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## **Accommodating new ways of working lessons from best practices and worst cases**

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## **Accommodating New Ways of Working: Lessons from Best Practices and Worst Cases**

### **ABSTRACT**

**Purpose** – This paper explores which factors may explain the high or low percentages of satisfied employees in offices with shared activity-based workplaces.

**Design/methodology/approach** – The paper compares data on employee satisfaction from two cases with remarkably high satisfaction scores and two cases with significantly lower satisfaction scores (total N = 930), all of the same organisation. These cases were selected from a database with employee responses to a standardised questionnaire in 52 flexible work environments. In the four case studies, also group interviews were conducted.

**Findings** – Overall, there are large differences in employee satisfaction between cases with, at first sight, a similar activity-based office concept. The main differences between the best and worst cases regard employee satisfaction with the interior design, level of openness, subdivision of space, number and diversity of work places, and accessibility of the building. Employee satisfaction shows to be influenced by many physical characteristics of the work environment and by the implementation process. Satisfaction with the organisation may have an impact as well.

**Research limitations** – Almost all cases regard Dutch organisations. Due to the lack of quantitative scales to define the physical characteristics of the work environment, the study is mainly descriptive and explorative and does not include advanced multivariate statistical analyses.

**Practical implications** - The data revealed clear critical success factors including a supportive spatial lay-out to facilitate communication and concentration, attractive architectural design, ergonomic furniture, appropriate storage facilities, and coping with psychological and physical needs such as privacy, thermal comfort, daylight and view. Critical process factors are the commitment of managers, a balance between a top-down and a bottom-up approach, and clear instructions on how to use activity-based workplaces.

**Originality/value** –The study connects descriptive research with inductive reasoning to explore why employees may be satisfied or dissatisfied with flex offices. It is based on a combination of quantitative survey data from 52 cases and a closer look at two best cases and two worst cases based on qualitative data from interviews and personal observations. The study has high practical value due to the integral approach that incorporates many items of the physical environment and context factors like the implementation process.

**Keywords** – Employee satisfaction, office environment, activity-based workplaces, best practice, critical success factors, new ways of working.

**Paper type** – Research paper.

## **1. Introduction, purpose of the study and research questions**

### *1.1 In search for the 'best' office concept*

In the 1970's various organisations started to experiment with open offices, also called landscape offices or 'Burolandschaft'. Open offices were assumed to better support communication and collaboration than cellular offices, due to the visibility and proximity of colleagues and easy interactions (Bedoir, 1979; Van Meel, 2000). Other expected benefits include improved use flexibility due to an easier re-arrangement of workplaces, and cost savings by reduced circulation and construction space (fewer corridors, less walls). In practice however, employees complained about lack of privacy, difficulties with concentration, distraction by colleagues talking to each other and by phone calls, and the phenomenon of the Sick-Building Syndrome: health complaints due to a poor indoor air quality and lack of personal control (Block and Stokes, 1989; Hedge, 1982; Sundstrøm et al., 1982; Zalesney and Farace, 1987; Brennan et al., 2002; Banbury and Berry, 2005). The debate about the pros and cons of open offices is still going on in academic journals (see for instance Purdey and Leifer, 2012; Kim and De Dear, 2013) and on discussion sites such as LinkedIn.

In the early 1990's so-called combi-offices came up, starting in Sweden, to combine the benefits of cellular offices (opportunities to concentrate, privacy, personal control) and the benefits of open offices (easier contact with colleagues) by providing small enclosed spaces with assigned desks clustered around shared facilities in an open setting. From the mid-nineties on sharing of non-assigned activity based workspaces was introduced as well, both to provide a variety of workplaces that fit best with the various activities of the employees, and to cope with low-occupancy levels of personally assigned desks. As such, organisations wanted to improve the effectiveness and efficiency of costly resources. Nowadays worldwide numerous organisations have adopted the concept of "New Ways of Working" (NWoW) and shared activity-based workplaces, also referred to as new offices, flexible offices, flex offices or non-territorial offices. The main drivers behind shared use of activity-based workspaces are similar to the ones behind open offices: stimulating communication and collaboration and cost reduction (Becker, 2004; Allen et al., 2004). Related objectives are increasing productivity due to improved collaboration and a better fit of activity-based workplaces with the variety of tasks and the psychological needs of modern knowledge workers i.e. autonomy and freedom when, where and how to work, stimulating innovations, supporting (change of) culture, and contributing to sustainability by reducing the footprint (Van der Voordt, 2003; Haynes, 2008; Van der Voordt et al., 2012). It is expected that new ways of working in flex offices will have a positive impact on these items, both from a business point of view (efficiency and productivity) and from the perspective of the employees (support of work processes, freedom of where to work).

### *1.2 Conflicting outcomes*

Many authors have discussed interesting projects from leading companies and the need for new work environments due to innovative IT devices that enable to work where, when and how people want (Duffy, 1992; Becker, 1993; Aronoff and Kaplan, 1995; Duffy and Powell, 1996; Worthington, 1997; Becker, 2004). Most books on reinventing the workplace and

advanced workplace strategies show a positive and optimistic picture. The concept seems to address the need for personal control over the environment and provides an opportunity to choose a workplace that fits best with personal needs and work processes. Both factors are considered important elements for satisfaction and productivity (Leaman, 1995; Bodin-Danielsson and Bodin, 2008; Bakker, 2014). However, evaluations based on employee surveys are usually more critical. Although many people can cope well with shared use of activity-based workplaces, quite a number of people complain about a lack of privacy, poor support of work requiring concentration, and insufficient storage space (Van der Voordt, 2004; Maarleveld et al., 2009; Blok et al., 2009; Gorgievski et al., 2010; Appel-Meulenbroek et al., 2011; Riratanaphong and Van der Voordt, 2011; Van der Voordt et al., 2012; De Been and Beijer, 2014; Appel-Meulenbroek, 2015; Van der Voordt et al., 2016). When people are prohibited to personalize the work environment, they seek additional ways to make the environment familiar and pleasant and to mark their identity (Brunia and Hartjes-Gosselink, 2009).

