

Office Landscaping Effects in the Public Sector: Where
You Sit Matters

by

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Office Landscaping Effects in the Public Sector: Where You Sit Matters

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Executive Summary

Introduction

Offices are undergoing a transformation around the world. The archetypal office design – the familiar combination of cubicles and corner offices – is diminishing in dominance. As real estate costs rise and technology enables new ways of working, organizations are responding with offices designed to facilitate the new reality of office work. While each office arrangement is unique, these designs inevitably involve reducing space, removing walls, and creating open-plan landscapes. These new designs may also necessitate changes in work behaviour as organizations implement strategies transforming personal space into public space while requiring employees to share more in general and specifically, occupy shared spaces.

Implementing a new office design usually brings with it a corresponding change in office culture. The new landscape plays a role in shaping the behaviour of employees as they interact with each other and their new space. The direction of the change in behaviour, however, is contested. Proponents of designs with more openness often invoke notions of increased collaboration and interaction between employees; critics point out issues of privacy and personal space being areas of contention. Both arguments have traction and contribute to discussion on the impact of office designs on employee experiences and the broader office culture they create.

The purpose of this project is to examine these issues in the context of public sector offices. Innovative office designs are often thought of as the exclusive domain of modern, private sector corporations; accordingly, the literature, both academic and professional, slants heavily towards private sector settings. The public sector, however, is embracing new office designs with equal interest and for similar reasons. Governments, including those of Canada, the United States, and the United Kingdom, are implementing office design programs with increasing frequency. This rush to transform public offices is concerning for various reasons. Studies of private sector redesigns have revealed inconsistent results and the interaction between new office designs and unique public sector factors is understudied.

This project seeks to address this gap in the literature and produce applicable, actionable recommendations for public sector organizations interested in developing and implementing new office landscapes. These recommendations are designed to facilitate effective office design while creating conditions for positive employee experiences.

Methodology and Methods

This project used a reality-oriented inquiry methodology, combining qualitative research and empirical evidence to produce conclusions about the impact of office design on employee experiences in public sector offices. The primary method was an extensive literature review designed to systematically identify potential literature for inclusion. Exclusions based on project criteria reduced the literature from 830 articles to 25. The data analysis approach subjected the final 25 articles to a thematic analysis, identifying common themes occurring across the

literature. These themes formed the basis for recommendations for public sector office design. The thematic analysis also examined the methods used in the included articles to provide additional recommendations for public sector office design research.

Key Findings

The literature review identified several minor and major themes consistent across the literature. At the highest level, the research identified broad themes of control and culture. Further thematic analysis generated control subthemes of privacy, territoriality, and comfort; cultural themes included conduct, interaction behaviour, and change management. The thematic analysis also identified common research settings, research instruments, and recommendations.

Recommendations

The aim of this project was to generate recommendations for public sector office design and public sector office design research. Based on the results of the literature review and the subsequent thematic analysis, this project recommends that public sector offices interested in effective office design:

- Select task-appropriate, ergonomic furniture providing sufficient privacy;
- Recognize the value of employee personalization and autonomy over personalization policies;
- Understand the impact of physical features on employee interaction patterns; and
- Conduct in-depth, extensive evaluations both before and after an implemented design.

This project also recommends that academics and researchers studying public sector office design research:

- Reduce reliance on surveys as a primary or exclusive research tool;
- Utilize more mixed-method research techniques; and
- Intentionally select public sector offices as the research setting.

Each of the above recommendations includes more specific, detailed practices further explained in the Recommendations section of the project.

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1.0 Introduction

Cultivating a positive employee experience is often an essential part of developing an effective organization. Each organization has a unique makeup, with an overall culture comprised of objective and subjective dimensions and shared expectations and values that influence all aspects of organizational life (Buono, Bowditch, & Lewis, 1985, p. 482). The office – the physical manifestation of an organization – creates employee experiences in part through combining organizational culture with unique local factors. Although individual and social factors are obvious contributors to an employee's experience, the physical design of the office plays an important and unique role.

The physical layout and design of an office – termed office landscaping – can have a significant influence on the way employees interact and go about their work. Office landscaping can contribute positively to employee experiences through creating a more comfortable and inviting place to work; conversely, it can contribute negatively by isolating employees, removing employee privacy, or impeding communication. As a response to advances in technology and a desire to respond to real estate costs, some public sector organizations are implementing or developing strategies for new office landscapes. These landscapes – referred to as new offices, open-plan offices, alternative offices, innovative offices, or other similar variants – often involve reducing space and increasing employee density through open floor plans and removal of walls and individual offices. The physical attributes of these new landscapes, to varying degrees, affect employees at the individual and group levels and change the overall employee experience.

The purpose of this project is to examine research on the effects of office landscaping on the public sector, and to use this literature to develop recommendations for creating landscapes conducive to positive employee experiences in public sector organizations.

1.1 General Problem

Governments and public sector organizations are showing an increasing interest in implementing alternative office designs. For example, the Government of Canada's Workplace 2.0/GCWorkplace initiative, the United States Government's Total Workplace, Britain's The Way We Work (TW3), and Finland's Government Premises Strategy 2020 are all designed around the establishment of office arrangements based on alternative landscapes. Governments in Brazil and Australia's New South Wales are also implementing similar policies.

The implementation of these new strategies and the significant physical alterations required will affect office employees to some extent and to varying degrees, which will likely generate new problems and challenges. One such issue evident in the initiatives listed above is the overall reduction of government-owned space. Each initiative includes targets for significant reductions in office space allotted for employees, frequently using the measurement of square metres per full-time employee (m^2/FTE). In the British case, TW3 aims for a target of $8m^2/FTE$, down from an average of $11m^2/FTE$; the Finnish case is more aggressive, reducing the average ratio of $25m^2/FTE$ to $15-18m^2/FTE$. The Government of Canada's goals are perhaps the most drastic: targets range from $18.5m^2/FTE$ to as little as $1.5m^2/FTE$ based on work function.

Adjusting to new space targets will require increases in employee density as more employees occupy the same amount of space. Implementing these targets will also require increasing the ‘openness’ of the office; reducing space necessitates removing walls and enclosed offices. Although space reduction provides economic benefits – the UK, for example, estimated potential savings of as much as £7 billion in assets and £1.5 billion in annual operating costs (Hardy, 2008, p. 12) – increased density can have negative effects on employees. De Croon, Sluiter, Kuijer, and Frings-Dresen (2005, p. 129) found that increasing workspace density decreases employee satisfaction and introduces higher degrees of visual and acoustical disturbances, while Crouch and Nimran (1989, p. 151) determined that denser designs decrease employee privacy levels and increase anxieties over superiors’ surveillance of their actions.

Strategies for office landscaping also create employee concerns over communication, interpersonal relationships, and organizational commitment. Office landscaping is often combined with flexible and technologically enabled work practices under the umbrella term of “new ways of working” (NWoW or NWW) – a definition used to denote human resource management strategies that are decoupled and independent from time and location (Gerards, de Grip, & Baudewijns, 2018, p. 517). Offices with NWoW office landscaping policies may improve social relations for some employees but decrease them for others (p. 520). NWoW policies related to office landscaping may have negative effects such as prohibiting employees from personalizing their workspaces, requiring employees to share space and resources more intensively, and decreasing social and face-to-face interaction. All the governments listed above employ a variety of NWoW policies that augment their design programs.

The public sector’s rush to transform offices, sometimes radically, is worrisome. Office landscaping is not an unevaluated phenomenon. Although studies on private sector offices dominate the literature, private and public sector offices share significant similarities and much can be learned about the private sector office design experiences. Academics have researched office landscaping topics going back at least to Brookes (1972), and the findings have been consistent across time; in a systematic literature review of office design studies covering more than 30 years, De Croon, Sluiter, Kuijer, and Frings-Dresen (2005) concluded that office innovation has produced mostly negative or mixed results at best (p. 129). This consistency should be concerning to governments and public sector organizations, as, in all cases, the findings suggest that implementing any new office design should be a considered exercise.

There is not yet an extensive literature review focused on physical design impacts on public sector offices; there is also a dearth of studies generating applicable, pragmatic smart practices for implementation in a way that promotes positive employee experiences. If the issue is not addressed, the public sector could be ignoring considerable academic evidence, a potential source of practical guidance for adopting new office designs, and an opportunity to maintain or improve employee experiences.

1.2 Project Objectives and Research Questions

The primary research question of this project asked how, and to what extent, do the physical attributes and design of an office – the office landscape – contribute to employee experiences in public sector offices?

In addition to the primary research question, there are a series of complementary questions that clarified and shaped both the literature review and the recommendations section of the project. These questions narrowed the project's focus and identified specific topics for analysis. The iterative nature of the project required accommodation of additional questions that emerged during the research. Complementary and additional questions included:

- How do individual employee factors – personal comfort, job satisfaction, etc. – and group-level factors – communication, interaction, etc. – contribute to overall office experiences?
- What physical factors are most influential at the individual level and at the group level?
- What methods have researchers used to study office landscape effects?
- What rationale(s) are behind public sector organizations' office landscape choices?
- What can public sector organizations do to create office landscapes conducive to positive employee experiences?

The project's main objective was to analyze office landscaping's impact on employee experiences in the public sector through an in-depth literature review. The findings assisted in developing recommendations for public sector organizations to create offices supporting positive employee experiences. The findings also produced recommendations for academics researching public sector office design.

1.3 Organization of Report

This report is organized into six chapters. The first chapter contains a background and an overview of the literature. Because the primary project component is a literature review, the purpose of the overview is to provide a brief background on the public sector, the history of office landscaping, and identification of some seminal research studies. The information in the overview provided initial knowledge informing the project's direction.

The next chapter of the report contains the methodology used to conduct the review and synthesize the findings. This section also chronicles changes to the methodology as a result of the iterative nature of reviews. It also outlines the limitations and delimitations of the project.

The next three chapters describe the findings of the review and thematic analysis. Each chapter focuses on an individual, dominant theme – employee control, employee culture, or public sector office research design – and the various subthemes that comprise it.

The final chapter contains a series of recommendations and is linked to the findings of the previous chapters. It reports on practices found in the literature and recommends additional practices developed from synthesis of the literature review results, with a focus on providing real-world solutions for public sector office landscaping. This section also identifies gaps in the literature and provides recommendations for further research.

2.0 Background and Overview

2.1 Defining the Public Sector

This project revolves around the public sector and it is important to understand definitions of public and private sector organizations and what distinguishes each. The classic public-private distinction uses the Latin roots of both words as its foundation: public “of the people” and private “set apart.” Under this definition, public sector organizations are concerned with matters affecting a community, nation, or state – the public interest – and private sector organizations are interested in anything else (Perry & Rainey, 1988, p. 183). This essential definition generally equates public sector with government and private sector with business; while a common distinction, both sectors share a more complex and overlapping relationship.

The real-world characteristics of either type of organization are much more comingled than the traditional distinction: businesses are indeed often concerned with social and political issues and governments can act in ways that further private interest. These relationships complicate what qualifies as the public interest and what constitutes a public sector organization. This leads to the opposing perspective to the classic distinction: that there is none, and it is harmful to consider otherwise (Rainey & Bozeman, 2000, p. 448-49). There is value to this definition as well; it suggests that organizations, whether public or private in nature, operate similarly, and matters of public interest are applicable to both.

This project is specifically intended to examine office design in the public sector and uses the assertions of Nutt and Backoff’s (1993) update of Rainey’s (1989) public-private typology as a basis for defining public sector organizations. The typology suggests that specific environmental, transactional, and organizational process factors differentiate public and private organizations. Under Rainey’s typology, there is a public-private distinction, and what separates public and private sector organizations are how they engage with or are subject to different versions of similar factors. The typology’s organizational process factors – goals and performance expectations – are a differentiator between public and private organizations. Public sector response to these factors is unique; political turnover or interest group demands may influence a set of confusing and contradictory goals, and performance is not tied to the bottom line in the same manner as private organizations. Organizational process factors, along with political influence and ownership factors, can provide a basis for establishing the relationship between public sector processes and office design choices and differentiating it from the private sector. These factors may assist in explaining both the “how” and the “why” of the resulting physical environment.

Britain’s TW3 is an exemplar of how unique public sector factors influence eventual public sector office designs. TW3 is a British Civil Service program focused on developing flexible working environments, reducing and making more intensive use of space, and reducing the costs of work (Lake, 2014, p. 4-5) – typical goals requiring more open-plan, space-sharing, and cost-effective designs. While a program with these objectives could occur in a public or private sector organization, part of what makes TW3 a product of uniquely public sector factors is the role of political influence, public ownership, and Rainey’s (1989) organizational process factors.

TW3 is the result of political commitments; its foundations are in the Civil Service Reform Plan, a government-initiated program outlining expectations for the Civil Service to follow as part of the government's new policy agenda. The Civil Service, as an organization of government, is also publicly owned and thus subject to the expectations of public stakeholders. Private sector organizations are also subject to stakeholder scrutiny, but only to private stakeholders; for public organizations, stakeholder responsibility is ubiquitous. TW3 also includes evaluative metrics directly related to office design – space reduction, cost savings, and productivity measures – developed to satisfy the goals and performance expectations of the government's policy agenda. While these are again factors of concern to both public and private sector organizations, the office designs developed in response to TW3 are in part the result of distinctive public sector processes.

