Relocation to an activity-based flexible office – Design processes and outcomes

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ABSTRACT

Many organizations relocate to activity-based flexible offices (A-FOs) and the results are mixed. This study aims at identifying factors in the design and implementation process that contribute to perceived performance and environmental satisfaction with A-FOs.

A company with 50 employees was studied using interviews, questionnaires and documentation before and after relocation. The results showed that process factors such as objectives, financial and time resources, employee participation and empowerment, and methodological approach contributed to the outcomes. Perceived performance and employee satisfaction with the physical environment increased significantly after the relocation. Employee empowerment, highlighted by the employees, correlated with the performance and satisfaction parameters.

A conceptual model is proposed relating process factors, internal and external organizational context, and physical office setting to work condition consequences and overall outcomes such as employee performance and satisfaction.

1. Introduction

Following the development of mobile Information and Communication Technology the activity-based flexible office (A-FO) has been implemented worldwide (Appel-Meulenbroek et al., 2011; de Croon et al., 2005; Golden, 2007; Seddigh et al., 2014; Wohlers and Hertel, 2016). The reasons for implementing A-FOs are to decrease facility costs, increase flexibility and employee satisfaction (de Been et al., 2015; Hirst, 2011; Kim et al., 2016; Rolfö and Babapour Chafi, 2017), stimulate interaction, improve creativity and efficiency, reduce footprint, and attract personnel and external clients (van der Voordt, 2004; Vos and van der Voordt, 2002). The concept offers a variety of settings to support different work activities (Appel-Meulenbroek et al., 2011) and is normally dimensioned for 70% of the workforce (Danielsson and Bodin, 2008). Hence, employees choose where to carry out their work on a daily basis and share work desks and work spaces. The concept is also termed multispace office, flexible office, hot-desking office, non-territorial office, and activity-based office (Brunia et al., 2016; Kim et al., 2016; Knight and Haslam, 2010; Ruohomäki et al., 2015). However, although the office concept is the same, the physical office setting (space configuration and plan layout) and usage vary between A-FOs (Danielsson and Bodin, 2008; Rolfö and Babapour Chafi, 2017). The physical office setting and usage are decided in the design and implementation process (Lahtinen et al., 2015; Rolfö and Babapour Chafi, 2017).

Research has shown that employee performance and satisfaction in offices are affected by working conditions provided by the physical office setting. For example ambient conditions such as lighting, air quality and noise (Sundstrom and Sundstrom, 1986), and the provision of privacy, territoriality and communication (de Croon et al., 2005) affect performance and satisfaction. However, results regarding employee performance and satisfaction in A-FOs are inconsistent (de Been and Beijer, 2014; Nijp et al., 2016; Rolfö et al., 2017a). A-FOs have been shown to increase perceived performance through increased team-work quality and communication (de Croon et al., 2005) and fewer distractions (Seddigh et al., 2014). Moreover, the concept has also been shown to increase physical and mental demands such as finding and adjusting a workplace (Rolfö et al., 2017a; Wolfeld, 2010), decreasing perceived performance. For employee satisfaction, the office concept has been associated with modern interior design, and high aesthetics and autonomy (Rolfö et al., 2017a), but also with lack of privacy and personal territory, and impaired interpersonal relations (Brunia and Hartjes-Gosselink, 2009; de Croon et al., 2005; Morrison and Macky, 2017; Rolfö et al., 2017a; van der Voordt, 2004). A-FO literature suggests that fewer negative and more positive work condition consequences are reported in A-FOs that have had an extensive design and...
implementation process (Brunia et al., 2016).

Activity-based working, or New Ways of Working, is a philosophy whereby employees determine for themselves where, when and how to conduct their work (Appel-Meulenbroek et al., 2011). Hence when relocating to A-FOs, employees face a change in ways of working. From a sociotechnical perspective, this autonomous, flexible working philosophy puts new demands on the interdependent components of the sociotechnical system. The components are (1) the technological, (2) the personnel, (3) the organizational, and (4) the external environment subsystem (Hendrick and Kleiner, 2016). The sociotechnical system theory is used for designing new work systems and facilitating the process of change that, for example, is involved in office design and organizational development (Porras and Robertson, 1992). However, the sociotechnical perspective is not discussed in the literature on A-FO design processes.

Inappropriate office setting such as overcrowding, lack of rules and misuse of the concept are often the consequence of critical design process failures (Appel-Meulenbroek et al., 2011; Rolfö et al., 2017a). Normally, A-FO implementation lacks a systematic process and applies a general concept solution, rather than investigating internal organizational context such as tasks and activities performed by employees (Bjerrum and Bødker, 2003). Process factors contributing to successful changes are defined for industrial settings and open-plan offices. Success factors include for example (1) goals and change drivers, (2) employee participation, and (3) thorough process including good inventory and intervention activities (Davis et al., 2011; Vink et al., 2006; Vischer, 2008). Evaluations of interventions and ways of increasing readiness for change are described by Nielsen and Randall (2013). However, there are insufficient studies examining process factors specifically for A-FOs.