### *1.3 In search of predictors of success*

Because many variables may influence the levels of satisfaction in real life situations, it is hard to define cause-effect relationships and to trace which particular characteristics of the work environment are leading in success or failure of a flex office. Satisfaction about the shared use of activity based workspaces can be influenced by inter alia the spatial lay-out, the flex-ratio i.e. the number of available workplaces per person or per full time equivalent, the level of openness, ergonomics and comfort, employees' experiences with other work environments, and physical working conditions such as the indoor climate.

Apart from the physical environment itself, satisfaction about the organisation, the work processes, colleagues, and terms of employment such as wages, career perspective and number of days of leave can have a mediating effect on the appraisal of activity based workspaces (Riratanaphong and Van der Voordt, 2012). Furthermore the process of implementation shows to be important (Van der Voordt, 2003; de Bruyne, 2007). Avoiding or reduction of resistance to change is usually a major component of any change management approach. According to Kreitner and Kinicki (2007) there is no universal strategy for dealing with resistance. However, sound communication is essential and should at least include four elements: 1) inform employees about the change ('what'), 2) inform employees about the rationale underlying the change ('why'), 3) organise meetings for answering questions that employees may have, 4) let employees discuss how the change may affect them. Other factors that contribute to a successful implementation of a new office concept include:

- A clear understanding of the nature of change (Finch, 2012);
- An ex ante analysis of the organisation, its work processes and the current accommodation to define the drivers to change, which interventions are expected to be successful, and potential resistance to change (Hoendervanger et al., 2016);
- Having clear and unequivocal objectives (Van der Voordt, 2003; Unger, 2004);
- Commitment and shared perceptions among general managers and employees (Beer, Eisenstat and Spector, 1990; Dewulf and Vos, 1998; Klein and Knight, 2005);
- Adequate aftercare (Dewulf and Vos, 1998; Van der Voordt, 2003).

#### *1.4 Learning from best practices and worst cases*

In most studies, valuable *generic* conclusions are drawn with regards to the activity-based working concept, some of them based on many cases (e.g. Appel-Meulenbroek, 2015; De Been et al., 2015). However, yet little attention is paid to the differences between successful and unsuccessful cases. Organisations considering the implementation of new ways of working in activity-based work setting can draw benefits from the experience of other organisations that have already implemented activity-based workplaces in a more, or less, successful way.

It is expected that successfully implemented flexible office concepts have certain design or process characteristics in common that positively influence its success. It is also likely that unsuccessful flexible offices are characterised by corresponding failure factors. In order to increase our understanding of the factors that account for the success of activity-based offices, this paper aims to answer three research questions:

- How satisfied or dissatisfied are employees working in flex offices regarding various items of their work environment?
- What lessons can be learned from best practices and worst cases, i.e. cases with a remarkable high or low percentage of satisfied employees?
- What are the critical factors for success or failure of the design and implementation of flexible office concepts?

The many factors and complex relationship between these factors and satisfaction of the end users, call for an integrated approach in which many of the possible influential elements are taken into account.

## **2. Methods and data**

Since its foundation, the Center for People and Buildings (CfPB) in Delft, Netherlands, conducted numerous Pre- and Post-Occupancy Evaluations using a standardized questionnaire to measure the employees' (dis)satisfaction with different office environments. This makes it possible to conduct a cross-case analysis and to explore which cases are most successful or less successful.

### *2.1 Data collection*

The CfPB data were collected by a standardised questionnaire, the Work Environment Diagnosis Instrument (WODI) (Maarleveld et al., 2009). This questionnaire includes 41 items and, depending on the case study, some additional questions. The key questions regard employee satisfaction with the physical work environment and the perceived support of productivity by the work environment. In the current study, the 21 items that focus on employee satisfaction with the work environment, were used for the analyses, i.e. employee satisfaction with the organisation, content of work, architecture and lay-out of the building, privacy, concentration, communication, indoor climate, facilities and remote working. All items are assessed on a 5-point Likert scale ranging from very dissatisfied (1) to very satisfied (5) and the option 'not applicable'. One item that assesses the overall appreciation with the

implementation process, scored on a 10-point Likert scale ranging from lowest score (1) to highest score (10), was also used for analysis. If possible at all, additional in-depth group interviews were conducted as well, in order to understand the reasons for (dis)satisfaction with particular aspects of the work environment. These group interviews were semi-structured and included 4 to 6 employees with different functions (De Been et al., 2015). Furthermore, an analysis of context information and the implementation process is included, based on interviews, document analysis, and personal observations of the physical work environment and employee behaviour.

## *2.2 Case selection*

The WODI questionnaire of the Center for people and Buildings has been used in both traditional offices and flexible offices with activity-based workplaces. For this paper the flexible offices were selected for further analysis. This dataset includes the satisfaction scores of 7,140 respondents from 52 different cases in 21 different organisations. Most cases represent an office building, whereas some cases represent a part of a building, such as a wing or several floors, if this part is considerably different than other parts of the building. A case never entails more than one office building; if so the case study is split in separate cases. The 52 case studies were conducted between 2007 and 2014, mainly in the Netherlands. All respondents have white-collar functions, ranging from administrative support to research and management in the public and semi-public sector, higher educational institutions and some commercial organizations.

In order to improve our understanding of why the results differ from case to case, whereas the office concept is rather similar, two cases with high satisfaction levels and two cases with significantly lower satisfaction levels were selected for in-depth analysis. According to Yin (2009) best and worst case are critical instance cases from which much can be learned. The following criteria were used for the selection of two successful and two less successful cases:

- Buildings from the same organisation in order to minimise the influence of the type of organisation and organisational culture
- For at least half of the items significant differences between the percentages of satisfied employees in the best and worst cases
- All with a similar previous situation i.e. a cellular office, and a similar new situation i.e. a flexible office with shared use of activity-based workplaces and comparable behavioural rules (e.g. clean desk policy)
- All with comparable work processes.
- All from the Netherlands
- Responses from at least 50 respondents
- The availability of additional qualitative data, derived from group interviews, document analysis and/or observations

The characteristics of the four selected cases are presented in table 1.

