Post-Occupancy Evaluation of Facilities Change

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10. Post-Occupancy evaluation of facilities change

Theo van der Voordt, Iris de Been and Maartje Maarleveld

Chapter Overview

This chapter discusses possible aims, tools and deliverables of Post-Occupancy Evaluations (POE) (otherwise known as building-in-use studies), with a focus on interventions in supporting facilities. POE has a long tradition and has been applied in different fields (e.g. offices, educational buildings, health care facilities, retail and leisure, as well as residential areas). The objectives of POE are various and can include; delivering input to an improvement plan; building up a generic body of knowledge by exploring and testing scientific theories; and developing practical design guidelines and decision support tools. Data collection tools are also varied, ranging from observations, interviews and web-based questionnaires to walk-throughs and use of narratives. A number of different data analysis techniques are available as well, including qualitative methods, such as content analysis, and quantitative methods, such as descriptive and inductive statistical analyses. A case study illustrates the application of different data collection tools. This case study seeks answers to the effects of new ways of working on employee satisfaction and perceived labour productivity. This study has been conducted by the Center for People and Buildings, Delft, the Netherlands, which specialises in research into the relations between people, working activities and the working environment. The case is an example of physical interventions including changing the office lay-out, new furniture, new information and communication technology (ICT) and document storage systems, as well as the flexible use of workplaces. A POE of three pilots has been conducted to test if the new environment performed well as perceived by the managers and employees. The research data has been used in the first instance in order to test if the organizational goals and objectives have been attained; and to support decisions with regard to the next steps in this change process. The research data has been used in the second instance more generically, as input to a database for cross-case analyses, exploring and testing hypotheses and benchmarking objectives.

Keywords: Post-Occupancy Evaluation, data collection tools, benchmarking, decision support, buildings-in-use

10.1 Introduction

Post-Occupancy Evaluation (POE) is a tool that is being used to investigate users' experiences (satisfaction, perceptions and preferences) and user behaviour in connection to the built environment. In the wider context, including technical and economic issues, a common term is Building Performance Evaluation (BPE) (Preiser & Vischer, 2005). POE goes back to the 1960s and 1970s when there was increasing attention being paid to user participation and user oriented design and management. New disciplines such as architectural psychology and environmental psychology came to the fore (Proshanski et al., 1970; Küller, 1973; Zimring & Reitzenstein, 1980; Bell et all., 2001; Gifford, 1987/2002). Professionals and scientists working in this field started to meet at annual or biannual conferences of the International Association People-Environment Studies (IAPS) and the Environmental Design Research Association (EDRA). Preiser et al. (1988) later published their renowned book *Post-Occupancy Evaluation*. Whereas early POEs would focus on buildings and places (and, on a larger scale, residential areas and greenery), later work has also connected with facilities management (FM) as well (e.g. Preiser, 1993; Eley, 2001; Alexander, 2004). Nowadays POE is being applied to many different environments and facilities: for instance, to investigate the added value of FM, workplace management, performance management and sustainability.

Post-Occupancy Evaluations can be conducted for different reasons and for different target audiences: differ in breadth and depth; method of evaluation; time of evaluation and the people involved in the evaluation. All these points need to be considered when preparing an evaluation. In other words, there must be a clear picture of what is to be evaluated, why, how, when, for whom and by whom (Van der Voordt & Van Wegen, 2005).

10.2 Aims and objectives of POE

Evaluation allows lessons to be learnt which can lead to an improvement in the project under investigation and more generally to improve the quality of programming, designing, implementing and managing of facilities. The reasons for the exercise can be both ideological and economic, for example the promotion of health and welfare or a reduction in the facility costs. There can also be scientific goals, such as contributing to the formation of new theories or developing new tools (Table 10.1).

Table 10.1: Goals and objectives of POE

- To test if client's goals and objectives have been reached
- To record unanticipated results, positive or negative
- To legitimise a continuation or adaptation of accommodation policies
- To steer improvement and upgrading of buildings
- To monitor trends and developments
- To explore and test theories that improve our understanding of complex relationships between facilities, ways of working, organizational needs and user preferences
- To explore and test theories on complex decision making processes
- To build up a data base, including best practices and worst cases, for theory development and benchmarking purposes.
- To deliver input to the strategic brief, project brief, concept and design of new projects (pre-occupancy evaluation)
- To deliver tools, design guidelines and policy recommendations

Source: Mallory-Hill, van der Voordt & van Dortmont (2005), slightly adapted

10.2.1 Testing aims and expectations

Stakeholders involved in facility management have all kinds of wishes and expectations with regard to different facilities. The user wants facilities that support their activities effectively and efficiently, with an attractive "look and feel". The client may possibly want the facilities to add value to the organisation in terms of improved productivity, profitability and competitive advantage. This may be achieved by increased production, improved client and customer satisfaction, a positive corporate identity, distinctiveness and a reduction of investment and operating costs (De Vries et al, 2008; Jensen et al., 2010). Ex post evaluation establishes whether expectations were fulfilled and whether aims were actually achieved. Besides checking against explicitly formulated aims and expectations, evaluation can also bring to light unintended and unforeseen phenomena, positive and negative. A critical evaluation can give an insight into strengths and weaknesses, opportunities and threats (SWOT-analysis) (Hill et al, 1997; Ferrell et al, 1998).

