on a common task. This was much less prevalent in the B&K office. Here the coordination of sub-tasks with someone from another office, or the coaching of a colleague was relatively more typical. The relative silence is probably due to the less guidance and collaboration and the fact that the coordinating and coaching was done quietly because it was considered irrelevant to people not working on the same project. On the other hand, the employees at the B&K office were not annoyed by noise to the same degree as the employees at PBS. The relative silence may also be a cause of the fact that B&K had fewer quiet rooms than PBS. When you do not have quiet rooms to go to, a discipline of silence may emerge.

### **Sharing information and creating knowledge**

Innovative knowledge creation was not a big part of the work in the Danish offices. Most work consisted in the performance of rather well known procedures. The work of trying to come up with new ideas was not observed (even though people were asked to report if it happened). In B&K employees explained this by saying that when the architects have decided what they want, and technical designers have made certain sockets, plugs, pipes and so on, there are only so many ways to do it right. At PBS most employees in the office were conducting more or less standardized testing procedures and many could not see when they could ever find time to be innovative because of their tight deadlines. All this is not to say that the companies are not innovative. Different organizational, developmental and administrative initiatives show that they can be, but in the daily work of the employees in the New Offices observed, innovation is more the exception than the rule.

In the Danish offices observed, the majority of time was spend on individual problem solving but the sharing of information was also an important part of the daily work. The information databases and newsgroups of the companies' intranets were frequently used and people sitting close to each other often had brief encounters to resolve or discuss different issues. However, the question is whether the offices are

too large: The indirect information is limited to the few tables around the employee and when they need a conversation, they very often go to the other person's desk. So why have the big open office? One reason is that you can see if the person is there before you get up and waste time walking to an empty office. Another point is that the mere fact that you see your colleagues may make more faces familiar and remind you to seek assistance and provide help (even though some employees said that they would rather disturb someone by knocking at his door than disturbing someone that they can *see* is busy). Still, the noise and interruptions are spoiling the employees' ability to concentrate and when the 'quiet rooms' are booked for meetings, what can you do?

A way to solve the dilemma of wanting a big open office where you can see everyone and concurrently having the problem of too much noise and too many interruptions in the office might be to build dividing walls made of some kind of glass. To maintain a possibility of rearranging the setting, the partitionings should be mobile.

### **The indoor climate**

Problems with the heating- and ventilation system were quite severe (more so at PBS than B&K). This is mainly because too many people are dependent on the same system and the needs of each individual are different. Keld Johnsen's advice to slow down or stop the building of New Offices does not apply to the companies of our study. The buildings are there and another radical rebuilding is unrealistic. Therefore, answers to the question of how to improve the indoor climate are urgently needed. When all experts can do is recommending that the building of New Offices be halted, the discouragement of both employees and management is more than understandable. More research into this subject and any effective advice will be welcomed by many.

### **Pros and cons of the psychological work environment**

In our study, the New Office shows itself to be a good environment for the exchange of information and for support to be available and exercised. In addition, although people work with different people from project to project, a fairly widespread sense of belonging was reported and observed. These factors are known in work psychological literature to be of great significance to the bringing about of a healthy work environment. When people feel stressed, information, support and the feeling of being part of the group or organization is important. The setting of the New Office seems to

play an important role in this, mainly because of the amount of indirect information that lets you know the goings-on in the company, and because it enables employees to put faces on more people and thus to know who to go to for help.

Another factor that is known to alleviate the experience of stress is autonomy: The possibility of arranging one's own work and taking part in decisions. In the Danish companies, the tasks to be performed are mainly defined by project managers but within these delegations, there is a high degree of freedom to decide when and how to do the different tasks. There is a downside to the focus on autonomy though. Sometimes autonomy is praised to such a degree that employees feel a strong personal guilt when tasks are incompletely fulfilled, which can lead to stress or burning out (see Tynell 2001). In addition, since increased autonomy often means more subtle power relations, a feeling of insecurity and maybe even a culture of inter-collegial control may very well supplement feelings of guilt. This last mentioned aspect was not reported or observed but when it comes to deadlines, many employees feel the stress of having to live up to their own time estimates.

Some respondents said they were able to mentally shut out the noise and interruptions and concentrate on their work. However, a large majority of employees found the noise and interruptions to be very annoying and by far the most obvious liability of their new office. The possibility of working at home is a good solution for the individual employee but not for the sharing of knowledge. In other words, the New Office entails the dilemma of fostering an environment of support and knowledge sharing while struggling with a decrease in the employees' ability to concentrate because of noise and interruptions. The quiet rooms are meant to make up for the latter. However firstly, they need to be very well equipped and even if they are, some employees find it too cumbersome to bring all their stuff or to run back and forth (not all documents can be uploaded from the central server and some special software is installed only on individual PCs). Secondly, there is a need for more of them because they tend to be used for meetings. This, on the other hand, will conflict with the intention of intensifying the use of space.

The problem of the employees not taking an appropriate amount of breaks is prevalent. Most people tended to keep working as long as they could see that everyone else was working. At first glance it is an advantage for the company but a short break can increase the efficiency of the work being done. The challenge is to

find the right balance. A first step would be to agree on a policy of breaks and thus legitimise them.