**Table 1: Characteristics of the four selected cases**

	<b>Case 1</b>	<b>Case 2</b>	<b>Case 3</b>	<b>Case 4</b>
	<b>Successful</b>	<b>Successful</b>	<b>Less successful</b>	<b>Less successful</b>
<b>Location</b>	Utrecht	Hoofddorp	Utrecht	Groningen
<b>Built</b>	1997	1997	2005	2011
<b>Time NWoW in use</b>	1 year	1-2 years	1-2 years	1 year
<b>Flex factor</b>	0.7 workplaces/ person	0.7 workplaces/ person	0.7 workplaces/ person	0.7 workplaces/ person
<b>Respondents (response rate)</b>	N = 58 (69%)	N = 109 (60%)	N = 372 (52%)	N = 391 (49%)
<b>Focus groups</b>	2 groups	6 groups	6 groups	7 groups

### 2.3 Data-analysis

The descriptive part of the analysis consists of a comparison of quantitative data about employee satisfaction in 52 cases and a closer look at the four selected cases, on all 22 items. The differences between the average satisfaction scores on the 5-point scale (21 items) and 10-point scale (1 item) in the four cases were tested on statistical significance by ANOVA tests with additional Post-Hoc tests. The explorative part to understand the causes of similarities and dissimilarities between employees satisfaction in the four cases is based on inductive reasoning. In particular the qualitative data - group interviews, document analysis and personal observations - have been used to understand and explain the high and low satisfaction levels in the two successful cases and the two less successful cases.

### 3. Findings

Table 2 shows the percentages of (very) satisfied respondents (score 4 and 5 on the 5-point Likert scale) in each of the four selected cases and all 52 cases with shared activity-based workplaces. The table also shows which differences between the average scores on the 5-point scales in the four selected cases are statistically significant. Finally, the table shows the respondents' average grade of the implementation process, on a scale from 1 to 10.

**Table 2: Comparison of % satisfied employees in the four selected cases and the average and highest and lowest % satisfied employees in all 52 cases with shared activity-based workplaces.**

	% of (very) satisfied respondents in Case 1		% of (very) satisfied respondents in Case 2		% of (very) satisfied respondents in Case 3		% of (very) satisfied respondents in Case 4		Range between best and worst case	Average % satisfied respondents in 52 flex cases	Highest % of satisfied employees in 52 flex cases	Lowest % of satisfied employees in 52 flex cases	Range between highest and lowest score in 52 flex cases
Organisation**	<b>84%</b>	<sup>34</sup>	75%	<sup>34</sup>	52%	<sup>124</sup>	49%	<sup>123</sup>	35%	65%	98%	26%	72%
Content and complexity of work*	79%		80%		<b>82%</b>	<sup>4</sup>	73%	<sup>3</sup>	9%	78%	95%	40%	55%
Sharing own ideas about work environment**	<b>55%</b>	<sup>34</sup>	43%	<sup>34</sup>	24%	<sup>12</sup>	25%	<sup>12</sup>	31%	39%	67%	7%	60%
Accessibility of the building**	<b>98%</b>	<sup>234</sup>	84%	<sup>134</sup>	69%	<sup>124</sup>	46%	<sup>123</sup>	52%	78%	98%	19%	79%
Architecture and appearance of the building**	<b>90%</b>	<sup>234</sup>	60%	<sup>1</sup>	66%	<sup>14</sup>	73%	<sup>13</sup>	30%	63%	96%	12%	84%
Subdivision and overall layout of the building**	<b>83%</b>	<sup>234</sup>	46%	<sup>134</sup>	31%	<sup>12</sup>	29%	<sup>12</sup>	54%	49%	83%	18%	65%
Number and diversity of spaces**	<b>81%</b>	<sup>234</sup>	51%	<sup>134</sup>	23%	<sup>124</sup>	28%	<sup>123</sup>	53%	46%	81%	10%	71%
Adjacency and locality of the spaces**	<b>77%</b>	<sup>234</sup>	51%	<sup>134</sup>	29%	<sup>124</sup>	37%	<sup>123</sup>	38%	53%	86%	20%	66%
Openness and transparency of environment**	<b>90%</b>	<sup>234</sup>	57%	<sup>134</sup>	37%	<sup>12</sup>	33%	<sup>12</sup>	57%	54%	89%	19%	70%
Functionality and comfort of the workspaces**	<b>76%</b>	<sup>34</sup>	66%	<sup>34</sup>	32%	<sup>12</sup>	32%	<sup>12</sup>	34%	54%	82%	18%	64%
Interior design appearance and ambiance**	<b>86%</b>	<sup>34</sup>	78%	<sup>34</sup>	49%	<sup>124</sup>	21%	<sup>123</sup>	65%	58%	92%	18%	74%
Privacy	<b>53%</b>	<sup>234</sup>	31%	<sup>134</sup>	15%	<sup>12</sup>	13%	<sup>12</sup>	40%	29%	53%	8%	45%
Opportunities to concentrate**	<b>65%</b>	<sup>234</sup>	42%	<sup>134</sup>	25%	<sup>12</sup>	24%	<sup>12</sup>	41%	35%	65%	9%	56%
Opportunities to communicate**	<b>86%</b>	<sup>234</sup>	74%	<sup>134</sup>	55%	<sup>12</sup>	55%	<sup>12</sup>	31%	69%	92%	35%	57%
Archive facilities**	<b>28%</b>	<sup>3</sup>	26%		16%	<sup>14</sup>	24%	<sup>3</sup>	8%	31%	67%	2%	65%
ICT and ICT supporting services**	46%	<sup>2</sup>	<b>74%</b>	<sup>134</sup>	45%	<sup>2</sup>	53%	<sup>2</sup>	28%	51%	89%	17%	72%
Facility services**	<b>65%</b>	<sup>34</sup>	55%	<sup>34</sup>	32%	<sup>24</sup>	37%	<sup>3</sup>	33%	52%	87%	23%	64%
Indoor climate**	35%	<sup>3</sup>	<b>28%</b>	<sup>34</sup>	8%	<sup>124</sup>	15%	<sup>23</sup>	27%	34%	78%	0%	78%
Light**	<b>78%</b>	<sup>3</sup>	63%	<sup>3</sup>	40%	<sup>124</sup>	62%	<sup>3</sup>	38%	59%	88%	26%	62%
Acoustics**	<b>72%</b>	<sup>234</sup>	28%	<sup>1</sup>	28%	<sup>1</sup>	29%	<sup>1</sup>	44%	39%	79%	14%	65%
Opportunities for remote working	<b>62%</b>		54%		45%		46%		16%	52%	90%	5%	85%
Implementation process (grade from 1 to 10)	7,2	<sup>234</sup>	6,0	<sup>13</sup>	5,2	<sup>12</sup>	5,5	<sup>2</sup>	2,0	5,9	7,5	3,6	3,9

