

THE KNOWLEDGE WORKPLACE – SEARCHING FOR DATA ON USE OF OPEN PLAN OFFICES

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The nature of office work has changed. Organizations increasingly see themselves as knowledge-intensive. One important trend is an increasing emphasis on how organizations can stimulate creativity, collaboration, and knowledge sharing. Both management and workplace-literature suggest that companies can use office design and information and communication technologies as tools for strategic development. The main goal is to give better support to their core work-processes to enhance performance. Even though normative knowledge and theories about office design advocate that open plan offices enhance learning and knowledge sharing, the evidence of this has so far been limited and anecdotal, with relatively little empirical evidence.

In the research and development project “The Knowledge Workplace” (KWP 2003 – 2006), the authors and their research team worked with almost 20 Norwegian companies to develop methods for workplace design, with focus on organizational development, knowledge production, and knowledge sharing. In the project, a web-survey was developed. This has been filled in by knowledge workers in 9 of our cases: approximately 1100 persons in several different types of organizations. The respondents had all been relocated from cellular to open plan offices.

This paper presents some of the findings from the surveys and interviews. The results show that open plan offices indeed do enhance collaboration and knowledge sharing within the department / work unit, while they may create less cooperation between the different units and departments (which do not share the same open plan office space). There is more informal contact between colleagues than before the move. The respondents have more difficulties performing work that requires focus and concentration, and there are more reports and complaints about noise than before. In the empirical material, we see large differences between departments and units within the same organization. This suggests that differences in work processes, as well as different cultures, management, and implementation processes, create varying user satisfaction even within the same organisation, and in similar office spaces.

Category: *Research paper*

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INTRODUCTION

In the mid 1990s, the new hot topic in office design was named the “Alternative Office”. Inspiration from businesses like SOL, Ericsson, and Digital, was presented and discussed in conferences and magazines. The traditional office was believed to be a dinosaur, likely to become extinct, to give way to the new, more efficient office of the twenty-first century (e.g. Veldhoen and Piepers, 1995). New technologies, ICT, and new ways of thinking about learning, less hierarchical organizations, teleworking and openness were advocated, and paved way for new workplace solutions. It was argued that there was a strong link between the organization’s way of working, and the physical office layout and furniture. The new era would focus on knowledge work, and workspace design was advocated as one way to enhance knowledge work productivity. This meant more flexible space and use, as well as more open plan offices, as this was supposed to enhance interaction and learning (Duffy, 1997. Duffy et al. 1993. Myerson and Ross, 1999).

Organizations increasingly saw themselves as knowledge-intensive. Understanding how organizations create, store, and share knowledge, became critical to success, and we saw a shift of focus in the knowledge management literature from almost exclusively studying individual knowledge work, to also including the collective and relational aspects of organizational knowledge. Companies spent vast amounts on software and other technologies to improve knowledge sharing among employees. They established knowledge management programs and hired chief knowledge officers to improve the productivity of their knowledge workers. Many companies now started to experiment on how they could support collaboration and “free flow of knowledge” between their employees to enhance productivity. “Forget your old, tired ideas about leadership. The most successful corporation of the 1990s will be something called a learning organization”, Fortune Magazine wrote in their review of Peter Senge’s bestseller “The Fifth Discipline” (1991).

Drucker (2000) defines a knowledge worker as “someone who knows more about his or her job than anyone else in the organization”. Davenport (2002) points out that “*knowledge workers like autonomy, and don’t like to be told how to do their work*”. How to get these experts to collaborate and share their knowledge, as part of everyday practice, was high on the agenda of many a manager in professional companies. Three main factors needed to be addressed in combination; management and organization, technology, and office design in order to develop effective solutions. An increasing number of companies used office design as a tool for strategic development and to give better support to their core work-processes.

The research and development project “The Knowledge Workplace” developed from this assumption: That the physical workplace was in a dialectic relationship to organizational issues and ICT. In the project, we studied organizations that moved from enclosed private offices to different types of open plan offices. In the majority of the cases, the direct motivation for moving was economical, or that their current contract was close to termination. In the case studies, we observed that FM, design professionals, and the representatives from the construction companies, seldom really based the design of the new workplace on understanding of organizational goals, needs, work-styles, and human preferences, but on their own understanding of how “modern offices” should look, and on economic and practical considerations (Blakstad et al. 2003). New ways of designing workplaces were more often than not based on superficial understanding of knowledge work (Gjersvik and Blakstad 2004). We also observed that the user organization’s management in most cases found it difficult to formulate the goals and to manage the process. In KWP we started to work with top managers

and project teams in the user organization to help them to define their goals, understand their work-styles and organizational culture, and design realistic processes to achieve desired changes and strategies. In the process of defining goals, we found that there were similarities between different companies, as most of them wanted to focus on:

- Learning and knowledge sharing
- Interaction; work together as team and work across organizational borders
- Branding, identity, values

Even though the link between the performance of knowledge workers and workplace design was much debated, we could not find much in way of research results. We set out to develop a survey to evaluate new office solutions, not only to investigate indoor environment and fulfillment of functional and technical environment, as in most traditional Post Occupancy Evaluations (POEs), but to investigate how the end-users report on issues like learning, sharing of knowledge, concentration, and interaction with colleagues in their new offices.