In summary, perceived performance and employee satisfaction vary in A-FOs. A-FO literature suggests that the design and implementation process influences perceived performance and employee satisfaction in the A-FO (Brunia et al., 2016; Hongisto et al., 2016). However, there are few empirical studies supporting this claim. Moreover, few studies have integrated process evaluation and effect evaluation of interventions (Nielsen and Randall, 2013) and there are few models relating theory to practice to improve A-FO design and implementation processes. The aims of this paper are to:

- Identify process factors that contribute to employee satisfaction and dissatisfaction with the A-FO.
- Explore if and how perceived performance and employee satisfaction change after relocation from a mixed office to an A-FO.
- Propose a conceptual model including process factors, organizational context, and outcomes of office relocations.

2. Method

The research scope was to methodically study entire design and implementation processes for productive, satisfactory and healthy office work environments. Process evaluations, including appraisals of an intervention, call for a mixed method approach in order to identify factors and impact of the intervention, add meaning to results, and cross-validate results (Nielsen and Randall, 2013). This longitudinal case study combined results from interviews, questionnaires and documentation.

2.1. The case company

The research was carried out at a small IT-service company that anticipated it would soon outgrow its office premises and was discussing the choice of office type. Before relocation the company premises consisted of seven cell offices, five shared offices, and two small office landscapes (cf. office definition in Danielsson and Bodin, 2008). The company relocated to a newly built A-FO (Fig. 1), with a centralized plan layout with 32 fully equipped workstations (two screens, keyboard, mouse, docking station and intranet connection). These workstations were divided into an open-plan interaction area, and an open-plan semi-quiet area. The employees could choose any work area and workstation but were required to clear the workstation from belongings by the end of the day or if unattended for more than two hours. There were no restrictions on using the same workstation on consecutive days. Job categories included IT-consultant agents, in-house IT-support, IT development, and support functions such as administration and management, including the owners. A large proportion of the employees worked as consulting agents in other organizations and were present in the office for one or two days/week. Besides Mondays, when all employees tried to be present in the office, there were normally equipped workstations available in both areas.

2.1.1. Objectives for relocation

There were several objectives for relocation. The existing office was perceived to hinder interaction between work groups. Moreover, the office type did not support the fact that the number of employees present in the office could vary on a daily basis, from overcrowded to empty and lacking in energy. Reconstruction of the existing premises was rejected due to a low cost-benefit ratio. According to planning documentation, the objectives were to create an energized meeting arena where employees and future talents want to go to perform work tasks, meet full potential, learn and cooperate. Moreover, the objectives included development of the company, the business and the view of work. The company’s ambition was to win the Great Place to Work’ Sverige (Sweden) competition.

2.1.2. Design and implementation process summary

The three year-long design and implementation process is described in Rolfö et al. (2017b). In short, in order to decide office type, employees’ activities and needs were investigated through several methods (Table 1). The focus was both on the physical as well as the organizational and social work environment. Work groups (e.g. IT-development group) were formed and thoughts were shared with the whole company during workplace meetings. Questionnaires were distributed to find out more about employee concerns and attitudes, when it was still possible to make changes to plans.

2.2. Data collection procedure

In order to identify influencers in the design and implementation process for employee satisfaction with the A-FO, all 31 employees who had been recruited at least 3 months before relocation were invited to participate in interviews by signing up on the company’s intranet. In total, 29 semi-structured individual interviews were conducted nine months after relocation. The interviews lasted on average 30 min and took place in an enclosed back-up room in the A-FO. Questions regarded satisfaction with the A-FO and the design process, possible reasons for the positive/negative outcomes, ability to influence the outcomes, what could have been done differently, and what in the process that was most rewarding (see appendix A for interview guide). All interviews were audio recorded. Interviewee responses regarding ability to influence the outcomes were triangulated with answers to the question “To what extent are you satisfied with the participation in decision making regarding the design of the new premises” posed in the post-relocation questionnaire.

In order to explore changes in environmental satisfaction and perceived performance, questionnaires were distributed to all employees at the company (Table 2); 3 months before (response rate 89%), and 9 months after (response rate 92%) relocation. Of the 31 employees working on both questionnaire distribution occasions, 28 answered both questionnaires (response rate 90%).

The pre-relocation questionnaire included 98 questions. Comments were optional for every question. The post-relocation questionnaire also
included 40 questions that concerned aspects only relevant for working in the A-FO, and perceived change of different parameters from their previous to present office (Table 3).

Planning documentation (objectives, rule documents), and architectural drawings were collected to further explore the design and implementation process, and physical characteristics such as zone allocations.

2.3. Data analysis procedure

The interviews were transcribed verbatim and analysed by categorization in a qualitative data analysis tool (QSR-NVIVO). Employees were categorized as satisfied or dissatisfied with the A-FO, and further categorized as satisfied or dissatisfied with the design and implementation process. With a bottom-up approach and thematic content analysis all mentioned reasons for satisfaction/dissatisfaction were identified and clustered into codes. The codes were change objectives, financial and time resources, organizational and social design process, work analysis, employee participation, communication, management and external competence. Finally, citations were selected to exemplify the codes, and de-identified with an interviewee number.

