

USE OF DATA FROM WORKPLACE EVALUATION IN BRIEFING AND DESIGN

Theo JM van der Voordt, Delft University of Technology, Faculty of Architecture, and Center for People and Buildings, Delft; D.J.M.vanderVoordt@tudelft.nl

ABSTRACT

Many organizations are engaged in organizational change, adopting new management styles and new ways of working. Innovative workplace design is used to facilitate organizational change, to improve user satisfaction and labour productivity, and to lower facility costs. Although some research has been done into the use and experience of new offices, there is still a need for sound data about the real effects on organizational goals and employee satisfaction. For this reason, the Center for People and Buildings in Delft has developed an instrument for a diagnostic Post-Occupancy Evaluation (POE). This tool has been tested in a number of case studies. This paper presents the structure of the tool and reflects on the usability of POE-data to indicate problems in the present situation, to evaluate the effects of design interventions, and to support future decisions in briefing, design and management of office buildings.

KEYWORDS workplaces; performance; evaluation; briefing;

INTRODUCTION

Briefing, design and management of offices are complex processes. Decisions have to be made on different scale levels: the building as a whole e.g. its site, shell, structure and services, building sections, workplaces, and facilities such as furniture, IT and filing systems. Multiple actors are involved: shareholders, CEO's, CFO's, facility managers, designers, consultants and end users, each of them having their own preferences and interests. According to Mintzberg (2001), seeing, thinking and doing interact in a cyclic and iterative way. Personal views, intuition, emotion and rationality are all playing their role. Evidence-based decision-making may help to improve the positive effects of design interventions and to reduce the risks of a poor result (Pullen, 2005). This is in particular true for new "non-territorial" offices with desk sharing and desk-rotating along a variety of task-related workspaces. Organizational objectives such as cost reduction by a more efficient use of space may conflict with employee's preference to keeping their own personal desk and universal needs for expression of status, privacy and personalisation. In order to take optimal decisions, one first has to know what people really want and how they value their present work environment and alternative solutions. Secondly one has to find the "right" balance in coping with conflicting needs and objectives of different employees and other stakeholders. This paper presents methods for data-collection and research findings from workplace evaluation studies in a number of Dutch traditional and flexible offices. The research shows an ambivalent appraisal of openness and shared use of workplaces. The positive effect on communication and interaction is counterbalanced by complaints about distraction and lack of privacy. Clear information and communication and well balanced user involvement during the implementation process shows to have a strong impact to the overall appraisal.

RESEARCH METHODS

In order to attain a better understanding of the experience and use of different office concepts and facilities, a review of literature has been executed. In addition, a number of building-in-use studies were carried out, partly in new non-territorial offices and partly in traditional offices previously to changing the accommodation. In the first studies, the focus of our research was on satisfaction and importance of internal and external communication, accessibility and quality of the working environment. Furthermore questions were asked about the work process (e.g. time spent on different activities, way of filing documents), perceived productivity, background information (sex, age) and most positive and most negative aspects of the work environment (Vos and Dewulf, 1999). In need for more information, the questionnaire has been improved and extended with questions about the appraisal of the organisation, the way of working, health and safety, image of the building, and appraisal of the implementation process. Utilisation studies were included as well. Furthermore conceptual frameworks and interview protocols have been developed for measuring facility costs and effects of office design on future value of the building (adaptability, durability) and operating results (Volker and Van der Voordt, 2005 a/b). Figure 1 shows the structure of the present toolkit.

