BACKGROUND

An increasing proportion of the population in Western societies work in offices. The influence of office concepts on employees' well-being thus has consequences for public health. The physical work environment is also assumed to influence knowledge workers' productivity. If so, the office concepts might influence the effectiveness and bottom line of organizations, which again have consequences for the national economy. With all these outcomes at stake, it is not surprising that there for several years has been an ongoing debate around the topic of office concepts. The debate is dominated by strong opinions for and against, as well as descriptions of real-world successes and failures, and research references supporting the different viewpoints (e.g., Borzykowski, 11.01.2017; Dahle, 31.03.2017; Harr, 5.12.2011; Sander, 11.04.2017). However, the influence of the physical work environment has been little emphasized by the research community. The research field is relatively small, and it is also characterized by interdisciplinarity, with influences from psychology, medicine, facilities management, organizational science, architecture, and others (Bodin Danielsson, 2010; Cohen, 2007). Furthermore, a broad overview of the field as a whole does not exist. It is therefore hard to say with any emphasis how an ideal workplace should be designed. However, a closer examination of the research field might help clear up the topic.

Description of the intervention

An office concept is an abstract idea or plan for the layout and/or the rules of a physical office workplace. Office concepts widely in use today include the cell or private office, which accommodates one person per room; the shared office, which accommodates two to three persons per room; and the open-plan or landscape office, which accommodates four or more persons per room, in extreme cases holding several hundred individuals (Ahlin & Westlander, 1991; Bodin Danielsson, 2010; Duffy, 1999). A variant of the open-plan office is the cubicle office, where partitions shield the individual workplaces visually from each other. While these concepts are defined by the number of employees per room, other concepts are defined by the rules for use of the office. Such concepts include the flexible office or activity based concept, where employees have no assigned seating, but are free to work anywhere in the office, as their work tasks demand and the employees themselves wish (Ahlin & Westlander, 1991; Bodin Danielsson, 2010; Duffy, 1999). Flexible office concepts are usually associated with open-plan layouts, but are not restricted to this.

How the intervention might work

How are office concepts imagined to function? The different office concepts are presented as having different and sometimes overlapping strengths, as well as weaknesses.

Beginning in the 1960s, the prevailing trend within office design has been a shift from traditional cell office layouts to various new office concepts based on open-plan layouts (Blakstad & Hatling, 2009). Office designers advocating the implementation of open-plan office concepts claimed that these concepts would improve financial gains, in two ways. Firstly, by utilizing office space, heating and ventilation more efficiently. And secondly, by improving organizational performance, as it is
assumed easier for people to find and contact each other in open-plan offices, thus fostering communication, collaboration, team identification and leader-employee contact (Becker & Steele, 1995; Duffy, 1999). These claims are also supported by some studies (e.g., Becker, 2002). The flip side of this ease of communication is that employees tend to experience open offices as noisy and disruptive, potentially reducing productivity (Banbury & Berry, 2005; Sundstrom, Town, Rice, Osborn, & Brill, 1994). The lack of acoustic as well as visual privacy found by open office spaces is further found to have a negative influence on workplace satisfaction (Kim & de Dear, 2013). These concerns echo in the wider research literature, where several reviews of comparative studies have found open-plan offices to be associated with reduced health, well-being and productivity at work (Bakke & Fostervold, 2017; De Croon, Sluiter, Kuijer & Frings-Dresen, 2005; Richardson et al., 2017).

Cell offices, on the other hand, are often considered the most concentration-friendly office concept, as they minimize visual and auditory distractions and offer privacy for the employees. Additionally, collaboration might be enhanced through the ease of having meetings with one or two others in the office, without having to seek out a meeting room or worry about disturbing others. The reviews mentioned above support the use of cell offices, finding them to be associated with favourable health, well-being and productivity outcomes (Bakke & Fostervold, 2017; De Croon et al., 2005; Richardson et al., 2017). However, cell offices have also been criticized for creating boring corridor-dominated workplaces (Bodin Danielsson, 2015), being hierarchical and status-oriented (Becker & Steele, 1995), hindering effective team work between employees through physical barriers (Skyrme, 1994), and being excessively resource-demanding in terms of office space (Duffy, 1999).

Since the 1990s, various flexible office concepts have been emerging, offering solutions to problems posed by both cell offices and open landscape offices (van der Voordt, 2003). Flexible offices are designed to reflect the flexible and multi-locational working styles of modern knowledge work (van Koetsveld & Kamperman, 2011). In activity-based working environments employees can choose to work in different open, enclosed and semi-enclosed settings that are designed to support specific work tasks, so that both collaboration and concentration can be promoted. A central hypothesis of activity-based flexible offices is that the ability to choose work location can improve employees’ sense of privacy (Wohlers & Hertel, 2017). Indeed, one review of the literature concluded that the best concept would be a mix of open-plan and cellular concepts, adapted to the work processes and attitudes of the employees (though they did not specify that this need to be a flexible office; Al Horr et al., 2016). Flexible office is also often viewed as an economical choice, as building size can be reduced to match the actual number of employees present in the office (Chilton & Baldry, 1997). Studies find mixed results regarding flexible offices. As they often are based on open-plan layouts, they are associated with the same problems as open-plan offices, such as cognitive stress (Seddigh, Berntson, Bodin Danielsson, & Westerlund, 2014) and weakened concentration and privacy (De Been & Beijer, 2014). It is also reported that employees more frequently choose to work from home instead of in the flexible office (Berthelsen, Muhonen, & Toivanen, 2017). Also, if the flexible office concept is not used as intended, this could result in productivity loss (Appel-Muelenbroek, Groenen, & Jansen, 2011) and lowered satisfaction with the work environment (Hoendervanger et al., 2016). On the other hand, several studies find flexible offices to function well, and the employees to be highly satisfied (Bodin Danielsson & Bodin, 2008; Ekstrand, 2015; Ekstrand & Damman, 2016).