10.2.2 Exploration and testing of theory

Apart from allowing optimisation of the building under evaluation, there are other higher-level arguments in favour of evaluation, above and beyond the individual project. Evaluation makes it possible for others to learn from experiences during the design and construction process and in the use and management phase of similar projects. Individual evaluations and comparisons with other buildings and planning processes can make a significant contribution to the development and testing of theories (for example, on the relationship between facilities or facilities management and human behaviour and experience and the effect on organisational goals and values, or between design decisions and design quality, cost, and environmental impact.

10.2.3 Improving understanding of decision-making processes

Decisions are often based on different considerations. The role played by emotions, intuition, judgments and prejudices, social ideals and norms and values is at least as important as that played by rational argument and available information. As such one might speak of "bounded rationality" (Simon 1978; Rubinstein, 1998). The evaluation of decision making processes in facility management can lead to a better understanding of the motives underlying the decisions, roles of the various participants, and use of data and information. Such an understanding is also important for interpreting the result of a product evaluation and guidelines and policy recommendations derived from it. Points requiring attention include the significance of research in decision-making, the use of tools, the influence of limiting preconditions and the resolution of conflicting interests. There is also a psychological reason for evaluating facilities or facilities change management processes. Change is exciting, but can involve a good deal of stress. Everyone involved will have spent a good deal of time and energy searching for optimal solutions consistent with the budget, reaching compromises, moving and rearranging. Scheduling an opportunity for evaluation will allow people to express their frustrations, enthusiasms and dissatisfaction.

10.2.4 Database of reference projects

Systematic documentation of the findings of evaluation can lead to the creation of a database of interesting projects, containing a number of key items of information about the project and the findings of the evaluation. Modern relational databases allow the linking of CAD drawing and analytical tools in a networked environment. Box 1 shows the results of an analysis of the CfPB database on relations between satisfaction with facilities and perceived labour productivity.

Box 1: Findings of the analysis of the CfPB database on relations between satisfaction with facilities and perceived labour productivity (Batenburg & Van der Voordt, 2008)

A statistical analyses of data collected with an extended version of WODI Light of the Delft Center for People and Buildings (see paragraph 9.3.1), with 2,197 respondents from 17 different office environments, showed a significant but weak correlation between user satisfaction on facilities and self-estimated percentage of time that one is being productive. Much stronger correlations came up between satisfaction about facilities and users' perceptions of the supporting impact of the working environment on ones' own productivity. In a questionnaire used for this study the respondents were asked to indicate their degree of satisfaction with 63 aspects of the physical working environment. All satisfaction items were measured with a 5-point Likert scale, with 1 = highly unsatisfied until 5 = completely satisfied. The aspects were categorized in nine sub-dimensions. The most satisfactory sub-dimension was the worksite (4.4), indicating that desks are generally comfortable and ergonomic. The average satisfaction with the climate conditions was relatively low (3.0), a result that resembles earlier research findings.

The perceived productivity of employees was measured in two different ways. Firstly, respondents were asked: "During what percentage of your working time are you productive?" (Model A). The average response was 78% of total working time, though some respondents stated a much higher percentage (up to 100%) and some a much lower value. Secondly, respondents were asked the extent to which the working environment supported 10 different aspects of their own productivity, such as efficient communication with colleagues and absence of health complaints. The average score here was 3.3 on a 5-point scale, indicating that the respondents were reasonably satisfied with the perceived productivity support. The response to this question was combined with the response to the request of assigning a mark to the degree to which the overall working environment supported ones' own productivity (Model B). Here we used the scale to which people were accustomed from school and university (where 6 is a pass, 8 very good and 10 outstanding). The average mark assigned was 6.4, which agrees well with the mean score of 3.3 on a 5-point scale.

The added value of the physical working environment for productivity has been tested with taking into account three other factors that can be expected to influence the (perceived) productivity of office employees: level of job satisfaction, level of satisfaction with the organization, and personal and job characteristics.

Results

The net relationship between the employee's estimate of his or her own productivity (proportion of total working time spent productively) and facility satisfaction level showed to be significant, but the regression coefficient was smaller compared to the effect of job satisfaction. Quite remarkable, personal and job characteristics and organizational satisfaction were not significantly related to this measurement of perceived labour productivity. The explanatory power of this first Model A was relatively low, as the explicative variables only account for 11% of the observed variance in the dependent variable. Model B clearly showed that employees who are satisfied with the facilities rate the degree of support for their productivity provided by the working environment significantly higher. The effect of this factor on the perceived productivity was considerably larger than the effect of job satisfaction, satisfaction with the organization and personal and job-related characteristics. Fifty-four per cent of the variance in perceived productivity was explained by the four key factors and underlying characteristics considered in our model.

The scatter diagrams (Figures 10.1a and 10.1b) relating satisfaction with facilities and perceived individual productivity (z-scores) shows that both models are linear. However, Model A shows a great deal of spread around the theoretical line with its slight positive slope derived from the regression analysis.

