

Office concepts: A scoping review[☆]

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ABSTRACT

Office concepts influence employees' work experience and performance, as well as the profitability of organisations. This study used a scoping review approach to map the field of empirical research on office concepts, identify research gaps, provide recommendations for future research, and inform practice. Systematic searches across three databases identified a total of 257 empirical studies on office concepts. Study selection and data charting were performed independently by two reviewers using standardized forms, with disagreements resolved through discussion. General and methodological characteristics of the included studies were mapped. For studies comparing different office concepts, the degree of focus on spatial design and change processes were also mapped. The findings establish that this is a strongly interdisciplinary field, with increasing publication numbers in recent years. The included studies are heterogeneous, using a variety of study designs and outcome variables, and focus on various aspects of the office environment. Studies comparing different office concepts tend to not focus on spatial design or change processes. This lack might cause these areas to come across as less important than they are, and has implications for practical decision-making regarding workplace design. We recommend that future research efforts focus on conducting randomized controlled trials in real-world office settings. Further research gaps can be identified using the tables and figures included.

1. Introduction

The physical work environment influence office workers' productivity and well-being [1–4]. Because of this, office concepts (such as private offices, open-plan offices, and flexible offices) are likely to influence the effectiveness and profitability of organisations, the national and international economy, and even public health. Despite this, there is relatively little research on the influence of the physical work environment; the research field is assumed to be small and characterized by interdisciplinarity [5,6]. Furthermore, a broad overview of the field as a whole, such as given by a scoping review, does not exist. Naturally, this makes it difficult for leaders and designers to retrieve the information they need to make choices regarding office workplace design. It also makes it difficult to identify research gaps and thus conduct timely research.

An office concept is a three-fold construction [7]; p.12), consisting of (1) a typical plan for the layout of a physical office workplace (such as open-plan or private offices), (2) a set of rules regarding how the office should be used (such as whether there is free seating or not), and is (3) located at an organisation's central offices (not at home, in cafés, or similar). Office concepts widely in use today include the private or

cell 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, and in extreme cases holding several hundred individuals [5,8,9]. These concepts are defined by the number of employees per room, while the rules of use often are more or less unspoken. Other concepts are defined by explicit 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 [5,8,9]. Flexible office concepts are usually associated with open-plan layouts, but are not restricted to this.

Prior systematic reviews comparing different office concepts to each other, tend to conclude by recommending private offices rather than open-plan offices, due to users' lack of satisfaction, privacy, productivity and well-being in open-plan offices [10–12]. However, in light of recent research and development in the field of workplace design, there may be reasons to revisit these conclusions. According to Leesman, perhaps the world's largest office workplace database, open offices routinely receive among the highest as well as the lowest scores on their benchmarking index [13]. This finding does not make sense if

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open-plan concepts are always associated with negative effects, suggesting instead that these concepts have the potential for both success and failure. From a practice perspective, one argument for re-evaluating the effects of open-plan offices can be made on the basis of the developments in office design associated with flexible office concepts [9,14]. Flexible concepts provide solutions to the problematic issues of open space by providing a variety of spaces that allow users the possibility of maintaining their privacy and avoiding noise and distraction, while supporting their ability to collaborate with others [15]. However, research on flexible office concepts shows that outcomes are mixed. Some flexible offices perform very well, while others seem to fail [16]. The lack of consistent findings points to a lack of knowledge about the variables that moderate the effects of office concepts – the variables which decide whether a given concept will succeed or not.

What can such moderating variables be? Two of the three reviews mentioned above [10,11] discuss possible moderators, including differences in spatial design, work practices and personality, user control over the environment, as well as how the concept is implemented and whether employees are given a say in the process. A fourth systematic review [17] even conclude in this vein, recommending a mix of open and cellular design, depending on local factors such as organisational culture and work processes. And a study comparing various workplaces using the same flexible concept found that the factors which distinguished workplaces with low employee satisfaction from workplaces with high employee satisfaction, was the spatial design, the consideration given to organisational change, and the adaptation to local work processes [16]. In sum, the moderators which are repeated across these studies are the spatial design, the change process, and the adaptation to the local setting.

In the following, we will briefly describe the potential moderators' spatial design and change processes. We consider adaptation to the local setting to be an integral part of both these topics. For example, different sectors are associated with different organisational cultures [18,19], and different worker types (such as academics, administrative personnel, IT workers, engineers) tend to have different work practices. If these and other aspects of the local setting are well adapted to, then that will be reflected in the spatial design and how the change process is conducted. Thus, it is difficult to entangle this variable from the two others.

Spatial design encompasses the level of openness, the subdivision of space, the number and diversity of workplaces [16], and also the frequency and accessibility of concentration and meeting rooms, the quality of sound reduction measures, and other physical, layout-related aspects of the workspace design. A well-designed office might be a better place to work than a poorly designed office, regardless of office concept. And as noted, the spatial design is no one-size-fits-all, as the design and concept need to be adapted to the specific work processes of the employees and other local factors. For practitioners, spatial design is a perspective that is more immediately relevant than office concepts.

However, even a custom-fit office concept with a spatial design suited to the organisation might fail, if the employees feel trampled by the way the change process proceeded. By change process we mean the process of change from one office concept to another, usually through relocation or refurbishment, including mapping, design, implementation, and eventual follow-up. Workplace change can be understood as a process of organisational change that can potentially invigorate an organisation [20], but also runs the risk of having unintended effects [21]. Workplace change can be a threatening experience to many [22], and because of this, organisational change needs to be handled with care. Consideration of user involvement and work process development are key topics here. And for practitioners using research to inform their practice, descriptions of the before and after situations, as well as how the process unfolded, is of vital importance to be able to interpret the research findings and apply them.

In other words, the investigation of office concepts is a complex endeavour, and if potential moderators are not taken into consideration

when comparing office concepts, they can easily become confounding variables. Given that prior reviews barely examined these variables, it is unclear whether their findings are representative of the practical realities of workplace design. It is even more unclear how much weight the moderators should be given. Thus, the connections suggested above are tentative. All of this makes it very hard to make evidence-based decisions regarding office concepts. Evidently, a better understanding of the research field is needed; an overview of how office concepts have been investigated, and what the limitations and challenges of the field are. A scoping review can provide such an overview. A scoping review is a review aiming to map the volume, nature, and characteristics of a field of research [23]. From the overview afforded by a scoping review, it is possible to identify promising topics for future systematic reviews, as well as gaps in the literature that ought to be filled. Additionally, a scoping review would make it easier for practitioners and policy-makers to make sense and effective use of the research field.