The trend towards landscapes offices are according to Davenport et al. (2000), fuelled by the four f-factors: fad, fashion, faith, and finance. We will present some of our main findings, which we hope can contribute to a more *factual* base on the *functioning* of work space environments. We aim at investigating the underlying hypothesis in most recent writings on office design: that the workplace design can enhance communication, learning, and interaction between knowledge workers.

THE OPEN PLAN OFFICE

We need a more comprehensive understanding, or typology, of different types of offices, to be able to investigate the effects of different types of office designs. Before the 1990s, most Norwegian offices were either cellular or combi-offices, even though there were examples of large open plan offices in the 1960s and '70s. Apart from some exceptions (e.g. trading-floors, call-centers, design/architects' studios), the large, open office landscapes soon fell into discredit for bad indoor environment, and were relatively rare in the beginning of the 90s (Blakstad 1997). After the introduction of "alternative offices" in the mid '90s, a much broader variety of office types and workplace solutions emerged. Different types of open plan offices were developed. Some involved sharing of desks (hot desking or free address), others focused on designing different spaces for special functions, activity settings, while others again focused on universal solutions that made it easy to move people around. Several typologies of workplaces were developed (e.g. Franklin Becker, 1999, Frank Duffy, 1997 and Vos et al., 1997). But different types of open plan layouts were not further described and classified.

In practice, people talk about "open plan offices", as if this is a single type. In reality, the term covers a variety of different solutions. Becker and Sims (2001) label the different types of open plan offices, based on their physical arrangements: High-paneled cubicle, Low-paneled cubicle, Shared enclosed office, Team-oriented workstation / pod and Team-oriented bullpen. Applying this typology provides us with a more nuanced and accurate terminology to replace the more generic term "open plan office".

An underlying problem for us, when analyzing findings from research on open plan offices, is that the most common open plan solutions from other parts of the world, including the Anglo-Saxon offices, most often are high- or low-paneled cubicles. These are different from

Norwegian open plan offices both when it comes to indoor environment (daylight, temperature, air quality, e.g.) and space configuration (density, partition walls, e.g.). In Norway, standards for natural daylight and indoor environment are regulated by legislation, and traditionally, offices have been cellular. The DEKAR project categorizes 75% of Norwegian offices as cellular and individual (Bakke 2007). For comparison, Steelcase (2006) estimated that only 30% of American office workers have private offices. New Norwegian open plan offices are most often team-oriented pods or bullpens, and are generally of a high standard when it comes to indoor environment and spaciousness. There may, however, be differences, even within the same type of open plan office. The spatial and functional quality of the workplace and the match between users, use and physical solutions may vary a lot within spaces with apparently the same workplace solution. But the nature of the workplace can never be described, based exclusively on its physical characteristics. It must be understood as a combination of physical, virtual and social spaces (Nenonen 2005). Yet, in most studies of the effect of open plan offices, the type of open plan office, spatial arrangements and qualities, ICT, types of work, social relations and use, are not described.

Effects of open plan offices

As mentioned, studies on open plan offices do, in most cases, not discuss the physical differences within the open plan office layout. Still, there is a growing body of research that shows the negative effects on employees in open plan offices in general (for a systematic review of literature: De Croon et al. 2005). In most cases, this is related to increased noise, lack of individual control over work environment, less privacy, loss of status when moving from a cellular office, distractions, and perceived crowding (e.g. Brennan et al, 2002, Maher and Hippel, 2005, Banbury and Berry, 2005). Individuals handle distractions differently, and Mahler and Hippel (2005) show large variations in the individuals' ability to inhibit distractions.

Studies showing both negative and positive effects of open plan offices most often do not discuss what kind of open plan layouts are studied, their spatial and architectural design quality, their use and match with the work that is going on inside them, or the organizational context in which they are used. It can be argued that this may be due to the fact that the open plan cubicles are the dominant type of open plan offices in many parts of the world, and that this is categorized as "open plan" without further refinement and discussion. Still, it limits transferability of the data to the Scandinavian context.