\*\* p < 0,01 | \* < 0,05

<sup>1234</sup>	Significant difference between the case(s) with the corresponding number (Case 1, 2, 3 and 4)
<b>Bold</b>	Highest average score on a 5-point satisfaction scale
<u>Underline</u>	Lowest average score on a 5-point satisfaction scale

The percentages of satisfied respondents in the 52 cases show that not all aspects of a flexible work environment are widely appreciated. Aspects that are, in general, appreciated by a high percentage of employees are the accessibility of the building, the architecture and appearance of the building and the opportunities to communicate (all with over 60% satisfied employees). Indoor climate, privacy, archive facilities, opportunities to concentrate and sharing own ideas about the work environment are positively appraised by a much lower percentage of respondents (less than 40% satisfied). However, table 2 also shows huge differences between the percentages of satisfied respondents in the 52 cases. For example, while on average 69% of the respondents is satisfied with the opportunity to communicate, in one of the cases only one third (35%) of the respondents is satisfied with this aspect whereas in another case almost all respondents (92%) are satisfied with this item. This shows that regardless of the seemingly similar office concepts, there are some case-specific factors that really influence the scores.

The largest differences in the percentage of satisfied employees between the two best and two worst cases regard the interior design (86% versus 21%), level of openness (90% versus 33%), subdivision of space (83% versus 29%), number and diversity of work places (81% versus 23%), and accessibility of the building (98% versus 46%). Besides, also the percentage of satisfied employees with regard to the organisation differs a lot, from 84% (best case) till 49% (worst case). In all cases, the majority of the employees is satisfied about the content and complexity of their work (ranging from 73% till 82%).

The high range of satisfied and dissatisfied employees in different cases shows that there seem to be case-specific factors, presumably related to the physical environment, organisation, management style and the implementation process, that really matter and have a substantial influence on the perception of the activity-based working environment. In the two best cases, especially the first, the implementation process is rated higher compared to the two worst cases.

### *3.1 Possible explanations of high and low employee satisfaction levels*

Based on the group interviews, document analysis and personal observations, many factors were found that may explain the high and low percentages of satisfied employees. Table 3 summarizes the similarities and dissimilarities between the four selected cases, both regarding the percentage of satisfied employees per item compared to the average percentage of satisfied employees in all 52 flexible cases and possible explanations for the outstanding high or low scores. Below the main findings per case are further explained.

**Table 3: Satisfaction levels per aspect per case compared with the average satisfaction scores in 52 cases and possible explanations for the different satisfaction levels, based on group interviews, document analysis and personal observations.**