This scoping review addressed the following research question: What research has so far been done on how working in different office concepts impact outcomes relevant to employees and organisations?

The aims of this study are to (1) conduct a systematic search of the published literature for empirical studies on office concepts, (2) chart the characteristics and methodologies used in the identified studies, (3) uncover gaps and limitations of the research field, and (4) propose recommendations for advancing the field and enhancing the applicability of the research for practice. There will be a particular emphasis on the moderators mentioned above.

2. Method

This scoping review was guided by established methodological frameworks [23,24]. The study protocol was registered at the web site for the research project (www.smap.no, from August 2019 moved to www.mellomrom.no) on the 11th of June 2018. To ensure the protocol remains available, it was also uploaded to the Open Science Framework (<https://osf.io/f2q4s/>) on the 4th of June 2019. The protocol can be obtained from any of these two sites, or from the primary author upon request.

2.1. Inclusion criteria

2.1.1. Types of studies

All empirical research designs, publication types and time frames were included, as the aim of the study was to achieve an overview of the research status. For the same reason, all years and publication statuses were also included. Furthermore, all languages were included, on the condition that they were sufficiently comprehended, either directly or through the use of Google Translate, to enable complete data charting. Non-empirical publications such as theoretical papers, opinion papers, historical overviews, unsystematic reviews, and non-research publications, were excluded from the review.

2.1.2. Types of outcomes

Study outcomes had to be relevant for office employees or workplaces/organisations as a whole. Both qualitative and quantitative outcomes were included. Qualitative outcomes were operationalized as the purpose or goal of the study. If studies focused on outcomes of limited relevance to employees or organisations today, such as smoking in the office, they were excluded.

2.1.3. Types of participants

The study population had to be relevant for the workplace setting, in other words, employees, students or adults from the general population (age 18–65 years), or organisations as a whole. Patients and populations diagnosed with illness were excluded. Studies with no participants, or simulated participants, were included if they focused on outcomes relevant for the individual worker or the organisation as a

whole.

2.1.4. Types of settings

The study setting had to be one or more office concepts for knowledge workers, such as private offices, open offices, or flexible offices. Laboratory studies were also included, as long as they were conducted in a way that simulated one or more office concepts. Studies on very specialized office types, such as dental offices, contact centre offices or offices for people with disabilities, as well as office buildings and generic "offices" without a clear specification of office concept type, were excluded. Mobile and home offices were also excluded. Studies on coworking spaces were included as long as they specified the office concept investigated, as coworking spaces can use various concepts.

2.2. Search methods

2.2.1. Electronic sources

Database sources for the review were PsycINFO, SocINDEX, and Scopus. Several databases were tested in advance of conducting the review, and these three were considered to yield the most relevant results in regards to the research question. In PsycINFO, the search was limited to title, abstract, heading word, table of contents, original title, tests, and measures. In SocINDEX, the search was not limited. In Scopus, the search was limited to title, abstract and keywords, and further limited to the subject areas medicine, sociology, business, multidisciplinary, psychology, and economy.

2.2.2. Other sources

Other data sources, such as reference lists, citing studies, and grey literature, were not searched as the aim of this review was to gain a representative (not completely comprehensive or precise) overview of the research field. This was decided in order to balance breadth with feasibility, in line with the recommendations by Levac and colleagues (2010).

2.2.3. Search terms

The search terms used were a supplemented and expanded version of the list of terms used in the review by Ref. [10]; see Table 1. The terms were tested in advance to ensure the highest number of relevant studies, and avoiding terms yielding excessive amounts of irrelevant studies. For example, the terms "office", "private office", and "single office" were excluded because of very high numbers of irrelevant studies.

2.3. Data collection and analysis

2.3.1. Reference retrieval

The references were handled using Endnote and the online software Piano (<http://piano.evidentli.com>), which includes Abstrackr.

Abstrackr has in previous studies been found a helpful tool for study screening [25,26]. First, all references from the three databases were downloaded to Endnote, where duplicates were identified and removed. From Endnote, the references were exported to Piano, where Abstrackr was used as a co-working tool where two reviewers (authors AG and FT) independently eliminated irrelevant references based on abstract, title and keywords. Any differing opinions between the reviewers were solved through discussion, so that all articles were categorised as either relevant or irrelevant. The relevant records went on to full-text screening. Each record was screened independently by two reviewers (AG screened all records, FT and ES screened a portion each), with disagreements again solved through discussion.

2.3.2. Data charting and management

Data were then charted from this final selection of studies. A data charting form was created by the first author, and then the details of the approach were developed by all three authors in collaboration. Half the records were charted independently by two reviewers (AG screened all records, FT and ES screened a portion each), with disagreements again solved through discussion, so as to land an agreed-upon approach for further charting. As the reviewers were very much in agreement in their assessments, the first author alone charted the remaining half of the studies, using the agreed-upon approach. When multiple studies were included in the same article, data from each study were extracted separately. If several articles were based on the same study, all were included only if they investigated different data. The same data was never extracted more than once.

Data were charted on 1) the office concepts investigated, 2) year of publication, 3) country, 4) population and sector, 5) field of research, 6) study design, 7) which workplace aspect was in focus, and 8) outcome variables. For some of these characteristics, multiple categories could fit for the same study. In those cases, the best fit was chosen, so that each study was categorised as one type only (outcome variables are an exception; every outcome variable for each study was charted). For more detailed information on how charting was done, see supplementary materials.

Data from studies comparing different office concepts were mapped separately and named "comparative studies". This category includes both studies that compare office concepts located separate places, and studies involving change from one office concept to another. These studies are especially informative for guiding office concept decisions. For this reason, two additional sets of data were charted from the comparative studies only: the degree of focus on spatial design, and the degree of focus on (any) change process. This was charted on a scale from 1 (weak focus) to 10 (strong focus). For more information on this scale, see supplementary materials.