2.2 Office Development

The history of the office extends as far back as ancient Egypt, Greece, and Rome, where administrative workers performed their work in designated cells within buildings in centralized locations (Rassia, 2017, pp. 9-10). While this approach reflects the cubicle-centric design common in Western offices, ancient cultures also developed the beginnings of alternative office designs. In an early example of “hotdesking” – designing individual workspaces for certain tasks and sharing them amongst multiple users – scribes and clerks in ancient Egypt would operate from multiple workspaces depending on their tasks (pp. 9-10).

This general design philosophy – assigning workers to a workspace based on task – has endured, bringing with it social implications for the workplace. In late 19th and early 20th century America, the industrial management principles of Frederick Winslow Taylor stressed scientific observation and maximum efficiency. This approach led to Taylor's concept of “soldiering”, where, due to either inherent or witnessed laziness, industrial workers would not achieve full efficiency without office managers' observation and intervention (Taylor, 2003, p. 30-32). Taylor's influence on office design in the early 1900s is most evident in the 1904 Larkin Building, designed for the Larkin Soap Company's mail-order business. The building's design was essentially open-plan, with one large room furnished with repeating rows of desks and a separate private area for managers' offices. The spartan design afforded no privacy to floor employees and did not contribute positively to office culture: the company banned employee conversations (Myerson, 2009, p. 12). While the Larkin Soap Company's building and policies are extreme examples of Taylorian offices, associations between task, job rank, status, and space suggest that office landscaping can create separation between higher positions in separate offices and lower positions in shared spaces and influence office relations and societal structures (Rassia, 2017, p. 10-11).

Another important milestone in office landscaping was the development of the *Bürolandschaft* concept. In contrast to Taylorism, the Quickborner Team's *Bürolandschaft* – German for “office landscaping” – was a mid-20th century design philosophy promoting better communication among staff members by understanding organizational charts and arranging desks and furniture based on communication pathways (Binyaseen, 2010, p. 349-350). *Bürolandschaft* was emblematic of the emerging progressive work culture at the time, representing a “rejection of bureaucratic and hierarchical conventional postwar corporations” in favour of collaboration and worker autonomy (Kaufmann-Buhler, 2016, p. 206). The first office to adopt *Bürolandschaft*

was a DuPont office in 1967; the Quickborner Team spent weeks tracking communication patterns and placing workstations without the limits of job titles or positions (p. 209). The result of DuPont's redesign was an irregular office landscape of desks in a chaotic layout. Evaluations of the office suggested that the open-plan design saved space, was easy to rearrange, and reduced maintenance costs, but there were complaints of increased noise and visual disturbance ("Bürolandschaft U.S.A.," 1968, p. 175-176). The redesign also received a lukewarm reception for its focus on employees; a DuPont spokesperson claimed that there were efficiency gains but personnel relations losses, and, about the company mood, that "[t]here is neither great enthusiasm nor serious objection" (p. 176). *Bürolandschaft* did not endure but the idea of open plans and office landscapes designed to foster communication and collaboration continues in contemporary times in new office landscapes.

The nature of work is also changing office landscapes. Much of public sector office work is "knowledge-based work" – work less concerned with repetitive tasks and more interested in the "production and exchange of knowledge and information" (Cole, Bild, & Oliver, 2012, p. 183). Knowledge-based work involves little manual labour, less supervision, and, combined with technology, is less spatially bound; office workers are able to work far more flexibly, and require a more flexible approach to office landscaping (Green & Myerson, 2011, p. 19). Understanding technology and knowledge-based work's effects on a new design philosophy decoupling space and task is a challenging but essential concept for office landscapers.

2.3 Office Research

Organizations' development of new office landscapes has provided researchers an opportunity to study the effects. Articles examining the impact of office designs began to proliferate in the 1960s and 1970s following the *Bürolandschaft* experiment in 1967. Research topics have been wide and diverse, ranging from quantitative studies of lighting and noise to qualitative studies of interpersonal relations and communication. The following is a brief overview of office research categories; while this project is concerned with the public sector, some important office landscaping research in private sector settings is necessary to acknowledge.

Measuring variables influencing employee satisfaction is a common theme in office landscaping research. Research in this area often takes a quantitative or quantitized approach, adjusting variables and searching for statistical explanations in the data. Brookes' (1972) study of an office converting from cubicles to an open-plan office is an early example; his use of statistical analysis to arrive at the conclusion that "it [the office] looks better but it works worse" (p. 232) is a typical format for quantitative office landscaping research.

Following Brookes, the work of Eric Sundstrom is important to the field. Sundstrom's work is commonly referenced in office landscaping research in both private and public settings as evidence of landscaping impacts. Sundstrom's studies of office design, privacy, and employee satisfaction, whether focusing on communication (Sundstrom, Herbert, & Brown, 1982), physical enclosure (Sundstrom, Town, Brown, Forman, & McGee, 1982), or noise (Sundstrom, Town, Rice, Osborn, & Brill, 1994) are important contributions to the literature.

Enough research on employee satisfaction exists to enable systematic literature review. De Croon, Sluiter, Kuijer, and Frings-Dresen (2005) compiled 49 studies on employee satisfaction

from a variety of sectors across jurisdictions and decades. In what appears to be the only article dedicated exclusively to a systematic literature review of this topic, the authors conclude that there is an “unfavourable effect of workplace openness” (p. 130) that influences employee satisfaction. As the only systematic literature review, this study is a valuable contribution to the literature for its amalgamation of studies across time and space and for its variety of individual and group level factors.

2.4 Office Landscaping and the Public Sector

There is less literature researching office design in public sector offices compared to research on the private sector. Some jurisdictions have published documents specifically outlining physical office regulations or design policies (such as the Government of Canada’s Workplace 2.0/GCWorkplace, Britain’s Working Beyond Walls or Australia’s New South Wales Fitout Design Principles), but scholarly literature is limited. In Brazil, Costa and Villarouco (2012) examined employee perceptions of open-plan offices in three federal government offices; in America, Kaufmann-Buhler (2016) took a historical approach and wrote of an open-plan office in Wisconsin in the 1980s. Giddings and Ladinski (2016), with a UK public sector office as the subject, conducted an evaluation of the impacts of an office redesign to an open-plan and higher density office on employees. Academics have also produced scholarly office landscaping articles on governments in Canada, Australia, and the Scandinavian countries, many of which are referenced in this report.

2.5 The Focus of This Study

This study addresses the gap that exists at the intersection of public sector organizations and office design. While there is considerable overlap in the designs of public and private sector offices, and much of the private sector office experience is applicable, the public sector is nevertheless unique. The distinctive factors that differentiate the public sector, and their impact on public sector office design, have not been studied to the depth of the private sector. This study focuses on the past and present experiences of public sector organizations – and in particular, their employees – with office design. Public sector organizations have, and will likely continue to, implement design programs responding to new economic and technological realities: this report’s focus on analysis of their experiences can contribute to a body of knowledge and recommendations for effective office design unique to the public sector.

3.0 Methodology and Methods

3.1 Ontological Framework

This project takes influence from Patton's (2002) concept of reality-oriented qualitative inquiry. Reality-oriented qualitative inquiry, while rejecting claims of absolute truth, maintains that qualitative research with empirical evidence and sufficient rigour can lead to valid, plausible, and accurate conclusions about what is occurring in the area of interest (p. 93). Reality-oriented inquiry is an appropriate concept to apply to a literature review intended to produce recommendations; patterns and congruities in studies can enable the development of theory and causality and inform policy choices (p. 93).

This concept, as well as a pragmatic approach, informed the recommendations section of the project to provide real, usable information and advice for public sector office landscaping. The same approach also extended to recommendations for academics engaging in office landscaping research.

3.2 Methodology

In order to identify and understand linkages between office designs and office employees in the public sector, the project utilized a systematic review process. The systematic review is an intensive, expanded form of a literature review designed to "locate, appraise and synthesize" studies and evidence related to a research question (Dickson, Cherry & Boland, 2014, p. 3). Systematic reviews agglomerate multiple sources of relevant evidence in an effort to address the shortcomings of individual studies and increase generalizability.

The review used qualitative and mixed-method theory based on Oliver and Tripney's (2017, p. 3-5) spectrum of approaches to systematic reviewing as its foundation. The spectrum's qualitative approach presents an iterative model with open questions and tentative concepts amenable to adjustment, with the goal of creating hypotheses and better understanding of issues. The mixed-method approach, with more defined research questions and a goal of identifying policy options, also informed the project. The review method generally followed Cherry, Perkins, Dickson and Boland's (2014, p. 146-158) multi-step qualitative systematic review process. The process moves from initial scoping searches conducted during the proposal phase to identifying relevant databases, search terms, and inclusion/exclusion criteria. It then recommends strategies for screening articles, leading to a final synthesis of findings.

To clarify research questions and preliminary inclusion/exclusion criteria, the project used the simple, qualitatively oriented PICo (population, phenomenon of interest, context) mnemonic for conducting systematic reviews (The Joanna Briggs Institute, 2011, p. 13). The PICo model produced the following criteria:

- Population: Office workers in public sector organizations.
- Interest: Office landscaping impacts on workers' individual and social office experiences.

- Context: Public sector offices designed using open-plan or other unique office arrangements or landscapes or examining physical factors in conventionally designed offices.

The preliminary criteria the PICO method established provided a sufficient foundation for further refinement and a starting point for generating scoping searches.

The aim of the literature review was to identify available literature on office landscaping with a preference for the public sector. Initial scoping searches generated a limited body of public sector literature; these searches influenced the initial development of inclusion/exclusion criteria to include private sector literature. The actual search, however, identified multiple sources of public sector literature in a variety of locations. At the same time, the vast body of private sector literature results became unmanageable. This necessitated adjustments to the search terms and criteria – a common issue due to the iterative nature of systematic reviews (Dundar & Fleeman, 2014, p. 46, 58-59). The general congruity of studies – similar office designs, findings, conclusions and so on – between sectors led to the decision to include only academic literature on the public sector after searching the first two databases. This did not preclude the inclusion of public sector literature identified before the decision. The decision also led to more restrictive criteria to filter out further articles. Establishing a higher standard for inclusion also enabled the collection of a wider variety of public sector office landscaping literature.

The initial content analysis approach also evolved into a more thematic analysis approach as the review progressed. Content and thematic analysis approaches are nearly identical in principles and procedures, except for thematic analysis' greater emphasis on the qualitative aspects of the review material (Marks & Yardley, 2004, p. 2-3). Themes emerging from the review articles trended more towards qualitative dimensions, making the thematic analysis approach a slightly more suitable choice. The thematic analysis also became broader and less granular in response to the material. While the project's original intent was to create detailed, coded summaries unique to each article, the article content did not require that depth of analysis to produce consistent themes and reach the saturation point. The articles had somewhat less discrete and identifiable boundaries between their study interests than expected; the arrangement of the themes and subthemes in the Findings chapters reflect the overlap in content.

3.3 Methods

Literature Review

The initial scoping searches identified several potential databases, including Emerald Insight; Taylor & Francis Online; EBSCO; and Wiley Online Journals. Each database contains an interdisciplinary assortment of subjects and sub-databases; the review included all sub-databases except in EBSCO, which, due to its size, required assessments of each sub-database for relevancy. The University of Victoria Libraries E-Journals by Subject tool produced a list of 119 public administration journals; assessment of each journal's scope led to the inclusion of 19 journals, mostly contained in the above databases. Project search terms were developed from keywords in relevant articles and brainstorming to generate further potential terms. Brainstorming sessions also utilized a thesaurus to identify synonyms for relevant terms. The University of Victoria's Public Administration librarian also provided input on developing

search terms and structuring Boolean searches. The following table lists the project search terms:

Table 1		
<i>List of Search Terms</i>		
Office Arrangement Terms	Setting Terms	Additional Terms
activity based office	bureaucracy	environmental psychology
activity based workplace	governance	new ways of working
activity based workspace	government	office concepts
desk sharing	local authority	office design
flexible office	public administration	office landscaping
flexible workplace	public management	office layout
flexible workspace	public sector	office space
hotdesking		physical office environment
non-territorial office		physical work environment
non-territorial workplace		post occupancy evaluation
non-territorial workspace		workplace design
open office		workplace layout
open plan		workspace design
open workplace		workspace layout
open workspace		

The search process began in September 2018, upon completion of the initial scoping searches and construction of the list of search terms. Early application of search terms produced 945 results through two databases, suggesting that the project could capture relevant literature on both public and private sectors; however, the explosion of search results into the hundreds of thousands necessitated the change to focus exclusively on the public sector. Following the change, the adjusted search process produced 830 potential articles across all databases. 80 articles were duplicates appearing in more than one search or more than one database, leaving 750 unique articles for evaluation. A complete list of search strings is included in the Appendix section.