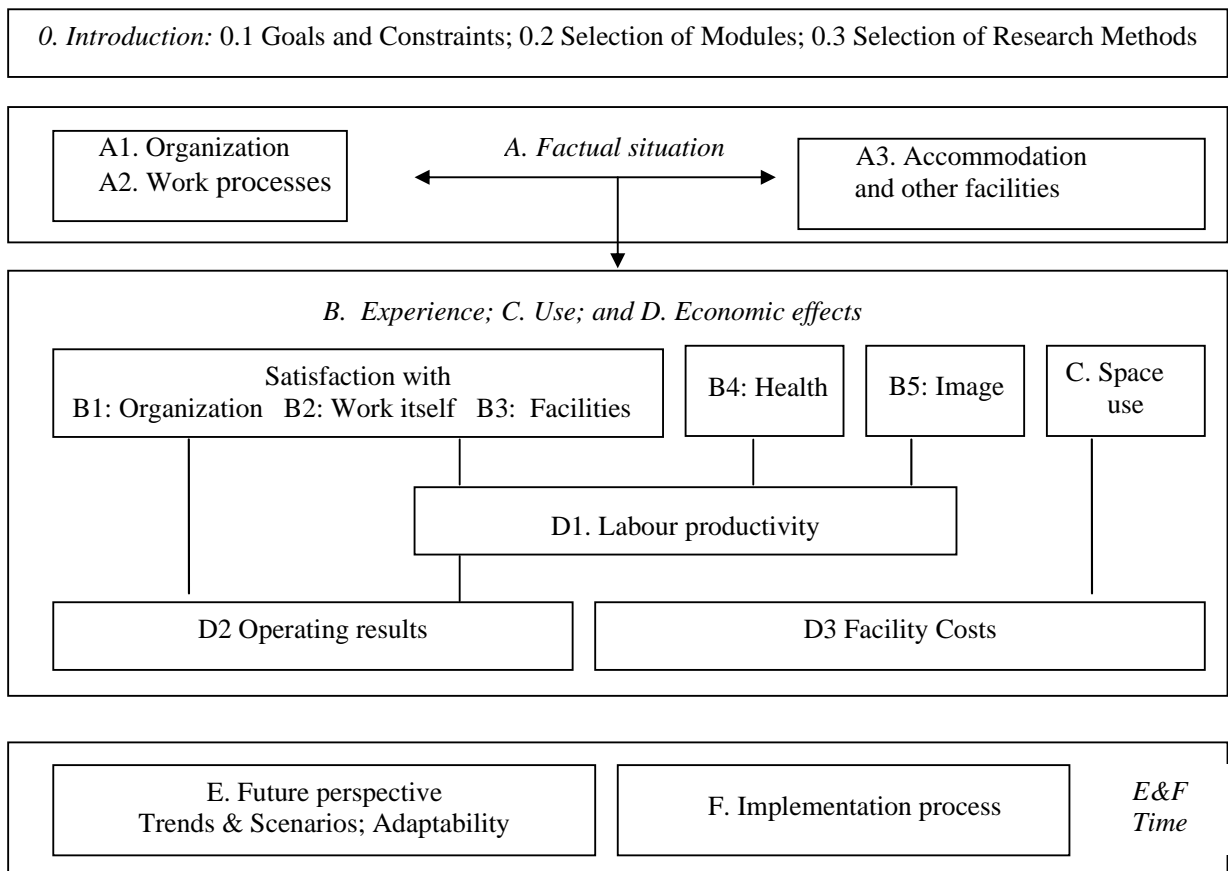


Figure 1: Modular structure of the diagnostic tool

Three introductory modules guide the user in choosing the scope of the evaluations, the objectives, research methods and prerequisites with respect to time and money, leading to an evaluation study that suits the conditions of the organization. The point of departure of the evaluation is the preliminary objectives set for the work environment, e.g. better communication and collaboration, improving labour productivity, easier attraction and retention of employees and clients, or reduction of the facility costs. The next three modules collect data on the new and old situation with respect to the organization (A1), working processes (A2), and facilities (A3), in order to assess the suitability of the accommodation for the organization and its processes. Six modules have been set up in order to measure the way in which the work environment is experienced (B1-B5) and actually used (C). In addition there are three modules for measuring economic effects: labour productivity (D1), operating results (D2) and facility costs (D3), and one module for measuring the future value, i.e. adaptability to expected trends and developments. The final module (F) deals with the implementation process. A process evaluation is important for determining the extent to which the use and experience of the accommodation have been influenced by the method of implementation. The modular structure increases the accessibility and allows to applying a selection in line with the reason for the diagnosis.