2.3.3. Study quality

Assessment of study quality is not considered part of the mandate of

Table 1

Search terms used in all database searches.

1. "activity based office"	15. "flex* office"	28. "office innovation"
2. "activity based working"	16. "free seating"	29. "office landscape"
3. "activity-related office"	17. "hot desking"	30. "office layout"
4. "cell office"	18. "innovative office"	31. "office renovation"
5. "cellular office"	19. "integrated workplace concept"	32. "office type"
6. "clean desk"	20. "landscape office"	33. "open* office"
7. "closed office"	21. "lean office"	34. "open plan office"
8. "cocon concept"	22. "multi-person office"	35. "open workplace"
9. "cocon office"	23. "new office layout"	36. "open workspace"
10. "combi office"	24. "non territorial office"	37. "shared office"
11. "concentration office"	25. "non territorial workplace"	38. "shared-room office"
12. "concentration workplace"	26. "office concept"	39. "team office"
13. "desk-sharing"	27. "office design"	40. "workplace concept"
14. "enclos* office"		

Note. The terms were combined with the operator OR.

scoping reviews [23]. To ensure feasibility, it was decided that study quality should not be assessed in this scoping review.

2.4. Consultation

In line with methodological recommendations [23,24], the current study involved consultation with stakeholders and practitioners in the field. More specifically, the need for this study was identified during a research and innovation project aimed at developing an evidence-based certification system for smart, attractive and productive workplaces (SMAP, see Funding). The project involved various professional groups, including architects, psychologists, researchers, real estate managers, and civil engineers, most of them from Norway. Representatives from two Norwegian companies with extensive experience in workplace design, one private and one public, were particularly invested in this study, motivated by a need to understand the research field better. The consultation took the form of meetings between practitioners, stakeholders, and researchers before and during the research period. This was helpful in formulating the research questions, pinpointing central issues in the field, and identifying the practical implications of the findings.

3. Results

3.1. Reference retrieval

The search was conducted in February 2018. The search of online databases initially retrieved 1094 records. Following de-duplication, 974 records were screened by title, abstract and keyword, after which 451 records continued to full-text screening. This screening led to a final sample of 249 articles which were included in the review. As some articles consisted of multiple studies, the final sample of studies counted 257. The process from retrieval to final articles included is shown in Fig. 1.

3.2. Office concepts investigated

The office concepts investigated by the included studies are reported in Fig. 2. Of the 257 studies, 12 (4.7%) investigated private offices only, 108 (42%) investigated one of several types of open office concepts, and 45 (17.5%) investigated one of several types of flexible

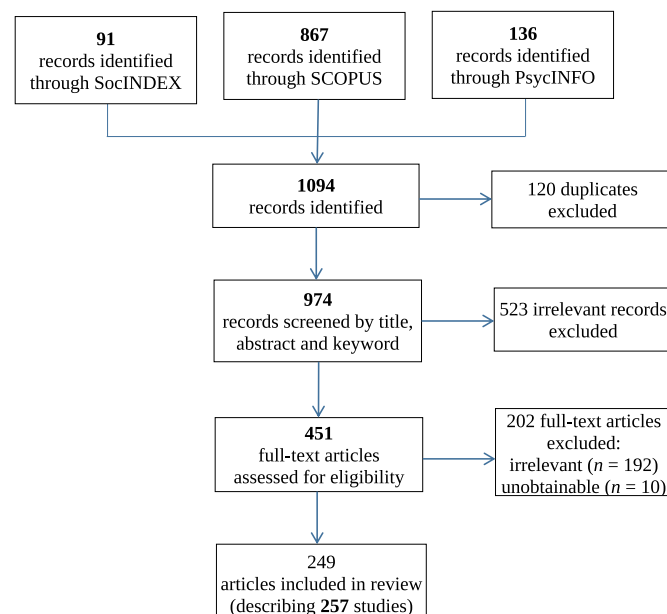


Fig. 1. Flowchart of the study selection process.

office concepts. Furthermore, 11 (4.3%) investigated two or more different office concepts, without comparing them to each other, and the remaining 81 (31.5%) compared two or more office concepts to each other (“comparative studies”).

3.3. General characteristics of included studies

All the included studies were published between 1970 and 2018, with 85.6% published after 2000. 2005 was the first year with over five studies published in the field. The five years with the highest number of studies are, in order, 2017 (29 studies), 2016 (28), 2012 (22), 2015 (20), and 2008 (19). Most (88.3%) of the studies are from Western countries (countries in Europe, North America, and Oceania). The ten countries with the highest number of studies are, in order, the US (40 studies), the UK (28), Sweden (26), The Netherlands (25), Finland (20), Australia (13), Canada (11), Denmark (11), Norway (11), and Germany (7).

The sectors, populations, and fields of research are reported in Figs. 3–6, with separate colours for all studies and comparative studies. The “all studies” category includes comparative studies.

Most of the studies have been conducted in the private sector (28.8%), no sector (typically laboratory research; 21.8%), or various sectors in the same study (15.2%). A significant portion of the studies, 15.6%, did not give sufficient information to identify any sector. Similarly, 22.6% of the studies did not give information on the population they investigated, and 33.5% investigated various populations in the same study. 32.3% of the studies reported a single-category, identifiable human population. Among these, the largest categories were students (7.8%), management and administration (6.2%) and academic employees (4.7%).

Research fields were measured in two ways: by outcome variable and method used, and by publication (journal, book, or conference). When measured by the outcome variable, the majority (60.7%) of the studies fell within the field of psychology, with the central outcome variables focusing on the human mind and behaviour. The second largest research field was engineering (13.2%), consisting of studies with a highly technical focus, often without a human population. When measured by publication, the largest research field was architecture, with 33.9% of the included studies published in building and architecture-related journals, conference proceedings or books. The second largest category was psychology (18.3%), followed by medicine (15.2%), business and administration (12.1%) and ergonomics (10.9%). When investigating comparative articles only, the same overall pattern emerges, with the exception that there are very few engineering studies among this sample. The field of business and management is also less prominent among these studies.

