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Maral Babapour Chafi[a] and Linda Rolfö[b]
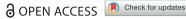
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ABSTRACT

Activity-based Flexible Offices (A-FOs) are offices with unassigned desks that provide a variety of workspaces. This paper presents desk-sharing and speech rules identified in A-FOs in four Swedish organisations, the emergence of and compliance with these rules, and their consequences for work conditions. Data collection involved 105 semi-structured interviews, document analyses, and observations. The identified rules were: (1) to remove belongings, (2) temporal restrictions on using the same workstations, (3) temporal restrictions on using scarce zones, (4) restrictions on verbal interactions, and (5) restrictions on phone conversations. The cases with extensive user involvement in their planning process had explicit unambiguous rules. A better compliance with rules occurred when (i) the employees were well-prepared and had a unified understanding regarding how and why to follow the rules, (ii) the rules were explicitly communicated and were regarded as easy to follow, and (iii) following the rules facilitated work and improved work conditions.

Practitioner summary: Five rules were identified for applying desk-sharing and speech policies in A-FOs. Extensive user involvement resulted in having well-defined and explicitly communicated rules, and prepared employees for how to use the A-FO. Implicit and ambiguous rules led to conflicting interpretations, disregarding rules, and were associated with more negative work conditions.

Abbreviations: A-FOs: Activity-based Flexible Offices; JD-R: Demands-Resources model; ABW: Activity-based working; ABO: Activity-based offices

1. Introduction

Technological developments, virtual work and organisational changes have put new demands on the work environment of knowledge workers over the past few decades (De Croon et al. 2005; Lee and Brand 2005). The Activity-based Flexible Office (A-FO) concept is implemented by many organisations worldwide to improve utilisation of office space, decrease facility costs and increase efficiency and flexibility (Vos and van der Voordt 2002; Elsbach 2003; Hirst 2011; De Been, Beijer, and Den Hollander 2015; Kim et al. 2016; Rolfö and Babapour 2017). The A-FO concept aims at providing a variety of workspaces that suit the employees' work activities and environmental preferences (Wohlers and Hertel 2016). Other expected benefits of the A-FO are to stimulate interaction (De Been and Beijer 2014), increase employee satisfaction and productivity, attract and retain personnel, reduce footprint and gain a positive image among external clients (Vos and van der Voordt 2002; van der Voordt 2004).

The A-FO concept is also referred to as new offices, flexible offices, flex offices, flexi-desking, hot-desking or non-territorial offices (Knight and Haslam 2010; Brunia, De Been, and van der Voordt 2016; Kim et al. 2016) and is explicitly about sharing of workspaces (De Croon et al. 2005). To cope with the low-occupancy levels of personally assigned desks in traditional offices, A-FOs often provide fewer workstations than there are employees (De Been and Beijer 2014).

Normally, A-FOs are dimensioned for 70% of the workforce (Danielsson and Bodin 2008). To ensure availability of workstations, employees are expected to clear their desks every time they leave the workstation for more than one hour (Hirst 2011) or more than a few hours (e.g. De Been and Beijer 2014). To facilitate rotation of employees, toolboxes are provided, and archives are commonly digitalised (van der Voordt 2004). Nonetheless, nesting tendencies and leaving things behind have been found due, for example, to a tendency to mark one's identity (Elsbach 2003; Hirst 2011). Nesting tendencies indicate that desk-sharing policies have not been established or are being violated, impeding employee rotation across units and teams.

A-FOs provide space variety, thus enabling employees to choose where and how to carry out different work activities (Appel-Meulenbroek, Groenen, and Janssen 2011; Rolfö, Eklund, and Jahncke 2017; Babapour, Karlsson, and Osvalder 2018). The environmental features vary between different A-FOs (Danielsson and Bodin 2008) but normally have an open character (De Been and Beijer 2014) to support conversation and collaboration, with additional half-open work locations and enclosed 'back-up spaces' for concentrated work, informal and formal meetings and private phone calls (Danielsson and Bodin 2008; Wohlers and Hertel 2016). A distinguishing feature of the A-FO concept is the provision of designated spaces with different speech levels for concentrated and collaborative work. However, in some case studies (e.g. Appel-Meulenbroek, Groenen, and Janssen 2011; Rolfö, Eklund, and Jahncke 2017; Babapour, Karlsson, and Osvalder 2018) policies to ensure concentrated work have been disregarded. This highlights the importance of addressing the specification and level of compliance with the speech policies.

Office environments are sociotechnical systems comprised of interdependent sub-systems: (i) a personnel subsystem made up of individuals or groups working together, (ii) a technology subsystem required for performing work, (iii) a work design subsystem made up of structures and processes embedded within an organisation, and (iv) the external environment (cf. Hendrick and Kleiner 2016). Formal rules and procedures are regarded as one of the most common mechanisms designed into a work system to ensure communication, coordination and control among the different sub-systems (Hendrick and Kleiner 2016). Another system perspective is Activity Theory, applied for analysing and redesigning work (Engeström 2000). Activity theory aims at understanding the individual's everyday activities in their collective contexts (Nardi 1996). In this view, human activity is comprised of a complex arrangement of people and mediating technologies (Nardi 1996). Rules are considered as a part of the human activity system: 'temporal rhythms of work, the uses of resources, and the codes of conduct that are continuously constructed and contested in the form of explicit and implicit rules' (Engeström 2006, p. 4). In both these perspectives, rules are regarded as integral parts of the work system that influence other components of the system. In the literature on A-FOs, little is found regarding rules for sharing workspaces (e.g. use duration or the frequency of changing workstations), and how the rules influence the work system as a whole.

Rules described in A-FO literature are referred to as house rules (Bjerrum and Bødker 2003) and behavioural rules (Skogland 2017). These can also be seen as *codes of conduct* defined as a community's attempt to clearly state expectations of actions (McCabe, Trevino, and Butterfield 1996), or *norms and values*, which are not clearly stated, that is to say unwritten and implicit rules (Porras and Robertson 1992). In this paper, rules are defined as instructions, etiquettes, expectations or codes of conducts that regulate the use of spaces in A-FOs. Furthermore, rules are specifications of desk-sharing and speech policies that guide day-to-day actions. These are either formal and explicit or informal and implicit. Communicating and embedding rules into the organisation's culture can facilitate changes in office use (McCabe, Trevino, and Butterfield 1996). In addition, post-relocation measures, such as supervision, are suggested for getting employees to use the premises as expected (Brunia, De Been, and van der Voordt 2016).

Positive consequences for work conditions have been found in A-FOs, for instance increased autonomy (e.g. Vos and van der Voordt 2002), increased concentration opportunities (e.g. Seddigh et al. 2014), decreased sedentary time (e.g. Foley et al. 2016), improved communication (De Croon et al. 2005) and easier knowledge transfer (van der Voordt 2004). However, negative consequences have also been reported, such as difficulties in locating colleagues (van der Voordt 2004; Rolfö, Eklund, and Jahncke 2017), negative interpersonal relationships (Morrison and Macky 2017), time loss (e.g. Kim et al. 2016), and lack of privacy (Gorgievski et al. 2010). Many factors in A-FOs may have an impact on work conditions, such as spatial configuration and layout, and IT support, although the impact of rules on work conditions has not been specifically distinguished in the literature.

The identified work condition consequences of A-FOs relate to job demands and resources, that is to say, autonomy and physical, mental and inter-and intra-team demands and resources (cf. Bakker and Demerouti 2007).

The results of implementation of A-FOs are inconsistent (De Been and Beijer 2014). Bjerrum and Bødker (2003) found that A-FO implementations lacked processes and investigation of tasks, and applied a general concept solution. Brunia, De Been, and van der Voordt (2016) suggest that the planning process may have an impact on work conditions, specifically with regards to user participation. However, the literature on A-FOs is scarce regarding how employees are/can be involved. In addition, A-FO literature lacks elaboration on emergence and specification of policies in pre-relocation planning, and the implementation strength of policies.