Example: Perceived Productivity

Each module consists of instructions for use accompanied by a little theory, a brief discussion of the relevance, a description of possible measurement methods and questionnaires for oral and written interviews, and a reasoned-out choice. The labour productivity module, for example, starts with a brief analysis of what precisely labour productivity means, what physical environmental variables exert a particular influence on it and how labour productivity may be measured. Table 1 shows a number of potential research methods (Van der Voordt, 2003).

Table 1: Methods to measure labour productivity

-
1. *Actual labour productivity*. For example, the number of translated words per each employee and per unit of time (translation agency), the number of phone calls that have been made (call centre), concluded policies (insurance company) per division, or the number of manufactured cars per FTE (automobile industry);
 2. *Perceived productivity*. For example, by asking people to assign a report mark to the environment indicating the extent to which it supports their productivity, or by asking them to rate their appreciation using a three or five-point scale (see box). Variants include: What percentage of your time is spent working productively? What percentage of your time is spent working unproductively due to much distraction? What percentage of your time is spent searching for a suitable workplace? By what percentage would your productivity increase if working conditions were to change?
 3. *Amount of time spent*. The amount of time gained because filing is carried out more efficiently, staff turnover can be dealt with more easily (rooms no longer have to be cleared out, after all), or the amount of time that is lost by having to log on more frequently and clearing desks on a regular basis;
 4. *Absenteeism due to illness* (a form of non-productivity);
 5. *Indirect indicators*. To what extent are people able to concentrate properly or are they actually distracted; how quickly can employees solve a problem or supplement a lack of knowledge through interaction with colleagues?
-

Since measuring of actual productivity is particularly awkward in knowledge organizations the focus is on perceived labour productivity, i.e. productivity as experienced by the management and employees. The interview protocol starts with an open question: "How do you consider that the accommodation and other facilities contribute towards labour productivity? Positively or negatively? Why?" Questions are then asked about the assumed effect of a number of environmental factors, including job-rotation, the flex-factor i.e. the number of workspaces per employee, the transparency of the environment, network facilities, etc. The questionnaire for the employees includes such questions as: How well does the work environment support work requiring concentration and communication with colleagues and external parties? How well does your work environment support office work, telephoning, formal and informal consultation and filing? To what extent do you agree with the following propositions: an innovative office fits well with our organisation; our work environment boosts my productivity; our office encourages high-quality work; etc.

RESEARCH FINDINGS

Employee satisfaction

Up until now the findings have shown that, if expressed as a mark out of ten, the users of innovative offices assign an average score of 6.9 to its concept. This is satisfactory and almost 0.5 point more than the average appraisal of the cases with a traditional concept, but not especially well. Besides, the different appraisal might also be an effect of different building age! Individual opinions vary considerably. In various projects, the majority of people are generally positive about shared use of non-assigned workspaces, but there are also projects where the majority would prefer to revert to the old situation. Critical factors are the functionality and perception value of the workplace and other facilities, and the extent to which a balance is found between efficient and effective working and the fulfilment of psychological needs. A poor relationship between the number of employees and the number of workplaces is viewed in an extremely negative light. Flexible working is superfluous if there are too many workplaces, but a shortage causes much irritation and forces personnel to use ones that are less suitable or to work at home. In some projects, concentration cells are barely used for this purpose. In others there showed to be a shortage. It is very important that workplaces are allocated properly. Desk sharing is at odds with the need for personalisation and an individual territory. Users often try to claim a familiar place by arriving at work earlier or by leaving items behind during their absence. The same (flexible) workplace for everyone provides fewer opportunities to express one's status. Some employees are fairly laconic while others make an issue of it. The principle of 'clean desk' makes personalisation (personalising the desk) difficult or outright impossible. Although personnel are able to deal with this properly in the long run, or move from desk personalisation towards common space personalisation, this is a negative point. The effect of flexible working on social interaction is a mixed one. The ability to choose one's desk is generally appreciated. Besides improved autonomy and a more dynamic atmosphere, it also provides people with the opportunity to establish new contacts. As a result, they can become better acquainted with less familiar colleagues and acquire new knowledge and experience: a significant point that is scored both from an individual perspective as well as for 'learning' organisations. At the same time, close contact between colleagues who were used to sit close to each other and work well together may be unintentionally disrupted. In general, opportunities for formal contact have hardly changed, but particularly in new buildings we noticed an improved appraisal of aesthetics, interior design and meeting room facilities. The increased openness and transparency - less