After de-duplication, the 750 remaining articles were further evaluated using Dunder and Fleeman’s (2014, p. 48-49) selection process. The initial search’s identification of a large amount of literature, as well as the subsequent methodological change, led to an exclusion-based approach to selecting studies. This approach allowed for the development of more restrictive and stringent criteria requirements. In alignment with the project’s methodology, the exclusion criteria were qualitative in nature and based on the research questions. Although the research questions provided the foundation, criteria development included an inductive component as additional criteria for exclusion organically emerged from examination of the articles. A study was excluded if it matched any of the following nine criteria:

- it was clearly irrelevant to the project;
- it was not focused on the public sector;
- it was not a case study or an experiment (theoretical papers, reviews, or opinion pieces);

- it was not about office design;
- the setting was not an office (classrooms, universities, laboratories);
- the results involved private sector settings not clearly distinct from the public sector or not used for comparison;
- the main focus was a tool, framework, or theoretical model that was left untested or tested irrelevant measures in an office setting;
- the focus was on human resource policies not tied to physical office factors;
- the focus was building efficiency (energy usage, heating or cooling outputs) without a human component.

The exclusion process screened each study's title and abstract for evidence of exclusion criteria. If a study did not have an abstract or the abstract did not provide sufficient information, it was skimmed for search terms and evidence of exclusion content. Application of the criteria reduced the study pool from 750 to 33. At the final exclusion stage, each remaining paper was read in full and re-assessed against the exclusion criteria. After final exclusions, a total of 25 studies remained for the review. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA, 2009) diagram in the Appendix section shows the breakdown of the search.

The remaining 25 studies were analyzed for their research methodology as well as their outcomes. Each study was defined as qualitative or quantitative based on Creswell's (2014, p. 46-48) definitions of research approaches. To align with the research questions, the analysis focused on the study setting, the impact of physical factors at the individual and/or the group level, and the inclusion of recommendations and/or best practices. Additional categories based on themes discovered during the research included the response rates for studies utilizing a survey and whether or not the study had a longitudinal component or contained a post-occupancy evaluation.

The final 25 studies demonstrated a preference for quantitative approaches. Sixteen studies used a quantitative approach, 8 used qualitative, and 1 appeared to be a mixture. The USA had the highest number of studies (8), followed by the UK (4); the Netherlands (4); Australia (3); and Brazil, Canada, Finland, Pakistan, and Sweden (1 each). One study's setting was a combination of Canada and the USA. 15 studies examined physical factors exclusively in open-plan or other unique office landscapes, while 10 did not restrict the office setting. 10 studies had longitudinal approaches or contained a post-occupancy evaluation, and 15 did not. 20 studies included a survey as a research instrument while 5 used a different approach. Finally, 8 studies included recommendations and/or best practices based on study results, while 17 did not. A detailed table of included studies is included in the Appendix section.

Thematic Analysis

After identifying the search terms and articles for inclusion, the review utilized a generally inductive approach to content analysis to recognize and develop themes. As the systematic review process and the research questions were flexible and inductive in nature, this method was a logical choice. Conducting an inductive content analysis involves preparation, organization, and reporting of data (Elo et al., 2014, p. 1-2). The research questions established two broad categories for analysis: office factors and research trends. The intent of both units was first to

provide a basis for coding and subsequently to assist in organizing subthemes into broader themes across the literature in line with Elo and Kyngäs' (2008, p. 111) abstraction process. These themes were revised to be as overarching as possible as data in the articles provided new information.

The thematic analysis identified a number of consistent themes and subthemes across both major categories. Regarding office factors, the broadest themes the analysis identified were control and culture. The following subthemes constituted the control theme:

- Privacy, comprised of:
 - Visual privacy
 - Auditory privacy
 - Olfactory privacy;
- Territoriality, comprised of:
 - Space ownership
 - Claiming behaviour; and
- Comfort, comprised of:
 - Environmental conditions
 - Ergonomics
 - Productivity.

The theme of culture had an equally diverse grouping of themes, spanning the following subthemes and areas of interest:

- Conduct, comprised of:
 - Civil Inattention
 - Rule attitudes;
- Interaction Behaviour, comprised of:
 - Interaction locations
 - Interdepartmental interactions
 - Interaction expectations; and
- Change Management, comprised of:
 - Reactions
 - Inconsistencies.

The thematic analysis also identified consistent themes in the second major category of research trends, including:

- Reasons for selecting public sector settings;
- Selection and usage of research instruments; and
- Application of research findings.

The next three chapters of the project report on each theme and subtheme to provide a detailed perspective on public sector office design, office design impacts, and the relationship between the office environment and the employees who operate within it.

3.4 Analytical Framework

This project analyzes the drivers and decisions informing public sector office design. Its analytical framework focuses on the motivation behind employee and employer design ambitions

and how the relationship between efficiency and effectiveness impacts the design experience. High-level decisions – policies, commitments, and/or political mandates – create requirements that drive office design programs. These requirements put pressure on organizations to develop programs fostering efficient, compliant designs. The resulting programs support and/or conflict with employee desires for a positive design experience – a well-managed process creating private, autonomous, and comfortable offices – to shape the design. How the organization balances employee and employer interests determines the final design, its reception, and its overall effectiveness. Figure 1 presents a visual display of the analytical framework; while it generally proceeds in one direction, each organization will likely have a unique relationship and degree of reciprocity between variables.

3.5 Limitations

Literature Review

This project did not involve primary research. The secondary research that formed the basis of the literature review and recommendations is bound by the original research's parameters. Any biases or delimitations in the original research were an influence on the secondary research. The limitations of the original literature also restrict the availability of content; there may not have been literature available, or it may not exist. Similarly, although an initial search produced a variety of relevant literature, documents may have been missed, even with effective search parameters and due diligence. While these issues were unavoidable, the application of search parameters was as thorough and systematic as possible, and examination of the documents to determine inclusionary/exclusionary criteria was done with attention to detail to assist in mitigating these effects.

Recommendations

The results of the literature review necessarily influenced the project's recommendations. The overall body of office landscaping literature is wide in variety and scope. Although this project was designed for public sector audiences and included only public sector articles, the wealth of office design research is in the private sector; as a result, the included articles at times referenced private sector findings. Some of the articles included in the review had private sector components complementing a public sector focus, usually as a comparison between sectors.

3.6 Scope or Delimitations

Literature Review

This project was subject to several delimitations. The literature review encompassed a variety of literature produced at different times and in different contexts, but the project is for contemporary public sector audiences, focusing on innovative office landscaping applications when possible. This project was concerned with office landscaping impacts on employee experiences at the individual and social level; employee productivity or performance factors not having a direct connection to physical conditions were out of scope. Similarly, social practices (office-organized events, workshops, etc.) encouraging positive experiences but unrelated to office landscaping were out of scope. Social factors related to physical factors, such as

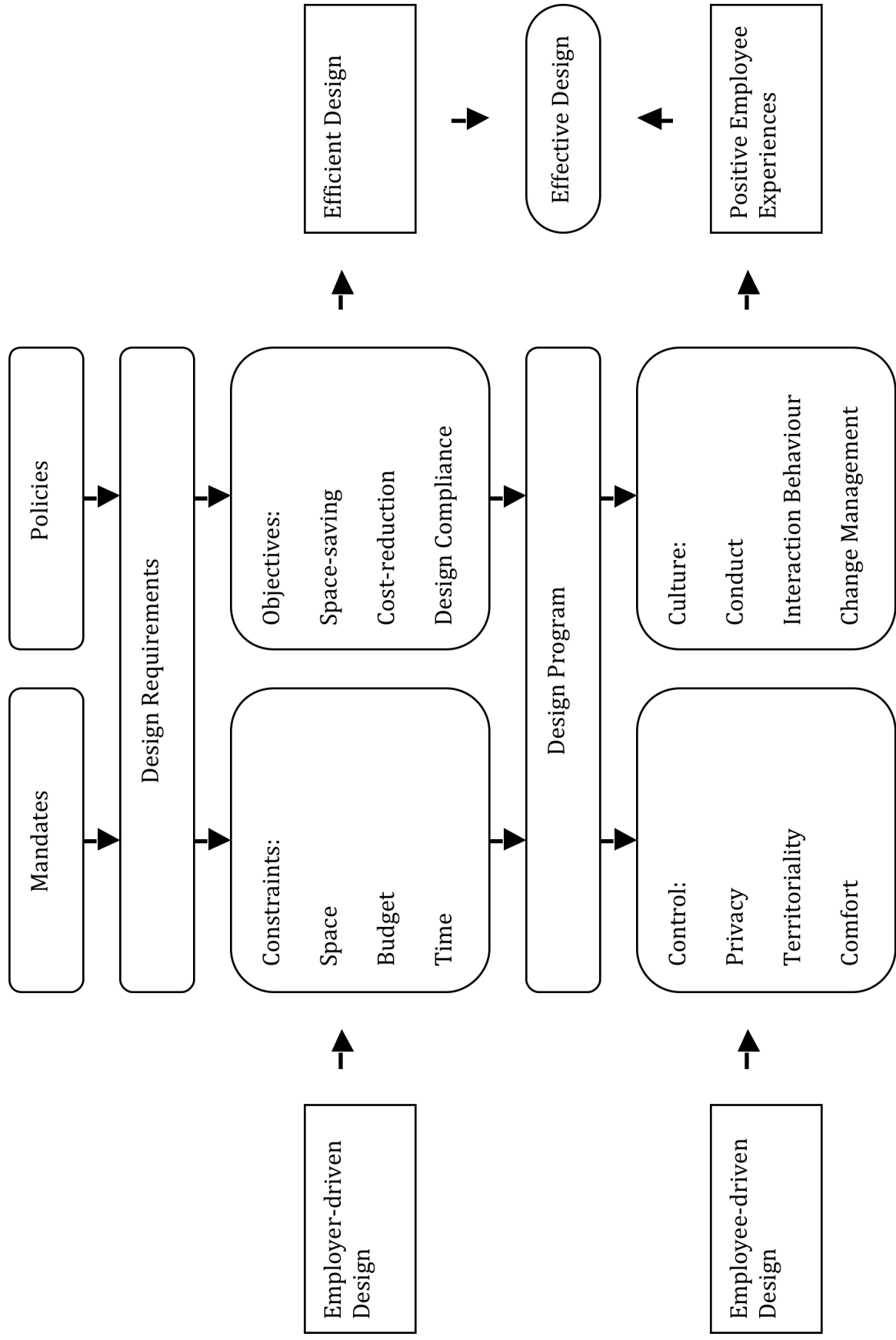


Figure 1. Analytical framework. This diagram displays the relationship between design variables.

communication pathways due to office layouts or conversations enabled by physical proximity were in scope. The project also focused on interior building factors only. External or architectural factors were out of scope unless related to the interior, such as window locations or multiple-story building construction.

Recommendations

The recommendations section is also subject to delimitations. This project only used public sector literature to develop the recommendations section; private sector or other literature contributed only as additional support. Similar to the literature review, the recommendations are also only limited to office landscaping. Practices influencing employee experiences at the individual or social level without adjustment to physical or design factors were not within the purview of this project.

4.0 Findings: Employee Control Over the Workplace

A primary theme underpinning many of the articles is a ubiquitous employee desire for control over the workplace. One component is privacy, evident through the repeated concerns over insufficient privacy measures in the workplace. Another is territoriality, emerging from research focused on space ownership. A final component is the impact of workplace comfort, through research on environment and ergonomic conditions. The following section addresses these themes and their relationship with office landscapes.

4.1 Subtheme: Privacy

A number of articles specifically focused on privacy. Privacy was a primary factor in Sundstrom's private sector settings and appeared of equal importance in public sector settings. Van der Voordt and Van Meel (as cited in Appel-Meulenbroek, Groenen, & Janssen, 2011, p. 125) divided privacy into visual, auditory, territorial, and informative (control of information about oneself) dimensions, all studied across the literature. The most common types of privacy generated through analysis of the literature were of the visual and auditory variety.

Visual Privacy

Of the articles studying privacy, visual privacy was the most common concern. One of the main objectives of open-plan office landscapes is to remove barriers to communication, often translating into the removal of physical barriers. In an administrative setting at a university, Sundstrom et al. (1982, p. 558) found that physical enclosure has a significant impact on visual privacy. The review articles supported this conclusion; in an earlier article, McCarrey, Peterson, Edwards, and von Kulmiz (1974, p. 402) suggested that unpredictable stimulation in open-plan offices, combined with an individual's lessened ability to control the stimuli, results in decreased privacy of all types. Hotdesking employees in Appel-Meulenbroek, Groenen, and Janssen's (2011, p. 128) study also reported being easily distracted from observing events around them. It is also important to note that some employees in the study purposely chose workstations not in the direct eyesight of others to increase visual privacy.

