

# **The effects of a Task facilitating Working Environment on office space use, communication, concentration, collaboration, privacy and distraction.**

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## **ABSTRACT**

The conducted study consists of a comparison of two office environments on office space use, perceived concentration, communication, collaboration, privacy and distraction. In the old office environment people mostly had owned workstations and worked in an open office area, while the new office environment consist of a task facilitating environment with a large variety of flexible and shared workspaces (such as open offices, concentration areas, discussion zones, coffee corners etc.). Assumed effects of the new type of office interior were improvements of communication, reduction of office building cost and increase in wellbeing and productivity. However a decrease in concentration due to more distraction is also often mentioned. Data on actual workspace use from two departments was retrieved in both work environments using Radio Frequency Identification (RFID) tags of 85 employees, and a questionnaire was carried out among all 1225 employees in order to measure communication, concentration, collaboration, privacy and distraction. The study indicates that it is possible to increase both communication and concentration by introducing task facilitating working environment. Improvements were also found for collaboration, privacy and reduction of distraction.

## **INTRODUCTION**

Due to the introduction of a large variety of new communication tools and more flexible ways of organizing work processes the working environment of office workers have changed substantially (Croon et al. 2005). Nowadays, office workers in European companies can often work from home or other remote locations (Lai et al. 2002). A study of Hengst et al. (2008) showed that 68% of all companies in the Netherlands have mobile workers. In the service sector this number is even higher (86%). Three percent of the Dutch workers even work predominantly at home according to this study. Although mobile working (like at home) has some advantages, coming to the office still provides workers with the added value of interacting with colleagues (Lai et al. 2002). In an evaluation of mobile work among three companies and three governmental service departments it was shown that people feel less connected and demand more communication facilities at the office if they work mobile regularly, in virtual teams or while travelling. To solve these problems some offices have created more attractive, flexible and comfortable communication facilities.

One of the often seen actions in order to increase communication facilities and collaborative work is the introduction of open and shared work spaces. Furthermore, task facilitating offices are designed, where employees can choose from a wide range of workplaces, depending on which task they are performing; such as open offices, concentration areas, discussion zones, coffee corners etc. (Voordt, 2003). It is often done in combination with facilities to work at home or while traveling as well. Assumed effects of this type of office interiors are that (Bauman & Arens, 1996; Veitch, 2002; Voordt, 2003; Robertson, 2006):

- communication at the office is better due to more and better communication areas (speeds information flow and facilitates spontaneous team interactions),
- office building costs and environmental load can be reduced as less space is needed as a part of the work force is doing their work at another place,
- wellbeing and productivity is increased due to the fact that employees can choose the working environment fitting to the task

On the other hand there are some commonly mentioned disadvantages of these open offices

like a lack of concentration, a reduction of personal privacy and an increase of distraction (Bauman & Arents, 1996). These assumptions of the effects of task facilitating open offices are rather new and the effects are hardly studied (Voordt, 2003; Croon et al. 2005). One of the causes is the lack of appropriate systems to measure productivity and work space use (Voordt, 2003; De Croon et al. 2003). Some studies do mention improvements in communication due to task facilitating office interiors (Lee & Brand, 2005) which might enhance productivity. A disadvantage of more communication could be the reduction in concentration due to the increased distractions (Korte et al. 2006; Voordt, 2003) which can have a negative effect on the productivity (Lee & Brand, 2005; Banbury & Berry, 2005). In our vision it is therefore important to have areas where concentrated work can be done. The assumption is that adding these silent rooms (often just for one person) should solve the problem of the lack of concentration possibilities.