walls, glazed partitions – supports communication as well, but also causes distraction and lack of privacy, visually but above all acoustically. Confidential conversations may be overheard and unwanted interruptions may easily bring people out of their “flow state” (DeMarco & Leister, 1987). In various cases people miss indoor plants and works of art.

The level of satisfaction with the concept is related to the nature of the work. An above-average proportion of people whose work involves frequent concentration would prefer to return to a traditional office concept. Personal characteristics also turn out to affect the rating. Women seem to have somewhat less difficulty than men with respect to sharing workplaces, and the reduced ability to express status. Men have less difficulty with the lack of acoustic privacy. Employees aged over 50 are the least satisfied with the sharing of workplaces, changing place, and the openness. This is possibly explained by the fact that older employees have sometimes worked for decades along traditional lines and find it less easy to switch to new methods of working. Another explanation is that older people generally tire more easily and so tend to be more disturbed by the wide range of stimuli in an open work environment.

Critical factors in the process showed to be an enthusiastic initiator, evident objectives, a sound balance between top down and bottom up (user participation), a transparent project organisation with clear-cut tasks and competencies of various actors, serious consideration of any user resistance and proper follow-up care (Becker et al., 1994; Van der Voordt, 2003; Allen et al., 2004). A sufficient amount of time must be reserved for notifying, assisting and training employees and for managing change processes. At the same time, processes may not last too long in view of the costs involved and the fact that people may drop out. Expectations must not be too high and personnel must be made aware that everything may not be implemented in full accordance with the proposals stemming from user participation.

Labour productivity

In modern combi-offices, employees can communicate properly and work effectively thanks to a diverse range of activity-related workplaces. Formal meeting places and informal meeting points fulfil the need for formal consultation and informal contact. The concept is partly a response to the drawbacks of cellular offices (too closed for social interaction) and open plan offices (too open for concentrated work). So a combi-office may be expected to contribute positively to productivity, compared with an open plan office. In comparison with the cellular office, the effect is more difficult to predict. A combi-office appears to facilitate communication but it produces more distraction than single or two-person rooms. Again, research findings showed mixed results. In one of the first Dutch combi-offices, the so-called DynamicOffice Haarlem, compared to the previous set-up (mainly cellular offices), perceived productivity has dropped by a full point from 7.5 to 6.5 on a 10-point scale (Vos, 1997-1999). A second follow-up measurement revealed a slight recovery to 6.8. Perhaps this is due to a degree of habituation. Older employees respond somewhat more negatively than younger ones (6.3 compared to 6.9). The proportion that thinks the working environment is conducive to individual productivity has decreased from 60% to 25%. Employees attributed the decline in perceived productivity to less privacy, more distraction, visual stimuli, noise and the time lost due to logging in more frequently, desk clearing, work scheduling and furniture adjustments. A positive point is the stimulus to interact; people approach each other more easily due to the large degree of openness. Newcomers were generally more positive than experienced employees. When people join the organisation, they apparently consider the environment as a fact. For experienced employees, the high expectations have not been met entirely. Unlike the DynamicOffice Haarlem, the Breda regional office of ABN AMRO Bank

showed an increase in perceived productivity (Van der Voordt and Diemel, 2001). In the baseline measurement (temporary accommodation in an open plan office), only 14% of employees stated that the working environment had increased productivity. This percentage rose to 51% after a new “Flexido” concept was introduced. The percentage of employees with a negative opinion sank from 21% to 8%. A positive point is the opportunity to withdraw to a concentration workplace where passers-by and telephone calls pose less of a distraction than before. Another positive point is the more efficient filing system.