The review articles also suggested that increased visibility might have related effects beyond visual privacy. It is common sense to conclude that landscaping an office to include more open space and fewer barriers would decrease individual privacy, but the effects of potential proximity and visual access to an individual's superiors under this design pose an additional, unintended set of consequences. Pugsley and Haynes (2002, p. 39) anticipated that the change to an open-plan office would generate difficulties for managers trying to adapt to lower privacy levels; in actuality, staff were the most unsettled from being in constant managerial sight. Crouch and Nimran's (1989) study of managers corroborates this conclusion, finding that the visibility of the manager and the manager's superior impacted both the managers' and subordinates' perceptions. The most effective configuration was a superior who subordinates could hear, but not see. Although this decreased the superior's privacy from an increased chance of being overheard, it generated higher task performance from the manager. The opposite arrangement – a superior who can be seen but not heard – correlated with lower performance. The authors suggest that a

visible superior might indicate to the manager that they are deliberately being monitored due to performance, further reinforcing lower performance. This monitoring effect leads to a broader and general concept: the more visibility employees have, the more capacity there is for continuous observation of each other and a subsequent potential for lower task performance.

Visual privacy granted to employees in open-plan office settings is important enough that even perceived increases in privacy can affect individual satisfaction. Rashid, Wineman, and Zimring's (2009, p. 17) study quantitatively demonstrated a positive correlation between perceived levels of privacy, job satisfaction, and organizational commitment. This correlation appeared despite a move from a traditional office to an open-plan office with significantly more visibility, suggesting that privacy levels are privy to both objective and subjective dimensions.

Auditory Privacy

A number of articles considered auditory privacy as a component of study. Qualitatively, Brunia, de Been, and van der Voordt (2016) found in a comparative case study of four offices in a public sector organization that acoustical conditions were a factor in employee satisfaction. All four offices moved from a more traditional office to a more open or flexible office; in both less successful cases, acoustical distractions and a lack of privacy in a large open workspace contributed to lower satisfaction levels (p. 11-12). Similar to visual privacy, perceived acoustical privacy was also a factor, with employees electing to avoid open areas perceived to be less private in favour of closed or protected offices.

The desire for control of auditory privacy extends beyond the inevitable background office noise emanating from computers, telephones, foot traffic, and similar disturbances. Quantitatively, Tharr and Tubbs (1998) examined a government office's practice of playing instrumental music over speakers in a mostly open-plan office. Although sound measurements of the music deemed it within acceptable noise levels, employees perceived it as an annoyance in an office with already significant background noise. It was also interfering with concentration and speech intelligibility. The music was audible in both the open and private areas of the office, further demonstrating its permeation. While listening to music at work may be desirable, the authors concluded that it should be through controllable, personal devices, and that using music as a masking sound to cover the office background noise was ineffective (p. 565). This supports the position that employees do not perceive auditory privacy equally, and that separate sources of auditory disturbance do not have a uniform impact.

The review uncovered only marginal research refuting auditory privacy as an important contributor to the physical office environment's effects on employee experiences. Giddings and Ladinski's (2016) open-plan office study found that an atmosphere that employees deemed "maybe a little too lively" increased distractions and decreased privacy but did not score as "serious issues" impacting satisfaction or productivity (p. 214-215). Although the authors did not define the parameters of "a little too lively", it is likely that auditory distractions contributed. No other articles encountered during the review directly or indirectly claimed auditory privacy as a non-factor.

Olfactory Privacy

Two articles, although not studying privacy, made passing reference to a potential additional dimension of olfactory privacy. Hirst (2011, p. 775) noted that the norms of minimal communication and acknowledgement in her hotdesking environment made her minutely aware of, among other things, the smells emanating from other parts of the office. Pinder and Byers' ethnographic study (2015, p. 113) describes a similar situation in an open-plan office where, unable to focus her attention, Pinder notices an employee eating an odorless sandwich. While in both situations the authors are acting in participant-observer research roles, their experiences suggest that distractions occur in forms beyond the visual and auditory. Olfactory privacy seems to be an unstudied phenomenon and may be a contributor to employee experiences in office landscapes where smells can more easily proliferate.

4.2 Subtheme: Territoriality

Space Ownership

Another control-related concern consistently appearing in the literature was employee ownership of space. Oldham and Brass' (1979) sociotechnical theory suggests that physical boundaries influence employee experiences and “transform a work area into a private, defensible space” (p. 270). As open-plan landscapes inevitably decrease the boundaries demarcating workspaces, offices utilizing these designs lessen employee ability to create private space and a sense of territory. The implied public, communal ownership of space in open-plan offices may result in employees perceiving a loss of control over space and less personal identification with work (Zalesny & Farace, 1987, p. 242).

The review provided evidence for the sociotechnical theory, particularly in situations with non-assigned and non-territorial workspaces (hotdesking and activity-based workplaces). This style of workplace is often accompanied by a “clean desk” policy requiring employees to clear their belongings from their workspace when they leave for the day or expect to be away for longer than a specified time. Clean desk policies leave a workspace clear for subsequent users and tend to restrict the display of personal items or objects. The motivation for personalizing a workspace is often the creation of territory and a zone of control, and a reminder that an individual is unique and exists outside of the workplace (Brunia & Hartjes-Gosselink, 2009, p. 3). As personal items are expressions of individual identity and have emotional significance, limiting the ability to personalize workspaces can have a psychological effect on employees' office experiences. Removing barriers and shifting space from private to public use may cause a perception of the office environment as uniform, sterile and unwelcoming.

Claiming Behaviour

The review also found considerable evidence of a lack of support for non-territorial office arrangements. Multiple studies indicated different responses to policies restricting employee territoriality ranging from apathy to outright subversion. Almost 70 percent of respondents in Appel-Meulenbroek, Groenen, and Janssen's (2011) hotdesking study did not change locations during the day, and over 60 percent either claimed or personalized non-assigned workstations or avoided using workstations others were known to use (p. 128). Claiming behaviour also

extended beyond the employee's physical presence: Brunia & Hartjes-Gosselink (2009, p. 7) noticed that employees were leaving coats or noticeably adjusting computer monitors to confirm ownership even when not in the office. The ability to create territory seems to play a role in overall job satisfaction; in a comparison of open-plan offices, Brunia, de Been, and van der Voordt (2016, p. 39-41) found claiming behaviour in low-satisfaction offices but did not mention it in offices with more satisfied employees.

Hirst's (2011) ethnographic study provides a more dramatic example of subversion. She noticed that employee "nesting" – repeated use of the same desks and installation of personal property – occurred in more desirable physical spaces next to windows or in corners (p. 776-777). This settling behaviour was occurring despite official policies prohibiting it and the implementation manager's view that "it's a space, not your space." (p. 774). Management-level employees appeared to be aware both of the nesting behaviour and the contravention of official policy, yet nonetheless engaged in it themselves. From the findings of the review, it appears that employee desire for autonomous territory is consistent across organizations and important enough that policies against it have a high chance of ineffectiveness.

4.3 Subtheme: Comfort

Another major theme evident in the literature is the impact of comfortable surroundings on employees. Office employees generally spend a significant amount of the workday indoors; as such, they are susceptible to the quality of the office environment. High-quality indoor office environments can contribute to a positive employee experience and can also ward off the development of sick building syndrome, a series of health or comfort-related effects attributable to time spent in a building. A toxic environment, whether climactic or ergonomical, may have negative impacts on employee absenteeism, health, comfort, and satisfaction (Joshi, 2008, p. 61).

Environmental Conditions

Numerous articles focused on the effects of office environments, ergonomics, and furniture on employee health and overall satisfaction. Implementing a new office design alone may not translate to health or satisfaction benefits: Meijer, Frings-Dresen, and Sluiter (2009) found that innovative office concepts had "no or limited effects" (p. 1035) on fatigue, health, and productivity, even though the results suggested employees perceived the opposite. Kim and Young (2014, p. 80-81) hypothesized that an office environment with favourable conditions – appropriate lighting, employee density, indoor climate, and ergonomics – would result in better outcomes in health and productivity. The authors found that a comfortable indoor climate with positive air quality, temperature, and outside views significantly affects employee health and productivity, as well as satisfaction by reducing employee turnover (p. 88-89). Predictably, ergonomic measures – adjustable computer monitors and chairs – improved health and productivity rates, although there was minimal effect on turnover (p. 89). While the design of the office was not specifically mentioned, the calculations for density (p. 82) suggest that there was at least some open-plan area involved.

Ergonomics

Other review articles, particularly those concerning chairs and computers, corroborate the importance of ergonomics and furniture. One primary concern is the impact of workstation changes on the health and well being of employees. In a public sector ergonomics experiment, May, Reed, Schwoerer, and Potter (2004, p. 131-132) found that several ergonomic interventions – changes to seating, computer locations, and computer aids – were responsible for increases in workstation satisfaction and reductions in the upper body pain office workers commonly experience. The study also discovered that employee age contributed to the results; younger employees perceived ergonomic workstations as more satisfying, even with no significant change in pain or eyestrain. These findings are not exclusive to modern computing or ergonomics; Stellman, Klitzman, Gordon, and Snow's (1987, p. 108-109) study on workers using visual display terminals (monitors) found higher rates of negative responses to ergonomic and environmental stress with more prolonged usage.

Productivity

In terms of productivity, Jaffri (2015) concluded that appropriate furniture in a public sector office had significant positive effects on the willingness of employees to fulfill their responsibilities, over and above office layout, noise, and lighting (p. 47). Conversely, providing inappropriate furniture can be detrimental to productivity and comfort, and may represent a mismatch between the expected and the actual office environment. In a Brazilian office, employees, even when supplied with furniture and workstations developed for open-plan spaces, viewed the furniture as inappropriate for the context of their office and a contributor to inadequate performance (Costa & Villarouco, 2012, p. 3785). Furniture also appears to potentially be of value to the government sector in particular: Langston, Song, and Purdey (2008, p. 61-62) found government employees ranked appropriate furniture higher than those in educational or commercial sectors.

The review studies lead to a conclusion that employees with adequate control of and comfort in their surroundings are satisfied employees, which in turn may create more productive employees. This relationship is congruent with both common sense and business literature; Halkos and Bousinakis (2010, p. 426-428) determined a correlation between satisfaction and productivity significant enough to deem productivity “seriously affected” by both satisfaction and job stress factors. While non-physical qualitative factors such as job security and organizational trust influence overall satisfaction, the review studies suggest that comfortable, controllable physical surroundings are a factor as well. Employees unable to adequately exert control over their surroundings may be less satisfied, less productive, and detrimental to the organization.

4.4 Conclusion

Addressing control issues is important to any office arrangement, but the open-plan designs associated with new office landscapes face a unique set of control challenges. The very nature of open-plan design, regardless of its intent, necessarily increases visibility and subsequently reduces privacy, which the articles in this review have found to be a ubiquitous concern. Open-plan offices also impose a degree of mandated uniformity; interchangeable or repeating furniture, workstations, and technology further reduce employees' ability to control space and may result

in territorial or claiming behaviours. A uniform indoor environment – preset lighting, temperature, and so on – may impact employee perceptions of comfort and have an effect on productivity. Finding an effective balance between employee and organizational control of the office environment presents a concern public sector organizations implementing new office designs will need to address.

5.0 Findings: Culture in Open Space Work Environments

The office is a working environment, but it is a social environment as well; accordingly, the review found numerous cultural themes consistently appearing throughout the literature. Open offices have unique effects on employee behaviour, which establishes norms and rules for social conduct that contribute to office culture. A similar contributor concerns how employees manage their interactions, both with each other and with the environment: office designs influence the social and work-related interactions that comprise office culture. The manner in which an organization manages the design process from development to implementation also seems to effect culture, influencing employee attitudes towards their new working environment. This section examines these themes and their relationship with employee office experiences.

5.1 Subtheme: Conduct

A cultural theme cutting across much of the literature concerns employee conduct in the office. In addition to the effects on privacy and space ownership, office designs share a relationship with office conduct. This relationship influences the development and implementation of both formal and informal rules and policies. In a formal, top-down sense, an organization may decide to implement a broad, overarching policy to achieve a certain objective – standardizing space usage or increasing collaboration, for example – and require offices to adjust their physical conditions to conform to the standard. The way employees interpret, obey, or resist these directives may lead to the development of parallel informal rule sets unique to each office that may be inconsistent with formal policies. This split between espoused and actual conduct appears in multiple cases and is consistent across open-plan, hotdesking, and other innovative office approaches. While the effect on employees varies in direction and degree, the literature suggests office design influences social etiquette and employee conduct and contributes to shaping overall office culture.

Civil Inattention

An overarching trend in offices with higher visibility and shared space is the existence of an implicit social code of conduct. Goffman's (1963) sociological concept of civil inattention appears to play a significant role in office conduct. Civil inattention suggests that individuals in close physical proximity will visually acknowledge one another, but then withdraw their attention in an unspoken agreement that the other is neither insignificant nor a specific target for attention (p. 83-88). Once individuals establish civil inattention, subsequent unintentional visual contact violates the agreement and leads to slight embarrassment and withdrawal. This benign, studied lack of interest demonstrates respect for personal privacy in public space between individuals, while at the same time maintaining an inoffensive and neutral stance.