3.4. Methodological characteristics of included studies

The methodological characteristics of the studies included in this review are reported in Figs. 7–9. The majority of the included studies are either correlational studies (28%), field experiments (24.5%), qualitative studies (12.8%) or randomized controlled trials (10.1%). Among the comparative studies, most are field experiments (43%) or correlational studies (37.2%).

The studies tend to focus mainly on office layout/design (26.5%), noise (16.7%), office concepts (with no focus on layout/design) (16.3%), or office use (10.9%). Among the comparative studies, the majority focus mainly on either office concepts only (37.2%) or office layout/design (32.6%). Only 5.4% of the included studies focus mainly on the change process, and among comparative studies, this percentage is at 4.7%.

The included studies investigate very many different outcome variables. Of these, the most commonly investigated were workplace satisfaction measures (18.3%) and performance measures (14%), followed by office use/behaviour (9.1%), communication and social

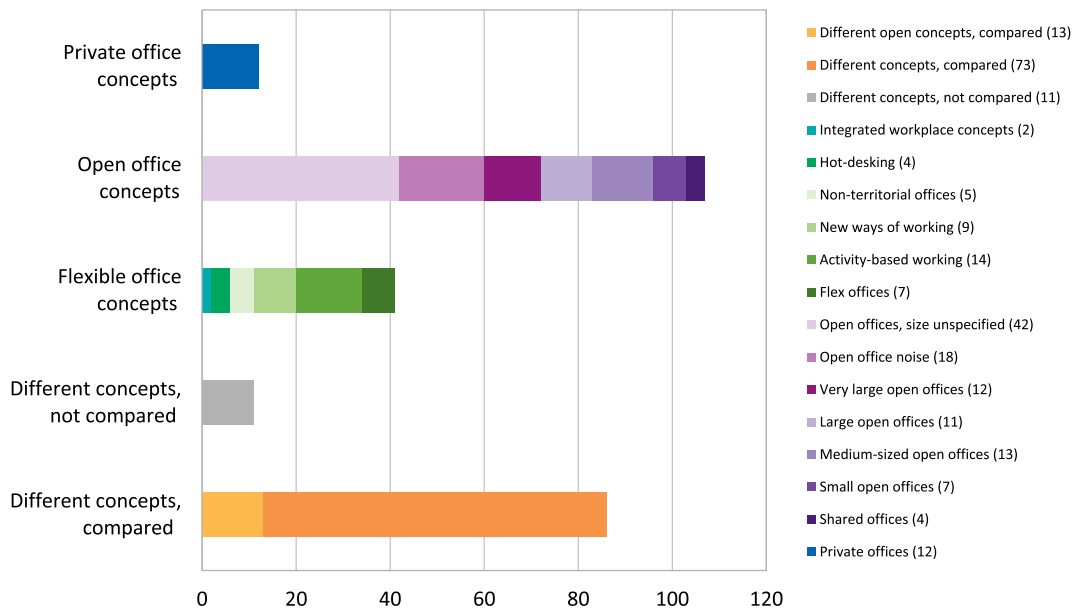


Fig. 2. Office concepts investigated in included studies. Number of studies in parentheses.

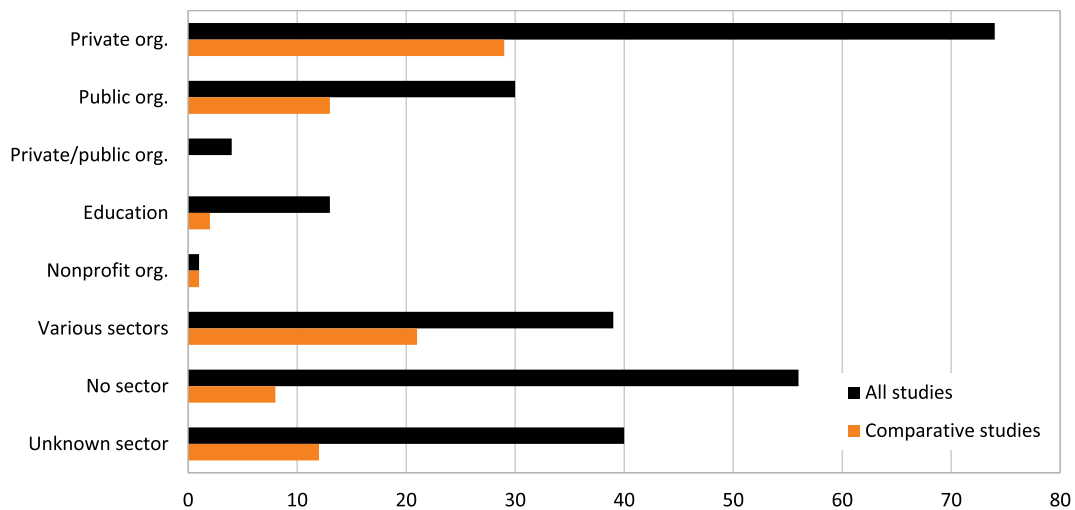


Fig. 3. Sectors the included studies have been conducted in. Number of studies on the x-axis.

environment (8.3%) and physical health/SBS (8.3%). Among the comparative studies, the most commonly investigated outcomes were workplace satisfaction (17.4%), communication and social environment (13.8%), physical health/SBS (11.8%), performance (11.3%), and work experience (9.7%).

3.5. Distributions of methodological characteristics

Distributions across the following categories were mapped: office concepts, study design, study focus, and outcomes. This created a total of six distribution tables, reported in Tables 2–4. The numbers in each cell of the tables refer to the number of studies that correspond to the two mapped characteristics. For example, in Table 2, we can see that there are 18 studies using a field experimental design that also has one or more outcomes in the category “communication and social environment”. In Table 3, we find that there are 16 RCT studies that focus on noise. And in Table 4, we can see that there are no studies on cell offices with outcomes in the category “business value”. Note that when “outcomes” are one of the two characteristics mapped, the same study may appear in several cells, as most studies report several outcomes (total $N = 515$). When “outcomes” are not one of the two

characteristics mapped, each study appears in one cell only (total $N = 257$).