Since these early pioneers, a number of other organisations have moved towards a more flexible and non-territorial office concept. Table 2 shows the bandwidth in minimum and maximum (dis)satisfaction with the effect of the work environment on supporting labour productivity in eight projects (Van der Voordt, Maarleveld and Attema, 2006).

Table 2: Bandwidth in (dis)satisfaction on support of productivity (in %)

	Dissatisfied/disagree			Satisfied/agree			Score TOTAAL		
	Min	Max	TOT	min	max	TOT	N	average	SD
Desk tasks	6%	25%	13%	43%	71%	58%	1272	3.5	.71
Phoning	7%	42%	17%	22%	55%	49%	1401	3.3	.75
Filing	4%	33%	15%	21%	48%	35%	1254	3.2	.68
Copying, fax, printing	1%	24%	16%	43%	75%	47%	1190	3.3	.73
Concentration	26%	51%	32%	24%	44%	35%	1407	3.0	.82
Communication / colleagues	4%	14%	8%	59%	77%	67%	1406	3.6	.64
Communication / supervisors	7%	22%	12%	43%	55%	51%	1407	3.4	.70
External communication	5%	25%	14%	32%	57%	45%	1400	3.3	.71
Formal meetings	2%	37%	17%	35%	83%	47%	1389	3.3	.74
Informal meetings	1%	24%	12%	35%	84%	54%	1397	3.4	.69
The office stimulates high-quality work	12%	61%	36%	11%	47%	26%	1357	2.9	.78
The work environment stimulates my productivity	22%	49%	36%	15%	47%	26%	1256	2.9	.78

Three cases are designed and used as a flexible, non-territorial office. Four cases are traditional offices with personal desks. One case was initially designed and used as a flexible office with non-assigned desks, but after some years everybody is allocated a personal desk again. In total one of three employees is dissatisfied with being able to work in a concentrated way. This is about twice as much as dissatisfaction levels with other items. Just a little 35% is satisfied with opportunities for concentration. For most other items total satisfaction levels vary from 45% to 67%. An exception is filing. Here too, only 35% is satisfied with their situation. The appraisal of supporting communication is very positive. Response on “stimulating” productivity and high-quality work is less positive. This shows an effect of how a question is raised or a statement is formulated. A more pronounced formulation seems to evoke less pronounced agreement. A multivariate statistical “path analysis” showed a strong correlation between “the work environment stimulates my productivity”, “nice space to work” and “the office stimulates high-quality work”. A compound scale of these items correlated significantly with “wellbeing and nice work atmosphere”, “positive image”, “quiet work space” and “openness and transparency”. This shows that apart from functional performance, a well designed office with positive perceptual qualities contributes to perceived productivity, too.

APPLICATION IN DECISION MAKING

Systematic data collection in a number of projects makes it possible to establish similarities and differences between projects as regards concepts and effects, thereby providing a firm foundation for theory-building on the relationships between organizational characteristics, the characteristics of work processes and the most appropriate accommodation. When measurements are taken over extended periods it is also possible to determine the long-term effects. Data from successful projects (best practices) can serve as a source of inspiration for new projects. Knowledge of less effective concepts (worst cases) can be used in order to prevent failures in the future. In the long run, frequently asked questions may be answered. In this way data obtained with the diagnostic instrument may contribute towards more efficient and effective decision-making (Table 3).

Table 3: Possible applications of a work environment diagnosis

-
- To substantiate the choice of an office concept (ex ante)
 - To substantiate the schedule of requirements or brief (ditto)
 - Testing “ex post” whether the accommodation objectives have been attained
 - Determining unintended side-effects, both positive and negative
 - Providing insight into the relationships between accommodation and other facilities as a means, and improved performance, job satisfaction and cost reduction, etc., as an end
 - Legitimation for the continuation, amendment or adaptation of the accommodation policy
 - Providing a basis for improvement plans and development of a future vision
 - Monitoring development within organizations and at macro level
 - Providing a basis for theory-building and tools to support decision-making processes
 - Providing input for a database, as frame of reference and for benchmarking
-