In summary, previous research on A-FOs mainly addresses productivity, work satisfaction and health (van der Voordt 2004; De Croon et al. 2005; Danielsson and Bodin 2008; Brunia, De Been, and van der Voordt 2016). Despite rules being integral components of work systems that influence individuals, teams and organisations, scant research studies were identified regarding rules, compliance with rules, and their impact on work conditions in A-FOs. Furthermore, the planning process and ways of specifying rules in A-FOs have not been elaborated on.

The overall purpose of this paper is to gain a deeper understanding of rules and policies relevant for A-FOs, and to further facilitate decision-making regarding rules in the planning process. More specifically, the aims are to:

- Investigate and compare user participation and emergence of rules in the planning processes of A-FOs.
- Identify and compare desk-sharing and speech rules, as well as compliance with rules.
- Explore consequences of the identified rules for work conditions.

2. Methodology

2.1. Data collection procedure

A case study approach, investigating four case organisations in Sweden (Table 1) in 2015–2016, was chosen for in-depth analysis and comparison of rules, and their impacts on work conditions in A-FOs. Case studies are designed to collect detailed information on a case, or multiple cases (Merriam 2009), by using multiple sources of data (Creswell 2013). Multiple data

Table 1. Case organisations and data collection.

Organisations	Case 1 (C1)	Case 2 (C2)	Case 3 (C3)	Case 4 (C4)
Type of organisation	Health and safety knowledge and training provider	IT service and support providers	Insurance company	Science park
Professions	Leadership Administration Project management Communication Educations	Leadership Administration Project management Consultant agents In-house IT and telephone support IT development	Leadership Administration Project management IT development Business development	Leadership Administration Project management Communication Data analysts Business development
No. of employees relocated	40 (entire company)	50 (entire company)	79 (2 units) +~20 consultants	13 (entire company) +~30 external stakeholders
Interviews with employees				
No. of interviewees (female/male)	24 (20/4)	43 (5/38)	26 (10/16)	12 (7/5)
Interviewees' age, mean (min–max)	50 (37–65)	38 (23–61)	43 (31–60)	47 (27–65)
Interview time: no. of months after relocation	2.5	9	3	2
Observations				
No. of days	2	4	2	4
Office settings				
Workstations	43	35	74	45
Office type before relocation	Large open-plan	Cell offices, Shared offices, Medium sized open-plan offices	Large open-plan	Cell offices

collection methods were used: document analysis, interviews and observations. The four organisations were selected since they had recently relocated to A-FOs, and were participating in larger research projects on A-FO implementations. This allowed for cross-case comparisons in order to gain a deeper understanding of different implementations of A-FOs. The partaking organisations granted access for data collection after initial contacts with the management.

Planning documents and architectural drawings were collected to gain insights into planning processes, documented rules, and zone allocations. A review of architectural drawings reveals physical characteristics of the work system and their impact on work processes (Carayon et al. 2006). Furthermore, unstructured interviews were held with a process manager at each case organisation to describe user participation and the emergence and planning of explicit rules. These were conducted either face-to-face or through phone. The interview questions to the process managers addressed timeline and activities during the implementation process, methods and tools used during the process, stakeholders and their level of involvement, and the intentions behind implementation of the A-FOs.

A total of 105 semi-structured individual interviews were conducted with the case organisations' employees to identify and compare desk-sharing and speech rules and to explore their consequences for work conditions. All employees were invited and encouraged by management to sign up for interviews. The interviews were held at the respective organisations' premises in enclosed meeting rooms and lasted on an average for 30 min. All 105 interviews were audio-recorded. The interview questions addressed the following themes in the four A-FOs:

- **Background information:** Position, years employed at the company, and the office type occupied before relocation to the A-FO.

- **Work activities:** Work tasks, and the extent of individual and collaborative work.
- **Office use:** Zone and workstation choices and setting up and clearing out workstations.
- **Strengths:** support/positive changes in the work environment after A-FO implementation.
- **Weaknesses:** obstacles/annoyances/negative changes in the work environment after A-FO implementation.

Direct observations were conducted by the authors at the case organisations' premises in connection with the interviews to investigate compliance with the identified rules. The duration of the observations varied between 2–4 workdays. Field notes were documented at approximately 30-minute intervals addressing use of workstations, flow of employees and time and location of conversations and phone calls.

2.2. Data analysis procedure

The planning documents and interviews with the process managers were analysed to identify the extent of user participation and emergence of explicit rules in the planning process. Furthermore, architectural drawings were reviewed to analyse realisation of speech policies and zones with different speech levels in the architectural drawings. Field notes from the observations were reviewed and compiled to extract the extent of compliance with the explicit rules (the number of available, reserved and occupied workstations, and the number of conversations in different zones).

The 105 interviews with employees (Table 1) were transcribed verbatim. Analysis of the data was conducted jointly by the authors. A qualitative data analysis tool (QSR-NVIVO) was used for creating nodes and facilitating the analysis. The analysis used a bottom-up approach with the research questions as a starting point. This involved iterative reading of the transcripts, exclusion of irrelevant data, and identification of recurring themes (cf. thematic content analysis in Miles and Huberman 1994). The identified themes were: (i) explicit, implicit and ambiguous rules

Table 2. Work condition categories and their applications in A-FOs inspired by job demand-resources model (cf. Bakker and Demerouti, 2007).

Work conditions	
Autonomy	Whether individuals are provided with/deprived of freedom in planning work and in choosing the procedures, instruments and workspaces in A-FOs.
Physical resources	Ways in which the individual's work is facilitated by means of decreased physical demands and/or contributes to the individual's physical health.
Mental resources	Ways in which individuals' work is facilitated by means of decreased cognitive workload in A-FOs: (i) whether the office stimuli, such as noise levels, facilitate cognitive processes or impose an increased cognitive demand; and (ii) whether working hours are changed due to desk-sharing.
Inter- and intra-team resources	Ways in which A-FO supports or impedes interactions and collaborations within and across groups or units.

regarding desk-sharing and speech policies, (ii) compliance with rules and (iii) positive and negative consequences of the desk-sharing and speech policies.

A top-down approach was taken to further cluster the identified positive and negative consequences into work condition categories (Table 2) inspired by the job demand-resources model (Bakker and Demerouti 2007). Furthermore, the proportion of interviewees reporting the consequences was determined by reviewing the interview transcripts. Quotes were selected to exemplify the identified codes (rules) and categories (work conditions), and de-identified with an interviewee number in each case (e.g. I5-C2). Moreover, the identified rules, compliance with rules and their consequences were compared in cross-case analyses. Lastly, cross-case displays were created to bring together findings regarding work condition consequences into a comprehensive whole, and evaluate their occurrence in parts of or throughout the office (cf. cross-case analysis in Miles and Huberman 1994).

3. Results

Results regarding the planning process, the rules and the work condition consequences in each of the cases are presented separately and further summarised in cross-case comparisons.

3.1. User participation and emergence of rules in planning processes

The results in this section are derived from planning documents, architectural drawings and comments from the process managers in each case organisation.

Case 1: All 40 employees of C1 (Health and safety knowledge and training provider) participated in a survey regarding needs and expectations, and a workshop on how to improve their work environment, before the office type was decided. Moreover, all employees participated in several workshops regarding their activities and needs, facilitated by workplace designers. Furthermore, all employees were invited to A-FO site visits. Moreover, approximately 25% of the employees were representatives in a reference group that had meetings every 2–4 weeks for the planning process duration (1.5 years). The representatives communicated discussions, decisions and concerns between the employees and the reference group. Management also communicated directly with those employees who expressed major concerns. In addition, risk assessments were conducted. Two explicit rules concerning desk-sharing and speech policies were

decided by the reference group who wanted to avoid having many rules for potential problems. To make sure that the rules were spread among all of the employees, several channels were used such as meetings, the intranet, and the architectural drawings.