3.6. Spatial design and change process focus in comparative studies

For the comparative studies, we charted data on the degree of focus on spatial design and change process. Spatial design focus was charted from all these studies, and change process focus from only those comparative studies where workplace change occurred. The studies had a slightly stronger focus on spatial design ($M = 4.26, SD = 2.40, N = 86$) than on the change process ($M = 3.89, SD = 2.48, N = 36$). Overall, few studies tended to focus strongly on either aspect. Studies scored 8 or above did analyses on spatial design aspects ($N = 11$) or the change process ($N = 3$).

4. Discussion

This paper has reviewed research on office concepts. In the following, we will give an overview of the included studies, followed by implications for research and practice, and lastly the strengths and limitations of this review. Identified gaps in the research field will be

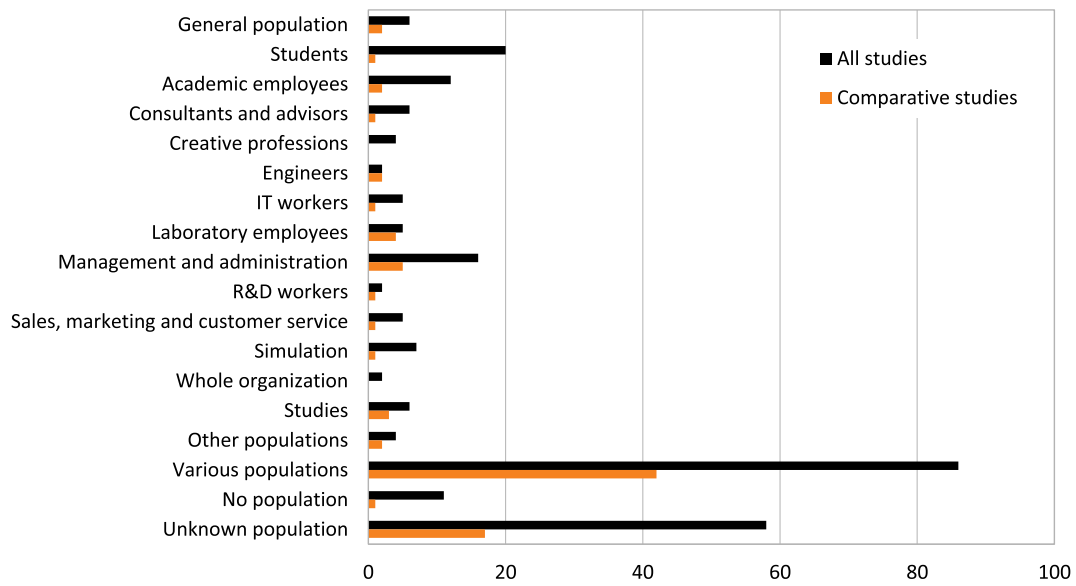


Fig. 4. Populations the included studies have investigated. Number of studies on the x-axis.

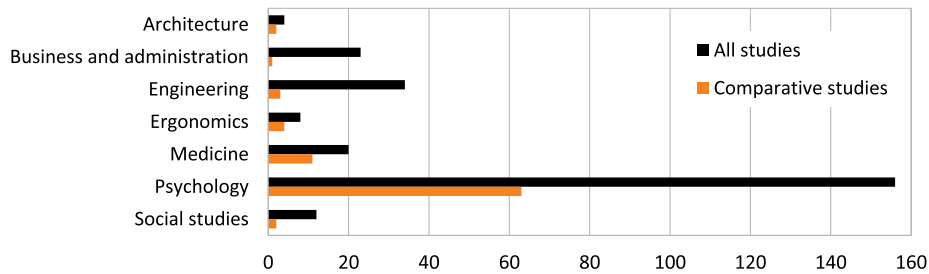


Fig. 5. Research fields represented by the included studies, by outcome variable and method used. Number of studies on the x-axis.

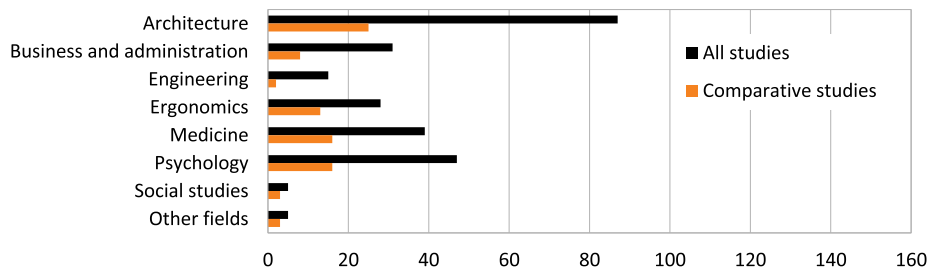


Fig. 6. Research fields represented by the included studies, by publication (journal, conference or book). Number of studies on the x-axis.

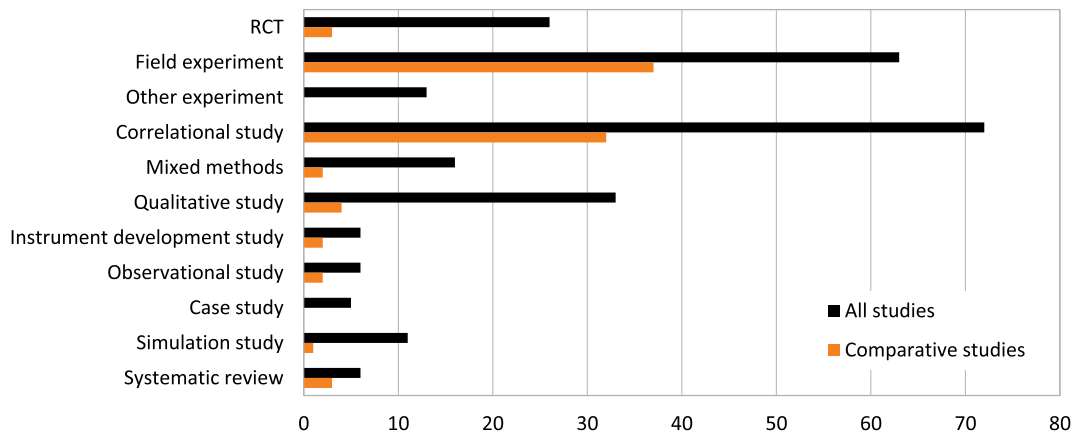


Fig. 7. Study designs of the included studies. Number of studies on the x-axis.