Even though the majority of studies don't differentiate between different types of workplaces, there are some exceptions. In "Offices that work", Becker and Sims (2001) study the effect of the different office layouts on communication, interaction, flexibility, and cost. They show that the frequency, duration, and nature of interaction vary across the different open plan layouts. The observed frequency of interactions was found to be higher in more open office types (bullpens, pods and low-paneled cubicles), whilst observed duration of interaction was shorter in the most open office types. They conclude, based on surveys, interviews and observation, that the team-oriented bullpen provides the best solution in order to optimize communication, flexibility, and cost.

Both open plan offices and more enclosed workplace solutions can serve important purposes, and both have different positive and negative impact on the user organization. There is a trade-off between open space that encourage interaction and collaboration, and more enclosed space that may provide more privacy, concentration, and individual performance (Heerwagen, 2004). In the evaluation of Telenor's open, free address offices at Fornebu near Oslo, Arge

(2006) shows that 89.5% of her respondents say that the workplace enhances communication and co-operation, but the study also documents that it is the concentration work that suffers in the new solution. At the same time, she points at changes to the workplace design that would have improved the situation, without changing the main ideas behind the workplace concept.

Even though the effect of open plan offices on work performance is debated, it has other abilities, such as more flexibility, ability to house more employees, and reduced set-up and renovation times, that are highly valued by organizations. Mosbech (2003) points at the importance of defining organizational goals in order to make the best decisions. Her view is that the office should not be open at any cost, but that an open plan solution is the right answer if the organizational goals are related to innovation, creativity, communication, and change.

Can we measure performance in open plan offices?

If workplaces play a role in enhancing knowledge work performance, how can this effect be observed and measured? In many case-studies of relations between workplace layout and workplace performance, “productivity” is the main parameter which is investigated in relation to workplace design. The actual performance is always difficult to describe, and even more so to quantify.

Van der Voordt (2004) defines five ways to measure productivity in studies of effects of real estate and offices: Actual labor productivity, perceived productivity, amount of time spent on specific tasks, absenteeism due to illness, and indirect indicators. Indirect indicators may be interaction, communication, innovation, learning, cooperation, ease to perform individual and collective tasks, as well as satisfaction. Focusing on such indirect indicators, we have to accept that we investigate parameters with an indirect relation to productivity as such.

Most case-studies of effects of open plan offices use self-assessed productivity, and measure this in surveys. In *Space Meets Status*, Visher (2005, page 81) states that: “*Knowing the range and complexity of influences on the performance of work, users’ self-reports tend to be more an indicator than a measure of environmental effects*”.

Another challenge to measurements of productivity is that one usually measures individual productivity. The theory behind new knowledge workplaces is that people should learn from each other, and that collective performance may be enhanced by working in the same open plan office, sometimes on the expense of individual performance. Backer and Sims (2001): “... *the major reason for an office today is to bring people together: to socialize and share information; to inspire and inform each other; to provide guidance and feedback.*”

Our studies of literature, as well as our own work, have shown us that we still have a long way to go when it comes to understanding knowledge-worker productivity: “*We are in the year 2000 roughly where we were in the year 1900 in terms of [understanding how to improve] the productivity of the manual worker.*” (Drücker 1999, quoted in Davenport et al., 2002).

THE KNOWLEDGE WORKPLACE PROJECT

In this paper, we present results from the user surveys that were developed and carried out in the Knowledge Workplace Project (KWP). KWP was a four-year project where researchers and participating organizations, both private and public, studied new office solutions and new

ways of working in knowledge-intensive organizations. The project had a case-study approach, and over a period of 4 years, the project completed more than 20 case-studies. The case-studies were carried out in organizations that were working strategically with new office design and the support of core business activities and common future goals of the company, such as collaboration, knowledge sharing, and innovation. Most of the organizations were deploying open-plan offices as the default workplace in their future office, supplemented with a menu of specialized rooms. Typically, the new open plan offices the organizations moved into were “team-oriented bullpens”, with small groups of desks in an open plan office, and with access to smaller, enclosed and shared rooms for team meetings, concentration work, e.g.

Research methods for data collection

In the case projects, we conducted workshops, interviews and made observations, most often both before and after the move. In addition to this, we performed a web-based survey (usually only after the move), providing both us with both qualitative and quantitative data from all cases. In some of the cases, data were also collected by registration of the time used on different activities and occupancy data (presence in space and use of different rooms). All organizations were part of KWP, a research and development project, which meant that they are likely to have put more strategic emphasis on the project and the process than the average organization. No formal registration or evaluation was done of the actual workplace layout, as all the cases belonged to a similar type, “team-oriented bullpens”.