Scientific effects of these interiors with added concentration area's on wellbeing are studied (e.g. Bauer, 2003; Robertson et al. 2006) and it could be related to productivity, especially when people have the possibility to choose the environment they need. Wellbeing and productivity might increase when employees have more control over the decisions on the way of doing their job (Robertson et al. 2006) The hypotheses of this study were:

*The new task facilitating office building with less office space and more variety in workplaces (like open spaces, concentration areas etc.) increases communication, collaboration and efficiency of workspace use in comparison to the old traditional working office. Adding concentration areas to the task facilitating office environment will reduce the side effects such as a decrease of concentration and privacy and the increase of distraction.*

To test this hypotheses a study was conducted in an international ICT company. This company changed from a traditional office to an entire new task facilitating office building (see figures 1 and 2). In order to measure efficiency of workplace use, a system to measure the actual workspace use over time was developed and tested. A questionnaire was used as well to measure office use, communication, concentration, collaboration,

privacy and distraction and was filled out in the old and new working environment.

## METHOD

### Study design

To compare the traditional and the new office environment measurements were carried out in the traditional office and in the new office environment after 2 months of use. In the old office environment people mostly had owned workstations, and worked in an open office area (see figure 1). In the new office environment the flexible work environment was introduced in which employees have shared workspaces. Since the entire office was equipped with wireless internet the employees were able to work everywhere throughout the department. In this new office environments lounge workspaces, small meeting spaces, concentration areas and standing tables were introduced (see figure 2).



Figure 1. Traditional office environment with owned workstations.



Figure 2. New office environment with shared workstations and different task facilitating spaces (lounge workspace, concentration area and telephone booth).

### Measurements

*Work space use.* In order to retrieve location data of the employees, a new measurement system consisting of portable tags and beacons with an active Radio Frequency Identification (RFID) circuit was developed. The system was able to measure location data of employees wearing RFID tags, with a sample frequency of 2Hz. A total of 85 employees of two departments (A and B) were asked to volunteer in

the study and wore the portable tags throughout their entire work day. Measurements of location data from the old traditional office environment was conducted during one workweek and in the new environment two workweeks.

*Questionnaire.* A web based internet questionnaire was carried out in the old and the new office environment among 1125 employees of the company. The questionnaire consists of questions regarding office space use, communication, concentration, collaboration, privacy and distraction. Question items from several validated questionnaires were combined and used in the questionnaire.

### Statistical analyses

Descriptive statistics were used in order to compare old and new office environment on workplace use.

To compare questionnaire data from the traditional and the task facilitating office an independent t-test was used.

## RESULTS

In total 684 employees (81% male, average age 37 years) of the total 1125 invited employees completed the questionnaire. 315 completed both pre and post questionnaires. One third (33.3%) of the responded group was working as intern consultants, one third (34.7%) external consultant, 17.5% was management and 14.5% had an administrative function. RFID data were collected from 236 workstations and 35 meeting spaces of which 97 workstations and 13 meeting spaces were measured in the old traditional office and 139 workstations and 26 meeting spaces in the new task facilitating office. Seventy employees of two departments wore a RFID tag in the traditional office and 79 employees wore a tag in the new task facilitating office. Sixty-six of them wore a RFID tag in both the old and the new office environment.

### Office space use

Figure 3 shows the percentage of work time spent at different workstations. Compared to the traditional offices, the employees make less use of the owned workstations and more use of shared workstations and meeting rooms. The percentage

of time spent in a concentration room has not increased in the new office environment.

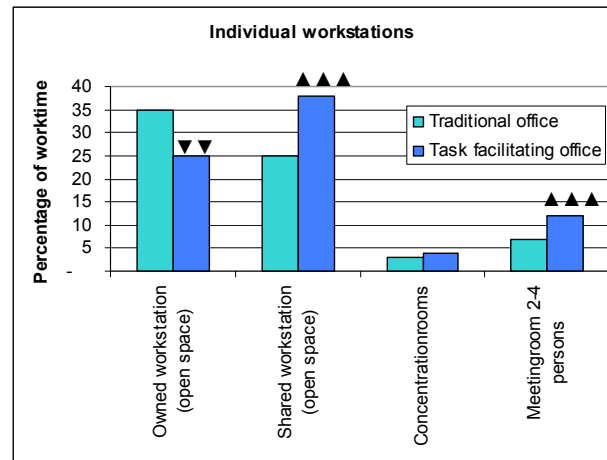


Figure 3. Percentage of work time spend at an office workstation. Significant: ▲:  $p < 0,05$ , ▲▲:  $p < 0,01$ , ▲▲▲:  $p < 0,001$  (and ▼): significantly high (low) means.