For the pre- and post-relocation statistical analyses a within-subjects design was used. Parameters with interval, ordinal, and nominal measurement scales were analysed with paired T-tests, Wilcoxon signed-ranks tests and descriptive analysis respectively (n = 28). The Spearman’s coefficient of rank correlation r_s was conducted for correlations on the post-relocation questionnaire responses. The analyses were facilitated in SPSS.

The affinity diagram (Karsak et al., 2003) was used to construct the conceptual model. In total, 102 terms from sociotechnical and macro-ergonomic theories, 28 intervention terms and 97 terms from office literature were collected, 12 terms from organizational change theory, as well as 30 terms from empirical research findings. After synonym reduction and categorization, 41 terms remained which were organized into six subgroupings. After several iterations the model was evaluated by academic professionals within the ergonomics discipline for final alterations.

3. Results

In total 26/29 interviewees were satisfied both with the A-FO and the design and implementation process, reporting that process factors had influenced their environmental satisfaction.

3.1. Process factors influencing environmental satisfaction

3.1.1. Change objectives

A reported process factor influencing environmental satisfaction was the company’s objectives for the change. According to interviewees the objectives were exciting and congruent with employees’ well-being: “The aim was to make it as good as possible for us working here” (I-5).

Moreover, alignment of space and long-term objectives was reported: “The key is the long-term thinking regarding our values. Working life is...”

### Table 2

<table>
<thead>
<tr>
<th>No. of employees (female/male)</th>
<th>Response</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-relocation</td>
<td>Post-relocation</td>
<td>Pre- and post-relocation</td>
</tr>
<tr>
<td>36 (4/32)</td>
<td>50’ (5/45)</td>
<td>31’ (3/28)</td>
</tr>
<tr>
<td>89%</td>
<td>92%</td>
<td>90%</td>
</tr>
</tbody>
</table>

* Between the pre- and post-relocation questionnaire distributions, 16 were employed and 2 quit.

b 3 of the 34 employees were on leave when the questionnaires were distributed.
about more than just this office” (I-25).

3.1.2. Financial and time resources

Environmental satisfaction was influenced by financial and time resources. The company decided to invest in a new building: “New thinking and new building. Starting something new” (I-17), and time and financial resources were provided, both in earlier stages: “We ended up successfully because lots of time and money were spent early on in the process” (I-25), as well as in the later stages of the process: “money has not been restricted for interior design. It’s important for the holistic impression and atmosphere. A cozy environment you thrive in” (I-21). The design and implementation duration enhanced readiness for the change: “we discussed it for a long time [...]. Back and forth [...]. Many people were prepared for what was going to happen and how it would work” (I-27). The duration contributed to a positive attitude towards the A-FO: “had worked with it for so long. Almost everyone was convinced that it would work” (I-4).

3.1.3. Physical, organizational and social design process

The multidimensionality of the process, including physical, organizational and social dimensions, was a reported influencer for environmental satisfaction: “It was a thought-through journey, not only the building, materials and furniture, but also how to act” (I-2). For physical work environment functionality, usefulness and variability of office space and furniture were regarded as contributors to environmental satisfaction: “Take your time and really analyse […], what function, how many will use them” (I-28). For the daily routines and working culture, norms, rules and feedback culture were discussed: “behavioural rules are really important to make it work” (I-28). According to planning documentation five rules were decided after several workshops. In sum, the entire design and implementation process was thorough: “nothing was left to chance. The company took the process very seriously” (I-2).

3.1.4. Employee participation and empowerment

Most employees reported to have participated in the process: “so many perspectives in the beginning of the process” (I-25) which was reported to contribute to environmental satisfaction. Employee participation was perceived as a necessity to reach the objectives: “The goal was clear that we want to work like this. We all need to contribute to get there (I-15). All 26 interviewees who were satisfied with the A-FO reported they had been empowered to influence the design and functionalities of the A-FO: “I feel there is nothing that I could not influence” (I-8). Ownership of the process was also perceived: “the employees [said] ‘this is how we reason’ […] instead of ‘this is how the management reasoned’. Many are proud of having contributed” (I-25). The post-relocation questionnaire confirmed that most of the employees (83%) were satisfied (to a high or very high extent) with their participation in the decision making regarding the design of the new premises (n = 27).

3.1.5. Methodological approach

Several process methods were reported, such as workshops, need analysis, feedback sessions and reference site visits, and enabled proactive and innovative thinking: “we started from scratch [...]. Things didn’t just happen, because we thought ahead” (I-22). Especially the analyses of activities and work processes were reported as influencers: “Everything is based on a good pre-study with workshops on goals” (I-27). Employees emphasized the analysis depth during the initial phase of the design process: “A lot of time was spent on the pre-study of needs and requirements” (I-8). Moreover, employees highlighted the work analysis to align space with work and “really consider most scenarios” (I-2). According to some interviewees, the work analysis verified that the A-FO solution was suitable for the company’s type of work: “we are in a sector of constant change. Many people here are used to new technology and renewals. It’s easy for our profession to work anywhere” (I-23).

3.1.6. Communication

The employees reported “being informed throughout the project” (I-14) on weekly workplace meetings. Communication transparency was mentioned: “the openness of the project is a big part” (I-5). Moreover, the information flow contributed to making the employees understand the nature of activity-based working: “get everyone to understand what activity-based working is (I-28). Employees being recruited during the design process were also informed about activity-based working: “It was so well described, the opportunities in the new office” (I-7).