Based on the multivariate regression analyses, it can be concluded that the working environment has a fairly limited effect on perceived productivity, especially in relation to the many other factors that were not considered in our model. However, when asking people how satisfied they are about the support of the working environment to being able to perform a number of activities, in particular satisfaction with the facilities showed to have a substantial

influence on perceived productivity. Further analyses in depth revealed that both functional aspects and psychological aspects of the working environment – such as agreeable working surroundings, adequate privacy and inspiring office design –affect perceived labour productivity. It should be emphasized that the focus of the research discussed here was on the relationship between satisfaction and perceived labour productivity, and not on the connection between objective facility performance indicators and actual labour productivity. A review of literature (Van der Voordt, 2003) traced a number of studies showing strong effects of ergonomic furniture, high-quality lighting, noise reduction, design interventions to facilitate team work and the introduction of tele-working on drop in absenteeism, reduction in meeting time, reduction in duplicate files, decrease in errors and higher self-reported productivity.
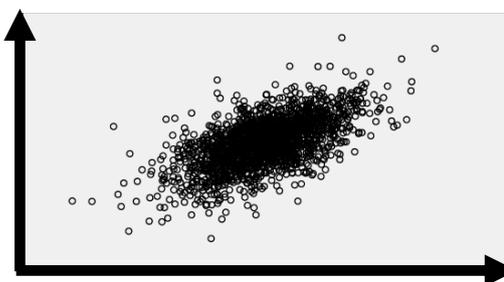
Perceived own productivity level
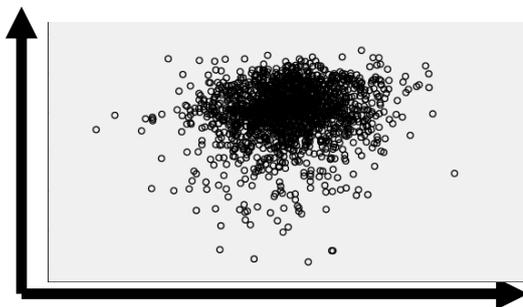
Scatter diagram relating satisfaction with facilities and perceived individual productivity

Satisfaction with facilities

Perceived support of productivity

Scatter diagram relating satisfaction with facilities and perceived degree of support for productivity from working environment

Satisfaction with facilities

Figure 10.1a/b: Scatter diagrams of satisfaction with facilities and perceived (support of) individual labour productivity

10.2.5 Input to existing or new decision-making processes

Findings from *ex ante* POE or pilot studies, as part of a change process, can allow bottlenecks to be identified in good time. Careful evaluation will increase the likelihood of successful decisions and a positive return on investment. Changes are often easier and less expensive in the preparation phase than improvements after implementation. The results of a project-oriented ex post evaluation can be used to solve teething troubles and to indicate minor adjustments or radical improvements. Depending on the problems identified, possible solutions might be functional,

technical, social, or economical (in terms of varying the price/performance ratio). If there is a major mismatch between supply and demand, replacement by other facilities might be the best solution. Lessons learnt from *ex post* evaluations can also be used as an input in *ex ante* evaluation of new projects in order to avoid mistakes and to support evidence based decision-making.

10.2.6 Tools, design guidelines and policy recommendations

Knowledge and understanding are essential preconditions for well-considered decisions. But the results of POE need to be 'translated' into a form which will be quickly and easily accessible to clients, designers, consultants, policy makers, real estate and facility managers and other stakeholders in the building process. Results may be presented in forms such as checklists, design guidelines, seals of approval and manuals. Tools of this kind can be highly effective for formulating and checking building plans, avoiding mistakes, directing policy and developing legislation and regulations.

10.3 Data-collection methods

In recent decades, a sizable number of data-collection strategies and methods have been developed, including surveys; case studies and experiments; questionnaires; checklists and assessment scales; individual and group interviews; workshops; walkthrough observations; and analysis of documents (Lang et al., 1974; Zeisel, 1981/1991; Bechtel et al., 1987; Baird et al., 1996; Vos & Dewulf, 1999; Boardass & Leaman, 2001; Groat & Wang, 2002; Preiser & Vischer, 2004; Van der Voordt & Van Wegen, 2005). Since its inception in 2001, the Center for People and Buildings (CfPB), Delft, the Netherlands has developed a number of new tools that focus on decision support and Pre- and Post-Occupancy Evaluations of working environments (see for Pre-Design Evaluation also Chapter 7). So far the CfPB-tools include the WODI-toolkit with a set of working environment diagnostic tools (Maarleveld et al. 2009); a workplace guide (Van Meel et al., 2007); a workplace game (De Bruyne & de Jong, 2008); an Accommodation Choice model (Ikiz-Koppejan et al., 2009); and two tools to deliver quantitative data about places and costs: the PACT tool (Places and ACTivities) to estimate the number of workplaces needed, overall and per type of workplace, and the PARAP life cycle cost model. Most tools can be used in Post-Occupancy Evaluation and in Pre-Design Evaluations (PDE) as well. We will briefly summarize the tools that have been used in a POE of three pilots in a facilities change process that will be discussed in the next paragraph.