Figure 4 shows the number of workstation switches, which can be seen as an indication of the number of workstations a person occupied during a working day. This has increased for department A, but not for department B. Averaged employees make use of at least 2.7 workstations during a working day. An increase in the number of workstations would be expected since the work task might differ during the day and the new office environment offers more variability in task facilitating workplaces.

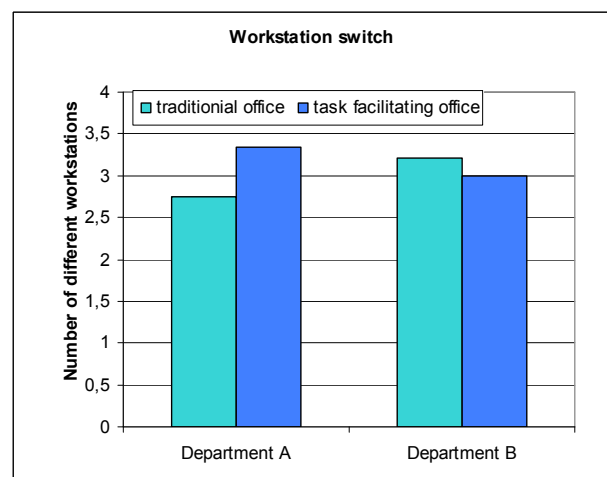


Figure 4. The number of workstation switches averaged per employee during a workday.

The 'travel time' is the time that an employee is at the office, but not sitting in a meeting room or at a workstation. This means that a person is walking or standing at place where there are no

workstations. In figure 5 a percentage of the total working time not at a workstation is demonstrated. An increase in the percentage of travel time can be seen in the new office environment for both departments.

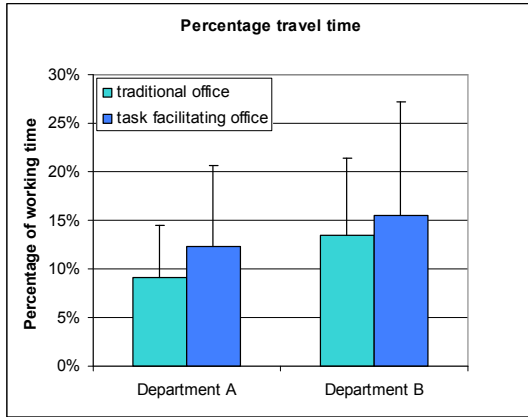


Figure 5. Percentage of the working time that an employee is traveling through the department.

Although there is less workspace available in the new office environment the subject experienced an increase in the sufficiency of workplaces compared to the old work environment (see figure 6).

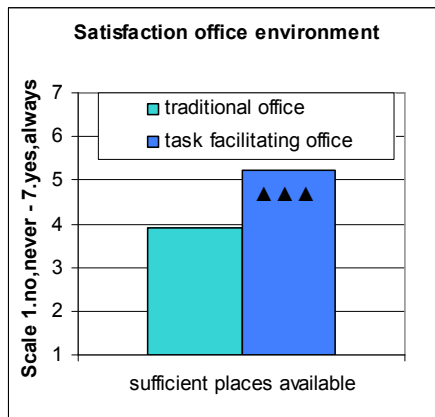


Figure 6. The average score on sufficient workplaces available. . Significant: ▲▲▲:  $p < 0,001$  significantly high means.