Case 2: All 49 employees of C2 (IT service and support providers) participated in needs and activity analyses before the office type was decided. All employees were encouraged to participate in different planning groups, workshops, focus group interviews, a groundbreaking ceremony, kick-offs, feedback sessions, six questionnaires and they were all invited to contribute to a 'mood board' with inspirational pictures of desired interior designs during the two and a half year planning process. Moreover, a reference group representing all departments paid a study visit to an A-FO, and gathered reflections, concerns and ideas from the rest of their work groups. Work processes were digitalised to enable flexibility and mobility of employees. The design progression was presented on a weekly basis to the whole company. A project manager highlighted early discussions on ways of working: '*defining the groundwork, what are our main activities? How and where do we work? How should we treat each other?*' (I3-C2). Furthermore, several workshops were held focusing on rules, which were concretised. The rules were communicated through a PowerPoint presentation and architectural drawings at a company meeting, on the intranet and presented to every new employee. The presentation included suggestions for addressing and avoiding potential rule breaking: 'to make it work, a precondition is to give each other clear, direct and instant feedback if rules are not followed'.

Case 3: All 79 employees of C3 (Insurance company) took part in a 3-hour mandatory workshop on behaviour regarding how to use the A-FO, during the 9-month planning process. The discussions raised in the workshop addressed claiming desks, the use of back-up rooms, and whether some rooms were to be quiet. A reference group consisting of 15 participants developed and documented rules. However, management opposed having formal rules due to potential rule breaking, so no rules were decided.

Case 4: All 13 employees of C4 (Science park) participated in a survey regarding needs and requirements, and a diary study for activity analyses. The employees were presented with the A-FO layout 6 months before relocation. However, they were not engaged in the planning and design process and did not have the opportunity to influence the design decisions. Since multiple companies were going to use the same facilities, the facility management and the

designers planned for spaces that could accommodate organisations with different needs. No workshops or discussions were held to address rules.

Cross-case comparison: The cases varied in planning process extent (Table 3). C1-2 had high employee involvement in various stages of the planning process and some empowerment in the decision-making of rules. In contrast, C3–4 had no or comparatively low employee involvement in the process and rules were not decided.

3.2. Desk-sharing and speech policies and their consequence for work conditions

Based on the interviews and planning documents, three rules (R1–3) were identified for enabling desk-sharing and rotation of employees in the four case

Table 3. User participation and emergence of rules in the planning process.

	Case 1	Case 2	Case 3	Case 4
Employee involvement in choosing office type	Yes	Yes	No	No
Workshops on employees' needs and activities	Yes	Yes	No	Yes
Employee participation in decision on rules	Yes	Yes	No	No
Clear communication of rules with employees	Yes	Yes	N/A	N/A

N/A: not applicable.

organisations, and two rules (R4–5) were identified for allocation of zones with various speech levels:

- R1 - **To remove belongings:** Addressed clearing the workstation from personal and work-related belongings when finished, i.e. clean desk policy. Specifically, the rule addressed the duration for which the desks were allowed to be claimed but unattended.
- R2 - **Restrictions on using the same workstation in open zones,** addressed limits on choosing the same desk on consecutive days.
- R3 - Restrictions **on using workstations in scarce zones,** addressed limits on choosing scarce zones such as back-up rooms or quiet rooms for 1–2 persons on consecutive days.
- R4 - **To interact verbally with colleagues in different zones:** This rule indicated allocation of zones where conversations with and/or interruption of colleagues were allowed/forbidden.
- R5 - **To speak on the phone in different zones:** This rule indicated allocation of zones where phone conversations were allowed/forbidden.

The identified rules were either (1) explicitly expressed in the planning documents, by the interviewees, and in
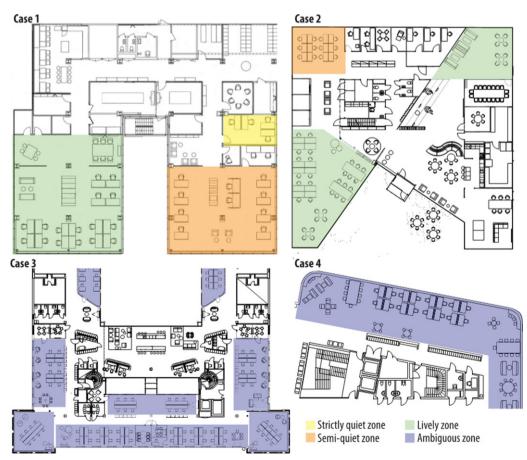

Figure 1. Architectural drawings marked with allocated zones for different speech levels.

the booking systems, (2) implicitly expressed by the interviewees, or (3) ambiguous (where the interviewees had different interpretations of a rule or expressed uncertainties). Speech rules were realised in three different zones in C1, two zones in C2, while no specific zones were distinguished in C3-4 (Figure 1).

3.2.1. Case 1 (health and safety knowledge and training provider)

According to the planning documents, to enable desk-sharing in C1, the employees were explicitly required to remove their belongings by the end of the day (R1), although they were allowed to reserve/occupy workstations during a whole work day despite being elsewhere. The question of whether or not it was permissible to use the same desks in open zones on consecutive days (R2) was reported as being ambiguous in the interviews: '*we have decided to try to change workstations and not sit at the same desk. But I don't know how explicit that rule is*' (I5-C1). Furthermore, there was an implicit restriction on using the scarce zones on consecutive days (R3): '*in the beginning I always sat in a back-up room, since I talk a lot on the phone, until a colleague commented that we should not have assigned desks*' (I20-C1). In addition, C1 had explicitly allocated three zones with different speech policies i.e. R4-5; (i) a strictly quiet zone where verbal interactions, interruptions and phone conversations were forbidden, (ii) a semi-quiet zone where verbal interactions were acceptable with lowered voices, but phone conversations were forbidden, and (iii) zones where interaction with colleagues was explicitly encouraged (Figure 1).

Compliance: All interviewees complied with R1 (to remove belongings), which was also confirmed by observations. Moreover, most interviewees tried not to use the same desks on consecutive days (R2). Regarding repeated use of the same workstations in the scarce zones (R3), some exceptions were observed and reported: '*There are those who don't care about that rule. But they're not that many*' (I5-C1). Some interviewees expressed annoyance with their colleagues' repeated use of workstations while others were more accepting: '*instead of letting a person feel discomfort, one should make a solution for that person*' (I16-C1). Breaking of R4 and R5 was neither reported nor observed in C1: '*This part is actually quiet. I think most people appreciate [it]*' (I15-C1). Exceptions were observed and reported in the strictly quiet zone: '*When we're alone, we can decide ourselves to talk a little, [… besides] there is always someone who has a question*' (I16-C1).

Work condition consequences: consequences of desk-sharing and speech policies are presented in Table 4.

3.2.2. Case 2 (IT service and support providers)

Desk-sharing policy was explicitly specified in rule statements in C2: 'We want our workstations to be as available as possible. Therefore, it is suitable to remove your belongings from the workstation when you plan to be absent more than 2 hours [R1]. This way you will enable your colleague to use the workstation'. According to the interviewees, using the same workstations in open or scarce zones on consecutive days (R2-3) was implicitly allowed: '*There is no one forcing you to move. It is actually permissible to use the same desk every day if you want, if it is not occupied*' (I7-C2). The interviewees had a clear understanding of the explicit and implicit rules and reported no ambiguities. Furthermore, C2 had explicitly allocated zones; a semi-quiet zone, and an interactive zone where having phone conversations and interacting with colleagues was explicitly allowed (Figure 1). The semi-quiet zone was customised for uninterrupted work, as well as providing phone support to customers, as this was one of the prominent work activities. Therefore, phone conversations were allowed, but conversations with and/or interruption of colleagues were forbidden. No zone was strictly quiet.