10.3.1 WODI Light

In order to be able to measure employee satisfaction with the working environment, the CfPB developed the so-called Work Environment Diagnostic Instrument (WODI) (Volker & van der Voordt, 2005; Maarleveld et al, 2009). Later on a shortened web based questionnaire (WODI Light) has been developed that can be filled out in ten minutes. The WODI Light questionnaire focuses on issues that turned out to be of utmost importance to overall employee satisfaction and labour productivity. The questionnaire includes a number of thematically clustered

questions on a 5-point scale together with several questions on personal characteristics and overall appraisals using a 10-point scale (for an example see Figure10.2). Themes include (satisfaction with) organization, work, the building as a whole, the working environment and workplace, privacy, concentration, communication, document storage, IT, indoor climate, external services and perceived support of labour productivity. The respondents are asked to report their actual use of workplaces and percentage of time spent on different activities during a regular day. The results of the survey can be compared with the average percentage of satisfied and dissatisfied employees in all other WODI Light case studies on a number of Key Performance Indicators (Section 10.3.2). All data are stored in an ever growing database to be used for further research.

Figure 10.2: Part of the digital WODI Light questionnaire

10.3.2 WODI Light Performance Indicators: Satisfaction and Dissatisfaction

Based on the results of a cross case analysis of WODI Light data from over 6500 respondents in 41 cases (19 organizations) conducted in the period 2007-2009, average percentages of satisfied and dissatisfied employees have been calculated, resulting in a list of key performance indicators (Table 10.2). Organizations can use this data to define their own targets for the level of employee satisfaction on issues with a high impact on employees' overall satisfaction, or to compare one's own working environment performance with to the perceived performance of other organisations. The WODI Light indicator is based on the average scores on dissatisfaction (marks 1-2 on a 5-point scale) and satisfaction (4-5); neutral appraisals (3) are not included. The indicator will be updated each year based on additional data that has been collected in the former year. Data of organisations that evaluate their work environment by WODI will be automatically compared with the WODI Light Key Performance Indicators. Instead of setting the goal 'to perform equally or better than the average satisfaction scores' it is also possible to use the indicators and the ranges as a reference to decide on another aimed percentage of

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satisfied employees per aspect, in order to match with organisational objectives and constraints. Another possibility is to use the underlying WODI data to calculate a new benchmark indicator. For example, an organisation could decide to strive for percentages of satisfied employees that are equal or higher than in the three best-performing buildings. A third possibility is to choose an 'a priori' standard, e.g. 'at least 80% of the employees should be satisfied with the working environment'.

Table 10.2: Key Performance Indicators 2010 - showing the average percentage of satisfied and dissatisfied employees based on 41 WODI Light cases and the range between minimum and maximum percentages (Brunia et al. 2010).

Aspects of the workplace environment	Satisfaction		Dissatisfaction	
	Indicator 2010	Range (min – max)	Indicator 2010	Range (min – max)
Organisation	64 %	41% - 86%	11 %	0% - 30%
Content and complexity of work	79 %	40% - 100%	6 %	0% - 29%
Sharing own ideas regarding work environment	43 %	7% - 66%	22 %	0% - 64%
Accessibility of the building	77 %	51% - 96%	12 %	1% - 32%
Architecture and 'look' of the building	53 %	8% - 96%	20 %	0% - 69%
Subdivision of the whole building	47 %	18% - 80%	23 %	5% - 51%
Number, diversity and functionality of the spaces	45 %	15% - 77%	25 %	0% - 52%
Adjacency and locality of the spaces	54 %	27% - 80%	18 %	6% - 42%
Openess and transparency	54 %	30% - 86%	19 %	3% - 41%
Functionality and comfort of own workspace	59 %	30% - 82%	21 %	0% - 42%
Ambience and 'look' of the interior	54 %	15% - 88%	21 %	0% - 57%
Privacy	37 %	10% - 79%	37 %	9% - 75%
Possibilities for concentration	40 %	15% - 86%	38 %	14% - 73%
Communication and social interaction	70 %	44% - 92%	11 %	0% - 34%
Archive and storage facilities	35 %	11% - 71%	29 %	12% - 60%
ICT and supporting services	55 %	29% - 95%	18 %	0% - 39%
Facilities and facilities management	55 %	31% - 70%	11 %	2% - 28%
Indoor climate	40 %	22% - 61%	35 %	16% - 48%
Lighting	62 %	41% - 85%	14 %	2% - 28%
Acoustics	46 %	22% - 69%	26 %	8% - 50%
Possibilities for remote working	42 %	5% - 89%	20 %	2% - 55%

According to Table 10.2, a high percentage of Dutch employees are satisfied with; the content and complexity of their work; the accessibility of the building; and support of communication and social interaction. On the other hand, many employees expressed dissatisfaction with the possibilities for concentration, privacy and indoor climate. It should be emphasized here that the range per item was quite large.

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9.3.3 Workplace game

The Workplace Game is a communication tool that enables office workers to exchange ideas about the use of the office environment through open discussion. It makes often implicit thoughts about behaviour in the office more explicit. Playing the game entails walking through an imaginary work environment with colleagues while facing and discussing several situations with regard to values and norms, information and knowledge, and attitude and behaviour in the work environment. Depending on the position of the organisation – for example, prior to a renovation or renewal of the present building or a move to another building or when managing a new environment - the Workplace Game can be used to create discussions about new rules and regulations for behaviour. It can also be used to stimulate shared values and norms, to create awareness of the (impact of) workplace change, to stimulate the preferred use of the work environment and to raise awareness of one's own points of view, as well as suppositions and norms in relation to the work environment.