*Productivity regarding concentration, communication and cooperation.*

Despite the fact that there is no significant increase in the percentage of working time spent in concentration areas, the self rated productivity of the work with regard to concentration has increased. In the old traditional office environment the concentration was rated as being negative, while in the new task facilitating office the concentration has increased above neutral. The

communication with colleagues as well as with visitors increased as well. Also, the new office environment better supported cooperation with colleagues (see figure 7).

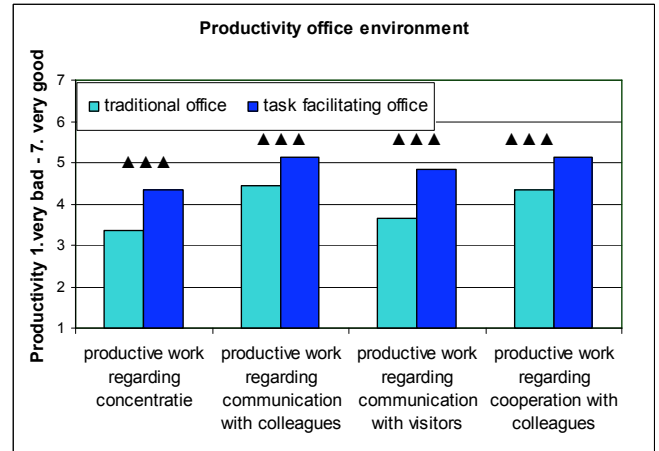


Figure 7. Average score on productivity outcomes. Significant: ▲▲▲:  $p < 0,001$  significantly high means.

*Satisfaction with office environment (privacy, concentration and distraction).*

Figure 8 shows that the difficulty to concentrate has decreased in the new task facilitating office environment. The privacy of the office environment increased from negative support for privacy of the old traditional office environment towards a neutral score in the new task facilitating office environment.

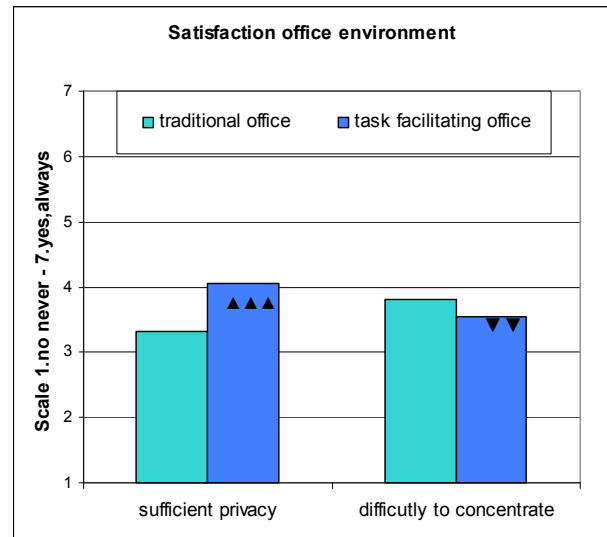


Figure 8. Average score on sufficient privacy and difficultly to concentrate in the traditional and task facilitating office environment. Significant: ▲:  $p < 0,05$ , ▲▲:  $p < 0,01$ , ▲▲▲:  $p < 0,001$  (and ▼): significantly high (low) means.

*Distractions office environment.* The new task facilitating office also caused a decrease in the perceived and actual noise of the office environment, and less visual distraction as compared to the old traditional office environment (see figure 9)

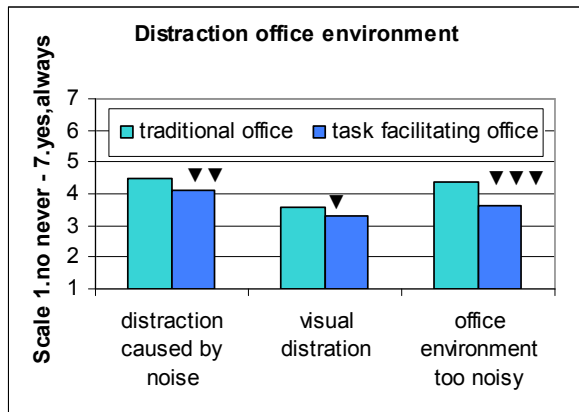


Figure 9. Average score wellbeing and satisfaction with the office environment. All variables are significant ( $p < 0,001$ ) except for walking distance colleagues ( $p < 0,01$ ).