	Case 1	Case 2	Case 3	Case 4
<b>Organisation**</b>	++ commitment of management	++ commitment of management	--	-- management not fully committed to the concept and not all of them flex themselves
<b>Content and complexity of work*</b>	+/-	+/-	+/-	+/-
<b>Sharing own ideas about work environment**</b>	++ employees involved in concept and design	+/- possibility to give feedback in working groups	-- employees could give their opinion about the number and diversity of spaces	-- employees could give their opinion but not all input was implemented
<b>Accessibility of the building**</b>	+++ location near central train station	+/- location near central train station of a large city	+/- far away of railway station; longer travel time due to move to other city	---- due to a merge of small offices some people have to travel longer
<b>Architecture and appearance of the building**</b>	+++ light interior with natural materials and plants is very much appreciated	+/- large amount of daylight; light and bright coloured materials	+/- quite large and deep building	++ employees are proud of the new building, which is a price winner and marks the city
<b>Subdivision and overall layout of the building**</b>	++++ small floorplan, easy to oversee, two separate areas	+/-	-- long walking distances; lack of overview; employees work in a different zone than expected	--- employees work in a different zone than expected and which does not fit to their needs
<b>Number and diversity of spaces**</b>	++++ sufficient mix of spaces; open spaces alternated with enclosed spaces; all types of workplaces	+/- nice diversity of spaces for meeting or working individually	--- popular spaces limited available due to territorial behaviour	-- enclosed spaces limited available due to territorial behaviour; relatively many open spaces
<b>Adjacency and locality of the spaces**</b>	+++ small floorplan, easy to oversee; many meeting rooms available at short distance	+/-	--- needed spaces not always nearby	-- employees need to walk across the building to find the spaces they need
<b>Openness and transparency of environment**</b>	++++ openness alternated with closed spaces; glass walls	+/-	-- glass walls should be less transparent	--- open space is relatively large; lack of privacy
<b>Functionality and comfort of the workspaces**</b>	+++	++ sufficient diversity, but not all workspaces are equally facilitated with IT	---	---
<b>Interior design appearance and ambience**</b>	+++ light, coloured, natural materials	+++ light and coloured materials	+/- dark (grey) with some bright coloured accents	---- colourless interior; use of raw and sober materials (e.g. concrete)
<b>Privacy</b>	+++ sufficient enclosed spaces and use of acoustic materials	+/- conversations could be easily overheard	-- large open spaces	--- large open spaces; no space for confidential telephone calls
<b>Opportunities to concentrate**</b>	++++ quiet zone supports concentration; sufficient enclosed spaces	+/- sounds from surroundings are distracting	-- large open spaces with much distraction; enclosed spaces often occupied by the same person	-- not enough enclosed spaces; claiming behaviour; too much distraction in open spaces
<b>Opportunities to communicate**</b>	++ open zone supports communication; meeting rooms nearby, but often occupied or no-shows	+/- large pantry areas with meeting tables	-- meeting rooms not always sufficiently nearby	-- problems with booking large meeting rooms (everything is fully booked/many no-shows)
<b>Archive facilities**</b>	+/- 1 metre of personal archive space; digital archive system is not yet fully developed	+/- 1 metre of personal archive space	-- 1 metre of personal archive space	-- 1 metre of personal archive space; digital archive system is not yet fully developed
<b>ICT and ICT supporting services**</b>	+/- loss of time due to problems with connecting cables	+++	+/- employees were not always familiar with possibilities of their devices	+/-
<b>Facility services**</b>	++	+/- complaints about cleaning services	--- lack of feedback on employees' complaints	--
<b>Indoor climate**</b>	+/- too warm on one side or too cold on the other side of the building	+/- big differences in temperatures between floors	--- too warm (south side) or too cold (north side); no clear response to employees' complaints	-- high ambitions and expectations about sustainability not answered; too warm (south side) or too cold
<b>Light**</b>	++ much daylight (windows on all sides); light coloured materials	+/- much daylight; light coloured materials	-- quite deep building with limited daylight; dark materials	+/- many windows; possibility to open windows is appreciated
<b>Acoustics**</b>	++++ use of sound absorbing materials; acoustic panels	- lack of acoustic measures; insufficient acoustic isolation	--	-- lack of acoustic measures in open space; conversations easily overheard
<b>Opportunities for remote working</b>	++	+/-	+/-	+/-
<b>Implementation process (based on interviews)</b>	employees involved; workshops; tour through new environment; time schedule visible	sufficient information for most employees; representatives employees involved	employees not sufficiently involved; no supervision on proper use	employees not sufficiently involved; no reactions to problems in work environment; no supervision on proper use

+/- < 10% above or below average

++ 10-19% above average

+++ 20-29% above average

++++ 30-39% above average

-- 10-19% below average

--- 20-29% below average

---- 30-39% below average

empty cell = no remarkable issues

\* statistically significant differences between cases  $p < 0.05$

\*\* statistically significant differences between cases  $p < 0.01$

### *Case 1- High satisfaction levels*

The layout of the building and the mix of available work spaces are highly appreciated. The work environment is situated above a large conference centre with many meeting rooms, available to the users of the work environment. This makes it easy to conduct both planned and ad hoc meetings. The work environment itself is rather small and easy to overlook. The office environment is spatially subdivided in two sections by a pantry and an open meeting area. The employees make use of these two sections in a way that fits their needs. People who need interaction with colleagues generally choose a workplace on the left side of the building while people who need more silence and concentration mainly choose a workplace at the right side of the building. The work environment is rather transparent, due to the open spaces and the use of transparent materials (e.g. glass doors). At the same time sufficient privacy is provided by enclosed spaces. In the interviews, the respondents mentioned that the amount of openness is exactly right. Much attention has been paid to the use of sound absorbing materials (cork and carpet) and acoustic panels between the work places in the open spaces. Due to these characteristics it is not surprising that the satisfaction percentages regarding both the opportunities to communicate (86% satisfied respondents, versus 69% on average in all 52 cases) and opportunities to concentrate (65% versus an average of 35%) are rather high. The high satisfaction with light (78% versus 59% on average) may be explained by the rather narrow building with plenty access of daylight on both sides, and the use of light coloured natural materials. Case 1 is located on the top floor of a building with windows on all sides.

The respondents in case 1 were less positive about the IT and supporting IT facilities. People do not like having to connect laptop cables each time they switch places. The hassle with cables and the loss of time may discourage employees to shift from one workplace to another. Also, the loss of time due to necessary updates of the IT-software made seemed to be a dissatisfier concerning the supporting IT facilities.

Respondents were quite satisfied with the organisation and their work. This may have influenced the positive appraisal of the work environment. The careful implementation process has probably contributed to the positive evaluation as well. The flexible use of workplaces was embraced by the management and the employees felt sufficiently informed about the new work environment. The concept has been elaborated in cooperation with the employees, which the respondents appreciated greatly. The architect offered the opportunity to be involved in the design process. Employees were also involved in a workshop about the new way of working, got a tour through the new work environment during its construction, and had a clear view on the time schedule of the relocation.

### *Case 2 – High satisfaction levels*

The large amount of daylight in the work environment, the use of light and bright coloured materials, and the large pantry areas with tables that people can use to communicate, work or just drink their coffee are much appreciated here. The layout of the work environment offers a high diversity of work and meeting spaces, open as well as enclosed. The acoustics are a bit more problematic, due to a lack of acoustic measures. Some walls are not sufficiently acoustically isolated and conversations can be easily overheard, even from enclosed rooms.

The IT services are very well appreciated, whereas the IT facilities are not very different compared to other cases. A possible explanation might be that many respondents work at an IT department and are probably more comfortable with using flexible IT facilities.

The respondents of case 2 were also quite satisfied with the organisation in comparison to the other cases. During the implementation process, the employees had the possibility to give feedback on the office design by attending working groups regarding the relocation, which is appreciated. Most employees felt sufficiently informed about the new work environment.