10.3.4 Space Utilization Monitor (SUM)

To measure the actual use and occupancy of the work places the CfPB developed a software application for a handheld computer. During the walkthrough the researcher records whether the workplaces are vacant, temporarily vacant or occupied and if 'yes' also the performed activities. Usually this involves eight measurements a day during a working week. The two days that show the highest average occupancy will be measured again in the following week. The provided output includes charts of occupancy levels and activities per type of workplace, per hour, per day or per department. These data can be used to support decision making about the introduction of hot-desking, the ratio of the number of desks / number of employees, and the number of workplaces per type of workplace (open setting, places for concentration, informal and formal meeting places and so on) (Maarleveld et al., 2009).

10.4 Application in practice: a case study

10.4.1 Context and aims of the case study

To illustrate the use of several data collection tools a case study will be discussed that focuses on employee satisfaction with regard to the work environment. The main tasks of the public educational organisation concerned are academic examination, administration and customer service. This organisation is facing several changes in both the organisational structure and the working environment. As a consequence of merging with another organisation the strategy, vision and working methods will change as well. Due to ICT developments face-to-face contacts will increasingly be replaced by virtual contact via the Internet. The organisation will move into a new office building in 2011. The challenge is to develop and create a new work environment that supports the (new) work methods and processes. The organisation aims to achieve a *better, more pleasant, and less expensive* housing solution and has opted for a new

building and a well-considered design and implementation process in order to elaborate these goals. The process has been set up with a high level of employee and management participation. The case study included reflections on the new office concept and the implementation process (based on insights from earlier research), an *ex ante* evaluation of the present environment and ex-post evaluations of three pilots in which the future workplace concept has been applied during one year to test if it works well (De Been & Maarleveld, 2008). With this case study the organisation aimed to use the pilots as a "living lab":

- To get insight into future processes, preferred behaviour and working methods of employees and management

- To help employees and managers to gain insight into the consequences of new working methods and working processes for the office concept

- To learn from these preliminary experiences and to use the lessons learned as input to the next phase i.e. the design and implementation of the new office concept in the whole organisation.

The pilot environments also functioned as an example for all users of the future office building, providing them with an opportunity to familiarise themselves with the new office concept. The members of the overall project group and the three pilot working groups were strongly involved in the research process. The overall project group was responsible for the development and implementation of the new office concept for the whole organisation. The pilot working groups represented the pilot departments and were responsible for the provision of information and the involvement of their colleagues. Pilot group *A* did so weekly; the working group kept their colleagues informed and asked for their opinion and input when they thought this was necessary. The other two workgroups informed their colleagues on a monthly basis, but did not ask for their opinion. One of those two groups (B and C) could only start informing their colleagues halfway through the design phase as it was unknown to them which group was going to move into the pilot area.

10.4.2 Data collection

The first step of the research was to get insight in the strategy, aims and constraints of the organisation and of the pilots in particular. Information concerning roles, research approach, aims and restrictions with regard to the office concept and communication has been collected by interviews with key players of the organisation and a workshop with the working groups (Figure 10.3). This not only brought up valuable and sound research information but it also made the organisation more aware of their aims and constraints, prompting them to formulate their aims more clearly and explicitly.
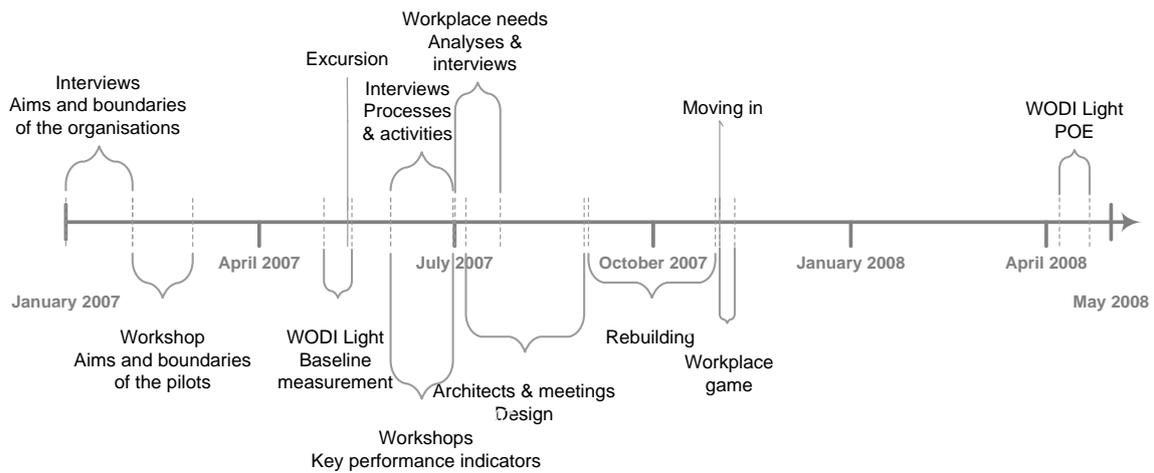
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Figure 10.3 Research activities in chronological order

Figure 10.4: Final design of one of the new working environments (Pilot A)

Two months later the project group and pilot working groups made a field trip to two different office buildings, both with an innovative office concept, to make them aware of the opportunities and risks of the new office concept. Hereafter a "zero measurement" has been conducted using the WODI Light tool in order to get insight into employee satisfaction, perceived influence on productivity and the actual use of the "old" working environment present in the pilot departments.