The surveys were conducted between 5 to 12 months after moving into new, more open offices. The survey covered the following topics:

- How well the office supports different needs (like collaboration, concentration, knowledge sharing, e.g.).
- Satisfaction and work environment.
- Use of space and rooms.
- Physical work environment.
- The process of developing and implementing new office solutions.

The survey was sent to all employees in 9 cases. The response rate varies between 50 to 80%. We used web-based questionnaires (ConfirmIt). For every statement or question, the respondents could choose from 2 positive alternatives (e.g. Better / Much Better or Agree / Strongly Agree) and 2 negative alternatives (eg. Worse / Much Worse or Disagree / Strongly Disagree). Respondents could also remain neutral. The data set used for this paper consists of 9 cases, both from public and private sectors. The number of respondents varies between 1100 and 1200, due to the fact that some of the organizations chose not to inquire about some of the topics.

The survey is a self-reporting assessment of the effects of the workplace design. Managers and employees were asked to evaluate how their work was affected, on topics like collaboration and knowledge sharing, through a list of more than 80 questions. This information was collected as a survey, which has some limitations. It may, for example, bias the sample towards those who are more willing to answer, and it does not allow for clarification of misunderstandings of questions asked. In order to broaden the picture further and strengthen the validity, we used a methodological triangulation approach (Brannen, 1992), where we investigated the same issues through in-depth individual interviews and observations.

FINDINGS

The topics explored in the survey cover a range of issues associated with open plan office layouts and work performance, and include both physical and social work conditions. A relocation of work space from cells to landscape inescapably implies some changes in individuals' habits, routines, processes, and practices, but it cannot be taken for granted that they will always lead to the better. In the following, we present some of the results from the survey, and relate the survey findings to findings from our interviews and registrations.

Enhanced Collaboration and Experience Sharing

On an overall level, the results show that open plan offices enhance collaboration and enable knowledge sharing within a department or work unit, that informal contact is enhanced, and that the general working atmosphere is perceived as good. Figure 1 shows that on average, 58% are more satisfied with the new office solution when it comes to knowledge and experience sharing. For co-operation within a department, on average 66% find their new facilities "better" or "much better" (see Figure 2) than their previous ones. For co-operation between departments (Figure 3), the corresponding number is 38%. Organizational goals of enhancing innovation, creativity, communication, and change, seem therefore to fit well with the results. The different results for cooperation inside departments and between departments suggest that local patterns of collaboration, with its norms and behaviours, may be perceived as difficult to adapt to from distance, or as closed for colleagues that are not physically situated in the same work environment.