Compliance: The majority of employees complied with the desk-sharing rules according to observations and interviewees: '*when we moved here, somehow our mind was already set on working like this. In fact, we had planned for it for several years. That is why it wasn't a big deal. It felt like we had almost worked like this, because we had talked about it so much*' (I24-C2). Exceptions in the form of nesting tendencies in open zones (R2) were observed and reported. These were not interpreted as rule breaking. Instead, the interviewees showed consideration for colleagues: '*Sometimes, I don't sit there, because I want to leave it free for others*' (I35-C2). However, nesting tendencies in scarce zones (R3) generated uncertainties: '*Colleagues who book [the scarce zones] all the time, start a trend of occupying specific rooms all the time. Something they should or maybe should not do*' (I41-C2). Furthermore, breaking the no-interruption rule (R4) in the semi-quiet zone was reported and observed: '*People walk up and initiate conversations even though we have decided we should not behave that way*' (I22-C2). Interrupting colleagues (violating R4) was not considered harmful: '*We've definitely violated the rule, but because there were only a few other*

Table 4. Positive and negative work conditions, the proportion of interviewees (P) reporting the consequences, and excerpts from interviews in Case 1.

C1: Work condition consequences of desk-sharing rules			P.	Interview excerpts
Autonomy	+	Increased decision latitude for choosing workstations	15/24	'One is not left with this bad workstation. Instead, I can choose where to sit.' (I15-C1)
	−	Limitations on having assigned desks and personalising workstations	11/24	'You don't want to be called a slouch and sit at the same desk all the time. [...] There is a place that I think is the best. I choose desks in proximity to it.' (I23-C1)
	−	Social pressure for switching workstations on consecutive days or being available	4/24	
Physical resources	+	Increased physical activities / decreased sedentary time	2/24	'The biggest positive change is that you walk more. I have a pedometer, [...] I walk between $1/3$ and $2/3$ more than before.' (I23-C1)
	−	Complications with workstation adjustments leading to neck, back and shoulder problems	9/24	'My shoulders hurt. Something's wrong with these chairs. We got instructions.' (I7-C1)
	−	Inconvenient transportation and setting up of work-related artefacts	6/24	'I have to run back and forth to the other side to get papers from the locker.' (I9-C1)
Mental resources	+	Decluttered workspaces	7/24	'I was surrounded with stuff [...]. It's quite nice to get rid of it all.' (I6-C1)
	−	Increased planning and set up time leading to fragmentation of work	7/24	'I have to mentally prepare every morning. Where was I? What was most important? Takes a lot longer to get started.' (I9-C1)
	−	Limited access to printed documents	5/24	
Intra-team resources	+	Increased access to colleagues, team members and management	7/24	'It is more spontaneous here. It's easier to talk instead of having long mail conversations.' (I19-C1)
	+	Facilitate spontaneous meetings	8/24	
	+	Working side-by-side and easily sharing documents and screens	9/24	'It is great to be able to sit next to each other with our computers.' (I18-C1)
	−	Difficulties in locating and gathering colleagues and information exchange	8/24	'I don't see those who choose the quiet zone. There's less interaction with them.' (I15-C1)
	−	Risk of isolation from team members	16/24	'The bad thing is, when do you go for a coffee break or lunch? We have lost that.' (I1-C1)
	−	Missing out on social activities	2/24	
	−	Risk of feeling alone and unnoticed	2/24	'The risk is of feeling lonely at this workplace.' (I6-C1)
	−	Difficulties in grasping others' well-being	3/24	
Inter-team resources	+	Increased inter-team interactions	14/24	'I have more contact with people. It's easier to communicate across units.' (I14-C1)
	+	Increased understanding of inter-team colleagues	10/24	
	+	Decreased hierarchies	3/24	'Our CEO sat close by and heard me on the phone with a customer. She gave me positive feedback afterwards.' (I11-C1)

C1: Work condition consequences of speech rules				
Autonomy	+	Freedom to choose workstations with different speech levels	15/24	'The most positive change is that if I need a quiet space, I can have it.' (I7-C1)
Mental resources	+	Options for shielding oneself from interruptions by colleagues in the quiet zones	16/24	'It's possible to withdraw pretty easily if you want, for better or worse, and avoid interacting.' (I15-C1)
	+	Avoiding distractions from others' phone calls	4/24	
	−	Distractions and increased noise levels in the interactive zones	9/24	'Sometimes it gets too social, everyone's chit chatting because it's fun.' (I11-C1)
Inter- and intra-team resources	+	Quick exchange of information: Lower threshold for initiating conversations, and more support and knowledge sharing	11/24	'We talk a lot more now, not only within the unit, but also with others [...]. You overhear completely new things when sitting mixed. That benefits our work.' (I18-C1)
	+	Overhearing conversations	7/24	
	−	Missing out on important information	4/24	'You get to know about important decisions in a client meeting and it's not really nice.' (I6-C1)
	−	Limitations on interacting with colleagues when needed in the semi-quiet zones.	9/24	'It takes longer to get in touch with the project managers [in the semi-quiet zone].' (I13-C1)

Table 5. Positive and negative work conditions, the proportion of interviewees (P) reporting the consequences, and excerpts from interviews in Case 2.

C2: Work condition consequences of desk-sharing rules

	+/-		P.	Interview excerpts
Autonomy	+	Increased decision latitude for choosing workstations	36/43	'I am free to choose where to sit depending on what I want to work with.' (I15-C2)
	–	Difficulties in finding workstations in some of the zones	23/43	'Occasionally, it has been fully occupied, without a single free space. Then you have to go around and find another place.' (I11-C2) 'It would have been nice to be able to leave your things on the desk.' (I7-C2)
	–	Limitations on having assigned desks, and personalising workstations	13/43	
Physical resources	+	Decreased sedentary time	4/43	'Standing is also a positive thing. [...] There's more standing and working.' (I42-C2)
	–	Inconvenient transporting/setting up of belongings	5/43	'You need to have an eye on your stuff and bring them around. It's more to think about.' (I24-C2)
Mental resources	+	Decluttered workspaces	4/43	'It looks nicer and it is more clean.' (I25-C2)
	–	Increased planning and set up time	1/43	'You have to collect everything and put it in a tiny locker.' (I38-C2)
	–	Limited access to paper documents	2/43	
Inter-team resources	+	Increased access and proximity to colleagues; increased team cohesion due to natural meeting arenas	27/43	'You can ask a question and get a response directly. It helps both me and our customers since I can solve problems quicker.' (I17-C2)
	+	Facilitated spontaneous interactions (more informal meetings and cross-talk)	30/43	'It is easier to collaborate, to go away for a quick spontaneous meeting. [...] or to sit together at a desk.' (I9-C2)
	+	Facilitated side-by-side work	13/43	
	–	Difficulties in finding, gathering and collaborating with colleagues	8/43	'To quickly gather colleagues requires more work now.' (I40-C2)
	–	Increased risk of isolation from team	11/43	'It can be isolating in the quiet zone.' (I40-C2)
	–	Missing out on social activities	1/43	
	–	Risk of feeling alone and unnoticed	1/43	'How do I know that it [the absence] is not because that person is feeling bad? Or is he/she working from home for two weeks because it's difficult to concentrate here?' (I21-C2)
	–	Difficulties in grasping colleagues' wellbeing	2/43	
Intra-team resources	+	Increased intra-team interactions	33/43	'It's a better atmosphere that perhaps encourages taking extra minutes by the coffee machine.' (I10-C2)
	+	Increased understanding of intra-team colleagues; a good social environment	16/43	
	+	Decreased hierarchies	12/43	'Everyone is on the same level. It's not my office or yours.' (I30-C2).