Two out of three pilot departments had formulated 'employee satisfaction' as one of the objectives. In several workshops the WODI Light results were discussed regarding employee satisfaction and perceived productivity, whilst at the same time developing their own sought after performance level. Various sources of information have been used for this, such as (1) the WODI Light Key performance indicator (section 10.3.2); (2) data from an earlier case study where an adjusted performance indicator had been developed; (3) the aims of ones' own pilot department; and (4) the results of the WODI Light zero measurement.

To make an evidence based proposal of required numbers and types of workplaces, the distribution of activities that took place during work time was thoroughly discussed in the pilot working groups, and where necessary, adjusted. Subsequently, five interior architects presented possible solutions for the office lay-out and interior design. Eventually, three out of these five architects were assigned to one of the pilot departments to work on the final pilot design. The architects were handed all information that came out of the research with regard to the distribution of activities and satisfaction with the present working environment. Figure 10.4 shows the final design of one of the pilot departments (A).

The new pilot designs differ from the old design by application of a huge diversity of activity-based workplaces, a reduced total work area(by flexible and shared use of workplaces instead of personal desks), increased openness and transparency, new IT facilities, a shift to digital archiving and less individual space to store documents or other material.

10.4.3 Moving in

Just before and during moving into the new office environment the employees of the three pilot departments discussed several issues regarding the new environment by playing the Workplace Game (Maarleveld, 2008). It appeared that the attitude towards the new design differed a lot between the groups. Employees of the two pilots who were only informed monthly were somewhat sceptical towards the new design and new ways of working whereas others were much more positive. The discussions during the game stimulated all three pilots to formulate regulations concerning the use of the new work environment, including rules about not eating at a workplace and applying a clear-desk policy when leaving it for more than two hours. Not all new working environments were finished off completely when the pilot groups moved in. It took one to two weeks before everything was fully arranged.

10.4.4 Post Occupancy Evaluation

Four months after moving into the new pilot environments, a post occupancy evaluation was carried out using the WODI Light tool and the Space Utilization Monitor (SUM). Using the same WODI Light tool before and after the move made it possible to compare the data from the zero measurement "ex ante" (before the move) and the post occupancy evaluation of the new environment. The SUM tool provided detailed information about occupation levels and use of different types of workplaces in the new work environment and gave insight in the suitability of the new office lay-out and the number and types of workplaces.

Figure 10.5 shows a comparison of the zero measurement *ex ante* and the post occupancy evaluation of pilot A with regard to employee satisfaction in relation to several aspects of the working environment. In the new situation many aspects of the physical environment were being appraised more positively. These included the ambience and look of the interior, openness and transparency of the work environment, functionality and comfort of the workspaces. However, some other aspects are now being judged more negatively (e.g. facility management, archive, storage facilities and ICT).
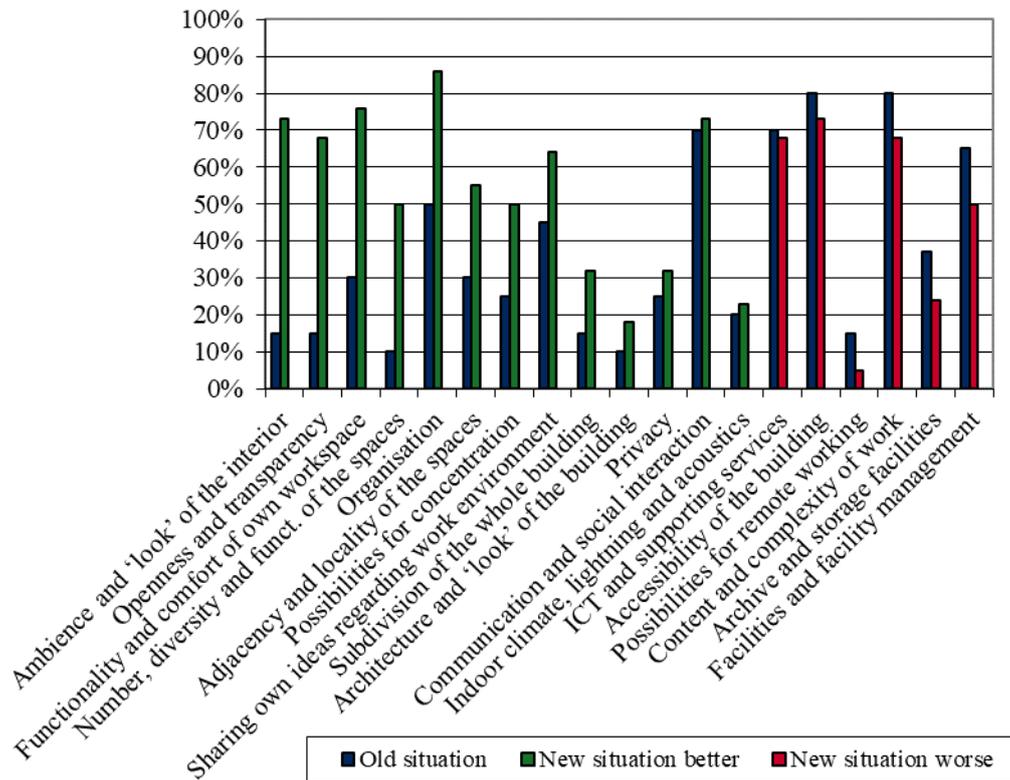

Figure 10.5: Satisfaction with the old and new working environment.