In other words, there are various pros and cons associated with the different office concepts – and sometimes, confusingly, the same factor appears as both pro and con, as in the case of collaboration in open plan offices (Irving, 2016). Additionally, employees tend to prefer the office concept they currently work in, regardless of office concept type (Skogland & Skjæveland, 2017). And in an analysis of perhaps the world's largest workplace data database, Leesman, open offices came out as dominating both ends of the scale, making up the majority of both the best and the worst workplaces (Rothe, april 2017). Such findings are incomprehensible if any one office concept truly is the "best". However, moderating variables might be able to explain the discrepancies. This is a topic barely touched upon in previous reviews of the literature. Possible moderator candidates
include the layout quality, the adaptation to work processes, and the consideration given to
organizational change (Brunia, De Been & van der Voordt, 2016).

An office with good layout qualities might be a better place to work than an office with bad
layout qualities, regardless of office concept. Layout qualities include the number of workplaces in
the room, the frequency and accessibility of concentration and meeting rooms, the quality of sound
reduction measures, the air quality, and others. Also, layout is no one-size-fits-all, as the layout and
concept need to be adapted to the specific work processes of the employees. Brunia and colleagues
(2016), looking at employees in apparently similar flexible offices, found that a main difference
between the cases with highest and lowest satisfaction scores, were in regard to layout qualities
such as level of openness, subdivision of space, and number and diversity of work places.

Consideration of organizational change during the implementation of the office concept is also
an important success factor (Brunia et al., 2016). Even the perfectly fitting office concept with
flawless layout qualities might fail, if the employees feel trampled by the way the change process
proceeded. Workplace change can be a threatening experience to many (Skogland & Skjæveland,
2017), and because of this organizational change need to be handled with care. Consideration of
user involvement and work process development are key topics here.

In other words, the effects of office concepts are complex, and every aspect appears to be
connected to every other. Furthermore, a systematic review of the complete research field in all its
complexity is lacking. Thus, the findings and connections mentioned above are tentative.

**Why it is important to do this review**

Choosing the right office concept is in everyone's best interest, from the individual employee,
who often spend most of her or his waking hours in the office; to the organization, as productivity
decrease among employees can sum up to cause economic damage across the organization; and
even to society as a whole, given that so many people work in offices that offices' influence on
employees have public health consequences. As of today, the research field is not clear enough to be
helpful in deciding upon which office concept to implement. It might be that the moderators are
crucial, and that the actual office concept chosen is secondary as long as the moderators are heeded.
Or it might be the other way around, that there really is a "best" office concept, as previous reviews
indicate, and the moderators are merely the frosting on the cake. Or both aspects could be vital.
Without an overview of the research, no-one really knows. Because of this, there is need of a better
understanding of the research field, including both comparative studies and case studies. A kind of
research map would be most helpful, clearly pointing out what study methods have been used so far,
what research questions have been focused on, which outcome variables has been investigated and
which have not, and whether there are any interactions between these factors. In other words, there
is need for a scoping review. From the overview afforded by a scoping review, it will also be easier
to identify promising topics for later systematic review(s), as well as gaps in the literature which
ought to be filled.

**OBJECTIVES**

The planned review will address the following research question: What research has so far been
done on how working in different office concepts impact outcomes relevant to employees and
organizations?

In particular, the scoping review will aim to map 1) the office concepts investigated, 2) the study
designs employed, 3) studies comparing different office concepts, 4) any focus on layout qualities,
5) any focus on user involvement, 6) any outcome variables investigated, 7) which countries the
studies have been conducted in, 8) which years the studies have been published, and 9) interactions
between these factors useful in informing future research and practice.
METHODS

Criteria for considering studies for this review

Types of studies
All study designs, publication types and time frames will be included, as the aim of the study is to achieve an overview of the research status. For the same reason, all years, languages and publication statuses are also included.

Types of participants
The study population has to be relevant for the workplace setting, in other words employees, students or adults from the general population (age 18-65 years), or organizations as a whole. Patients and populations diagnosed with illness will be excluded.