Lessons for facilities managers

From our ongoing cross case analysis, most positive points of new flexible offices appear to be a more conscious planning of different work tasks, improved communication between colleagues, the opportunity to retire to a concentration cell or work at home, attractive interior design with ergonomic and adjustable furniture, and professional high-tech infrastructure e.g. quicker computers, Internet and Intranet and high-tech telephones. Negative points are the amount of time that is wasted by having to log on more often, loss of concentration due to distraction, lack of visual and conversational privacy, continual acclimatisation and ICT-related problems such as faltering technology, connection problems or unfamiliarity with central and digital filing systems. Other important lessons learned are:

- Resistance against desk-sharing and – be it less popular – desk-rotating is lower than one might expect according to psychological needs for having a place of ones own, being able to express status and personalisation. In advance many employees fear to be moved to an open plan office. But visits to well-designed and properly managed new offices may reduce resistance. After a certain period most people get used to flexible ways of working.
- A clear explanation of the drivers to change and taking peoples objections seriously may help to overcome resistance, in advance and in the long run.
- Openness and transparency are positively judged because of its perception of “spaciousness”, but disliked because of lack of visual and acoustic privacy.

- Appraisal of being able to work in a concentrated way is not always worse in more open offices, provided that people can withdraw into well-designed concentration cells.
- Clean desk policy is not a big problem, but needs continuous awareness. People who withdraw from agreed behavioural rules should be corrected at once.
- Paying attention to functional performance and ergonomics is paid back by improved employee satisfaction.
- New buildings with light colours and attractive materials are positively appraised with respect to aesthetics and image of the building. Application of plants and art contributes to employee satisfaction.
- The lower appraisal of “space for personal attributes” in innovative offices might be compensated by creating positive conditions per building section.
- Most employees have a positive attitude to digital filing. Introduction of new filing systems requires some support of employees (information, training).
- Many buildings show a high level of dissatisfaction with thermal comfort, both physically (temperature, ventilation) and psychologically (lack of personal control). This needs special attention of designers and clients.

Different concepts for different types of office workers

Another interesting example of drawing practical implications from research is the PhD-thesis of Barry Haynes (2005) on workplace connectivity and self-assessed productivity. Key components of office productivity showed to be comfort, office layout, informal interaction points, environmental services, designated areas, interaction and distraction. Interaction and distraction were perceived as having the strongest positive and negative influences. The findings are used to reflect on workplace needs of four different types of workers.

Individual process workers appeared to working largely on their own. They perceived the limited interaction with their colleagues as contributing to their productivity. To ensure that positive interactions are enabled, and not left to chance, consideration needs to be given to the development of different kinds of space, such as break out areas and informal meeting points. As a consequence, interactions around people’s desks can be minimised and the negative effects of distraction can be reduced. The creation of such areas does not necessarily mean an increase in space requirement, as this new-shared space can be accommodated if some of the individual space is relinquished. Part of the individual work could be undertaken away from the office environment, e.g. at home. Such a solution to increase the productivity of individual process workers requires organisational culture and a management style that supports more flexible working (Becker & Steele, 1995). The positive correlation between interaction and perceived productivity of *group process workers* indicates the benefits of collaborative work processes such as teamwork. Whilst interaction is perceived as positive, distraction is perceived as negative. The negative distraction component can be reduced by providing clearly defined group areas. Office protocols could lead to localising agreements between groups of office occupiers and a possible solution to the interaction and distraction paradox. *Concentrated study workers* showed to spend a large percentage of their time out of the office. Providing this type of worker with dedicated office space is an inefficient use of space. Although this work process is predominately individual knowledge work, these office workers also value interaction. Distraction showed to have the most negative impact on productivity. A possible solution for concentrated study workers would be an environment designed on the principles of “commons and caves” (Hurst, 1995). The caves could be small cellular type offices provided on a shared basis. The commons area could be provided by informal meeting areas. The common space could be used on an ad hoc basis, thereby

enabling random interactions and conversations. *Transactional knowledge workers* valued the office environment as a knowledge exchange centre. They undertake the most variety of tasks, with a high level of interaction with colleagues. As in previous work patterns, but to a greater extent, interaction is perceived as the component that has the most effect on office occupiers' productivity. To ensure an optimum balance between interaction and distraction, consideration needs to be given to both the behavioural environment and the physical environment. The behavioural environment could be addressed by the adoption of appropriate office protocols. The physical environment could be addressed by designing "multiactivity" areas for a range of different uses.