## DISCUSSION

### Communication and Concentration

The new task facilitating office environment provides the employee with a wide variety of workspaces in order to optimize support of the working task. The new work environment consists of open workplaces in combination with concentration spaces and meeting rooms and has less square meters of working surface. The convictions of this new type of working environment are that it enhances communication and collaboration. However although an increase in communication as a result of task facilitating offices is mentioned (Lee & Brand, 2005) previous research on open workspaces has shown that open workplaces also cause a lack of concentration, a reduction of personal privacy and an increase of distraction (Bauman & Arents, 1996). It seems to be that concentration decreases when communication increases as a cause of distraction (Voordt, 2003). This however should not be the case when sufficient concentration areas are provided and the amount of distraction is reduced.

The results confirm the hypothesis that the task facilitating environment will cause an increase in communication. This did not only account for the communication with colleagues

but also for communication with visitors. The results also confirm the expectation that the new office environment will counteract the decrease of concentration. However the counteraction is not caused by the added concentration areas since there is no significant increase in the actual use of these areas. Even without the use of these areas the flexible office environment better facilitated concentration work. Productivity with regard to concentration has increased significantly and the difficulty to concentrate is decreased as compared to the traditional office environment.

The perceived privacy at the office has also increased significantly and less distractions (visual as well as audio) is reported for the new office environment.

### Office space use

The significant increase in communication, collaboration, concentration and the privacy together with a decrease in distraction assumes that there was a good match between work environment and work tasks. Task facilitating office environments requires a different approach of working, and it is expected that employees will choose the most appropriate workspace for their work task. Since there are several work tasks throughout the day (telephone calls, concentrated reading, meetings, communicate with project etc.) it was expected that the employees would change to different workplaces throughout the day as well. This however is not strongly confirmed by the data computed from the RFID tags. The data on the number of workplace switches is somehow conflicting and does not strongly indicate an increase in the number of workplaces used throughout the day. There are several explanations that could be considered. For instance the fact that the number of workspace switches was already high at the traditional office (2.7 different workplaces per day) assumes that people were already using different workspaces, but the variety of the different workspaces was less, and might not have been the best fit to the work task.

The expected effect of the new task facilitating office is that it might enhance interaction with colleagues and therefore cause an increase in communication. It is possible that time spent in interaction with colleagues could be seen back in the percentage of travel time. The percentage of traveling time has increased in both departments for the new task facilitating office

environment. However since we do not know what exactly took place during that time we can not draw any conclusions other than that there is more time spent in places other than the working and meeting places.

## CONCLUSION

There are many convictions on the effects of new ways of work. Smaller office buildings with task facilitated working environments with shared work stations are supposed to lower the building costs, increase communication and wellbeing.

Previous research showed improvement of the communication, but this was accompanied by a decrease of the concentration (Lee & Brand; 2005). This study shows that it is in fact possible to increase both communication and concentration by introducing task facilitating working environment. Improvements were also found for collaboration, privacy and reduction of distraction, while the RFID data confirms the expectation that movement of the employees increase. The RFID data however does not totally confirm an increase in change between different (task facilitating) workspaces.

Overall we can say that tracking the actual location of employees together with the use of a questionnaire on perceived productivity (like communication, concentration, collaboration, privacy and distraction) provides insight in the use and the effect of the different workspaces. The results show that this measuring method can be used to evaluate whether the work environment are designed well and is used for the proper purpose.

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