3.1.7. Management

Management and owner commitment and meticulousness were mentioned by the interviewees: “The precision and energy he [the owner] invested” (I-9). Employees appreciated that the management followed the office concept: “We have no exceptions, this was stated clearly from the beginning. Management too will work this way. This is a key to success” (I-15). In addition, the flat organizational model of the company was a reported contributor: “It’s perhaps our organizational model. Employees feel a sense of responsibility and […] speak up. We didn’t make decisions, but it’s not top-heavy. Our values are very comradely” (I-12).

3.1.8. External competence

Ordering competent researchers and consultants such as acousticians, lighting experts and architects was a reported contributor: “Partly it was about good design by the people we assigned to help us. Furniture and all. Architect” (I-22). External competence, experience and inspiration were also acquired through site visits: “they have visited Microsoft’s office and other workplaces. Probably reached the best solution” (I-18).

Table 3

Pre- and post-relocation questionnaire parameters, measurements scales, choice labels and scale points. For more details, see Appendix B.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Scale</th>
<th>Choice labels</th>
<th>Scale pts.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design and implementation process</td>
<td>Ordinal</td>
<td>Great extent/No extent</td>
<td>5</td>
</tr>
<tr>
<td>Opportunity to participate in design of the new office</td>
<td>Ordinal</td>
<td>Never/Always</td>
<td>5</td>
</tr>
<tr>
<td>Perceived individual and group performance</td>
<td>Ordinal</td>
<td>Very bad/Very good</td>
<td>5</td>
</tr>
<tr>
<td>Individual performance: Individual productivity at workplace, Collegial help, Disturbance</td>
<td>Ratio</td>
<td>No. of meetings</td>
<td>0 - &gt; 40</td>
</tr>
<tr>
<td>Group performance: Intra-team communication, Intra-team spreading of ideas, Inter-team spreading of ideas</td>
<td>Nominal</td>
<td>Office types</td>
<td>7</td>
</tr>
<tr>
<td>Environmental satisfaction</td>
<td>Ordinal</td>
<td>Very satisfied/Very dissatisfied</td>
<td>7</td>
</tr>
<tr>
<td>Physical work environment</td>
<td>Interval</td>
<td>Very satisfied/Very dissatisfied</td>
<td>7</td>
</tr>
<tr>
<td>Functionality of furniture, Aesthetics, Access to equipment, Distance to colleague, Workplace separation, Possibility of privacy, Airflow, Temperature, Amount of light, Visual comfort, Outdoor view, Noise level</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

L.V. Rolfö


144
3.2. Process factors influencing environmental dissatisfaction

The three interviewees who were dissatisfied with the A-FO were satisfied with the design process apart from the aspect that all their needs had not been prioritized: "Everyone had their say. Then some suggestions were dropped, some were not. To get 25–30 people to agree, and give them all due consideration, is perhaps difficult. But the support function should have been in greater focus" (I-10). These three employees felt they had not been given the opportunity to influence office type: "it felt like it was already decided. This is how it is" (I-10). This criticism was elaborated on by an employee: "we seriously considered that group to have a separate room with fixed work stations, but the majority of them wanted to be part of the new way of working" (I-25). One of the three interviewees also criticized insufficient follow-up on discussions and decisions.

3.3. Perceived performance pre- and post-relocation

The Wilcoxon signed ranks test showed significant increase in perceived individual and intra-team productivity, intra-team cooperation, inter- and intra-team spreading of ideas, improved communication in terms of increased number of informal and spontaneous meetings and a decrease in disturbance (Table 4).

Of the interviewees, 46% and 18% responded that their performance had increased and decreased respectively in the new office. Hence, 36% responded neutrally. Positive responses regarded proximity to colleagues, more space, getting a holistic view of the organization, possibility to withdraw to quiet spaces, variability, and cooperation: "Generally it's improved, above all in terms of cohesion with other colleagues. The environment is very inspiring. I enjoy working in this environment" (I-3). Negative responses from all job categories regarded noise levels, visual distraction and difficulties in concentrating: "it's more bustling here due to the facility [...] in this zone where everyone works (area ‘104’ in Fig. 1)” (I-2).

3.4. Environmental satisfaction pre- and post-relocation

According to questionnaire responses, the percentage of employees preferring the A-FO to other office types increased from 68% before the relocation to 82% after the relocation. Moreover, questionnaire respondents who were satisfied with the physical work environment increased from 54% before the relocation to 93% after the relocation. The paired t-tests showed a significant increase in satisfaction regarding aesthetics, functionality of furniture, possibility of privacy, airflow, temperature, amount of light, visual comfort and outdoor view (Fig. 2). Satisfaction regarding distance to colleagues, workspace separation and noise level showed no significant change.

Interviewees reported positive changes in interpersonal relations, interaction and cooperation with inter- and intra-team colleagues: “before it was ‘us’ and ‘them’. But since we meet each other more often you get enhanced understanding” (I-26). Interviewees also reported that it was easier to find and get hold of colleagues. Another positive change was the office setting, which was perceived as pleasant, inspiring and functional: “new fresh facilities. Convenient” (I-20). Autonomy and variation of work environment were also reported: “there’s more freedom to choose where you need to work” (I-17). Furthermore, the management style in the new office was highlighted: “management is open towards the employees and wants input. They are among us” (I-29).