CONCLUDING REMARKS

In practice, evaluations are often used to gauge employee satisfaction, to trying to confirm expectations, or just to finish a process properly. In order to make a project evaluation effective, four points of attention should be taken into account: clear objectives, commitment of organisation's management, pro-actively reflecting on possible results and what to do with it, and applying a budget for improvement measures (Middendorp and Chin Kwie Joe, 2006). Evaluating costs money and time of employees. If it is well known in advance that no time and money is available to improve the accommodation and/or its facilities, benefits of an evaluation might outweigh the costs. But evaluation can also have a more general added value to building up a body of knowledge, to deliver data for benchmarking and to develop a sound basis for evidence based decision making. So the next step is from looking back to forecasting!

REFERENCES

- Allen, T., Bell, A., Graham, R., Hardy, B., and Swaffer, F., *Working without walls*. Norwich, UK: DEGW & Office of Government Commerce, 2004.
- Becker, F., Quinn, K.L., Rappaport, K.J., & Sims, W.R., *Implementing Innovative Workplaces*. Ithaca: Cornell University International Workplace Studies Program, New York State College of Human Ecology, 1994.
- Becker, F., and Steele, F., *Workplace by Design*. Mapping the high-performance workscape. John-Bass Publishers, San Francisco, 1995.
- DeMarco, T., and Lister, T., *Peopeware: Productive Projects and Teams*, Dorset House, New York, 1987.
- Haynes, B.P., *Workplace Connectivity: A study of its impact on self-assessed productivity*. PhD-thesis. Sheffield Hallam University, Sheffield, England, 2005.
- Hurst, D. K., *Crisis & Renewal : Meeting the Challenge of Organizational Change*, Harvard Business Press, Cambridge MA, 1995.
- Middendorp, J., and Chin Kwie Joe, J., Evalueren: rendabel of obstakel? [Evaluation: effective or an obstacle], *Facility Management Magazine* 19, February 2006.
- Mintzberg, H., and Westley, F., Decision making it's not what you think. *MIT Sloan management Review*, Spring 2001, Vol. 42 No. 3, 89-93.
- Pullen, W., *Towards evidence-based reasoning in Facilities Management*. Keynote lecture FMA Ideation, Melbourne, May 2005.
- Volker, L., and Voordt, D.J.M. van der, *WODI-Evaluatie toolkit*. [Work Environment Diagnosis Evaluation toolkit] Delft: Center for People and Buildings, 2005a.

- Volker, L., and Voordt, D.J.M. van der, An Integral Tool for the Diagnostic Evaluation of Non-Territorial Offices. In: B. Martens and A.G. Keul (eds), *Designing Social Innovation. Planning, Building, Evaluating*. Göttingen: Hogrefe & Huber Publishers, 2005b, 241-250.
- Voordt, D.J.M. van der, and Diemel, L., Flexibel en doelmatig [Flexible and effective]. *Facility Management Magazine* (14) 96, December 2001, 34-42.
- Voordt, D.J.M. van der, *Costs and benefits of innovative workplace design*. Delft: Center for People and Buildings, 2003.
- Voordt, D.J.M. van der, Maarleveld, M., and Attema, J., *Gebruikers over hun kantooromgeving. Cross-case analyse van acht projecten*. [User experiences: cross-case analysis of eight projects]. Delft: Center for People and Buildings, forthcoming.
- Vos, P.G.J.C., *Werkt het beter in het Dynamisch kantoor Haarlem?* [Do things go better in the Dynamic Office, Haarlem?] Faculty of Architecture, Delft University of Technology, 1997-1999.
- Vos, P.G.J.C., and Dewulf, G.R.P.M., *Searching for data: a method to evaluate the effects of working in an innovative office*. Delft: Delft University Press, 1999.