### *Case 3 – Low satisfaction levels*

The interior of this building is quite dark, due to the use of dark colours with only a few bright coloured accents as well as the depth of the building, which results in limited daylight in the middle zones. The office with over 700 employees is quite large, with wide open spaces and long distances between different parts of the building. This makes it difficult to have an overview of the available spaces and to find colleagues. Due to organisational changes during the process, a number of employees had to work in another area than initially planned, with less concentration spaces. The places in the open spaces are rather large and not very popular due to distractions by sounds and movements of colleagues and the perceived lack of privacy. Various glass walls and glass doors have been made less transparent because of the experienced lack of privacy and for reasons of safety (sometimes people hurt themselves, not being aware of the glass). The enclosed workplaces dedicated to concentration work, small meetings or teamwork are much more popular and often (kept) occupied all day by the same person(s). According to the respondents there are not always sufficient workplaces available for everyone, which resulted in claiming behaviour.

Regarding the IT facilities, not all employees are familiar with the possibilities of their devices. Some people think they have to log off and on every time they shift from one work place to another, while they actually can just close their laptop and open it again to continue.

The location in the building determines whether people experience the environment as too hot (south side) or too cold (north side). The employees invented their own provisional solutions to problems, for example by placing an umbrella in front of the ventilation grille in order to prevent air flows. Responses from the interviews suggest that more explicit feedback on complaints could reduce the dissatisfaction about the indoor climate.

The employees are less satisfied about their organisation than the employees in case 1 and 2. The employees are also less satisfied about the implementation of the flexible and activity-based office concept. They feel like the architecture of the building was of more importance than the people that have to work inside of the building. They respond not being sufficiently involved in the change process and mention a lack of supervision on proper use of the work environment.

#### *Case 4 – Low satisfaction levels*

Due to the recent merger of three small regional offices into one large central office, some respondents need to travel a longer distance compared to the former situation. The workplace is divided into several areas, which were initially assigned to specific departments. Although the organisation tried to adjust the areas to the work processes of the concerned departments by differentiating the mix of workplaces, the employees do not find the mixes optimally suitable for their work processes. The employees perceived a lack of sufficient enclosed spaces for concentration work or telephone calls. This may partially be explained by the behaviour of the employees and the managers: very few people change places during the day. Some employees and managers claim enclosed rooms which limits the availability to others. Most meeting rooms are booked in advance, which makes it difficult to find a meeting space for ad hoc conversations.

The open spaces are relatively large; some of them can accommodate up to thirty people. As a consequence of the openness and lack of (available) enclosed rooms, employees reported to regularly be distracted by people passing by, conversations and ad hoc meetings in the open space. This may explain the low percentage of satisfied employees on concentration possibilities and privacy. Regarding the indoor climate, the high ambitions for a sustainable building raised high expectations that could not be fulfilled.

In case 4, the management was not fully committed to the concept and not all managers accepted to share the mix of different work places. Employees felt not being sufficiently involved in the change process, and mentioned inadequate reactions to problems in the work environment and a lack of supervision on proper use of the work environment. This may explain the low satisfaction level with the organisation and the overall appraisal of the implementation process.

#### *3.2 Cross-case comparison*

The findings confirm that many factors may explain employee satisfaction levels about the building as a whole, the architectural appearance of the building and the interior design, the spatial lay-out and subdivision of space, and the number and variety of workplaces. Even offices of the same organisation and with a similar office concept – here: activity-based offices with flexible use of workspaces – show huge differences in employee satisfaction, depending on how this concept has been applied, in particular regarding the spatial lay-out, the level of openness, and the availability of workplaces nearby that facilitate the current activities. All these factors have an important influence on communication and concentration opportunities. Besides, the implementation process plays an important role as well, in particular the commitment of the management, ways of communication, and if and how employees had the opportunity to influence the implementation process.

#### **4. Conclusions and practical implications**

Some convincing critical factors came to the fore from the analyses of two successful and two less successful cases. Regarding the physical environment, most critical seems to be a well thought-out spatial support of both communication and concentration. Open spaces should be alternated with enclosed rooms that are dedicated to concentration work or telephone calls and provide some privacy. Sufficient acoustic measures are needed to avoid aural distraction. As shown in several other studies, large open workspaces, accommodating more than approximately 15 people, should be avoided due to concentration and privacy issues (Hedge, 1982; Hua et al., 2010; Seddigh et al., 2014). Large open spaces can be visually and acoustically subdivided in smaller areas. In accordance with earlier research (Peponis, 2007; Oseland et al., 2011), meeting spaces turn out to be ideally located in the vicinity of the work areas, especially when it comes to (smaller) meeting spaces in order to facilitate ad hoc gatherings or sessions. Other recurrent success factors are a comfortable indoor climate and a large amount of daylight. Also, the use of light and/or natural colours seems to have a positive effect on the satisfaction of employees. These findings are in line with the results of former research of Brill and Weideman (2001). Based on the responses of 13,000 office workers in different settings they found the next factors to be most critical for a successful and productive work environment: the ability to work alone without being distracted; appropriate spatial conditions for spontaneous interaction, meetings and distraction-free group work; workplace comfort and ergonomics; enough space for items; high-quality lighting and daylight; and personal control over temperature and air quality. The current findings and the confirmation of findings from former research show that in spite of many changes in society, organisations, business processes and ways of working, some factors are constant over time and place and should always be taken into account carefully to be successful. The findings also provide research based evidence that an appropriate work environment really matters and can make a substantial difference in high or low employee satisfaction.

Regarding the preparation and implementation process, it is striking that both successful cases had a committed management team that participated in the concept of flexible working, whereas the management teams in the worst cases were much less supportive to the new housing concept and sometimes even claimed enclosed workspaces on the long term. Both successful cases were implemented with a relatively high level of end user involvement. This is in line with the outcomes of earlier studies on success factors in implementation processes (Beer, Eisenstat and Spector, 1990; Dewulf and Vos, 1998; Van der Voordt, 2003; Klein and Knight, 2005; Kreitner and Kinicki, 2007; de Bruyne, 2007).