C2: Work condition consequences of speech rules

	+/-		P.	Interview excerpts
Autonomy	+	Freedom to choose workstations with different speech levels	30/43	'I can sit in the interactive or the quiet space, [...] more often in the quiet one.' (I13-C2)
Mental resources	+	Options for shielding oneself from interruptions by colleagues in the quiet zones	12/43	'It is not OK to interrupt. Here you can be quite sure to be left in peace when working' (I6-C2)
	–	Exposure to phones conversations in all of the zones	20/43	'It's hard to concentrate. There is a lot of buzzing and telephone conversations.' (I2-C2)
	–	Distractions, due to too many and at times irrelevant conversations (due to e.g. disregarding the no-interruption rule)	27/43	'Background noise bothers me the most. Half a day is fine, but after longer period I feel very, very tired in the afternoon.' (I32-C2)
Inter- and intra-team resources	+	Quick exchange of ideas and information	26/43	'It is convenient to address issues as quickly as possible, instead of calling or sending an email' (I23-C2)
	+	Overhearing opportunities (knowledge sharing and more support)	14/43	'Most of our team sit in the quiet zone. You need to discuss if something happens.' (I25-C2)
	–	Missing out on important information	2/43	
	–	Limitations on initiating conversations in the semi-quiet zones	6/43	'I can't talk to anyone if I sit in the quiet zone. I have to move over.' (I31-C2)

people around. I'm not fond of rules. Small rules that I don't think matter. I have a hard time following them' (I14-C2). On the other hand, respect for R4 was also reported: 'I never walk over and knock on someone's shoulder. I use Skype' (I34-C2). The employees gave and received feedback regarding the rules: 'there have been times when someone has told me "you need to leave". I'll take it and do it. I don't get upset about it' (I14-C2). There was also recognition of the rules' importance for making the office work: 'It's very important to stick to and follow the rules. [Otherwise,] the whole office turns to an open office and people disturb each other the way they please. Then the point is lost' (I40-C2).

Work condition consequences: consequences of the identified rules are presented in Table 5. More positive than negative consequences were identified: 'we have been involved and developed this. […] It's hard to complain' (I14-C2).

3.2.3. Case 3 (insurance company)

No information regarding desk-sharing and speech rules was traced in the planning documents in C3. The employees perceived that they were required to remove their belongings when their desks were unattended (R1). However, ambiguities were reported regarding the duration of workstation non-attendance (between 30 min and 3 h): ' … there are no rules, for example for the duration of absence from my desk before I should make it available for someone else' (I7-C3). Ambiguities were also identified regarding R2-3: 'there are people who always occupy their desks, the same desk every day. Everyone has a different opinion on the matter' (I18-C3). Due to these ambiguities some of the interviewees expressed a need for specifying rules: 'Actually there are no […] rules, but perhaps some are needed' (I19-C3). Furthermore, C3 did not have allocated quiet, semi-quiet or interactive zones. In the open zones (Figure 1), verbal interactions were implicitly allowed. However, some interviewees expected others to speak more quietly. Regarding the enclosed zones, ambiguities and different interpretations were identified: while some expected these zones to be quiet, others used them for meetings or collaborations. This was mentioned to be due to either ambiguous information: 'We received different information in the beginning about these rooms […] that it was supposed to be a quiet room' (I9-C3), or lack of decisions made during the planning process on rules: 'We have never decided whether they should be quiet, so there are very different expectations on those rooms'

(I12-C3). Phone conversations (R5) were implicitly allowed in all zones.

Compliance: According to both interviews and observations, belongings were often left to mark workstations as 'occupied' during the day, when the employees were elsewhere (breaking R1): 'I think it's completely wrong! If it's activity-based, it's activity-based. If so you cannot nest. To nest is to avoid vacating the workstations when you expect to be absent for more than an hour' (I25-C3). Rule ambiguities were used as a justification for breaking R1: 'I'm sloppy regarding clean-desk. We don't really know the rules. […] There are no explicit rules telling us what applies' (I23-C3). Time limitations were another reason for breaking R1: 'If I'm expected to clean the desk before every meeting, I won't have time to work' (I18-C3). Breaking R2 was also observed and reported: 'I get criticised because some people in my team occupy the same desks every day, never vacating them' (I18-C3). This led to implicit assignment of workstations to individuals or teams, as well as annoyance for interviewees whose team members were left without proximal workstations: 'That team works together from morning to evening and barricades different spaces. We don't have that many different sections [clusters of workstations], so some teams are left without' (I1-C3). Different interpretations for R3 were identified in the interviews and observations. The scarce zones were either used for short periods (for instance for a phone call), or for longer periods (for example for concentrative work). This led to unavailability of scarce zones.

Due to the different interpretations of the speech rules in the enclosed zones, some interviewees perceived the rules as being disregarded, and expressed annoyance: 'There were two people having a meeting in there so I said "This is supposed to be a quiet room. If you sit here it should be quiet", [and they responded] "Oh, we had no idea"' (I3-C3). In accord with the observations, some interviewees reported a general tendency to speak quietly in order to avoid distracting their colleagues in the open zones: 'Oh, now I have been standing here and disturbing, talking way too loudly. So I think you need to learn to improve' (I4-C3). In the open zones, phone calls and verbal interactions were frequently observed.

Work condition consequences: positive and negative consequences of desk-sharing and speech policies are presented in Table 6.

3.2.4. Case 4 (science park)

None of the desk-sharing and speech rules were traced in the planning documents in C4. The

Table 6. Positive and negative work conditions, the proportion of interviewees (P) reporting the consequences, and excerpts from interviews in Case 3.

C3: Work condition consequences of desk-sharing rules			P.	Interview excerpts
Autonomy	+	Increased decision latitude for choosing workstations	17/26	'I feel more creative when I can choose where to sit. It's the best thing with this office.' (I20-C3)
	–	Difficulties in finding appropriate and available workstations	16/26	'Sometimes you have to go four laps to find a spot in the middle of a team that speaks a lot. Because there are no free desks.' (I12-C3)
	–	Limitations on having assigned desks and personalising workstations	8/26	'It's nicer with own desks, the familiarity you feel when you come to work; the voices of people who you know sit in front of you.' (I23-C3)
	–	Social pressure for changing workstation	3/26	'"I'm good at changing desks every day so that no one will say "that is your desk".' (I18-C3)
Physical resources	+	Decreased sedentary time	4/26	'I change environment, posture, how I sit, and I stand much more often now.' (I19-C3)
	–	Complications with workstation adjustment	13/26	'It is troublesome to have to adjust the chairs every time you change workstation.' (I7-C3)
	–	Inconvenient transportation and setting up of belongings	6/26	'I have a clumsy and heavy toolbox from which things disappear easily.' (I15-C3)
Mental resources	+	Decluttered workspaces	2/26	'It facilitates a lot, both for the mind and because there are no piles with papers and rubbish everywhere.' (I5-C3)
	–	Increased planning and setup time e.g. for distinguishing free workstations from occupied ones leading to work fragmentation	8/26	'It's difficult to interpret when something is placed on a desk. You almost cannot distinguish whether someone is sitting there.' (I11-C3)
	–	Limited access to paper documents	2/26	'Now you have to run back and forth to find your documents and papers.' (I17-C3)
Inter-team resources	+	Increased access and proximity to colleagues	3/26	'To be able to sit next to the person you work with, or quickly exchange ideas has become easier.' (I5-C3)
	+	Facilitated spontaneous interactions	5/26	
	+	Facilitated side by side work	10/26	
	–	Difficulties locating team members	14/26	'It is difficult to find people. You don't know where they are.' (I24-C3)
	–	Increased risk of isolation from team impeding collaborations	15/26	'We are 10 in our team, it is hard to find workstations to sit together.' (I14-C3)
	–	Missing out on social activities	1/26	'We have fewer coffee breaks together.' (I5-C3)
	–	Difficulties in grasping colleagues' wellbeing	1/26	'You don't have the same overview as before, to know if someone's home or sick.'(I2-C3)
Intra-team resources	+	Increased intra-team interactions	8/26	'Now you sit with other teams who you can work with. Before you sat with one team.' (I5-C3)
	+	Increased understanding of intra-team colleagues	3/26	
	+	Decreased hierarchies	2/26	'It helps when you have hierarchies and will remove them. We are all equal here.' (I19-C3)
	–	Lack of familiarity with the social surrounding	1/26	'A lot of people move around who you don't really know.' (I23-C3)