Focus of the studies
The study has to focus on office concepts for knowledge workers, such as private offices, open offices, shared offices, activity-based offices, or others. Studies focusing on very specialized offices, such as dental offices, contact center offices or offices for people with disabilities, as well as office buildings and generic "offices" without specification of office concept type, will be excluded. Mobile and home offices will also be excluded. What "study focus" means will vary between study designs; it will be the intervention in experimental studies, the investigated study setting in case studies, and the topic of interest in theoretical articles.

Search methods for identification of studies

Electronic searches
Intended database sources for the review are PsycINFO, SocINDEX, and Scopus. In PsycINFO, the search will be limited to title, abstract, heading word, table of contents, original title, tests and measures. In SocINDEX, the search will not be limited. In Scopus, the search will be limited to title, abstract and keywords, and further limited to the subject areas medicine, sociology, business, multidisciplinary, psychology, and economy. The search will in all three databases consist of the following search terms (based on the terms used in the review by De Croon et al. (2005), but supplemented and expanded), combined with the operator OR:

1. "activity based office"
2. "activity based working"
3. "activity-related office"
4. "cell office"
5. "cellular office"
6. "clean desk"
7. "closed office"
8. "cocon concept"
9. "cocon office"
10. "combi office"
11. "concentration office"
12. "concentration workplace"
13. "desk-sharing"
14. "enclos* office"
15. "flex* office"
16. "free seating"
17. "hot desking"
Data collection and analysis

Selection of studies

The study records will be handled using Endnote and the online software Piano (which includes Abstrackr). First, all study records from the three databases will be downloaded to Endnote. There duplicates will be identified and removed. From Endnote, the study records will be exported to Piano, where Abstrackr will be used as a co-working tool where two independent reviewers will eliminate irrelevant studies based on abstract, title and keywords. Any differing opinions between the reviewers will be solved through discussion.

Relevant studies from other sources will be added to the set of remaining studies in Endnote. A flow diagram will be developed to detail the study selection process.

Data extraction and management

Data will be extracted from the remaining studies by two independent reviewers using an especially pre-designed data extraction form, the pdf search function in Endnote, and full-text reading where pdf search is inadequate. Any unclear data will be discussed between the reviewers.

Information on the following categories will be sought in the studies:

1. First author name
2. Year of publication
3. Country
4. Study design (RCT experiments, quasi-experiments, correlational studies, interview studies, observational studies, mixed methods, theoretical papers, instrument development studies, opinion papers, and others.)
5. Population (employees, students, general population, or organization.)
6. Number of participants
7. Gender distribution
8. **Outcome measure in focus** (productivity, well-being, communication, creativity, concentration, preference, stress, health, prosociality, sick leave, turnover, ergonomics, interaction, and others relevant for the individual employee and/or the organization.)

9. **Office concepts** (cell offices, small open offices, medium-sized open offices, large open offices, cubicles, shared offices, activity-based concepts, new ways of working, coworking spaces, and other office concepts. It will also be noted if different office concepts are compared in one study. Several of these categories can be used for the same study, if applicable.)

10. **Any focus on layout qualities present** (number of employees per room, area per employee, description of concentration rooms, meeting rooms, or social zones per employee, drawn-up plans present in paper, description of transparency or placement of functions, and others.)

11. **Change process** (any change process described, any user involvement described.)

12. **Office aspects in focus** (noise, air quality, temperature, lighting, user control, color, office use, leadership, territoriality, office use rules, and others.)

13. **Individual differences in focus** (gender, age, worker type, and others.)

14. **Field of research** (facilities management, organizational science, psychology, medicine, economy, sociology, engineering, and others.)

15. **Financing** (industry, independent, other)

16. **Study findings**

17. **Comments**

**Data synthesis.** The data will be mapped using appropriate software, where the categories mentioned above will be identified through pdf search and full-text reading when needed. The mapping will follow a funnel approach, meaning that the studies will be categorized in stages. For each stage, the number of studies in each category will be described, and all studies in categories of low relevance to the review will be excluded from further mapping. Relevance will be decided based on topic of the categories. Categories consisting of very few studies will also be considered for exclusion.

For example, the first stages will map study design and field of research. Here, opinion papers and editorials will be counted and then excluded, and so will studies within fields of research of minor relevance to the review, such as engineering. The further stages will develop in response to what we find as we go along. The number of included studies will thus decline through the mapping process, until only the most relevant studies are left, which will be read and mapped in detail.

The final stage will consist only of studies comparing different office concepts. If data suitable for quantitative analysis is found at this stage, meta-analysis will be considered.

**Risk of bias and evidence quality.** Study biases, meta-biases and the strength of the body of evidence will not be assessed. As this is a scoping review, all studies will not be read in their entirety, and thus there will not be gathered information for assessing biases or evidence quality.

The exception is if meta-analysis is conducted at the final stage (see paragraph above); then risk of bias and strength of evidence will be assessed for the studies included in the meta-analysis.
REFERENCES


van der Voordt, D. J. M. (2003). *Costs and benefits of innovative workplace design*. Delft University of Technology, Faculty of Architecture, Department of Real Estate and Housing.


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**Office concepts: What do we know? A scoping review** (Protocol)

Gjerland & Søiland (11. June 2018)