Reported negative changes regarded noise, and one of the zones being busy and crowded. Some employees from the in-house IT-support perceived restricted autonomy: “Since [we] speak on the phone and with each other, that’s the only zone [we] can work in” (I-8). Difficulties regarding discipline were also mentioned: “if work is hard, it is too easy to procrastinate. I reckon some people may not be able to perform here” (I-23). A minority of responses from support functions and in-house IT-support regarded territoriality: “the classic, ‘you’re used to your own space, things, papers’. Perhaps that’s the negative” (I-24).

3.5. Correlations

The linear regression analysis showed a significant positive correlation between satisfaction with participation in decision making regarding the design of the new premises, and individual productivity at the workplace (\( r_s = 0.69, p < 0.001, n = 24 \)), as well as environmental satisfaction (\( r_s = 0.80, p = < 0.001, n = 24 \)). Interview results support the regression analysis results.

3.6. Conceptual model

A general conceptual model is proposed for the design and implementation of offices in relation to outcomes (Fig. 3).

4. Discussion

4.1. Process factors

Rather than looking at office relocation as merely an opportunity to decrease overhead costs, the employees perceived the primary objective of the change was to improve their well-being, i.e. meaningful and beneficial to them. Saving space and cutting cost are depicted as the most common objectives of A-FO implementations (Kim et al., 2016) and have been shown (limited support) to reduce satisfaction with the design process and outcomes (Lahtinen et al., 2015). A change process that is perceived as meaningful, comprehensible and manageable, is easier to accept (Antonovsky, 1996), and improves engagement in the process (Nielsen and Randall, 2013).

Generous financial and time resources at the beginning of the process enabled the company to carry out a thorough work analysis that facilitated customization of the future office setting to suit the objectives and anticipated future work processes. This may have contributed to the positive performance and satisfaction ratings. Moreover, the resources facilitated employee participation.

The case applied a holistic and multidimensional design and

Table 4

Results from Wilcoxon signed rank test on performance parameters, including mean performance ratings, ranging from 1 (very bad or never) to 5 (very good or always) pre- and post-relocation, or number of times, Wilcoxon critical z-value and p-value of performance parameters.

<table>
<thead>
<tr>
<th>Performance</th>
<th>Scale</th>
<th>M pre-relocation</th>
<th>M post-relocation</th>
<th>Critical Z-value</th>
<th>Significance (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual productivity at workplace</td>
<td>1–5</td>
<td>3.73</td>
<td>4.23</td>
<td>−2.28</td>
<td>0.02</td>
</tr>
<tr>
<td>Intra-team productivity</td>
<td>1–2</td>
<td>0.88</td>
<td>1.42</td>
<td>−2.85</td>
<td>0.004</td>
</tr>
<tr>
<td>Intra-team cooperation</td>
<td>1–2</td>
<td>1.42</td>
<td>1.69</td>
<td>−2.11</td>
<td>0.035</td>
</tr>
<tr>
<td>Intra-team spreading of ideas</td>
<td>1–2</td>
<td>0.81</td>
<td>1.19</td>
<td>−2.67</td>
<td>0.008</td>
</tr>
<tr>
<td>Inter-team spreading of ideas</td>
<td>1–2</td>
<td>0.35</td>
<td>0.73</td>
<td>−2.06</td>
<td>0.04</td>
</tr>
<tr>
<td>Informal meetings</td>
<td>0– &gt; 40</td>
<td>6.88</td>
<td>8.88</td>
<td>−2.01</td>
<td>0.04</td>
</tr>
<tr>
<td>Spontaneous meetings</td>
<td>0– &gt; 40</td>
<td>3.73</td>
<td>6.62</td>
<td>−3.24</td>
<td>0.001</td>
</tr>
<tr>
<td>Disturbance</td>
<td>1–5</td>
<td>3.35</td>
<td>2.81</td>
<td>−0.72</td>
<td>0.402</td>
</tr>
</tbody>
</table>
implementation process, focusing on all parts of the sociotechnical system. For example, they focused on space configuration (external environmental), information technology development (technological subsystem), work activities and organization (the work design subsystem) and needs and behaviors of the employees (personnel subsystem). The importance of the behavioral dimension in A-FOs is emphasized by van Koetsveld and Kamperman (2011). The systematic work analysis (c.f. Garrigou et al., 1995) and different methods used throughout the process activated and, in line with Nielsen et al. (2009), made employees engage in and support the organizational-level changes. Moreover, the systematic work analysis may have contributed to an increased need-supply fit which, according to Gerdenitsch et al. (2017), has a linear interaction effect with environmental satisfaction and inter-team interaction.