C3: Work condition consequences of speech rules				
Autonomy	+	Freedom to choose workstations with different speech levels	7/26	'It is nice to be able to be alone and quiet, or if you don't want to collaborate.' (I24-C3)
Mental resources	+	Options for shielding oneself from interruptions	2/26	'Before it was not possible to hide away if you wanted to concentrate or not to be disturbed. You can have it here.' (I9-C3)
	–	Exposure to too many conversations	16/26	'There can be three different discussions going on close by. […] It's hard to focus.' (I4-C3)
Inter- and intra-team resources	+	Quick information exchange	7/26	'We sit together to hear people's discussions and get quick responses.' (I22-C3)
	+	Overhearing colleagues	2/26	

interviewees reported implicit rules for removing their belongings by the end of the day (R1). Furthermore, claiming workstations during a workday despite being elsewhere was implicitly allowed. A booking system allowed using a workstation in any of the zones for two consecutive days (R2-3). The majority of workspaces were located in open zones (Figure 1) where interactions and phone conversations were implicitly allowed, while there were no quiet zones. Nonetheless, uncertainties were reported: '*I don't know if this is the quiet or the interactive zone, if one is supposed to leave when receiving calls*' (I7-C4). As a result, the interviewees expressed a need for defining rules: '*we have to create policies so that this workplace can function properly*' (I3-C4).

Compliance: Observations and interviews revealed that most of the employees disregarded R1-2: '*I have established a fixed spot. I am not one of those who switch workstations on different days*' (I6-C4). This was due to difficulties in storing belongings and ICT issues: '*I have to connect my screen in another way than intended, which takes time*' (I3-C4). However, the interviewees did not interpret their colleagues' nesting tendencies as breaking R1-2. Furthermore, interviews and observations showed that the scarce zones were neither claimed nor used regularly (R3). Interviewees who complied with the desk-sharing rules expressed concerns regarding claimed workspaces '*I think it would be sad if we had assigned desks*' (I3-C4). No breaking of speech policies was mentioned, as there were no quiet zones. Some interviewees mentioned a general tendency to speak more quietly to avoid distracting others. In accordance with the interviews, intervals of loud verbal interactions and whispering were observed.

Work condition consequences: positive and negative consequences of the identified rules are presented in Table 7.

3.3. Cross-case comparison

Similarities and differences across the cases regarding desk-sharing and speech policies are highlighted in Figure 2. Furthermore, a comparison of work condition consequences is provided in Figure 3. In summary:

Desk-sharing policy: The removal of belongings (R1) by the end of the workday was the only common and unambiguous rule across the four cases. A high degree of compliance with R1 was identified in C1-2. Conversely, most instances of disregarding R1 were found in C4. Using the same desks on consecutive days in different zones (R2-3) were the least defined

rules, hence the most ambiguous. Repeated use of the same desks in open zones (R2) was reported in all cases. However, in C2 and C4, the repeated use of desks was not interpreted as disregarding R2-3. No ambiguities regarding the desk-sharing rules were identified in C2. Conversely, most ambiguities were reported in C3.

Speech policy: In C1, three zones were devised: strictly quiet, semi-quiet and interactive. In C2, two zones were devised: semi-quiet and interactive zones. In C3-4, no speech rules were distinguished and no zone was allocated for quiet work. The majority of the interviewees in C1 and C2 reported compliance with the speech rules. However, both cases reported exceptions of disregarding speech rules in the non-interruptive zones. The interviewees in C2 expressed a need for a strictly quiet zone. In C3-4, ambiguities regarding speech policies in different zones, and different interpretations and extents of disregarding rules were reported. Hence, the interviewees in C3-4 expressed a need for clear speech policies.

Consequences of desk-sharing policies: Positive consequences of desk-sharing were reported to a higher extent in C1-2 than in C3-4 (Figure 3). In C2, negative consequences were reported to a lower extent than the other cases. Increased decision latitude for choosing different workstations was identified to a similar extent in all cases. Negative consequences in all cases included: limited opportunities for personalisation, decreased mental and physical resources due to more planning, inconvenient transport and setup time, limited access to printed documents, decreased intra-team resources due to difficulties in locating and gathering colleagues, and increased risk of isolation from team members. Outlying negative work conditions were: (i) risk of feeling alone and unnoticed in C1-2, (ii) difficulties in finding available workstations in C2-3, and (iii) untidy and cluttered workspaces in C4.

Consequences of speech policies: In C1-2, positive consequences of speech rules were reported to a higher extent than in C3-4 (Figure 4). In C4, negative consequences were reported to a higher extent than in C1–3. The opportunity to choose different speech levels within the office was mentioned by more interviewees in C1-2 than in C3. Most interviewees in C4 mentioned an insufficient zone variation. Increased mental resources were highlighted regarding the strictly quiet and semi-quiet zones, specifically in C1-2 that provided options for avoiding distractions, interruptions and conversations. Conversely, decreased mental resources and increased demands on tolerating distractions such as interruptions, conversations,

Table 7. Positive and negative work conditions, the proportion of interviewees (P) reporting the consequences, and excerpts from interviews in Case 4.

C4: Work condition consequences of desk-sharing rules			P.	Interview excerpts
Autonomy	+	Increased decision latitude for choosing workstations	7/12	'There is a freedom in here that makes my previous office feel like a sardine can.' (I3-C4)
	−	Limited opportunities for personalisation	5/12	'I would like a corner with my decorations, photos and plants, more personalised.' (I4-C2)
	−	Social pressure for choosing specific workstations and avoiding quiet workspaces to be available for colleagues	2/12	'A colleague was of the opinion that we should gather and sit close to each other, so I didn't consider sitting further away.' (I7-C4)
Physical resources	−	Complications with adjusting workstations	2/12	'It's not possible to adjust the desk height as I want. I have to bend over to work.' (I2-C4).
	−	Inconvenient transporting/setting up of workstations	8/12	'You need to have keyboards and mice on all desks to make it easy to switch.' (I8-C4)
Mental resources	−	Visual clutter and distractions	2/12	'It's a mess. Visually it's demanding to be here. [...] There is no calmness.' (I2-C4)
	−	Increased planning and setup time, causing fragmentation of work	2/12	'It's not just plugging a cable. You need to connect your screen in a new way that is not the same as the one you used earlier.' (I3-C4)
	−	Limited access to paper documents	6/12	'It is not possible to work only on your laptop. [...] I need to draw when I think.' (I11-C4)
Inter-team resources	+	Increased access to team members and management	5/12	'It's good to have easy access to colleagues. You can see [the management] more.' (I8-C4)
	+	Facilitated spontaneous interactions, info exchange and access to "hidden" information	5/12	'You find the things between the lines. The small things that get the work to progress.' (I12-C4)
	+	Facilitated side-by-side work	5/12	'We need to discuss a lot. It is good to be able to sit side-by-side with your screens.' (I8-C4)
	−	Difficulties in finding and gathering colleagues (difficulties to collaborate)	2/12	'Less support since everyone is isolating themselves. It's an unexpected effect of this environment. [...] More who are not present and you don't know where they are.' (I6-C4)
	−	Increased risk of isolation from team members	4/12	'Now people go for coffee on their own.' (I1-C4)
	−	Missing out on social activities	1/12	
Intra-team resources	+	Increased intra-team interactions	6/12	'We can collaborate more tightly with our partners.' (I3-C4)
	+	Decreased hierarchies	2/16	'It is unique to have it like this, without the prestige [of own rooms].' (I3-C4)
	−	Lack of familiarity with the social surrounding	1/12	'There are a lot of people walking around that you don't know and never met before.' (I12-C4)