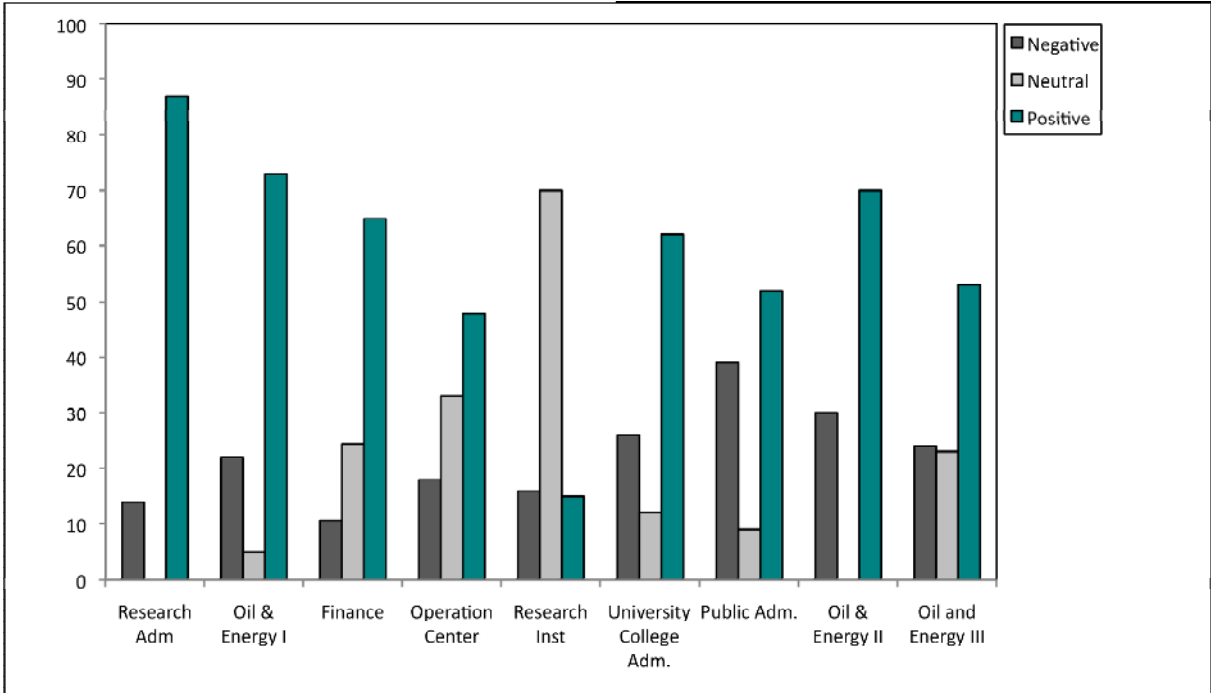


Figure 1: Knowledge and experience sharing

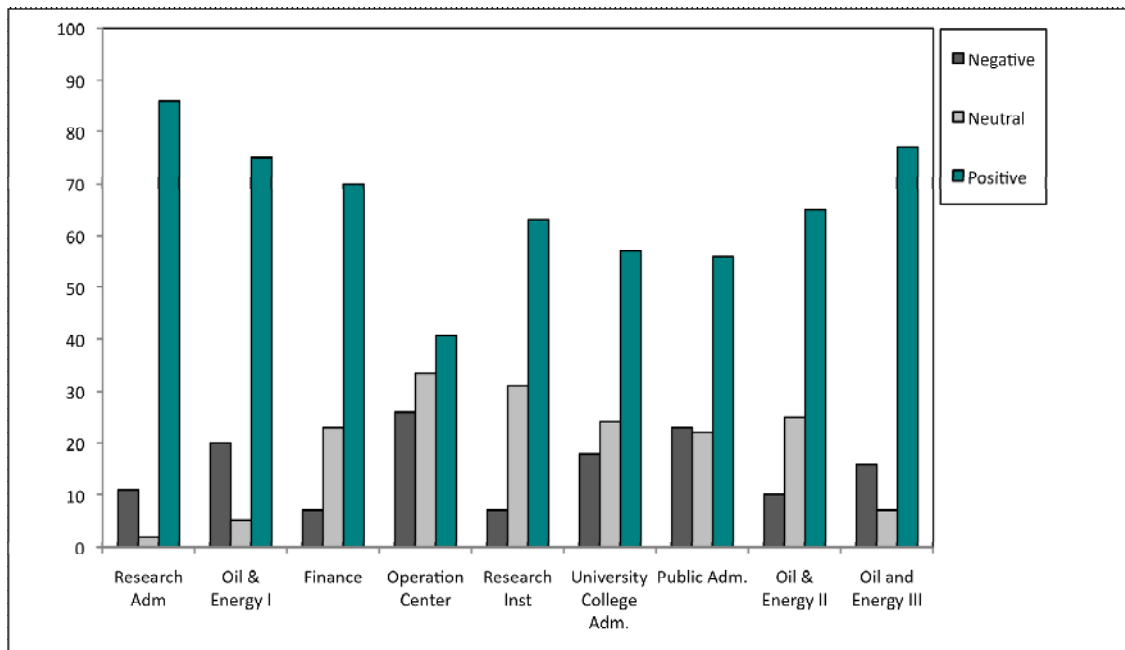


Figure 2: Co-operation in own department/unit

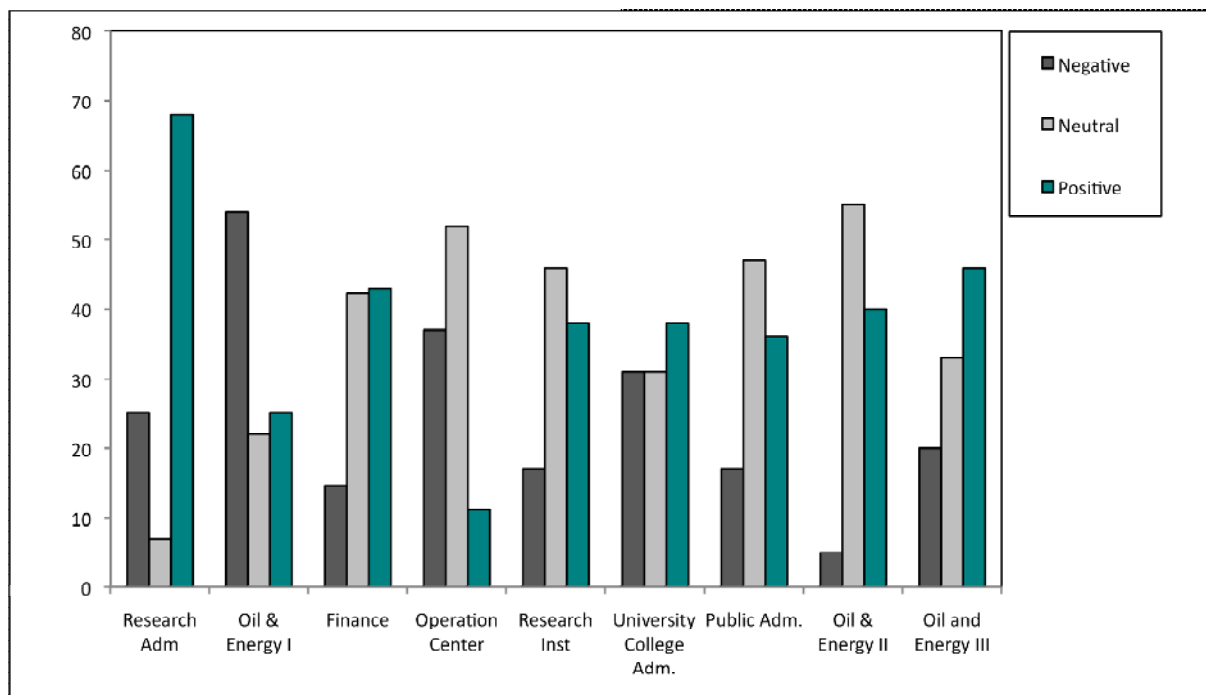


Figure 3: Co-operation between other departments/units

In our study we find that more than half of the users are satisfied with how the open plan offices support their need for communication and collective work. This finding is supported by the interviews.

“The cooperation between co-workers is better than before. It is easier for me to see if the others are present at the office, it is easy to establish contact with them and to get hold of them.” (Male 40 – 45)

“You can just voice a question into the workspace, and you will get an answer.” (Female 25 – 30)

In the cases, we saw that transfer of tacit knowledge from experienced, retiring workers is a major challenge for managers. Historically, the most effective model has been to have an apprentice learning from a master. Our research shows that office design, combined with changes in organization and incentives, etc., are effective means to support transfer of knowledge from experienced to inexperienced workers. In our interviews, we have seen that the respondents talk about how the possibility for inexperienced workers to work in the same room as more experienced employees is seen as very useful for the ones who learn, while the more experienced sometimes find it hard to find time to focus on their own work.

“The environment eases the information flow. That is important, especially when you are new to the job. It is much better than in a cellular office.” (Female 30-35)

Some experienced employees also report that it is difficult to “give away” some of their knowledge, which in many ways are seen as their most valuable currency, and which gives them status in the organization.

Individual Work

There is a balance between the need for working individualized and concentrated, and working in an atmosphere where colleagues are present, supporting and assisting on the spot. In the literature on knowledge management, it is assumed that organizational capabilities, knowledge, and learning are developed, sustained, and facilitated by enabling and connecting knowledge flows and communities of practice within and across organizational boundaries. From the theoretical discussion, we have seen that, in workplace literature from the last 15 years, individual concentration and work usually are downplayed in favour of collective work. In our study (figure 4), we see that in all of the organizations studied, there are a majority who find it difficult to do work which requires concentration and silence: 65% indicate a negative score. This has to be counterbalanced with the fact that providing facilities for individual, concentrated work was not stated as a goal for any of the organizations we studied. Still, we know from the interviews that this was an important aspect for the employees, and a topic that raised much debate in the projects.