The results showed high employee participation, empowerment (including office type choice), ownership, and satisfaction with the design and implementation process. Furthermore, questionnaire and interview results showed that employee empowerment correlated with the overall outcomes, which is in line with intervention studies (Knight and Haslam, 2010; Nielsen and Randall, 2013). Employee initiation, empowerment, and ownership are suggested impact factors on intervention outcomes (Augustsson, 2017; Hongisto et al., 2016; Nielsen and Randall, 2013). Although user participation in itself is no guarantee for successful designs (Daniellou and Garrigou, 1992) user involvement is favourable for facilitating mental preparation and creating, accepting and implementing a new workstyle and work system (Carayon et al., 2006; Lindahl et al., 2005; Nielsen and Randall, 2013; van Koetsveld and Kamperman, 2011).

The importance of information and communication was highlighted and is consistent with other studies (e.g., Jimmieson et al., 2004). Inadequate up-to-date information about decisions was a criticism of the design process, which is consistent with findings of Øyum (2006). Positive comments regarded the extent and transparency of communication. The study supports previous research suggesting that open and adequate information helps employees understand the intention behind an intervention, influences the employee's understanding and predicts the extent of participation in intervention activities (Nielsen et al., 2007; Weick et al., 2005).

Management commitment, ordering competence and external competence in terms of consultants were other contributors to satisfaction, which is consistent with literature (Blake and Mouton, 1983; Lahtinen et al., 2015; Rundquist, 2007). Management often acts as a role model and allocates resources, for example deciding whether staff can be released from duties to participate in workshops (Nielsen and Randall, 2013). The management in the present study showed commitment through active involvement and by allocating employees time and the company's financial resources for design process activities.

In addition to the process factors, internal organizational factors such as work tasks, organizational structure and power conditions, and procedures were reported influencers, which is supported by organizational change literature (Jacobsen, 2013). The company was used to change, utilized digital processes rather than paperwork, and was flexible in terms of work environment. This may have facilitated the change to activity-based working. Nevertheless other white-collar functions have been investigated with successful outcomes (Brunia et al., 2016), which implies that work tasks and procedures may have

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**Fig. 2.** Mean satisfaction ratings, ranging from −3 (very dissatisfied) to 3 (very satisfied), regarding office setting parameters, before relocation in the mixed office and after relocation in the A-FO (n = 28). For more details, see Appendix C.

**Fig. 3.** The relationships between process factors, organizational context, office settings, work condition consequences in terms of demands and resources and overall outcomes such as satisfaction and performance.
an impact but that this is not limited to IT-service organizations. Wohlers and Hertel (2016) hypothesize instead that A-FOs are more suited to companies with innovative and supportive culture, rather than bureaucratic ones. This case, having an innovative and supportive culture, supports their hypothesis. Other suggested internal organizational context influencers are employee characteristics and place before relocation in office literature (Riratanaphong & Van Der Voordt, 2012; Wohlers and Hertel, 2016) and organization size, age and history in organizational change literature (Jacobsen, 2013). External organizational context factors include contextual stability, regulations and normative conditions (Jacobsen, 2013).

In sum, change objectives, employee empowerment, inclusion of organizational and social change, a thorough work analysis, methodological approach, open and adequate communication, management commitment and use of external competence are process factors contributing to positive relocation outcomes. The organizational context such as work tasks, structure, power conditions and procedures are also highlighted as contributors to the positive outcomes.

4.2. Perceived performance and environmental satisfaction pre- and post-relocation

Communication parameters and perceived group performance increased significantly after relocation to the A-FO, which is consistent with the findings of de Croon et al. (2005). Moreover, perceived individual performance increased and mental demands in terms of disturbance decreased significantly, which is in agreement with the findings of Meijer et al. (2009), Seddigh et al. (2014) and Gerdenitsch et al. (2017).

Negative comments in interviews regarded mental working conditions in terms of acoustics. This might be due to having too many workstations in the interaction area, or because noise was transmitted from this area to the semi-quiet focus area (Fig. 1). Background noise is normally the strongest dissatisfier in office settings (Danielsson and Bodin, 2008; Rolfö and Eklund, 2015). However, despite lack of noise level improvement, perceived performance still increased significantly. This might be due to the provision of back-up rooms, and/or satisfaction with the organization and design processes.

Environmental satisfaction and the number of employees preferring the A-FO concept, increased after the relocation, which is in line with the results of Rolfö et al. (2017a). Moreover, aesthetics, functionality of furniture, airflow, temperature, amount of light, visual comfort and outdoor view increased significantly. The improvements in space configuration, interior design and ambient conditions are likely due to the acquisition of new equipment and new premises with the latest technological solutions. Improvements highlighted by employees in interviews were teamwork cohesion, having an inspiring environment, and increased autonomy and variation in office settings. Aesthetics and autonomy contributing to environmental satisfaction is supported by other studies (Rolfö et al., 2017a; van der Voordt, 2004). The possibility of privacy also increased significantly, which is probably due to the back-up rooms available in the new office. Nesting and lack of personal territory found in other A-FO studies (Brunia and Hartjes-Gosselink, 2009; Rolfö et al., 2017a; van der Voordt, 2004) was scarcely mentioned in this study. Reasons could be that the company had decided, after several workshops, on rules implicitly allowing employees to use the same workstation in consecutive days. Hence, nesting tendencies may have occurred but were not interpreted as rule breaking and reported as annoying by the interviewees (cf. Rolfö and Babapour Chafi, 2017).