C4: Work condition consequences of speech rules				
Autonomy	−	Limited opportunities to choose between zones, insufficient zone variation (feeling obliged to socialise)	9/12	'There is no way of protecting yourself if you want to work [...] if I don't say hello to that person, I feel I am being unfriendly.' (I7-C4).
Mental resources	−	Limited options for shielding oneself from interruptions	10/12	'There is higher demand here for being available for short discussions and meetings, and for visitors that come. You have to be more flexible and open than before.' (I11-C4)
	−	Limited opportunities to avoid other's phone conversations	1/12	
	−	Exposure to too many conversations in all of the zones	8/12	'You have to draw your own limits. You cannot just walk around and socialise.' (I12-C4)
Inter- and intra-team resources	+	Quick information exchange	5/12	'You can easily interact. I feel more confident to go over and talk to a colleague.' (I11-C4)
	+	Overhearing colleagues	4/12	

Desk-sharing rules		Case 1		Case 2		Case 3		Case 4	
R1.	To remove belongings by the end of the day	Explicit	◉	Explicit	◉	Implicit	◉	Explicit	◉
	To remove belongings during the work day	-		Explicit: duration of unattended use ≤ 120 mins	◉	Implicit: ambiguous duration of unattended use: 30-120 mins	✕	-	
R2.	To use the same desk in open zones in consecutive days	Ambiguous: whether or not allowed	✕	Implicit: allowed	◉	Ambiguous: whether or not allowed	✕	Ambiguous: whether or not allowed	✕
R3.	To use the scarce zones in consecutive days	Ambiguous: whether or not allowed	✕	Implicit: allowed	◉	Ambiguous: whether or not allowed	✕	Ambiguous: whether or not allowed	✕
Speech rules		Case 1		Case 2		Case 3		Case 4	
R1.	To interact with colleagues	Explicit: not allowed in the strictly quiet zone	◉	Explicit: not allowed in the semi- quiet zone	◉	Ambiguous: whether or not allowed in some zones	✕	Ambiguous: whether or not allowed in all zones	✕
R2.	To speak on the phone	Explicit: not allowed the stricitly zone	◉	Explicit: allowed in all zones	◉	Implicit: allowed in all zones	✕	Ambiguous: whether or not allowed	✕
		Implicit: not allowed the semi-quiet zone	◉						

◉ High degree of compliance: observed and reported　　◉ Exceptions of disregarding rules: observed and reported
◉ High degree of disregarding rules: observed and reported　　✕ Different interpretations and extents of rule breaking were reported.

Figure 2. Overview of desk-sharing and speech rules across the four cases.

Figure 3. Work condition consequences of desk-sharing rules and the extent to which they were reported across the four cases. The coloured bars respectively illustrate the proportion of interviewees that reported work condition consequences (Green: Positive work conditions, Red: Negative work conditions).

Figure 4. Work condition consequences of speech rules and the extent to which they were reported across the four cases. The coloured bars respectively illustrate the proportion of interviewees that reported work condition consequences (Green: Positive work conditions, Red: Negative work conditions).

phone calls and ring signals were mentioned to a greater extent in C4. An outlying positive work condition was reported in C1: the ability to avoid listening to colleagues' phone conversations and phones ringing. Positive work conditions mentioned in all cases were quick exchanges of information and benefits from overhearing ongoing conversations in the interactive zones. A negative work condition reported in all cases was too much conversation in the interactive zones.

4. Discussion

The overall purpose of this paper was to further the understanding of desk-sharing and speech policies and rules in A-FOs and to facilitate decision-making in the planning process. Specifically, the aims concerned planning of rules, explicitness and compliance with rules, and their work condition consequences. Rules for sharing workstations and having zones with different speech levels are key components of the A-FO. In total, five central rules were identified in the four case organisations:

- R1: To remove belongings – the duration allowed for claiming desks while being elsewhere.
- R2: Restrictions on using the same workstation in open zones.
- R3: Restrictions on using workstations in scarce zones.
- R4: To interact verbally with colleagues in different zones.
- R5: To speak on the phone in different zones.

4.1. User participation and the emergence of rules in the planning of A-FOs

In two of the cases (C1-2), the employees were involved from the beginning and throughout the planning processes of the A-FOs. In line with other studies, user involvement in the planning process had a positive effect on the acceptance of a new work system (cf. Carayon et al. 2006) and decreased misuses of the workplaces (cf. Appel-Meulenbroek, Groenen, and Janssen 2011). In these cases, rules were discussed, specified and made explicit by the employees. The results were three formalised and clearly communicated rules in C1-2. Discussions on rules were conducted both during workshops on rules, and also as a result of other activities and methods used (e.g. activity analyses) throughout the 1.5–2.5 years of planning (further details in previous work). These workshops were either formal or informal training sessions that ensured appropriate use of flexible workplaces (cf. Robertson et al. 2008), contributing to a unified understanding of why it was important to comply with the rules, and learning to use the premises accordingly. A unified mental model (Nielsen and Randall 2013), having shared perceptions of the importance of the change, and shared learning (Klein and Knight 2005) are predictors of successful organisational interventions and effective innovation implementation. Moreover, the long planning duration may have contributed to the acceptance of rules. According to Nielsen and Randall (2013), a long planning duration facilitates mental preparation and acceptance for change. In addition, employees in C2 were involved in decisions regarding work environment such as office type. This may be another predictor of compliance with rules and successful change and, in line with Vischer's (2008) findings, may explain the reported feelings of belonging and ownership. In contrast, desk-sharing and speech rules were less defined in C3-4. This may have been due to unclear division of responsibilities for maintaining the rules, and organisations' size and hierarchical structure. Restricted user involvement and empowerment (in C3-4) inhibited

preparation and acceptance for the change, gaining a shared mental model of how the A-FO worked, and understanding why it was important to comply with the rules.

4.2. Identification and comparison of rules relevant for A-FOs

Most of the rules were explicitly and clearly communicated in two of the cases (C1-2). The explicitness and communication of rules facilitated shared understanding of how to use the premises, and facilitated individual judgement of whether one's own actions complied with or disregarded the rules. Consequently, few employees disregarded the rules in these cases and the A-FO was used as intended. In cases with ambiguous rules (C3-4), employees had different mental models, assumed different implicit rules and had various interpretations of acceptable actions. Thus, acceptable actions for some employees were interpreted as rule breaking by others. This indicates that the employees in C-4 did not know what they were expected to do and how the system was supposed to work (cf. Porras and Robertson 1992). In cases where ambiguities of rules were identified, some employees used the ambiguity to justify negligence of the rules. For example, employees used the same favourite workstation on consecutive days, as there was no rule prohibiting this action. As a result, various implicit rules emerged among the employees (cf. autonomous rules in Daniellou 2005) that were not necessarily compatible with each other. A need to clarify the rules to know how to act in a correct way was expressed in C3-4. This wish contradicted the management decision not to implement rules in C3. Collaboration with managers is emphasised in Vink and Hallbeck (2012) to realise workplace improvements. To sum up, with explicitly stated rules employees felt secure in their choice of actions, while the absence of explicit rules meant implicit rules emerged, as well as various interpretations of acceptable actions and rule-breaking.