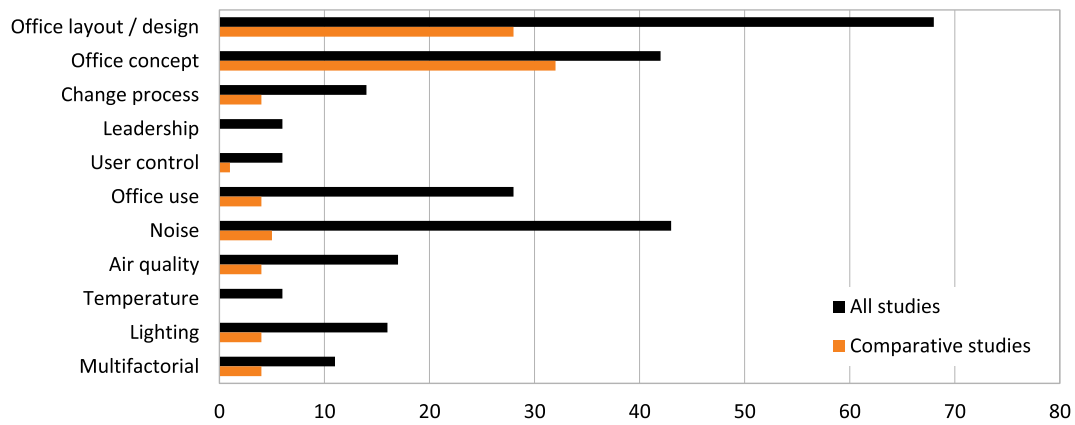


Fig. 8. Study focus of the included studies. Number of studies on the x-axis.

emphasized.

4.1. Overview of included studies

Our results confirm (e.g. Refs. [5,6], that this is a strongly interdisciplinary field, which for a long time has been rather small. However, it is also evident that the field has gained momentum in terms of publication numbers during the last decade.

There are some methodological trends among the included studies. The studies tend to focus mainly on the office concept or office layout/design, rather than change process, office use, air quality, or other aspects of the office environment. This might be natural considering that the research topic mapped is office concepts. Furthermore, among the comparative studies, there is a clear tendency towards more field experiments and correlational studies rather than other study designs. This might also be natural, given that comparing office concepts lends itself to these two designs. Perhaps more surprisingly, the research tends to focus on open office concepts rather than flexible or private office concepts – though comparative studies make up for some of this imbalance. This might reflect a higher prevalence of open offices as compared to flexible offices, and perhaps a lack of interest in private offices. Also, the studies tend to investigate person-level outcomes, such as workplace satisfaction and performance, rather than organisation-level outcomes, such as leadership and business value. Group-level outcomes such as communication and social interaction are also rather under-researched when compared to the amount of person-level outcomes investigated. Other than these similarities, the included studies vary widely in terms of study design, study focus, and outcome variables investigated.

In the introduction, we described some potential moderators on the

effects of office concepts: spatial design and change process. We also mentioned that adaptation to the local setting is a central aspect of both these moderators. In regards to study settings, there are some similarities among the included studies. Firstly, the vast majority of the studies are from traditional Western countries, making the research findings less likely to be as relevant in non-Western countries. Secondly, in regard to population, the private sector has received more research attention than the public sector, and the included studies have a tendency to investigate several populations or sectors in the same study, or not report population and sector at all. This makes it hard to establish whether certain office concepts might be more suitable for certain populations or sectors than other office concepts.

For the comparative studies only, the degree of focus on spatial design and change process was mapped. The analysis makes it clear that comparative studies tend not to focus on these topics, with most only describing them briefly, if at all, and only a very small number conducting analyses on them. This was particularly clear for change process focus. If these topics are essential for an office concept's success or failure (e.g. Ref. [16], then this gap in the research literature questions the practical relevance of the research findings. When these topics are not described in sufficient detail, it is difficult to know whether they might have influenced the outcomes, and this makes it hard to apply the study results in concrete projects.

4.2. Recommendations for future research

We hope this study can be useful as a tool for researchers in identifying research gaps and designing future studies. Particularly the distribution tables can be useful in this regard. Based on the reported characteristics of the included studies, we propose some

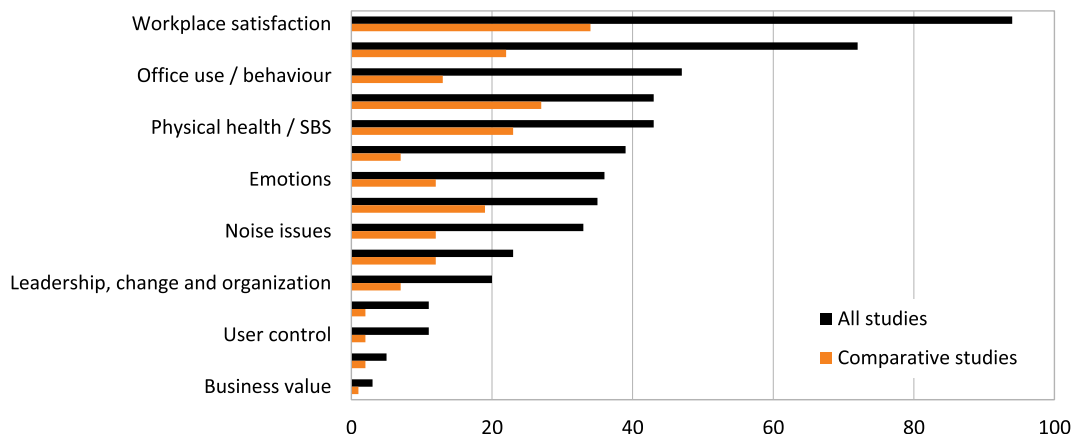


Fig. 9. The outcome variables of the included studies. Number of studies on the x-axis.