4.3. Conceptual model

This study has focused on process factors and their relationship to perceived performance and environmental satisfaction. The conceptual model (Fig. 4) relates these empirical research findings to interventions and design processes in other contexts (e.g. Nielsen and Randall, 2013; Porras and Robertson, 1992). This study has further addressed how changes in office setting contribute to changes in work conditions, such as communication, as well as perceived performance and overall satisfaction. The model visualizes these findings and relates them to sociotechnical, macroergonomic theories and research literature on office contexts.

The relationships in the model are further strengthened by A-FO literature and psycho-social literature. For example, the impact of office settings on overall outcomes, including space configuration, interior design, physical ambience, and policies has been widely investigated (i.e. Brunia and Hartjes-Gosselink, 2009; de Been and Beijer, 2014; de Croon et al., 2005; Rolfö and Eklund, 2015; Rolfö et al., 2017a; Sundstrom and Sundstrom, 1986). Continuing, the impact of clean desk and speech policies on work condition consequences have been investigated by Rolfö and Babapour Chafi, 2017. Work condition consequences in terms of demands and resources have been elaborated on by Bakker and Demerouti (2007) and de Croon et al. (2005). The impact of internal and external organizational context such as procedures, structure, power conditions, and culture on work conditions have been elaborated on by Porras and Robertson (1992) and Nielsen and Randall (2013). These organizational factors have also been related to satisfaction, health, perceived performance and success of organizational changes (Appel-Meulenbroek et al., 2011; De Paoli et al., 2013; Jacobsen, 2013; Kim et al., 2016; Rolfö et al., 2017a; Vischer, 2008; Wohlers and Hertel, 2016).

4.4. Methodological considerations

Case studies are designed to collect detailed information (Merriam, 2009), to explore and explain phenomenon (Yin, 1984) by using multiple data sources (Creswell and Poth, 2017). The mixed method approach used in this case study and the large number of interviews (29) gave an in-depth understanding of the process factors and outcomes after relocation. The generalizability of case studies is questionable; however, they can be used as good examples and particular results can be generalized to broader theory (Yin, 1984). For example, other case studies with companies performing other types of work, context, process, and office setting may be used to test the model. Other methodological strengths of this study were the high response rate both in the pre- and post-relocation questionnaire (90%) and the within-subjects study design.

The process factors are based on anecdotal data in interviews. The time between relocation and data collection may have decreased the validity of process factor responses due to lack of memory; however, without the time span integrated process and effect evaluations are impossible. Nine months gave the employees enough time to get used to their new premises and workstyle. Other process factors may be of interest, but this was not mentioned by interviewees. Further research is needed.

5. Conclusions

This case study presents relocation from mixed office types to an activity-based flexible office (A-FO). Perceived performance and employee satisfaction with the physical work environment increased after the relocation. Other improvements were aesthetics, communication and teamwork cohesion, autonomy and decreased distraction. The auditory work environment did not improve.

The study reports that process factors have a substantial impact on the perception of the A-FO. Process factors that contribute to the positive outcomes relate to meaningful change objectives, allocation of time and financial resources, organizational and social focus, employee participation and empowerment, a thorough initial work analysis, a methodological approach, open and adequate communication, management commitment and external competence.
A conceptual model, based on results from this explorative case study, systems theories and office research, is proposed for the design and implementation of A-FOs in relation to satisfaction, health and performance outcomes. The model relates process factors, organizational context, and office setting to working conditions and overall outcomes.

Acknowledgements

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Appendix A. Interview guide

Work tasks and office use

Name.
For how long have you worked at this company?
Describe your most common work tasks.
What are your most common work tasks?
How often are you in the office?
How much of your time is allocated to concentrated and cooperative work?
Where do you choose to sit when doing these work tasks?

The design process

Did you participate in decision making regarding office type?
Were you positive or negative towards the A-FO concept when you realized you were going to relocate to an A-FO?
Were you positive or negative towards the A-FO concept right before the relocation?
Did you participate in the work analysis with activities and needs mapping and the design of the premises?
How many hours did you spend on the design of the premises?
Are you pleased or displeased with the planning process? Why?
What could have been done differently?
What in the process was most rewarding?
Have you been able to have an impact on the design? Give examples.
Have your needs been considered in the design?
Are you pleased or displeased with the results?
What do you think had an impact on the positive/negative outcomes?

The office design and change

What was the biggest positive and negative change?
Is the office optimally designed for your work tasks? Please explain.
Does the office satisfy all your office-related needs?
Are there work tasks you choose not to do in the office? Why?
Are you supported or counteracted in working flexibly and are you able to change workplace when changing work task?
Is it important to you to have colleagues physically close in the office?
How has the social interplay changed?
How has the cohesion changed?
What are your biggest annoyances?
What other strengths and weaknesses do you notice regarding your work in the new office environment?
Do you notice new possibilities or concerns for your work in the new office environment?
Has the A-FO affected your performance?
Something else you would like to point out?