Since the definition of an A-FO involves flexi-desking, all cases (partly in C4) had either explicitly or implicitly implemented a clean desk policy, i.e. removal of belongings. However, the duration of unattended use of workstations is not specified by the office concept itself. Having said that, clearing unattended workstations was found to be necessary in the present study to offer enough workstation variability for the employees. Two of the cases addressed the duration explicitly by either restricting unattended use to twp hours (C2) or the whole day (C1). In one of the

cases with ambiguous time restrictions, employees reported annoyance of workstation shortage and restricted choice due to nesting (C3). It should be noted that applying time restrictions on unattended use of workstations may be more critical in A-FOs with a high employee-to-workstation ratio (reported in C3).

The A-FO concept enables and encourages the employees to switch workstations. However, it does not specifically require changing workstations or prohibit using the same ones on consecutive days. None of the cases in the present study addressed using the same workstation on consecutive days except C2 where it was implicitly allowed. The absence of explicit rules may have led to insecurities and obstructed the provision of feedback to colleagues regarding repeated use of the same workstation. Consequently ambiguities were identified in these cases, and in line with other studies (Brunia and Hartjes-Gosselink 2009; Hirst 2011; Rolfö, Eklund, and Jahncke 2017; Babapour, Karlsson, and Osvalder 2018), nesting tendencies were found. Individual consequences of nesting were limited to a few instances of feedback regarding repeated use of workstations. When nesting was limited to few instances, appropriate workstations were often available for individuals and teams. However, when nesting occurred in the scarce zones or by the majority of the employees, it led to implicit assignment of workstations. It also led to collective consequences such as limiting other employees' autonomy or a team's opportunity to find available or appropriate workstations. Choosing the same workstations may partly be due to having homogenous tasks or tasks that require collaboration with the same team members on consecutive days, and are best supported by the same office setting (cf. Hoendervanger et al. 2016). In that office setting, only a few workstations might provide ambient conditions (for instance temperature, lighting) as preferred by the employee. These findings highlight an inherent conflict in the A-FO concept; non-territoriality versus autonomy to choose preferred or needed office setting and workstation, which might be the same setting and workstation on consecutive days.

Two of the cases provided a variety of workspaces with different speech levels, customised to suit the employees' work needs. These involved explicit limitations on interacting with and interrupting colleagues or speaking on the phone. The speech rules were complied with by most of the employees. However, the non-interruption rule was more prominently disregarded in the semi-quiet zone in one of the cases (C2), potentially due to (i) lack of physical barriers to enter the zone, (ii) phone conversations being allowed

and occurring frequently, and (iii) conversations being rather easy to initiate. The findings are supported by a study by Appel-Meulenbroek, Groenen, and Janssen (2011) that reported on users having meetings in zones allocated for concentration. The other two cases did not have any explicit speech policies for the different zones leading to no variations in terms of speech levels in the A-FO, and therefore resembling open-plan offices. This can explain the prominent nesting tendencies in A-FOs, as well as negative noise-related work conditions reported in open-plan offices (Jahncke et al. 2011; Kim and de Dear 2013; Danielsson et al. 2015; Seddigh et al. 2015). In other words, switching workstations did not provide the employees with a more fitting workstation in terms of speech levels, while in C1-2, switching workstations was perceived to be beneficial due, for example, to the opportunity to use quiet zones for concentrative work. All told, zones should be complemented with speech policies to provide variation of workspaces suitable for different tasks, in other words there should be a value associated with switching workstations.

4.3. Consequences of the identified rules

The cross-comparison showed that cases with explicit and clearly communicated rules reported a higher proportion of resources in terms of positive work conditions, than demands and negative work conditions. Positive work conditions reported in all cases were increased decision latitude for choosing different workstations, increased inter-team interactions, quick exchanges of information and benefits from overhearing ongoing conversations in the interactive zones. Negative work conditions reported in all cases highlight that following the rules introduced new demands such as increased planning, transportation and setup time, and difficulties in locating and gathering colleagues. These demands made the rules difficult to follow. Other negative work conditions reported in all cases were limited opportunities for personalisation and difficulties in performing work such as too much verbal interaction or limited access to printed documents. These findings are in line with previous studies (Brunnberg 2000; Vos and van der Voordt 2002; van der Voordt 2004; De Croon et al. 2005; De Been and Beijer 2014; De Been, Beijer, and Den Hollander 2015). The common positive and negative work conditions can be seen as inherent consequences of implementing desk-sharing rules.

4.4. Methodological considerations

The mixed method approach used in four case studies (with different size, location and organisation type), and the large number of interviews (105) gave an in-depth understanding of rules and their consequences in A-FOs. Furthermore, triangulating data with planning documents, architectural drawings, and observations facilitated understanding of the interviewees' comments concerning the A-FO environment. The authors' joint analysis of the interviews revealed that all interviewees discussed the desk-sharing and the speech policies as main aspects governing work in A-FOs. In addition, this study reveals the importance of rules in A-FOs at varying times after relocation. However, it can be argued that the high extent of compliance with rules in the case study conducted nine months after relocation may have been due to the time they had to settle and accept the rules. On the other hand, the findings reveal that rules and ways of working were settled and accepted upon relocation due to the extensive user involvement in the planning process.

The focus of this paper was on identifying and comparing rules relevant for A-FOs. Other rules regulating aspects such as eating in the office were not central and exclusive to the A-FO concept and were therefore excluded. Moreover, the effects of office type prior to relocation on compliance with rules have not been addressed. Furthermore, deliberations on the pre-relocation office type, planning process, work tasks, office layout, office capacity, office use and their interdependency with rules may be of interest for future studies.

4.5. Implications

The findings from this study have practical implications for integrating the five identified rules in the planning process of A-FOs. For example, it is important to discuss and reach a shared understanding of expected switching frequency, both in open and scarce zones. Particularly in cases with high employee-to-workstation ratio, time restriction on unattended use of workstations should be addressed. In cases with a significant proportion of teamwork, the possibility of allocating zones to groups should be discussed. More importantly, zones with different speech levels and ambient conditions should be provided, to support different work activities, suit the individual employee's environmental preferences, and decrease nesting.

To ensure acceptance of rules in a new work system and decrease misuse, users should be involved

and empowered throughout the planning process and decision-making of rules. Furthermore, to reach shared understanding, guide daily actions and ensure positive work conditions, rules should be made explicit, unambiguous and clearly communicated. Moreover, if rules do not guide daily actions sufficiently and lead to insecurities, it is important to follow-up, modify or further specify the rules. Lastly, in order to ensure a satisfying and high-performing work environment, the rules should be planned in symbiosis with other components of an office environment as a sociotechnical system: (i) work activities, i.e. the work design system, (ii) layout configuration, capacity, IT, i.e. technology subsystem, and (iii) the needs of individuals and groups, i.e. the personnel subsystem.

5. Conclusions

Rules are crucial in Activity-based Flexible Offices (A-FOs) to provide a variety of environments, ensure positive work conditions, and make the flexible office concepts work, despite the scant attention they have received in the literature. Having explicit and unambiguous rules contributes to achieving the intended benefits of flexible offices, such as increasing efficiency and employee satisfaction. In cases with implicit and ambiguous policies, uncertainties, conflicting interpretations and disregarding of rules emerged, and a need for clearly defined rules was expressed. Moreover, rules were disregarded when (i) they were perceived as too time-/resource-demanding, (ii) the perceived usefulness was insufficient, or (iii) no individual or group consequences were perceived for breaking the rule.

The cases with extensive user involvement in the planning process had explicit and unambiguous rules customised to the employees' work processes. Furthermore, employees who had spent time addressing the future office seemed more prepared and unified regarding how to use the A-FO, were more accepting of the desk-sharing concept and reported fewer negative consequences on work conditions. To ensure positive work conditions in A-FOs, rules need to be discussed and explicitly decided on by the employees and management in the planning process of Activity-based Flexible Offices.

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