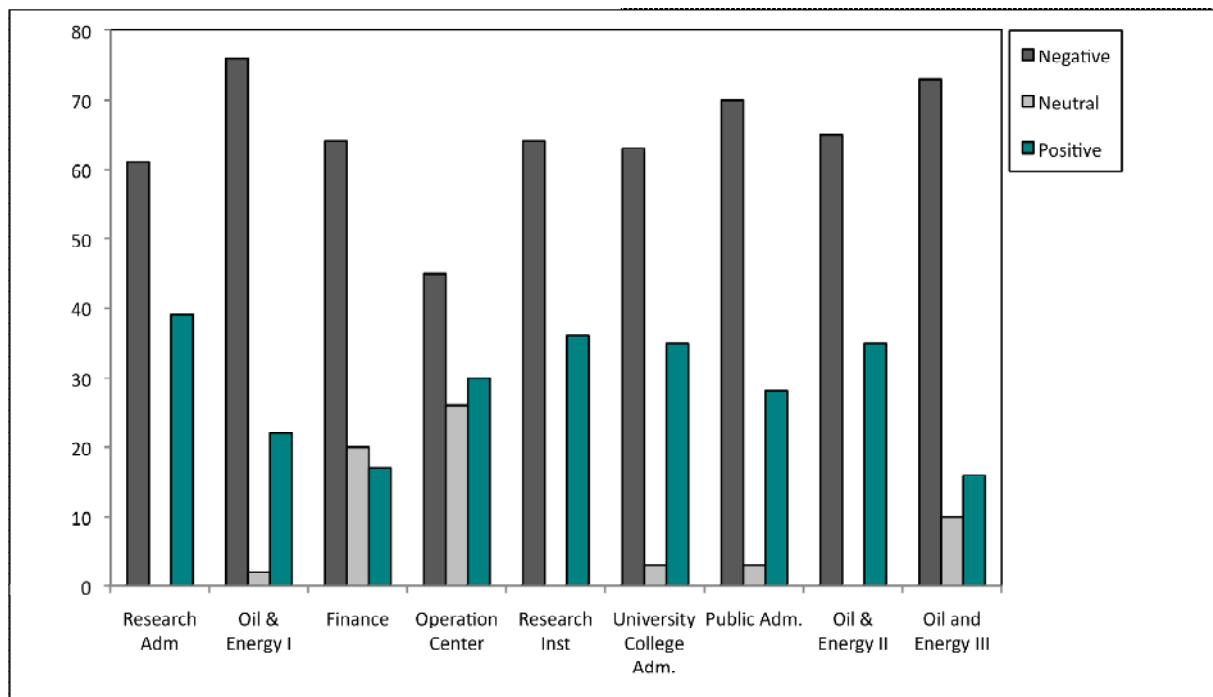


Figure 4: Concentration work

Noise

In our survey, the percentage of employees in the cases that reports having problems with noise from colleagues (they were specifically instructed to not include noise from outside the building or from technical equipment) varies between 77% (Oil and energy 1) and 35% (Research administration). The related percentage of respondents that does not find noise from colleagues to be a problem is 21% and 53%, respectively. There is a large variation in our material regarding this parameter, but the tendency is that most of our respondents find noise from colleagues to be a problem. Both physical, individual, and organizational variables, as well as combinations between them, may be responsible for the differences. In the case with the most negative results, there were design problems with the physical layout of the workplace, as discovered in some of the interviews:

“Many of my co-workers are exposed to communication routes within the office, they have their backs against the path people follow through the landscape. They are not happy with this. I have my back against the wall, and that feels safer. It makes a big difference”. (Female 40 – 45)

“We don’t have enough space for meetings, we need more, especially smaller team spaces close to our work desks.” (Male 45 – 50)

Our cases are open plan offices, but they all have small enclosed rooms intended for concentration work (concentration booth). Even though people complain about noise, we see that the concentration booths are relatively seldom used. The percentage that uses concentration booths several times a week varies between 16% and 45%. From the interviews, we see that this is due to poor work environments in the booths, location of the booths, and technical limitations (e.g. availability of networks and lack of mobile equipment).

Satisfaction

The survey respondents in our case studies are in general satisfied with their work environment, with answers in the different case-studies ranging between 90% and 39% as positive, and 10% and 20% as negative. They also report that they are happy at work, with answers ranging between 44% and 79% positive, corresponding with 19% and 44% negative.

Productivity

In our surveys, on average, 44% of the respondents answered that they had become less productive than before, while 35% indicated they have become more productive (Figure 5).