In the office context, the literature review identified a consistent pattern of civil inattention and social conduct unique to open designs and concerning the direction and focus of an employee's gaze. With lower partitions and closer employee proximity, the increased visibility occurring in open-plan offices appears to require employees to more carefully manage their attention to avoid initiating inadvertent interaction or scrutiny. This paradoxical "unfocused focus" rule of conduct

– acting civilly inattentive to appear inconspicuous – seems to have mixed effects in the office. Pinder and Byers (2015, p. 114) described open-plan conditions as anxiety-provoking; Pinder’s difficulty determining where to direct her gaze to avoid being conspicuous, and the subsequent reluctance to interact, suggests that the implicit requirement of civil inattention respects privacy but encourages isolation and stymies interaction. Her observations of face-to-face communications as brief, localized, and requiring excuse demonstrate the impact of violating social conduct and the “unexpected power of unspoken norms of proper comportment” (p. 116). Similar to Pinder and Byers, Hirst (2011) drew similar conclusions in a hotdesking environment, noting that the norm for office conduct involved minimal eye contact and interaction to avoid interrupting others. The office’s unexpressed social code of conduct required individuals to manage the direction of their focus to appear “as if gazing vaguely into space” to avoid being considered impolite (p. 775). Appel-Meulenbroek, Groenen, and Janssen’s (2011) study also found office eye contact and interaction was a deciding factor in workstation choice in both positive and negative directions; roughly a third of participants chose workstations enabling direct eye contact with others, but an additional third consciously chose workstations avoiding it (p. 128).

The established social conduct rules for workers’ attention in the offices described in the above studies provide evidence of civil inattention’s effect on overall office culture. While a small sample size, and not universally reflective of all offices or cultures, there appears to be at least some degree of consistency in civil inattention’s influence. Although Hirst (2011) and Pinder and Byers (2015) studied UK offices, and Appel-Meulenbroek, Groenen, and Janssen (2011) an office in the Netherlands, social conduct requiring an unfocused gaze, polite but minimal acknowledgement of others, and avoiding interruptions seems to be an important underlying phenomenon. The fact that there is no evidence of formal or codified rules regulating social conduct in any of these offices provides an interesting perspective and avenue of potential research across cultures to test the level of ubiquity of implied codes of social conduct in offices. The studies’ findings of more negative than positive evidence suggest that civil inattention, however polite in intention, negatively influences office culture. When combined with the seemingly ubiquitous employee desire for control over privacy, the norms of civil attention required across designs with more openness seem to stifle interaction and run counterintuitive to the general objective of unique office arrangements.

Rule Attitudes

In the studies examining cultural aspects of offices with open designs, there is a consistent trend in attitudes towards established and informal office rules and policies. Each office in these articles, regardless of location or design, features unspoken agreements concerning the extent of obedience the formal office policies command. Policies explicitly developed to regulate conduct in these types of offices – for example, limits on personal object displays or settlement of workstations – seem to be invariably flexible. Employees consistently treat rules specifically governing open office use as negotiable and adjustable to suit individual or collective tastes. This conduct is consistent with Strauss’ (1978, p. 229) notion of implicit negotiation: employees continually stretch or flout the rules, but the rules do not change in response, and an implicitly agreed-upon and condoned set of deviations from the rules emerges.

There is considerable evidence of agreed-upon rule deviations in the literature. Particular to non-territorial or hotdesking environments, rules prohibiting desk-claiming behaviour – the essence of these types of office designs – had markedly little traction. What is also common in these environments is little to no enforcement or managerial championing of desk-claiming policies. In Hirst (2011), many employees continued to violate the official rules by repeatedly using the same desk for reasons of convenience, productivity, privacy, or aesthetics. Managers exhibited the same behaviour, suggesting that all office employees, regardless of status, operated under an implicit agreement that the official policy had fuzzy boundaries. Although employees collectively respected the unspoken agreement allowing claiming, the decision to claim seemed to rest on individuals' desires. This had uneven effects, as employees who did not or could not exercise claiming rights were restricted to less desirable desk choices while at the same time compelled to respect the agreement and not challenge the unofficial claiming rights of others.

Poor response to new office arrangements may also contribute to poor adherence to official rules. Appel-Meulenbroek, Groenen, and Janssen (2011) and Brunia and Hartjes-Gosselink (2009) recorded similar experiences involving employees violating official policy in separate activity-based and non-territorial environments. In both studies, the organizations had official policies prohibiting desk-claiming and personalization of workspaces; in both organizations, both actions persisted and the prohibitions had limited and arbitrary adherence. The activity-based office in Appel-Meulenbroek, Groenen, and Janssen (2011, p. 128) garnered relatively low approval ratings for both suitability of workstations for intended activities (60% satisfied) and overall balance between individual and team workstations (48% felt the balance was off). The poor ratings for the office design may be reflected in the fact that over two-thirds of workers never switched workstations regardless of the type of work. Employees seemed to have an implicit agreement sanctioning the repeated use of singular workstations; consequently, a quarter of workers personalized workstations and a third indicated that they avoided workstations because they knew certain employees tended to sit in certain locations. A negative reaction to a change to a non-territorial office in Brunia and Hartjes-Gosselink's (2009) study produced similar deviations from official policy in favour of implicit agreements. The new environment and the prohibition on personalization contributed to "a decrease of humanization" within the organization and "an all about business" attitude, offsetting the fact that most employees had 25+ year tenures at the organization and positive job identities (p. 8). The perceived loss of control and identity brought on by the new environment led to employees discarding the official policy and personalizing both temporarily at individual desks and permanently in group areas. There was a general attitude across the office that so long as personalization did not bother anyone, it was allowed.

Despite the trend of unofficial rule sets emerging in response to ineffective formal policies, informal rules need not arise antagonistically, and can provide beneficial impacts. Strauss' (1978) negotiated order perspective suggests that rules are constantly evolving and shaped by those subject to them through continuous negotiation and interaction; as a result, the conditions of the work environment may create a system bearing little resemblance to the system the official directives intended to establish. Meiners' (2015) study of an American municipal office switching to an open-plan arrangement provides an example of beneficial informal rules. The mayor initiated the change in the interest of improving transparency and efficiency (p. 22) even though his staff did not have interdependent work routines. This initially seems to follow the

pattern of other articles found in the review: an executive-level decision to increase office openness in conditions where it may not be desirable or beneficial overall. What is different about the office in Meiners' case is that employees developed their own informal rules and ways of operating that the mayor – although often away from the office – participated in. Although there was a loss of privacy, employees had a tacit agreement on conduct that used office openness to their advantage; through benign surveillance, staff could overhear and subsequently participate in relevant issues, referred to as “half hearing” and “jumping in” (p. 23-24). The design also enabled an informal expansion of job roles, as employees who did not have the responsibility of responding to incoming calls were able to recognize and assist when the call volume became overwhelming.

In all of these scenarios, the official policies emerging from open-plan environments and regulated office usage held limited authority and led to the development of parallel rule sets. The intersection of formal and informal rules seemed to produce inconsistent effects in each office studied in the review articles. In Hirst (2011), the informal rules resulted in some employees having personalized, consistent desks, while other employees did not have the opportunity to choose. In this situation, even though the formal policy favoured the disadvantaged employee, the power of the implicit group agreement on conduct and the informal policy denied them what was a supposed official right. Similarly, in Appel-Meulenbroek, Groenen, and Janssen (2011) and Brunia and Hartjes-Gosselink (2009), the existence of formal and informal rules produced implicit agreements sanctioning rule interpretation, resulting in differences in workstation use and personalization. Brunia and Hartjes-Gosselink in particular highlighted the impact of delegating personalization decisions to the individual, noting that employees personalized differently depending on individual factors, including their attitude towards the non-territorial environment and their acceptance of the formal policy (p. 6). Finally, Meiners (2015) acknowledged the role of informal rules in producing positive effects; quickly responding in a hectic environment led to a necessary encouragement of additional participation stemming from overhearing conversations facilitated by the open office. The informal rules complemented the formal aims of transparency and efficiency, resulting in enhanced job roles and increased collaboration. Whether positive or negative, the informal rules in each office were large contributors to the office conduct and the broader office culture.

However prevalent they might be, this is not to say that placing primacy on unspoken, informal norms over official policies is universally effective. Championing an unpopular official policy and punishing transgression is equally inappropriate. Formal rules may be restrictive and ineffective if inadequately encouraged or enforced but can provide codified guidance unresponsive to individual whims. Informal rules may better fit a particular office and contribute to group identity and closeness but may also create employee disparity in less collegial environments and may be lost with employee departures. New rules may be a result of poor design, organizational antagonism, or genuine interest in improving office operations; whatever the case, the literature indicates new office arrangements will generate new versions of both types of rules. Overall, the articles evidence a consistent theme of rule negotiation, and suggest that employees will interpret both formal and informal rules to suit the reality of their environment, regardless of organizational input or authority.

5.2 Subtheme: Interaction Behaviour

One interesting direction in office design research is the study of architectural impacts on human behavioural patterns. This stream of research stems from social relations theory and the social relations approach, which suggests that the absence of walls or barriers leads to interaction and relationship formation amongst employees, leading to subsequent increases in employee motivation and satisfaction (Oldham & Brass, 1979, p. 267-269). The social relations approach also contends that high levels of social interaction create familiarity and positive individual perceptions of other employees, resulting in higher task performance. The influence of physical design and physical factors on employee circulation and interaction within the office was a consistent theme of study across the literature.

Interaction Patterns

Rashid's work on human interactions in public organizations is particularly notable and relevant. Rashid, Wineman, and Zimring (2009) used space syntax methods, observations, and quantitative measurements to produce a map of human movements and face-to-face interactions before and after an organization's move from a cellular office to an open-plan design. The catalyst for the move was a leadership belief that employee interaction and collaboration rates were lagging and inducing negative employee satisfaction and reduced organizational commitment. The study found that the social relations approach did have some support; more human movement and thus a higher potential for interaction occurred in more accessible and visible spaces. An increase in the overall number of recorded face-to-face interactions – essentially, communication – provided further support to the theory. This is consistent with emerging public sector office redesign policies, which commonly cite increased communication as a primary impetus for moving to open-plan designs. Although the move achieved the organization's objective of increasing overall interactions, the results were mixed. Interactions did not uniformly increase; despite a five-fold increase in interactions in the common areas, the proportion of interactions occurring at individual workspaces (between 80-85%) was not significantly different between the cellular and open-plan designs (p. 14). Higher job satisfaction did not experience a statistically significant increase, and there was insufficient evidence to support the belief that increased social interaction influences job satisfaction or organizational commitment.

Steen, Blombergsson, and Wiklander (2005) also tracked human movement and interaction patterns in public sector offices with similar functions and responsibilities but with different office designs, both internally and architecturally. Consistent with Rashid, Wineman, and Zimring's (2009) findings, the authors found workstations comprised the majority of interactions, and that accessible and visible spaces generate more movement, whether the spaces are the result of architectural construction or internal workplace arrangements (p. 186). Also consistent was the finding that even with increased movement rates in these areas, there is limited evidence positively linking accessibility to interaction: the highest traffic zones had comparatively fewer interactions. Less interaction also occurred in areas with poor visibility, such as offices with deep plan designs where workstations may be located far away from accessible spaces.

Interdepartmental Interactions

An additional issue evident in the research is the relationship between physical office designs and silo behaviour. Arranging employees in discrete hierarchies based on common functions – the organizational silo - can isolate and fragment organizations, reduce integration, encourage ‘us and them’ team mentalities, and negatively affect relationships between departmental teams (Cilliers & Greyvenstein, 2012, p. 3). While an organizational silo is not a physical structure in and of itself, office design has the potential to mitigate, or exacerbate, the invisible barriers silos present.

In Steen, Blombergsson and Wiklander’s (2005) study, office design had both positive and negative effects on silo behaviour. Although internal movement expectedly constituted most of the total employee movement, border-crossing – defined as movement between people in different zones or groups – occurred in consistent patterns depending on the general shape of the internal arrangement. Ring-shaped arrangements experienced the most border-crossing behaviour, followed by decreasing rates for rectilinear shapes or dead-end zones; in the worst case, layouts with stairs or common foyers experienced notably little border-crossing (p. 183). The shape of the internal design seemed to have a consistent impact: border-crossing behaviour is better facilitated through shorter distances requiring movement through different zones with minimal common area and without requiring stairs. While the study’s research suggests that movement does not guarantee interaction, movement is at least a potential generator of interaction. Office designs favouring more effective border-crossing conditions may initiate more cross-border movement and interaction, contributing to potential reductions in silo behaviour.

The ability to control office design is a considerable resource if an organization intends to attempt to increase meaningful interactions amongst employees. The finding that office design can positively contribute to interaction rates and integration between separate groups might suggest that situating departments together in a central location is favourable and effective, in addition to its potential economic appeal. The essential rationale for colocation is rooted in social relations theory; as in any innovative office design, arguments in favour of colocation contend that manipulating physical and visual distance to create closer proximity is beneficial for interaction (Rashid, 2013, p. 3-4). If an organization accompanies colocation efforts with the creation of enticing public space and simultaneously de-emphasized private space, the expected result is that employees will be drawn to the public space and experience more diverse interactions outside of their departments.