Although these arguments sound plausible to explain the differences in satisfaction levels, due to the huge number of possible influencing factors, it is difficult to “prove” cause-effect relationships i.e. the impact of particular work environment characteristics on employee satisfaction regarding a particular item. Employee satisfaction about the organization (ranging from 84% till 49%) may also have had an influence on the appraisal of the physical environment. Whereas satisfaction with the content and complexity of the work may have an influence as well, this percentage is quite similar and rather high in all four cases, ranging

from 73% to 82%. Another factor that might have had an influence on satisfaction levels is the size of the cases: the two successful cases are both smaller in size compared to the two less successful cases.

It is expected that when managers take into account the lessons learned from Pre- and Post-Occupancy Evaluations the number of satisfied employees will increase.

Regarding the lay-out, interior design and facilities it is recommended to provide:

- A variety of work spaces, with an adequate mix of places supporting communication and collaboration and places supporting concentration and privacy, individually and for groups
- Separations between open communication areas (e.g. pantries) and working areas
- Enough acoustic and visual privacy in open environments; sufficient acoustic materials and measures
- Not too large open spaces, but smaller open zones with a good overview, alternated with enclosed spaces or panels
- Short distances to places that are frequently needed by employees (e.g. spaces for ad hoc meetings for 2-4 persons)
- Natural materials and light colours and materials
- Lots of daylight
- Appropriate IT facilities for different types of activities, including filing
- Clear behavioural rules to enable proper use of the workplaces

Regarding the implementation process it is recommended to take care of:

- Sound information and communication about the concept
- Commitment of the management
- Adequate managing of expectations
- Opportunities for the employees to share their ideas about the work environment and way of working
- After care, to make the employees accustomed with the use and (expected) behaviour such as clean desk
- Quick responses to complaints or misunderstandings

A strength as well as a limitation of this research is that the two successful and the two less successful cases represent one public organisation. Possibly influential context factors are excluded by using cases from the same organisation, but it is more difficult to generalize the results. Additional case studies are needed to find out if similar findings will come to the fore in commercial private offices or organisations in other sectors such as research and development, health care, or retail and leisure.

## References

- Allen, T., Bell, A., Graham, R., Hardy, B. and Swaffer, F. (2004), *Working without walls*, London, DEGW / Norwich: HMSO.
- Appel-Meulenbroek, R. Groenen, P, and Janssen, I. (2011) “An end users perspective on activity-based office concepts”. *Journal of Corporate Real Estate* (13) 2, pp. 122-135.
- Appel-Meulenbroek, R., Kemperman, A., Van Susante, P. and Hoendervanger, J.G. (2015), “Differences in employee satisfaction in new versus traditional work environments”. Proceedings of the *European Facility Management Conference EFMC 2015*, Glasgow, 1-3 June 2015.
- Aronoff, S. and A. Kaplan (1995), *Total Workplace Performance. Rethinking the Office Environment*. WDL Publications, Ottawa.
- Bakker, I. (2014) *Uncovering the secrets of a productive work environment. A journey through the impact of plants and colour*, PhD Thesis, Faculty of Industrial design, TU Delft.
- Banbury, S. P. en Berry, D. C. (2005), “Office noise and employee concentration: Identifying causes of disruption and potential improvements”, *Ergonomics*, (48) 1, pp. 25-37.
- Becker, F. (2004), *Offices at Work. Uncommon Workspace Strategies that Add Value and Improve Performance*, San Francisco: Jossey-Bass.
- Becker, F. (1993), *The Ecology of New Ways of Working: Non Territorial Offices*, Ithaca, NY, Cornell University, International Workplace Studies Program.
- Bedoir, F. (1979), Open plan offices, landscape offices and celltype office. *Architektur* No. 1, pp. 16-26.
- Beer, M., Eisenstat, R. A. and Spector, B. (1990), “Why change programs don’t produce change”. *Harvard Business Review*, November-December 1990, Reprint Number 90601, pp. 4-12.
- Block, L. K. and Stokes, G. S. (1989) ‘Performance and satisfaction in private versus non-private work settings’, *Environment and Behavior*, (21), pp. 277-297.
- Blok, M., De Korte, E., Groenesteijn, L., Formanoy, M. and Vink, P. (2009) ‘The effects of a Task facilitating Working Environment on office space use, communication, concentration, collaboration, privacy and distraction’, *Proceedings of the 17th World Congress on Ergonomics, Beijing, China*.
- Bodin - Danielsson, C. B. and Bodin, L. (2008), “Office type in relation to health, well-being, and job satisfaction among employees”, *Environment and Behavior*, (40), pp. 636- 668.
- Brennan, A., Chugh, J.S. and Kline, T. (2002), “Traditional versus Open Office Design: A Longitudinal Fieldstudy”. *Environment and Behavior* (34) 3, pp. 279-299.
- Brill, M., and S. Weidemann (2001), *Disproving widespread myths about workplace design*. Kimball International, Jasper, USA.
- Brunia, S. and Hartjes-Gosselink, A.M. (2009), “Personalization in non-territorial offices: a study of a human need”. *Journal of Corporate Real Estate*, (11) 3, pp. 169-181.
- De Been, I., and Beijer, M. (2014), “The influence of office type on satisfaction and perceived productivity support”, *Journal of Facilities Management*, (12) 2, pp.142-157.
- De Been, I, Beijer, M. and Den Hollander, D. (2015), “How to cope with dilemmas in activity-based work environments”. Proceedings of the *European Facility Management Conference EFMC 2015*, Glasgow, 1-3 June 2015.