Table 2
Outcomes distributed by study design and study focus.

Categories		Outcomes													
	Business value	Communication and social environment	Emotions	Identity	Individual differences	Leadership, change, and organisation	Noise issues	Office use/behaviour	Performance	Physical health/SBS	Privacy	Spatial quality	User control	Work experience	Workplace satisfaction
Study design															
RCT	-	1	13	2	-	-	4	1	21	4	1	1	1	6	9
Field experiment	-	18	9	3	1	3	9	14	19	14	10	7	1	10	34
Other experiment	-	-	-	-	-	-	1	2	1	-	-	9	-	-	2
Correlational study	-	11	9	3	2	5	16	8	18	19	8	1	7	14	36
Mixed methods	1	2	2	1	1	2	1	5	3	1	1	2	1	1	5
Qualitative study	2	6	-	3	1	9	-	7	5	-	1	3	1	1	2
Inst. dev. study	1	1	-	-	-	-	-	3	2	-	1	2	-	-	2
Observational study	-	1	-	-	-	-	1	1	-	1	-	2	-	-	-
Case study	-	-	-	-	-	1	-	1	-	1	-	2	-	-	1
Simulation study	-	-	-	-	-	-	-	4	2	-	-	6	-	-	2
Systematic review	-	3	3	-	-	-	1	1	1	3	1	4	-	3	1
Study focus															
Office layout/design	2	20	8	4	5	4	5	14	22	6	10	5	3	8	29
Office concept	-	11	8	1	-	3	6	8	14	11	5	4	2	16	11
Change process	-	2	1	-	-	9	-	-	2	1	1	-	-	-	4
Leadership	1	-	-	1	-	3	-	-	-	-	-	1	-	-	1
User control	-	2	3	2	-	1	1	1	4	1	-	-	1	2	4
Office use	-	6	2	3	-	1	-	18	4	2	3	2	3	-	7
Noise	-	-	8	-	-	-	19	1	19	3	2	11	-	5	10
Air quality	-	-	2	-	-	-	-	1	1	10	1	7	1	1	5
Temperature	-	-	1	-	-	-	-	-	1	1	-	2	1	-	4
Lighting	-	1	-	-	-	-	-	4	-	3	-	6	-	-	11
Multifactorial	-	1	3	-	-	-	2	-	5	5	1	1	-	-	8

Table 3
Study designs distributed by office concept(s) and study focus.

Categories	Study design										
	RCT	Field experiment	Other experiment	Correlational study	Mixed methods	Qualitative study	Instrument development study	Observational study	Case study	Simulation study	Systematic review
Office concept(s)											
Cell offices	4	1	2	3	-	-	-	-	-	2	-
Open offices	19	17	11	29	5	11	1	4	3	5	2
Flexible offices	-	5	-	7	9	13	2	-	2	3	-
Different office concepts, no comparison	-	3	-	1	-	5	1	-	-	-	1
Comparative studies	3	37	-	32	2	4	2	2	-	1	3
Study focus											
Office layout/design	2	21	-	18	4	16	4	1	1	-	1
Office concept	-	11	-	22	2	3	-	-	1	-	3
Change process	-	5	-	1	2	6	-	-	-	-	-
Leadership	-	-	-	2	2	1	-	-	1	-	-
User control	2	2	-	2	-	-	-	-	-	-	-
Office use	-	5	-	7	4	7	-	1	-	4	-
Noise	16	7	6	6	1	-	1	3	-	3	-
Air quality	2	5	3	4	1	-	-	1	1	-	-
Temperature	1	-	-	2	-	-	-	-	-	3	-
Lighting	1	5	4	3	-	-	1	-	-	1	1
Multifactorial	2	2	-	5	-	-	-	-	1	-	1

recommendations for advancing the field of research on office concepts.

Some areas are characterized by very few studies. Private offices are one such area, with a handful of quantitative studies, and no qualitative studies. Further studies exploring the private office concept, and particularly qualitative studies, are therefore recommended. Another area is business value, which very few studies have as an outcome variable, despite this often being a central argument for choosing one office concept above another.

As noted previously, many studies do not specify sector or

population. This makes it hard to interpret the study findings, particularly in regards to whether there has been any adaptation to work processes or other aspects of the local setting. We recommend that future studies make sure to specify these aspects of their study populations, whenever possible. Also regarding setting, the overview of countries suggests that more studies from non-Western countries would be helpful in improving the applicability of office concept research beyond the traditional Western countries.

The spatial design and change focus analyses also suggest areas for

Table 4
Office concept(s) distributed by outcomes and study focus.

Categories	Office concept(s)				
	Cell offices	Open offices	Flexible offices	Different office concepts, no comparison	Comparative studies
Outcomes					
Business value	-	-	2	-	1
Communication and social environment	1	5	8	2	27
Emotions	5	15	2	2	12
Identity	2	3	4	-	2
Individual differences	1	1	1	-	2
Leadership, change, and organisation	-	5	7	1	7
Noise issues	-	19	2	-	12
Office use/behaviour	2	12	17	3	13
Performance	3	35	8	4	22
Physical health/SBS	1	14	2	3	23
Privacy	-	9	2	-	12
Spatial quality	2	22	4	4	7
User control	2	4	3	-	2
Work experience	2	12	1	1	19
Workplace satisfaction	5	41	11	3	34
Study focus					
Office layout/design	4	20	10	6	28
Office concept	-	6	4	-	32
Change process	-	3	5	2	4
Leadership	-	3	3	-	-
User control	2	3	-	-	1
Office use	1	4	18	1	4
Noise	-	37	1	-	5
Air quality	1	11	-	1	4
Temperature	2	4	-	-	-
Lighting	2	9	-	1	4
Multifactorial	-	7	-	-	4

Note. For Tables 2–4: numbers in cells refer to the number of studies.

future research. Particularly the finding that the comparative studies involving a change from one office concept to another, tend to not focus on how this change occurred – this indicates a major research gap. Future studies investigating such a scenario would do well to include the change process itself in their investigation, or risk a large confounding variable. For spatial design focus, the situation is somewhat better, but here also it is recommended that future studies take spatial design seriously, and steer away from the simplifying “private versus open” dichotomy.