Rashid’s (2013) study on colocation provides only limited evidence supporting this idea. Rashid’s study examined the effect of colocation by scoring employee perceptions of environmental design – whether the facilities were appropriate for interaction – and interaction freedom – where, when, and how they could interact – in a series of government departments with different functions collocated to a single building. The building design allocated each department a defined area, but all departments were connected and shared building amenities in an environment with more visibility and openness than any of the previous offices. Rashid’s study revealed inconsistent results among the departments; the facilities’ support for formal and informal interaction variously ranked positive, negative, and unchanged from pre- to post-move.

It is worth noting, however, that these results were less disparate and demonstrated an overall improvement after the move, suggesting that colocation produces more uniform perceptions of interaction support. This is not surprising, as departments previously in their own buildings were now sharing a common space; the downside to the colocation was that even with overall improved employee perceptions, overall interaction freedom decreased. Employees may have felt more guarded in a colocated environment, and, importantly, chance encounters in the common areas did not convincingly lead to interaction. This tempers the case for colocation, as the espoused benefits – increased interaction freedom leading to increased face-to-face interaction, collaboration, and team effectiveness – were not realized. The overall study results indicated that although the facility provided sufficient areas for both formal and informal interaction, the conditions were not compelling enough for employees to use them to their full extent (p. 20). Combined with the additional finding that workplace design is a significant factor in interaction freedom regardless of departmental proximity, the fact that the overall interaction freedom diminished implies that individual department culture and other pre-move factors may mitigate the benefits of colocation, and the organization may need to address these factors first.

Expectations and Mismatches

The common theme amongst all the studies examining human behaviour in office settings is that architectural and internal arrangements may not match the ways employees interact. While office design can facilitate positive employee interaction and movement, pre-conceived designs and expectations of where these behaviours should occur without due attention to employee preferences and office idiosyncrasies may lead to ineffective use of space. Multiple studies (Pugsley & Haynes, 2002; Rashid, Wineman, & Zimring, 2009; Steen, Blombergsson, & Wiklander, 2005; Appel-Meulenbroek, Groenen, & Janssen, 2011) found low use of meeting spaces and common and open areas, even when designed with casual or informal environments in mind. This suggests that the problem Pugsley and Haynes (2002) emphasized – mismatches between employee preferences, actual employee behaviours, and provided facilities – leads to not only poor usage of space but also potential lower quality employee interactions. The studies made a reasonable conclusion that most interaction takes place at employee workstations; however, Steen, Blombergsson, and Wiklander's (2005) finding of less interaction at workstations in or adjacent to higher traffic areas may be indicative of persistent privacy concerns. This may have a stronger effect in offices with more openness, and where the dividing line between the communal traffic area and the individual workstation is less distinct.

A final note on circulation and interaction is the potential for increased interaction gained from unintentional office sources. While the studies provided evidence that employees typically underutilized common areas intentionally engineered for interaction, unintentional sources such as printers and washrooms (Mullane et al., 2017, p. 7; Steen, Blombergsson, & Wiklander, 2005, p. 182) can induce movement and provide higher chances of interaction. Effectively placed, these additional sources may be viable vectors for formal and informal interaction and relationship-building behaviour.

5.3 Subtheme: Change Management

At its foundation, the concept of change management is “a structured approach to moving an organization from the current state to the desired future state” (Association for Project

Management, n.d.). Change management is an iterative process, moving in a general direction toward an end state based on accurate identifications of organizational needs and effective implementation plans. To produce an appropriate end result, implementation plans require a clear rationale for the change combined with an equally clear communication of benefits. Effective change management also requires the involvement and participation of affected users to achieve the vision of the future state.

Reactions

Several articles focused on the impact of change management processes on implementing new office environments. Lahtinen, Ruohomäki, Haapakangas, and Reijula (2015) performed an extensive study of change management on a Finnish government office consolidating a two-building, cellular office design into one building with an open plan designed for space efficiency. The authors found that even though the employees were aware of the official project objectives – supporting business area needs, creating flexible workspaces, and preserving the well-being of employees – they nonetheless perceived the intended actual objectives to be space-saving and cost cutting. An externally conducted consultation process designed to include employee representatives did not seem to assuage these concerns; rather, in some respects it exacerbated them. Employees felt that the project parameters were predetermined and the consultants did not understand the nature of their work or design the workspace around employee needs. Some employees did not consider the participation opportunities genuine, deeming the consultation process token or “quasi-democratic” (p. 205). The process did not generate trust in the project or confidence in the solution: a survey indicated uncertainty and pessimism, with nearly half of the respondents disagreeing that the new design would be a positive change or achieve the project objectives. Additionally, around 70% of respondents believed that the new design would either have no effect or weaken the functionality or pleasantness of the premises.

Brunia, de Been, and van der Voordt (2016) found both general and statistically significant correlations between higher satisfaction rates for a new flexible office design and employee involvement and contribution to the new environment. Higher levels of employee involvement and interest in participation were evident in the more successful cases; expectedly, employees graded the implementation process higher in these instances. A cross-case comparison indicated that demonstrated managerial and organizational commitment to change management produced more successful results (p. 41). This finding of a positive impact of managerial leadership and support is in line with public and private research and a common sense “do as I do” type of change management approach.

Inconsistency

Although the studies included in the literature review suggest congruency between user participation in change management and effective outcomes, it does not appear to be universal. Office redesigns attempting to create a physical environment supporting user needs – the architectural concept of *utilitas* – produce inconsistent results. Pugsley and Haynes (2002) examined utilization and usage rates of facilities in a UK office after an office redesign and found that facility supply and demand rates did not match (p. 37). The redesign’s primary objective of creating an environment supporting individual and collaborative work involved

reducing individual workstation and storage facilities and creating more shared facilities. Multiple post-occupancy evaluations found inconsistent results; although users expressed overall satisfaction with the new facilities in post-occupancy surveys, direct observation did not wholly support user perceptions. Usage rates between shared facility types were significantly uneven and seemingly uncorrelated with satisfaction rates; in particular, quantitative observations found that the breakout spaces, while rated well above the mean facility satisfaction rate, were never in use more than 18% of the time. At the same time, the touchdown space, the shared facility with the lowest satisfaction rate, was the second most utilized space. Only the meeting areas and quiet areas produced a correlation between higher satisfaction and higher usage rates. Although user requirements for particular tasks likely mediated both the choice of environment and the usage rate, after 12 months in the new office design, no shared facility yet exceeded 50% usage.

5.4 Conclusion

The themes explored in this section suggest that the physical environment shares an important and reciprocal relationship with employees and office culture. The new office environment creates new patterns of conduct and behaviour, which in turn influences how employees adjust the environment to accommodate them. Similar to the findings in the previous section on control, the results of this relationship may be unexpected or contrary to organizational expectations. Additionally, this relationship extends beyond the office itself; as seen in Brunia, de Been, and van der Voordt (2016), and Lahtinen, Ruohomäki, Haapakangas, and Reijula (2015), an organization's ability – or inability – to conduct positive development and change management processes affects employee attitudes towards the design before implementation ever begins. To create an environment conducive to positive employee experiences, public sector organizations will likely need to take the impacts of office design on office culture into account.

6.0 Findings: Research Trends on Open Space in the Public Sector

The second major category concerned public sector office research trends. While each article was unique in its research interests, methodology, and methods, the following themes reflected consistent trends in public sector office research.

6.1 Setting

One unfortunate trend encountered during the review was the lack of importance of the public sector setting. Although the review process ensured that selected articles were set in the public sector, or predominantly set in the public sector with private sector settings for comparison, the majority of studies did not focus on the organizational setting. In these cases, the choice of public sector settings seemed to be of secondary importance and was generally substitutable with private sector offices. While public and private sector offices significantly overlap in characteristics, there are unique public sector elements pertinent to office landscapes. The public sector shows some evidence of higher formalization of personnel and administrative procedures than private sector counterparts; additionally, lower public sector satisfaction ratings appear tied to low autonomy and extensive rules (Rainey & Bozeman, 2000, p. 455-459). Public sector employees also have less authority to make decisions, and have political mandates shaping their operations that may substantially change over time and stymie innovation (Nutt, 1999, p. 314-316). All of these conditions may impact public sector organizations' ability to design and implement innovative office concepts that are both consistent across offices, yet sufficiently tailored to context.

Despite these differences, the review found only limited evidence of public sector-focused research. Only two articles (Kim & Young, 2014; Meiners, 2015) were concerned specifically with public sector impacts. The connection between government policies and open-office implementation was not well represented; only Pugsley and Haynes (2002) and Giddings and Ladinski (2016) referenced official documents. There was also a minority of government-funded studies in Australia (Houghton, Foth, & Hearn, 2018); Canada (McCarrey, Peterson, Edwards, & von Kulmiz, 1974); Finland (Lahtinen, Ruohomäki, Haapakangas, & Reijula, 2015); and the UK (Pinder & Byers, 2015; Pugsley & Haynes, 2002). A final two studies (Langston, Song, & Purdey, 2008; Mullane et al., 2017) quantitatively compared private and public sector settings. Overall, the articles the review encountered indicate that there is a gap in the research on the relationship between public sector characteristics and open-plan office designs that could benefit from further study.

6.2 Research Instruments

An additional, potentially problematic trend in the research is the reliance on surveys as primary data collection instruments. Surveys and questionnaires, while widely utilized in organizational research, introduce an unavoidable element of subjectivity and bias that pose threats to data validity and representativeness. In the review, 19 of the 25 included studies utilized surveys, often as the only research instrument, as a basis for analysis. To achieve a more objective analysis, some studies, particularly those focusing on employee interactions, used topographical

and spatial layout software in addition to using surveys. The surveys in the review studies often relied on ordinal Likert scale-style questions, making it difficult to measure response intensity between scale degrees (Jamieson, 2004, p. 1217). The survey samples were highly variable, ranging from a few dozen to a few thousand participants. Response rates were similarly variable, ranging from 29% to 100%; 6 studies did not achieve a 50% response rate. Although the review results suggest that additional research emphasizing measureable methods over surveys would be beneficial, it would be difficult to separate the actual from the subjective. The effect of the physical environment on the employee is both real and perceived; as Langston, Song, and Purdey (2008, p. 64) noted in their comparative study of working conditions, “to some extent perceived conditions are all that matter”. To increase generalizability, further research will likely need to incorporate both objective and subjective elements.

6.3 Practicality

A final trend in the articles is a lack of translating experiment into action. 17 out of 25 articles did not substantively discuss specific recommendations and/or best practices emerging from the data. This is unfortunate, as many of the results are conducive to recommendations for further research, best practices, and practical applications. Although one publisher (Emerald) appears to require practical and research implications as part of its abstract format, in the articles reviewed, these recommendations were generally descriptive of the results as opposed to actionable applications. Interestingly, none of the articles directly acknowledging government funding contained best practices. While it is a small sample size, and likely that other studies in the review received government funding, the absence of prescriptions or recommendations for action is notable.

6.4 Conclusion

In summary, the thematic analysis suggests that public sector office research tends to follow consistent patterns. The decision to set the study in a public sector office setting differed between articles; while some researchers focused on the public sector by choice or by government commission, others used the setting to contrast with the private sector. There may have been an element of selection simply due to appropriateness: the choice of organization may have depended on which best fit the research. Although the review captured articles with a variety of methods, the amalgamation of methods and methodologies produced evidence of common research approaches. Regardless of the setting, there was an overall preference towards quantitative research using survey-generated and quantitized data with significantly different sample sizes and response rates. There was also a dearth of specific prescriptions for best practices stemming from the research. The consistency in research patterns indicates that there is effectiveness in the common approach as well as opportunity for new and novel approaches.

7.0 Recommendations

7.1 Introduction

Based on the findings of the thematic analysis, the physical attributes of an office have a unique and identifiable impact on those who work within it. In order to facilitate positive employee experiences and effective offices, this project recommends that public sector organizations implementing office design programs consider the following set of recommendations, including:

- Selecting task-appropriate, ergonomic furniture providing sufficient privacy;
- Recognizing the value of employee personalization and autonomy over personalization policies;
- Understanding the impact of physical features on employee interaction patterns; and
- Conducting in-depth, extensive evaluations both before and after an implemented design.

This project also recommends that researchers studying office design, and public sector office design in particular, produce more effective and applicable results through adopting the following practices related to research design:

- Reducing reliance on surveys as a primary or exclusive research tool;
- Utilizing more mixed-method research techniques; and
- Intentionally selecting public sector offices as the research setting.

The following table presents a summary of recommendations and maps them to the themes discovered in the report. Each recommendation is associated with, but not exclusive to, a single theme and subtheme: the recommendations are often a product of thematic overlap and intersection.

Theme	Subtheme	Recommendation
Control	Privacy	Choose furniture with visual privacy
	Comfort	Select appropriate ergonomic interventions
Culture	Conduct	Grant employee autonomy over policy Stimulate interaction with personalization
	Interaction Behaviour	Avoid assumptions for employee behaviour Design around interaction patterns
	Change Management	Conduct Pre-Design Evaluations Conduct Post-Occupancy Evaluations

Research Designs	Research Instruments	Rely less on surveys Use mixed and multi-method designs
	Setting	Focus on public sector factors

In the next section, the project will provide detailed explanations of each recommendation and specific actions available to public sector organizations and office design researchers.