Appendix B. Questionnaire parameters

| Parameter                           | Question                                                                 | Measure-     |
|-------------------------------------|--------------------------------------------------------------------------|ment scale   |
| Design process                      |                                                                            |             |
| Offer to participate in design      | To what extent are you pleased with the participation in decision making regarding the design of the new premises? | Ordinal     |
| Communication                       |                                                                            |             |
| Productivity at workplace           | How often do you manage to be productive at your workplace?              | Ordinal     |
| Communication within group          | How well does work-related communication function between the colleagues in your team/unit? | Ordinal     |
| Intra-team spreading of ideas       | How well do new ideas spread within the team/unit?                       | Ordinal     |
| Inter-team spreading of ideas       | How well do new ideas spread to other teams/units?                       | Ordinal     |
| Informal meetings                   | When you are at the office, how many times per average day do informal meetings occur (walking over and asking a colleague something, or a colleague asking you something)? | Ratio       |
| Spontaneous meetings                | When you are at the office, how many times per average day do spontaneous meetings occur (e.g. when collecting print-outs or mail)? | Ratio       |
| Collegial help                      | How often do you get help from your colleagues within the team/unit?     | Ordinal     |
| Disturbance                         | How often are you disturbed so that you cannot fully concentrate on your work task? | Ordinal     |
| Satisfaction                        |                                                                            |             |
| Office type preference              | Which office type do you prefer?                                         | Nominal     |
| Physical work environment           | How satisfied are you with the physical work environment?                | Ordinal     |
| How satisfied are you with ....     |                                                                            |             |
| Functionality of furniture          | ... functionality of furniture (chairs, tables, drawers ...)?             | Interval    |
| Aesthetics                          | ... aesthetics of the work place?                                        | Interval    |
| Distance to colleague               | ...distance between you and your colleagues?                             | Interval    |
| Workplace separation                | ...the degree of privacy with walls, separation panels and furnishings around your work place? | Interval    |
| Possibility of privacy              | ...the possibility to retreat to private areas for conversations, phone calls or quiet, concentrated work? | Interval    |
| Airflow                             | ... the airflow?                                                         | Interval    |
| Temperature                         | ... the temperature?                                                     | Interval    |
| Amount of light                     | ... the amount of light at your work station?                            | Interval    |
| Visual comfort                      | ... the visual comfort (glare, reflections, shadows etc.)?               | Interval    |
| Outdoor view                        | ... the possibility of view the outdoors?                                | Interval    |
| Noise level                         | ... the noise level you can hear from your work station?                  | Interval    |

Appendix C. Paired T-tests

Mean satisfaction ratings, standard deviation, t-value, degrees of freedom and p-value of environmental conditions ranging from −3 (very dissatisfied) to 3 (very satisfied).

<table>
<thead>
<tr>
<th></th>
<th>M pre-relocation</th>
<th>SD pre-relocation</th>
<th>M post-relocation</th>
<th>SD post-relocation</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetics</td>
<td>−0.67</td>
<td>1.30</td>
<td>2.44</td>
<td>1.22</td>
<td>−10.25</td>
<td>26</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Functionality of furniture</td>
<td>0.85</td>
<td>1.56</td>
<td>1.78</td>
<td>1.55</td>
<td>−2.48</td>
<td>26</td>
<td>0.02</td>
</tr>
<tr>
<td>Access to equipment</td>
<td>3.4</td>
<td>0.50</td>
<td>3.70</td>
<td>0.54</td>
<td>−2.84</td>
<td>26</td>
<td>0.009</td>
</tr>
<tr>
<td>Distance to colleague</td>
<td>1.15</td>
<td>1.26</td>
<td>1.54</td>
<td>1.56</td>
<td>−1.04</td>
<td>25</td>
<td>0.31</td>
</tr>
<tr>
<td>Workspace separation</td>
<td>0.62</td>
<td>1.32</td>
<td>1.15</td>
<td>1.85</td>
<td>−1.49</td>
<td>25</td>
<td>0.15</td>
</tr>
<tr>
<td>Possibility of privacy</td>
<td>−0.12</td>
<td>1.80</td>
<td>1.69</td>
<td>1.41</td>
<td>−4.28</td>
<td>25</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Noise level</td>
<td>−0.48</td>
<td>1.64</td>
<td>0.28</td>
<td>2.15</td>
<td>−1.94</td>
<td>24</td>
<td>0.065</td>
</tr>
<tr>
<td>Airflow</td>
<td>−1.04</td>
<td>1.22</td>
<td>2.07</td>
<td>1.14</td>
<td>−9.41</td>
<td>26</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Temperature</td>
<td>−0.85</td>
<td>1.23</td>
<td>0.33</td>
<td>1.96</td>
<td>−3.08</td>
<td>26</td>
<td>0.005</td>
</tr>
<tr>
<td>Amount of light</td>
<td>0.26</td>
<td>1.79</td>
<td>2.26</td>
<td>1.16</td>
<td>−4.68</td>
<td>26</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Visual comfort</td>
<td>0.001</td>
<td>1.36</td>
<td>1.41</td>
<td>1.53</td>
<td>−3.29</td>
<td>26</td>
<td>0.003</td>
</tr>
<tr>
<td>Outdoor view</td>
<td>0.44</td>
<td>1.83</td>
<td>2.52</td>
<td>0.85</td>
<td>−6.07</td>
<td>26</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
References