The pilot *A* department also compared the post-occupancy evaluation data with the adapted WODI Key Performance indicator based on their discussions about aimed satisfaction levels, the results of the WODI Light zero measurement and satisfaction levels in a particular case study (see Figure 10.6). With the new environment the pilot A group seems to have achieved their pre-set goals adequately except for privacy, archive and storage facilities as well as the number and diversity of workspaces.
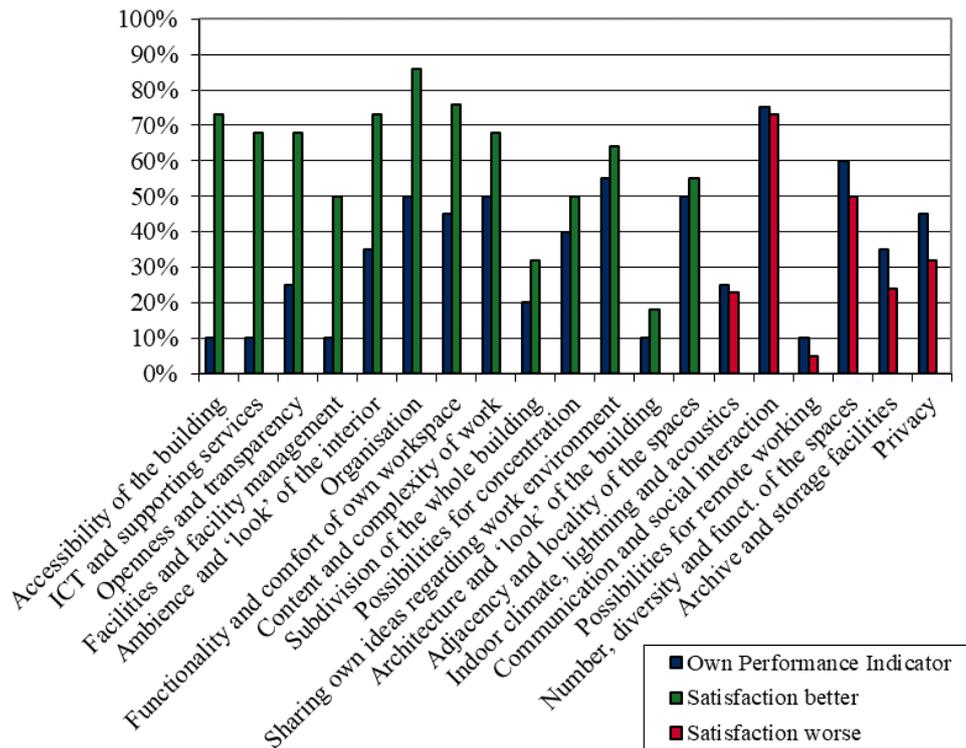
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Figure 10.6: Pilot A: satisfaction with the new environment compared to predefined satisfaction levels

The findings from the workspace occupation measurement showed that the variety and number of workspaces generally meet the needs of the pilot A department (Figure 10.7). The occupancy level was almost the same for the different types of spaces, which may indicate that most spaces are equally popular. However, though the mean occupancy level is 74%, the maximum occupancy level of all spaces together was 100%. So at least on one occasion all workspaces were occupied, leaving no space for those who sought a workplace.

10.4.5 Lessons learned

Different data collection tools (interviews, workshops, workplace game, web based questionnaire) were used to measure employee satisfaction in the old situation and after the move (post-occupancy evaluation). Space utilization measures were also considered in the before and after situations. The results provided extensive information and points of special interest to assist in the preparation and implementation of a new office concept. The pilot study showed that informing and involving the users in the process is of utmost importance. Key players not only should inform their colleagues about the goals and objectives of change and the planning of the implementation process, but should also ask for and deal with their opinions. Field trips to other innovative offices and visual presentations of the future office concept proved to be very useful.
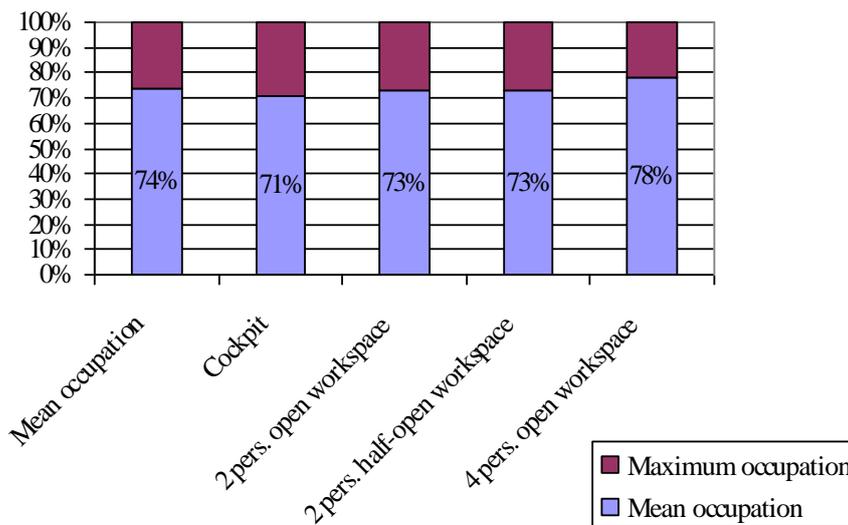
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Figure 10.7: Average and maximum occupancy levels of workspaces pilot A