7.2 Furniture and Placement

There is clear evidence that the type and layout of furniture within an office space has an effect on employees. Review articles examining ergonomics and furniture choices found impacts on diverse dimensions of the employee experience, including physical health, productivity, and communication and relationship development. The office furniture available – from off-the-shelf designs to the modular furniture pioneered by Herman Miller in the 1960s to custom-built designs – provides an endless array of options suited to each unique office. The choice of other physical office items such as printers or water coolers may also require consideration. In order to provide effective furnishings, the decision-making process will need to identify furniture that balances user needs and business costs with organizational philosophy and intended goals. As an element of office redesign, installing furniture may also be similarly costly, permanent, and carry expectations of longevity. This necessitates not only the appropriate selection of furniture but also its appropriate placement within the office space. The level of complexity involved in implementing office furniture provides a considerable challenge to interior designers, facility managers, and others involved in the design process.

Regardless of the office location or layout, employees in every public sector organization in the review articles indicated a preference for privacy when available. Unsurprisingly, the reduction in privacy inevitable in open-plan designs conflicts with employee preferences and can produce negative effects. The important information uncovered during the review useful for developing furniture recommendations is that increased visibility or closer visual proximity does not guarantee interaction, and may have counterintuitive effects. At best, Rashid, Wineman, and Zimring (2009) found evidence of increased interaction with increased visibility, but only inconsistent or tenuous connections to positive organizational climates (p. 16-17), suggesting that the increased interactions may not be of high quality or a substantial contributor. Despite some additional evidence of increases in task identity or perceived egalitarianism established through increased visibility (Zalesny & Farace, 1987, p. 255), office arrangements placing employees in close proximity to each other without sufficient breakup of sightlines seems to have more concrete negative effects. In some offices, these arrangements produced perceptions of monitoring and reduced trust (Crouch & Nimran, 1989); in others, they produced discomfort and confusion and incentive to withdraw to more private surroundings (Appel-Meulenbroek, Groenen, & Janssen, 2011; Brunia, de Been, & van der Voordt, 2016). These effects are clearly antithetical to the philosophy of collaboration through interaction and the creation of positive office culture that may underline the organization’s desire to redesign the physical environment in the first place.

Offices can mitigate some of the negative effects an open office generates by choosing appropriate furniture and appropriate placement. The evidence from the review concludes that furniture providing the ability to see, and be seen by, other employees does not seem to offer an advantage in interaction or collaboration that outweighs the negative impact on employee privacy or social etiquette. The ability to block out visual distractions and unintentional visual contact with others seems to contribute to a more comfortable environment and less employee concern over social conduct. A clear attempt to reduce privacy losses from a new arrangement potentially leads to perceptions of increased privacy, which Rashid, Wineman, and Zimring (2009) found to be impactful even if actual privacy decreased. Auditory privacy seems less negatively impactful; Crouch and Nimran's (1989) finding of audibility without visibility as a positive contributor to task performance, and Meiners' (2015) positive finding of auditory availability leading to collaboration suggests that an open-plan design that shifts privacy loss from visual to auditory may actually produce benefits.

In light of these conclusions, this review recommends that offices select furniture that offers opaque or semi-opaque partitions. These partitions may be integrated into the workstations themselves or freestanding and made of frosted glass or opaque material suited to the office's taste. The partitions should ideally be adjustable and able to reach eye-level to properly restrict visual access. At the same time, partitions should not be too readily available or able to fully enclose workstations to prevent nesting or attempts to create individual cellular offices within the open environment. These same principles can also be extended to placement: offices unable to or uninterested in allowing partition furniture should use other sight-obstructing objects – built-in architectural features, plants, and so on – to provide a measure of visual privacy. In the absence of partitions or objects, positioning workspaces to break up sight lines and avoiding long rows or workstation groupings facing each other may assist in preserving visual privacy. Although every office will have unique conditions, appropriate furniture selection and placement procedures can accommodate privacy and encourage collaboration while still promoting an open-plan philosophy and achieving space reduction and density targets.

This review also recommends offices seek consultation from both end-users and ergonomists on relevant ergonomic interventions, followed by gradual implementation. Congruent with common sense, the review articles focusing on furniture establish a clear connection between furniture, comfort, and satisfaction, whether in health (May, Reed, Schwoerer, & Potter, 2004) or productivity (Jaffri, 2015) terms. Evidence in the review articles suggests that ergonomic interventions – adjustments in seating, desks, and computer support – produce improvements in upper body pain levels, productivity, and overall comfort and satisfaction. These interventions need not be expensive or require extensive redesign: changes as simple as making wrist supporting mouse pads or removable back supports available can produce positive effects. While the availability of interventions may provide temptation for an organization to quickly implement ergonomic programs or regulate standardized ergonomic solutions, May, Reed, Schwoerer, and Potter's (2004) findings indicate that ergonomic changes influence each other; an effective intervention in one respect may be ineffective in another, or provide greater effect when combined with another (p. 131). Rushing the process also conflicts with evidence of time lag between implementation and effect; although an effective ergonomic intervention seems not to improve immediate or short-term outcomes, positive outcomes occur over time as users respond and the intervention gains traction. The organization as a whole can facilitate the

process by avoiding strict regulations and one-size-fits-all standardized solutions. Encouraging individual offices to solicit user input and develop ergonomic solutions can assist the office in choosing effective interventions that may be useful to other offices in the organization, as well as creating a unique identity that avoids sterile or unsuitable ergonomic environments. As a final note, the authors found that an office simply showing interest in ergonomically supporting employees can have a positive effect on job satisfaction. An organization making a genuine effort to improve ergonomics can increase perceived job satisfaction, even if the interventions' effectiveness is limited. The potential value of ergonomically friendly work environments suggests that offices would do well to carefully consider user needs and seek user input in addition to professional ergonomic advice.

7.3 Conduct

There is little evidence that official office policies restricting territorial behaviour are effective. This approach has merit: universal, codified policy can reduce uncertainty, assist in succession management, and provide a reliable basis for guidance. The issue is that these policies, however specific or well thought out, do not gain traction. There are valid reasons that employees did not feel compelled to comply. In the offices examined in Appel-Meulenbroek, Groenen, and Janssen (2011); Brunia, de Been, and van der Voordt (2016); Brunia and Hartjes-Gosselink (2009); Hirst (2011); and others there were various contributing factors to ineffectiveness in non-territorial policy, including:

- Disruptions to existing social orders;
- Competition for control over more private, aesthetic, or otherwise desirable workspaces;
- Poor manager buy-in, adherence, or enforcement of policies; and
- Inapplicability of policy to office operations and employee office roles.

While organizations may want consistency between employees, or, in the case of larger organizations, between offices, the distance between policy developers and end users can further exacerbate the problems non-territorial policies present. Broad policy by nature cannot recognize the unique environment of each office. Universal prohibitions on claiming territory may have little appeal in offices with limited flexible work capability; similarly, insistence on hotdesking may be unjustified in offices where work is not sufficiently specialized to require diversity in workspaces. In any situation, employees appear to regard non-territorial policies with at best grudging acceptance, and at worst with open disregard.

The problems of and reactions to personalization policy are much the same as those associated with non-territorial policy. There is little to no evidence that employees will consistently comply with official prohibitions on personalization, whether directly or through circumventive methods like clean-desk or non-territorial policies. Of all the review articles, only Houghton, Foth, and Hearn's (2018) study found personalization of limited importance, and the reason could not be clearly attributed to the work environment other than that it was a coworking space using mobile technology and located significantly closer to employees' homes (p. 773). The desire to personalize seems generally ubiquitous, and there is little appetite or ability to enforce restrictions against personalization: no office in the review with espoused personalization policies was successfully able to prevent it. Employees seem to consider rules against personalization as voluntary; while the amount and type of personalization differed between

employees, there seemed to be a tacit agreement that even if officially prohibited, personalization was not an issue so long as it was within reasonable limits.

In light of these responses, this review recommends granting at least some autonomy to employees over the details of office personalization and personalization policy. As the push to redesign the office seems, in government organizations at least, to be externally influenced and top-down in nature, individual offices may be suspicious or resentful of the organization's decision and experience an erosion of trust, as seen most convincingly in Lahtinen, Ruohomäki, Haapakangas, and Reijula (2015). The conversion of private to public space and the shift toward open, non-territorial environments typical of these redesigns will necessarily challenge and wrest some control of physical space from employees. In the absence of space ownership, the personal artifacts employees choose to display – expressions of identity and indicators of emotional comfort, familiarity, and control (Brunia & Hartjes-Gosselink, 2009, p. 7-8) – seem to become all the more important. Preventing personalization while simultaneously implementing office designs reducing employee control will not aid in cultivating employee trust in the organization. Employees cannot counter the loss of physical space in these designs, but retaining the right to personalize within the office will allow them to maintain emotional control. Empowering employees to police office personalization – to establish an informal code of what is acceptable – is a viable extension of trust from the organization. This will also ease the pressure on office managers, which, as seen in Hirst (2011), may have little interest in enforcing formal policy over personalization or territorial behaviour. While employees should not interpret personalization control as a free license to appropriate space, or to flaunt acceptable agreed-upon rules, the ideal version of the non-territorial office – where all space is public, equally desirable, and competition free – is not realistic for organizations to expect. Allowing office autonomy over personalization, to whatever extent the office deems appropriate, provides a goodwill gesture from the organization and can help rebuild trust and offset the negative consequences of a compulsory redesign.

This review also recommends that an organization intending to eliminate personalization respect and consider employee desires to personalize with small, temporary items. There is an important reason to retain some degree of personalization: it offers an increase in the quality of social interactions. The social relations argument – that open-plan offices and closer proximities create better conditions for communication and interaction – is an appealing logic for some organizations. There was ready acceptance of this position in government design programs: every program explicitly expressed better communication and effectiveness as intended outcomes. Government and other public sector organizations should recognize, however, that an open-plan design does not guarantee successful interaction outcomes. Although there were more interactions in the more open and accessible offices in Rashid, Wineman, and Zimring (2009) and Steen, Blombergsson, and Wiklander (2005), this does not mean they were socially meaningful: a large quantity of interactions does not create qualitative significance. By nature, office work requires some purely work-based interactions with little to no social or friendship-building intent. In other situations, the potential for qualitatively significant interaction exists – employees may wish to engage in meaningful social interactions – but there is no catalyst to initiate it. It is in these cases where organizational personalization policies have impact. Simple, common office items – unique coffee cups, family pictures, interesting trinkets, and so on – are personalized expressions of identity and convey something meaningful about the employee

beyond their job role. They are also temporary, easily removed or relocated, and can be invisible in public-facing organizations. Temporary objects also do not conflict with hotdesking or clean-desk arrangements. Although these objects may seem inconspicuous, they can bridge the gap between potential and actual meaningful interaction by identifying common interests and offering a visual cue to stimulate conversation. Most importantly, they can spur a quality interaction and subsequent relationship-building by enticing employees to ask the initial question of “What’s that?” An organization allowing this type of simple personalization creates opportunities for meaningful social interaction; a restrictive policy removes them. Organizations interested in relationship, friendship, or office culture-building should recognize the contribution of even small or temporary personalization to realizing successful interaction outcomes in open-plan offices. Combined with trust in employees to autonomously monitor personalization, organizations can maintain or foster individual identity and office culture, even with decreasing personal territory.

7.4 Interaction Behaviour

To some degree, organizations must make broad design decisions: they are unlikely to be able to accommodate all user input or preference. There is also an understandable desire for consistency in organizations with multiple offices. The issue is not whether the organization should have control over design initiatives at all, but how much: problems occur when these initiatives come with too many preformed expectations and too many decisions already made. This approach has the potential for major human resources – and also economic – repercussions.

The government office in Rashid (2013) provides an example of the negative consequences of inaccurate expectations for new office designs. The organization decided to colocate several distinct departments to a single, brand-new building designed without consideration for organizational or office dynamics. The organization assumed an inherent increase in interdepartmental interaction in an environment made for multiple departments; in actuality, employees between departments interacted neither formally or casually on the expected scale. While it may be economically tempting to build or acquire physical environments predesigned for certain arrangements, the costs and permanence of decisions over office space may outstrip the benefits. In Rashid’s study, the organization’s decision to colocate separate offices into a new building was likely a costly endeavour and based at least partly on a premise of assumed interaction patterns that did not materialize. The organization as a whole, seemingly intentionally or unintentionally, exercised too much control over design decisions and acted in perhaps too unilateral a fashion. There was not enough consideration for the departments and users involved and resulted in ownership of a new building that did not sufficiently satisfy expectations. Too much organizational control of design decisions is a consistent contributor to design ineffectiveness, both in newly built and redesigned environments. It is reasonable for the organization to remain the major authority over design decisions; however, if the balance between organization and user control tips too far in favour of the organization, it may result in environments that live up to the expectations of neither.