### **Personal space and territory**

Does the New Office impose any threats to people's needs for personal space and territory and increase the challenges of impression management? The expressions of needs in this regard are varied. Some like to be in the sort of open spaces that their new office offers because it provides an overview of what is happening and a feeling of freedom of movement. In addition, only a few report a feeling of intrusions of their personal space (although many find the office too crowded). Many do however have a wish to leave a personal mark on their surroundings and thus, when it comes to the question of territory, a majority confirm the theory of a 'territorial imperative'. Some employees use family photos and other personal belongings of sentimental value to mark their territory and some are annoyed by the directives on the uniformity of the interior design. In addition, the lack of willingness to be mobile experienced in particular by some managers, for instance the unwillingness to share desks, bears witness to a tendency or need to stake out a certain territory and preserve and defend it as one's own.

A few examples from the collected data show clearly the struggles of impression management and how it is harder in an open office. The employee who could not find a place to mourn is a case in point. However, most of the evidence with regard to challenges of impression management is more subtle. The reported experience of some employees that someone might be watching over your shoulder can be seen as an indication of the wish and attempt to maintain the image of a hardworking employee. Also the problems regarding the lack of confidentiality show how the work on saving face and behaving appropriately is challenged in the New Office.

Mental and virtual walls are probably created to ward off the problems of personal space and territory and impression management.

### **Collective vs. individual effectiveness**

The discrepancy between a decrease in effectiveness experienced by employees and an increase in effectiveness measured by corporate accounts may be due to many different circumstances that the scope of our study does not allow to investigate. One hypothesis, which has to do with the rebuilding of the offices, is that the lack of

individual effectiveness is counterbalanced by an increase in collective effectiveness. The idea is that when everyone has easier access to the goings-on in the company, the work process is more efficiently kept on track and mistakes are discovered in time. A number of employees though report that they do not believe this to be the case but as a counterexample a middle manager tells a story of an incident, where a manager overheard a conversation and thus was able to stop a work process that may well have cost a couple of months wasted work.

This discussion of individual vs. collective effectiveness parallels the contemporary discussion among organizational psychologists about qualification vs. competence. Jensen & Prah (2000) define qualification as what is needed to be successful in performing a predefined task in a predictable and unambiguous context. Defining competence as an intersubjective negotiation of the meaning of the common task, they argue that the changing, complex and ambiguous context of many modern organisations has created a demand for a more competent rather than a qualified work force. It is likely that the employees are focussing on the obstacles to their attempt to use their individual qualifications, whereas the corporate accounts show that the collective work force is competent.

## **Conclusion**

When a company decides to change to a New Office and improve it's ability to share and create knowledge, the tearing down of walls and the implementation of an intranet is only a small and insufficient step. As our study has shown, there are many obstacles and dilemmas to be managed in the process of carrying out some of the ideas in the concepts of New Office and Knowledge Management. Among the more conspicuous difficulties are the problems of creating a healthy indoor climate and the dilemmas of interruptions and noise vs. knowledge sharing, and of flexibility vs. personal space and territory. In general, the need for organisational change, both structurally and culturally, is imperative. In addition, some of the many actions to be taken may vary according to the kind of company in question. Based on our investigation we have made a tentative list of advice for anyone who wishes to take up the challenge.

### **A list of advice**

- Be very careful only to place together those people who can benefit from hearing each other
- Allow employees to leave a personal mark on their surroundings
- Consider using glass partitionings
- Legitimise taking breaks
- Do not underestimate the need for meeting rooms
- Beware of the fact that a high degree of flexibility is hard to obtain
- Make sure that 'quiet rooms' are ventilated and well equipped
- Pay special attention to the difficulties of creating a healthy indoor climate
- Let employees take part in the transformation process in order to create realistic expectations and find appropriate solutions

### **Further research challenges**

The purpose of our study has been to investigate the development of the work environment in knowledge intensive companies who combine the intensions related to the concepts of New Office and Knowledge Management. We have found that it is associated with several difficulties and dilemmas. An aspect that has only been a peripheral part of our investigation is the question of how to manage the process of transition. In order to be able to avoid some of the difficulties and dilemmas, further research into the management of the implementation of New Office and Knowledge Management is needed.

Secondly, more and more studies are emerging showing the difficulties regarding the creation of a healthy indoor climate in a New Office. Our study is one of them. More research into possible solutions must be considered an important next step.

Thirdly, the companies who combine New Office and Knowledge Management represent an environment that challenges traditional work psychological theory. A large amount of support, information and autonomy are found in such companies, and these factors have a long-standing tradition of being among the paramount alleviators of work strain. However, the employees in a New Office experience stress. This may be due to an overload of information that makes it hard to concentrate and to the fact that the apparent autonomy of estimating ones own deadlines conceals the actual

power relations in the company. In addition, our study has shown the relevance of such factors as personal space and territory and the challenges of impression management. More research is needed to get a more thorough understanding of these aspects and hence for work psychological theory to be up to date.

Lastly, the questions regarding effectiveness also need more attention than the scope of our study has allowed. The possibility of tele-working and the exercise of collective effectiveness may counterbalance the individual ineffectiveness. Our study seems to confirm this but other factors may very well be involved. Whether it is actually the case must still be regarded as a question open to further research.

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