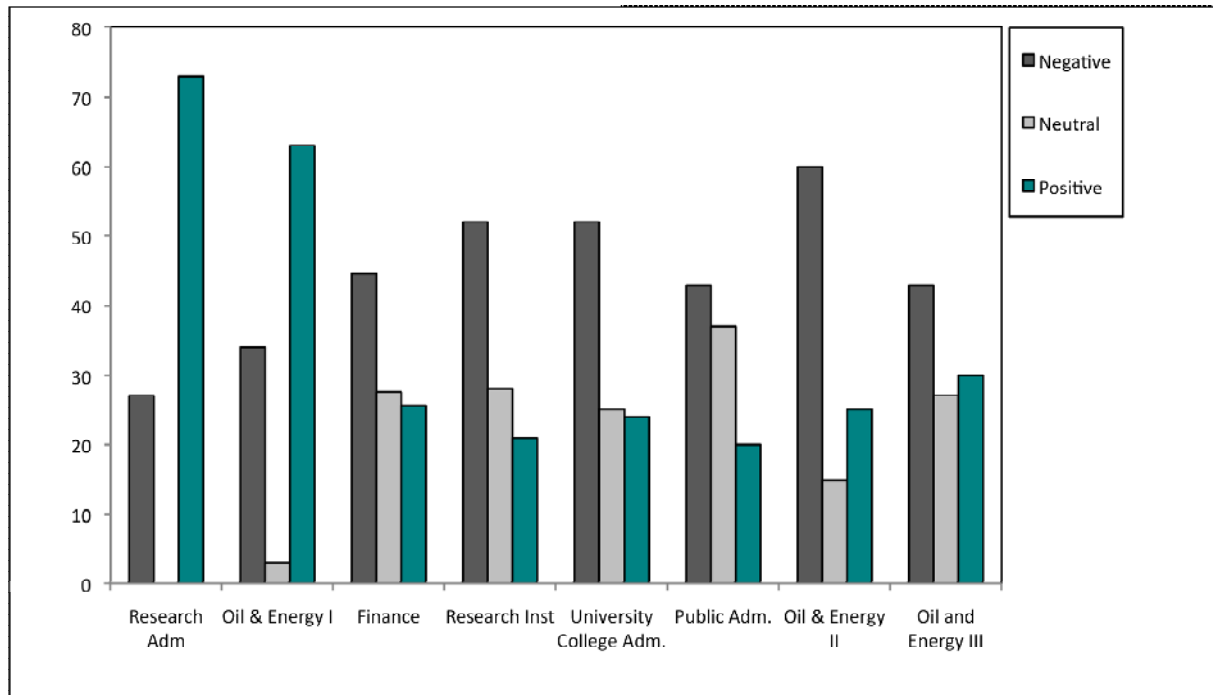


Figure 5: Self-assessed productivity

With the exceptions of the Research Administration organization and one of the Oil & Energy units, our survey data show that relocation to an open plan office has a negative impact on self-assessed productivity. However, our more in-depth data indicate that this result is not conclusive. These are the respondents own estimates of productivity, not measurements of actual efficiency and output. But productivity is associated with *individual* productivity, and assisting colleagues, participation in discussions, etc., are perceived as non-productive activities if they do not contribute to the fulfilment of the employee's own work tasks. Some of the employees we interviewed were well aware of this:

"It might be more efficient in the short run in a cellular office, where you can concentrate on you own thoughts over a period of time. But in the longer run, I think you are more efficient in the landscape, because we overhear things. In cellular offices, you would have used much more time to find information." (Male 40 – 45)

You have to think about who you work for: Yourself or (Company)? The landscape is a control mechanism; you are controlled while working here. In a cellular office, you can do a great deal that is not corrected by your work community." (Male 45 – 50)

Our interviews and registration of occupancy rates show that there are significant discrepancies between how people *think they spend* their days and how they *actually spend* their days in the case organizations. It applies both to activities, individual vs. collective activities (if they work together or work alone), as well as where the workday is spent physically. The knowledge workers in our case studies think that they spend much more time alone in front of their computer screen than they actually do. Similarly, people think that they spend less time in the cooperation and dialogue with colleagues than they actually do. This obviously affects how people think, in relation to the needs they have in order to be able to do the work they are set to, and their own assessment of their productivity.

CONCLUSIONS

This paper reports some of the findings from the Knowledge Workplace project. The theory about knowledge workplaces implies that openness enhances collectiveness, transfer of information, and interaction. Based on analyses of 9 of our cases, involving data from surveys, interviews, workshops, and registrations, we have set out to investigate the effects of these open offices on knowledge workers' individual and collective work. The results from our studies show that open plan offices in our cases have enhanced collaboration and knowledge sharing within the department / work unit, while they may create less cooperation between the different units and departments (which do not share the same open plan office-space). There is more informal contact between colleagues than before the move. The respondents have more difficulties performing work that requires focus and concentration, and there are more reports and complaints about noise than before. In the empirical material, we see large differences between departments and units within the same organization. This suggests that differences in work processes, as well as different cultures, management, and implementation processes, create varying effects on users even within the same organization, and in similar office spaces.

SUGGESTIONS FOR THE RESEARCH AGENDA

When reviewing literature, the normative work and the promised effects of new office solutions is not hard to find, but the empirical basis for these claims are limited. Our study suggests that the more open offices support collective work on expense of individual self-assessed productivity. Still, in the presented study, we have not been able to apply a more nuanced description of workplace typologies, or to access the spatial and functional quality of the workplace as such. We have only studied knowledge workers in open plan offices, and they have all been through a relocation which involved discussions about use and practise in the new office. More data are needed to provide a deeper understanding of the relation between work and place. For the future research agenda, we suggest empirical studies of knowledge workers in a variety of office layouts, combined with a nuanced classification of the different office layouts and organizational contexts, as well as description of work-styles and work-processes. The studies should combine both qualitative and quantitative methods, and investigate individual as well as collective measures of performance. Only in this way may we succeed in establishing more solid evidence of the workplace as enabler and disabler of knowledge work performance.

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