Compared to the areas mentioned above, some other areas are relatively more well-researched. There are several qualitative studies investigating change processes, office use and behaviour, leadership and organisational topics, and flexible office concepts. This indicates that these areas might be well suited for more quantitative research. There might also be sufficient data for systematic reviews on these topics. As the data is mainly qualitative, meta-synthesis would be a good design for reviews on these topics. Other areas that appear promising for future systematic reviews are the relation between office concept and noise issues, performance, privacy, and workplace satisfaction.

However, regarding the central issue that often is raised, “which office concept is best”, a systematic review might currently not be the best way ahead. The lack of focus on spatial design and change process aspects can conceal serious confounding variables, and before there exists a larger number of comparison studies that take these aspects into account, a review might become flawed. Also regarding reviews on other topics within the field of office concept research, there are likely too few studies to enable conclusive meta-analyses with separate subgroup analyses on the influence of variables such as sector, population, differences in spatial design, and differences in change processes, on any given outcome.

So even though systematic reviews and meta-analyses might be possible, what is most needed at this time is high-quality randomized controlled trials (RCTs) conducted in real-life workplace settings. RCT studies would be able to investigate the effect of different office concepts on productivity, satisfaction, communication, business value or any other given outcome, while at the same time controlling for the potential confounding variables which are so prominent in this field. Furthermore, conducting RCTs in real-life settings is crucial to ensure external validity. At this time, most of the existing RCT studies are laboratory studies, and real-life RCT studies would thus fill a major research gap. We are, however, aware of the difficulties of conducting real-life RCT studies on this study subject. Nevertheless, it is feasible. One approach could be randomizing at the organisational level rather than the level of the individual, so that some organisations are randomized to the experimental condition and other organisations are randomized to the control condition. Another could be to randomize individual office workers in large departments within the same organisation, so that employees with similar tasks and organisational culture are randomized to the various conditions. Both approaches require large research projects and funding in accordance with this. These studies furthermore need to thoroughly report the study setting(s), the spatial design(s), and the change process(es), so as to enable later systematic reviews and meta-analyses to grasp the various relevant factors which are at play.

4.3. Recommendations for practice

If using research to inform practical decisions regarding office concept design, it is advised to keep in mind the finding that comparative studies tend to not focus on spatial design or how changes took place. This means that the importance of the change process as well as spatial design aspects (such as design and prevalence of meeting rooms, placement of social areas, and the number of workplaces per person), might come across as less important than they actually are. So if these topics are not mentioned in the studies used to guide office concept decisions, consider whether they might have influenced the study

findings.

Therefore, when applying research to practice, it is at this stage advised using a variety of high-quality studies. No single study is likely to include all important aspects of the office environment at once. Also, take note of which populations, sectors, and countries the studies are on and from, so as to be able to decide how relevant the studies are for the setting at hand.

4.4. Strengths and limitations of this review

The strengths of this study include the use of rigorous and transparent methods throughout the entire process. Additionally, it was guided by a published protocol reviewed by an expert in knowledge synthesis. To ensure a representative search of the literature, the search was pre-tested in various databases so that the most relevant databases were chosen for the review. Most articles were screened independently by two reviewers (the authors) who met regularly to resolve conflicts, and the remaining articles were screened by one reviewer alone only when independent reviewing had proved to produce very similar data from both reviewers. The use of a bibliographic manager (EndNote) and systematic review software (Abstrackr) ensured that all citations and articles were properly accounted for during this process.

Still, the study has several limitations that should be kept in mind. First, grey literature, references and citing articles were not searched. The included studies are only based on database searches, for the purpose of giving a representative overview if not entirely comprehensive. Second, the quality of the included studies was not assessed. For this reason, gaps in the literature related to study quality cannot be identified based on this scoping review. Third, consultation with practitioners was conducted in a somewhat unsystematic manner (meetings). Interviews or surveys with the practitioners could have revealed further areas worth investigating. Fourth, one of the inclusion criteria for this study was that studies were included only if one or more office concepts were specified as their setting. This meant that some studies were excluded even when they were on the spatial design of offices, or the change process from one office to another, because they did not specify the office concept(s) used. Some of these excluded studies might be considered relevant to the topic at hand, and later reviews should consider including them.

Last, it is possible that the category of “private offices” have been under-represented in the current study, for several reasons. Private offices are often termed “traditional” offices, and it might be that researchers sometimes have found it unnecessary to specify the concept type when doing research on private offices. This would have led to the exclusion of the study from this review, as noted above. Furthermore, the search strategy used in the current study does not include the terms “private office” or “single office”. These terms were deliberately excluded because they yielded an excessively high number of hits, most of which were related to medical doctors’ consultation offices, which are not relevant to the current study. However, as both terms might have yielded some relevant studies as well, it is possible that the category of private offices appears smaller in the current study than it actually is in the existing literature.

5. Conclusion

This scoping review has charted empirical research on office concepts. Various office concepts have been studied, using a variety of study designs, populations, study focuses, and outcome variables. The field is relatively small, but the past decade has seen a surge in publication numbers. For comparative studies, the focus tends to be on office concepts to the exclusion of other relevant topics such as spatial design and change process. We recommend that future reviews and studies take these topics into account. Given the number of studies that met the inclusion criteria for this scoping review, systematic reviews could likely synthesize findings by office concept type, study focus, and

outcomes. However, due to the inherent complexity of the topic and the revealed limitations of the existing research, reviews might not be the best way forward at the moment. Instead, we recommend more randomized controlled studies conducted in real-life office settings. This study design can encompass the complexity of the study subject while also controlling for confounding variables. We hope the findings of our review can contribute to filling research gaps and gaining a better understanding of how to best design offices for the benefit of employees and organisations.

Conflicts of interest

The authors declare that they have no competing interests.

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Contributions

A.G. and H.L. conceived of the study. A.G., H.L., and E.S. designed the study. A.G., F.T., and E.S. undertook the literature review process. A.G. mapped the data. A.G. and E.S. drafted the manuscript, with input from F.T. and H.L. A.G., E.S., and F.T. read and approved the final manuscript.

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Appendix A. Supplementary data

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