- De Bruyne, E. (2007), *Effectieve implementatie van Kantoorinnovatie*. Delft: Center for People and Buildings.
- Dewulf, G. P. R. M. and Vos, P. G. J. C. (1998), “De (on-)mogelijkheden van kantoorinnovatie. Een fenomeen beschouwd”. *M&O*, (1), pp. 7-28.
- Duffy, F. (1992), *The Changing Workplace*. Phaidon Press Limited, London.
- Duffy, F., with K. Powell (1996), *The new office*. Conran Octopus, London.
- Finch, E. (2012), *Facilities Change Management*. Chichester, UK: Wiley-Blackwell.
- Gorgievski, M.J., van der Voordt, Th. J.M., van Herpen, S.G.A., van Akkeren, S. (2010), “After the fire. New ways of working in an academic setting”. *Facilities*, (28) 3/4, pp. 206-224.
- Haynes, B. P. (2008) ‘Impact of workplace connectivity on office productivity’, *Journal of Corporate Real Estate*, (10) 4, pp. 286–302.
- Hedge, A. (1982), “The open-plan office. A systematic investigation of employee reactions to their work environment”. *Environment and Behavior* (14) 5, pp. 519-542.
- Hoendervanger, J.G., Bergsma, F., Van der Voordt, T. and Jensen, P.A. (2016), “Tools to manage and measure adding value by FM and CREM”. In: Jensen, P.A. and Van der Voordt, T. (eds.), *Facilities Management and Corporate Real Estate Management as Value Drivers: How to Manage and Measure Adding Value*. Oxfordshire: Routledge.
- Hua, Y., Loftness, V., Kraut, R. and Powell, K. M. (2010) ‘Workplace collaborative space layout typology and occupant perception of collaboration environment’, *Environment and Planning B: Planning and Design*, (37), pp. 429-448.
- Kim, J. and De Dear, R. (2013), “Workspace satisfaction: The privacy-communication trade-off in open-plan offices”. *Journal of Environmental Psychology*, (36), pp. 18-26.
- Klein, K. J. and Knight, A. P. (2005), “Innovation implementation. Overcoming the challenge”. *Current Directions In Psychological Science*, (14) 5, pp. 243–246.
- Leaman, A. (1995) ‘Dissatisfaction and office productivity’, *Facilities*, (13) 2, pp. 13-19.
- Kreitner, R. and Kinicki, A. (2007) *Organisational Behaviour*. New York: McGraw Hill, seventh edition.
- Maarleveld, M., Volker, L., van der Voordt, T.J.M. (2009), “Measuring employee satisfaction in new offices – the WODI toolkit”. *Journal of Facilities Management* Vol. 7 nr. 3, pp. 181-197.
- Oseland, N., Marmot, A., Swaffer, F. and Ceneda, S. (2011) ‘Environments for successful interaction’, *Facilities*, (29) 1/2, pp. 50-62.
- Peponis, J., Bafna, S., Bajaj, R., Bromberg, J., Congdon, C. and Rashid, M. (2007) ‘Designing space to support knowledge work’, *Environment and Behavior*, (39) 6, pp. 815-840.
- Purdey, B. and Leifer, D. (2012), “A preliminary study of cognitive failures in open plan offices”. *Facilities* (30), 11/12, pp. 472-487.
- Riratanaphong, C. and Van der Voordt, Th. (2012), “Performance measurement of workplace change: A comparative analysis of data from Thailand, the Netherlands and Finland”. In: P.A. Jensen, T. van der Voordt and C. Coenen: *The added value of facilities management – Concepts, findings and perspectives*. Polyteknisk Verlag, Lyngby, Denmark, pp. 248-265.
- Riratanaphong, C., Van der Voordt, T. (2011) “Satisfaction and productivity after workplace change.” *European Facility Management Conference*, Vienna, 23-25 May 2011.
- Seddigh, A., Berntson, E., Bodin Danielson, C. and Westerlund, H. (2014) ‘Concentration requirements modify the effect of office type on indicators of health and performance’, *Journal of Environmental Psychology*, (38), pp. 167-174.

- Sundstrøm, E., R.K. Herbert and D.W. Brown (1982), "Privacy and communication in an open plan office: a case study". *Environment and Behavior* (14) 5, pp. 379-392.
- Unger, N. J. (2004). *Kantoorinnovatie moet je willen, kunnen en moeten*. Den Haag: Open Universiteit Nederland.
- Van der Voordt, D.J.M. (2003), *Costs and benefits of innovative workplace design*, Delft: Center for People and Buildings.
- Van der Voordt, T. (2004), "Productivity and employee satisfaction in flexible offices". *Journal of Corporate Real Estate* (6 ), 2, pp. 133-148.
- Van der Voordt, D.J.M., Ikiz-Koppejan, Y.M.D., and Gosselink, A. (2012), "Evidence-Based Decision-Making on Office Accommodation: Accommodation Choice Mode". In: S. Mallory-Hill, W.F.E. Preiser and C. Watson (eds), *Enhancing Building Performance*. Chichester, West Sussex, UK: Wiley-Blackwell.
- Van der Voordt, Th., de Been, I. , and Maarleveld, M. (2012), "Post-Occupancy Evaluation of Facilities Change". In E. Finch (ed), *Facilities Change Management*. Chichester, West Sussex: Wiley-Blackwell, pp. 137-154.
- Van der Voordt, T., Brunia, S., and Appel-Meulenbroek, R. (2016), "Satisfaction". In Jensen, P.A. and Van der Voordt, T. (eds.), *FM and CREM as value drivers: how to manage and measure added value*. Oxfordshire: Routledge.
- Van Meel, J. (2000), *The European Office. Office design and national context*. Rotterdam: 010 Publishers.
- Yin, R.K. (2009), *Case study research. Design and methods*. Sage Publications, California, Thousand Oaks: Sage, 2nd edition.
- Worthington, J. (1997), *Reinventing the Workplace*, Oxford: Butterworth-Heinemann.
- Zalesney, M.D. and R.V. Farace (1987), "Traditional versus open offices: A comparison of sociotechnical, social relations, and symbolic meaning perspectives." *Academy of Management Journal* (30) pp. 240-259.

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