Furthermore, it turned out that the management played an important role in reducing resistance and creating employee support. They served as an inspiring example to others by, for example, apply a clear-desk policy and sharing workplaces themselves.

The post-occupancy evaluation showed that the overall satisfaction with the new office environment was higher compared to the former office environment. This was particularly so with regard to the architecture and interior design of the work environment, functionality and comfort of the workplaces and openness and transparency of the work environment. The space utilization measurement showed that a high proportion of different workspaces were used. However, other aspects were evaluated more negatively following the move into the new office environment. This applied to supporting facilities such as archive and storage facilities and facility management. This finding emphasises the importance of providing sufficient and well-designed supporting facilities including ICT to support a new flexible working environment. Providing guidance and support after the move, proved to be important as well. For instance, by establishing a working group that was responsible for assisting employees and managers in using the new office concept.

Long-term monitoring and continuous evaluation of the new working environment may help to detect inadequacies and suggest ways to address shortcomings. For example, in providing a sound understanding of suitable interventions in the new workplace.

10.5 Concluding remarks

This chapter discussed possible goals and objectives of Post-Occupancy Evaluations as well as tools to collect and analyse data that can be used to support decision making, before and after a move. Knowledge from POE-research can be used as input into change management processes,

both with regard to lessons learned about performance and do's and don'ts in managing the *process*. This was illustrated by a case study of the initiation, design, implementation and management of a new working environment. Application of POE in a number of different cases revealed a huge number of data that can be used for purposes of benchmarking and building a growing body of knowledge about critical success factors.

Certain 'hard' factors showed to be key to performance, such as:

- sound insulation between places for communication and concentration,
- a well-considered capacity of archive and storage space
- advanced ICT facilities that work without any problems
- and an attractive indoor climate

But "soft" factors were also found to have an important role such as:

- a pleasant architectural appearance of the building and its interior,
- psychological issues such as privacy and personal control

The case studies confirmed the findings from literature reviews with regard to managerial conditions for arranging a thorough initiation, design and implementation process and good after care. (Table 10.3)

Many questions remain unanswered in relation to Post-occupancy evaluation (POE) as a general methodology. What were the costs and benefits of facilities change, both in monetary and non-monetary terms? What were the main priorities when taking into account employee satisfaction, productivity, organizational performance, competitive advantage and – of utmost societal relevance – sustainability? How can POE-findings contribute optimally to the decision making process, taking into account the different roles and interest of various stakeholders? Furthermore, how can POE-findings be conveyed in an accessible, simple and timely manner?   How can they also be linked to common phases in decision making such as setting managerial objectives, searching for alternatives, comparing and evaluating alternatives, making choices, implementing decisions and follow-up and control (Harrison, 1996)?

Table 10.3: Critical success factors in accommodation change processes (Van der Voordt, 2003)

1. A meticulous analysis of the organisation and its work processes beforehand.
2. Clear objectives.
3. Adequate project organisation with transparent task agreements and clear authorisation.
4. Commitment of management.
5. Adequate involvement and careful coordination between facility management, real estate management, human resource management and ICT specialists.
6. A well structured implementation process, with an enthusiastic initiator, a balance between top-down and bottom-up management, sufficient information and communication, and enough time for discussion and reflection.
7. Taking opposition seriously, particularly the tension between flexible working in open spaces and human needs for privacy, personal territory, identity, personalisation and status.
8. Providing assistance to employees (i.e. training courses in flexible working and central and digital filing systems).
9. Careful management of the building-in-use including 'guarding' the concept.

In order to be able to answer at least some of these questions, the Center for People and Buildings is working on further elaboration and testing of the so-called Accommodation Choice model (Ikiz-Koppejan et al, 2009). This is a process model containing four steps to support the initiation, design and implementation of new working environments. Another "work in progress" activity is a study on how to improve employee satisfaction and how to prevent dissatisfaction in connection with labour productivity. Other interesting next steps could be to compare data and tools from different countries in order to identify contextual and cultural influences, and to undertake a closer examination of the impact of services such as the reception desk, catering, cleaning and security on people's well-being and organizational performance.

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Research findings are also presented and discussed periodically at international conferences, inter alia: the annual European Facility Management Conference (EFMC) (see for instance www.efmc2010.com) that is being organised jointly by IFMA (www.ifma.org) and EuroFM (www.eurofm.org); the conferences of CIB W070 (www.fmresearch.co.uk), an international community dedicated to the furtherance of facilities management research; the biannual conferences of International Association People-Environment Studies (IAPS: www.iaps-association.org); and the annual Environmental Design Research Association conference (EDRA: www.edra.org).

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