Organizations also seem to have an additional issue concerning anticipated outcomes. There seems to be a broad assumption that a predetermined design favourable for interaction – the common spaces, reduced distances, and removed walls of open-plan designs – will inherently cause employees to interact. Hand in hand with this assumption is the expectation that not only

will employees interact more, but they will also interact in the intended manner. The review offices have demonstrated that this set of assumptions and associated expectations is unlikely to occur in practice. The offices experienced numerous interaction issues attributable to design failures: unused meeting and common areas; claiming of private space to avoid public space; using furniture or location as an interaction shield; too large a space or too far a distance between employees; and difficulty locating specific employees for intentional interactions. These offices featured organizational design decisions and assumptions about employee office behaviour that the designs did not validate. A higher value or reliance on employee input on interaction over a predetermined or poorly considered solution could have potentially identified design issues and provided a better picture of how employees actually interact with their space. In the end, conditions for interaction are not guarantees of interaction; employees are the ones interacting within their space, and just because they can does not mean that they will.

Organizations should also avoid assuming that employee interaction patterns are predictable, or that predesigned buildings, layouts, or off-the-shelf office furniture promising interaction gains always deliver. While some predetermined design parameters are unavoidable, a one-size-fits-all design fails to perfectly fit anything: organizations should not expect employees to interact in the exact manner the design predicts. The organization's designers would also do well to consider the current office situation and existing interaction patterns before attempting to use design to engineer new ones. The review offices did not provide evidence that a top-down approach to increasing interaction through design generates the desired employee response, and may actually end up decreasing it. Organizations expecting that a standardized design will influence behaviour in a certain manner fail to recognize that each office is unique, and employee interaction patterns are equally unique, unpredictable, and sometimes run contrary to expectations.

This review recommends that organizations designing an office intended to change employee interaction behaviour design around the user instead of expecting the user to conform to the design. Organizations should also pay attention to current interaction patterns and the potential unintended effect of physical features. The actual effects of a new office design on employee interaction may be much different what organizations and designers anticipate; appropriately conducted evaluations should identify differences in expectations. As an example, designers may expect a lunchroom or breakroom to be a hub of interaction. This is a reasonable expectation, but if the conditions are not right – if it is not the right size, too far away, or does not have the correct facilities – employees may react differently. If designers do not examine job roles, and employees often work flexible hours, from home, or outside the office, a large lunchroom with full kitchen facilities may end up unused. Where individual kitchen facilities exist can also have an impact; if individual work areas have their own microwave, refrigerator, or coffeemaker, there may be no need to visit a breakroom for these facilities. In both cases, the assumed behaviour – that employees would naturally congregate in these areas – would differ from the actual behaviour. While there is no perfect office arrangement, there are some consistent physical features affecting employee behaviour that organizations and designers should keep in mind:

- Meeting rooms. In an open-plan environment that is too noisy or not private enough, employees will retreat to meeting rooms for individual work.

- Casual furniture. Despite the effort to create a more informal and inviting atmosphere, employees seem hesitant to use areas with casual furnishings.
- Destination objects and areas. Employees have a higher chance of interaction in places containing items or services not available elsewhere. Office printers and washrooms can be potential areas of informal interaction between diverse groups of employees.
- Stairs and multiple floors. While Festinger, Schachter, and Back's (1950) study found interaction occurred in residential stairways between distant residents, office stairways do not seem to have the same effect. Buildings with too many floors and stairways create visual and personal distance that can discourage employees from interacting.
- Deep layouts. Buildings or office arrangements with workstation rows that are too long will cause employees to cluster at the ends. Deep cul-de-sac or U-shaped formations will discourage interaction from traffic passing through. Employees will also gravitate towards workstations with desirable features (lighting, windows/outside views, access to circulation areas) if available.
- Foyers and corridors. Similar to stairways or multiple floors, foyers that are too wide or corridors that create too much distance between areas discourage movement and potential interaction between areas.
- Rectilinear layouts. While easy to design and arrange in, purely rectilinear layouts create dead ends with less traffic and interaction.

There are a number of ways in which organizations can address these issues. If the organization has authority over building development, avoiding strictly rectilinear buildings that isolate departments in dead-end areas can prevent silo behaviour. Opening up stairwells and moving them away from the building perimeters can encourage traffic flow. Limiting the amount of floors can help as well, although organizations intending to house a large amount of employees should be careful not to choose single floor designs with too much horizontal distance. Keeping foyers and corridors from being too wide, isolating departments, or stifling border-crossing behaviour will also assist with distance issues and encourage interaction. Organizations can further encourage interaction by identifying often-used objects or areas – such as the above-mentioned printers and washrooms – and designing around these locations. Furniture and workstation layouts should not be too deep or difficult to navigate, and designers should recognize features that employees prize and endeavour to balance the layout to match. In public sector organizations at least, there seems to be a preference for professional furniture: effective themed or casual furniture should involve significant employee input and approval. Finally, while completely eliminating private offices or closed-off meeting areas is unlikely to be realistic, organizations can address the temptation to claim these areas by limiting obtrusive office noise. The use of small, modular rooms, such as the glassed pod designs of Framery Acoustics (www.frameryacoustics.com) and Zenbooth (www.zenbooth.net) can also provide a balance of privacy and openness and do not require placement around building borders. This approach is something of a modernized update to the established “caves and commons” design: private spaces for individual concentrated work border open areas for collaborative work. While these rooms can be expensive – a 6 person, 49ft² Zenbooth meeting room costs around \$16,000 USD – they are customizable, furnished, and can be moved if the organization relocates. These designs have achieved some traction in private and public sector organizations; the companies have clients as diverse as Microsoft, Tesla, and the United States Postal Service. Although any of the above methods of addressing office design need to be contextual and considered, they are

smart practices that can potentially create modern, open, lively, and interactive offices that still remain private – and economically viable.

7.5 Evaluations

Redesigning an office is a multidisciplinary process requiring contributions from a variety of fields. Input from architects, interior designers, facility managers, ergonomists and others will shape the new layout of an office and determine its eventual effectiveness. The considerable amount of coordination required to balance effective design with financial concerns and organizational philosophies makes an office redesign a significant and potentially expensive and time-consuming undertaking. The end result is also permanent, or at least expected to last. It is prudent, then, before designing or implementing a new office arrangement, to analyze the goals of the organization, the reason for initiating a new design, and the characteristics of the office in question. This phase – the pre-design evaluation (PDE) – seeks to define the intent of the new design, facilitate design and implementation processes, and improve the overall outcome. The PDE is applicable to both new and existing facilities, and asks several key questions (Ornstein and Andrade, 2012, p. 93-94), including:

- What is the current state – the arrangement/layout, the functionality, the occupancy level, etc. – of the existing facility's environment?
- How do users perceive the current environment in aspects of health, comfort, flexibility, and usability?
- What job profiles do users have, and what activities do they perform?
- What kind of legal, regulatory, or mandated characteristics must the new environment possess?

Unfortunately, the offices in the review articles that experienced less success after a redesign consistently show either an absent or insufficient PDE phase. In the less successful offices, essential PDE questions concerning current states, user perceptions and/or needs, and building/layout requirements were not satisfactorily answered. Misidentifying user needs was a constant concern; a lack of understanding or concern for job roles and office operations contributed to improper provision of facilities in Hirst (2011), Appel-Meulenbroek, Groenen, and Janssen (2011), and Costa and Villarouco (2012). Pugsley and Haynes (2002, p. 40) also observed mismatches between user needs and facilities supplied, concluding that without a thorough understanding of the nature of an office's work and the roles and procedures of those accomplishing it, ineffective space provision remains a risk. Poor understanding seems to have a particularly negative effect in hotdesking/activity-based environments. In these designs, discrete and differentiated spaces should closely match work procedures, but the hesitancy or disinterest in switching workstations in the offices in Hirst (2011) and Appel-Meulenbroek, Groenen, and Janssen (2011) suggests that a PDE did not exist or misinterpreted user needs.

Poor PDE participation processes creating negative user perceptions were also prevalent. An organization cannot conduct a proper PDE without user participation: it is difficult to construct the current state of the office without input from those who use it. The PDE is also the beginning of the change management process. Organizations that do not have a sufficient understanding of the current state and its impact on change management will struggle to effectively move the office toward the desired future state and may encounter avoidable resistance or negative user sentiment. This was the primary focus and issue in Lahtinen, Ruohomäki, Haapakangas, and

Reijula's (2015) study of user participation in office design; the government organization involved engaged in consultation, but office users did not find it a genuine dialogue. The organization had already decided on much of the final layout, and the negative user perception of the participatory process as more of a "talking to" than a "talking with" suggests users considered it only a token gesture. Similar employee complaints of weak or inauthentic participatory processes occurred in low satisfaction cases in Brunia, de Been, and van der Voordt (2016); conversely, solicitation of user input contributed to higher satisfaction among employees (p. 41). The PDE, user participation, and change management processes share a relationship that seems to dictate the smoothness of and satisfaction with the implementation of a new office design.

The PDE ideally addresses concerns well before implementation; in reality, however, the process is unavoidably imperfect. The organization and the users will likely assume or misidentify some parameter impacting the design during the process. A PoE (Post-occupancy Evaluation) is a process designed to examine the consequences of past design decisions on users and buildings in order to develop knowledge for future use (Preiser, Rabinowitz, & White, 1988, p. 3). PoEs are designed to be systematic and rigorous and include both qualitative and quantitative elements. Both PDEs and PoEs are similar in that they are longitudinal in nature: the PDE predicts and the PoE evaluates. A proper PoE occurs at a predetermined time or multiple times after implementation, ideally to give users time to adjust to the new environment and establish behaviours and opinions about its effectiveness. Like the PDE, the presence and sophistication of the PoE demonstrates the level of interest the organization has in evaluating its design. It can also be a demonstration of organizational commitment to engaging users. The PoE offers the organization the opportunity to learn about the consequences of the design, but also provides an avenue to display authentic interest in user input. In the same way that an effective PDE involves – and responds to – user input before implementation, an effective PoE solicits feedback post-implementation. If the organization makes a genuine effort to include user input during the PoE, and acts upon it afterwards, the PoE can not only help clarify what does and does not work but also contribute to employee satisfaction. In Brunia, de Been, and van der Voordt (2016), users had positive evaluations of the design and the organization in an office responsive to user concerns, while an office that left problems unaddressed was less satisfied (p. 39-41). It is probably not coincidental, and consistent with common sense, that the office with a positive user evaluation had more evidence of inclusive PDE and PoE practices. The PDE and PoE combine to provide a holistic start-to-end perspective on office design effectiveness and identify smart practices for designers and organizations to apply to office designs in the future.

This review recommends that public sector organizations make a commitment to conducting PDEs, while paying attention to one of Ornstein and Andrade's (2012, p. 94) key PDE questions in particular: what are the required characteristics of the building/environment to be designed? The unique environment of public sector organizations requires extra attention towards compliance with applicable policy, whether designing for a single office or a large organization. It is no secret that office designs can provide opportunities for significant cost savings through space reduction. It is also not surprising that the potential economic benefits are an appealing incentive for organizations to create regulations on space usage. This is not a unique proposition: all of the government policy documents and many of the review article offices had space reduction as an emphasized objective. The potential issue that can occur – and that a

proper PDE can address – is when the organization considers space reduction in isolation, and solicits designs based on their ability to suit space requirements without due attention to other constraints. As an example, in the government cases, space reduction policies included an evaluative metric in the form of space/FTE. The requirements were either uniform, as in the British case of 8m²/FTE, or tiered based on worker time in office, as in Canada’s Workplace 2.0 (18.5-1.5 m²/FTE). While an office constructed around either of these measurements will suit regulations on space, they may run contrary to other policies that a PDE examining the operating environment will detect. A conflicting mandate such as a legal obligation to safeguard information may be incompatible if space requirements place employees too close together or allow auditory or visual transmission of confidential information. A similar issue may occur if an office is subject to accommodation or accessibility regulations. A proper PDE that examines employee roles and requirements will identify conflicting policies and allow organizations a pre-emptive opportunity to determine which has primacy. In the event that the design requirements take precedence, the PDE will assist in anticipating consequences and adjusting the design to be as compliant as possible.

This review also recommends public sector organizations require PoEs as a part of any design program. The ability to evaluate design successes and failures and document them for future occurrences makes the PoE a valuable component for any organization, especially when the design is a pilot project or likely to be replicated across multiple offices. It also allows the organization to be honest with itself if the design is unsuccessful, and contributes to a repository of knowledge of what does and does not work. Understanding and judiciously applying the smart practices emerging from PoEs can help an organization anticipate or avoid decisions that it may have otherwise repeated. The PoE will be an additional cost of design, and organizations may be reluctant to bear the cost, time, and effort involved in the process, but there is another unique public sector reason to include PoEs in organizational mandates. In the public sector environment, public stakeholders can demand justifications for the use of public funds. If an organization is interested in cultivating public trust in its use of funds for office design programs, a PoE can provide transparent and accountable measures of effectiveness. The PoE’s ability to establish quantitative achievements of interest to the public, such as space savings or real estate cost reductions, makes it a potentially invaluable tool for demonstrating organizational fiscal responsibility. If an organization decides to relocate to a new office or redesign an existing one, a proper PoE can score the design – ideally using the objectives and metrics from the PDE – and demonstrate the results to the public in a concrete fashion.

Although organizations too far into implementation to develop a PDE can and should still establish some type of post-implementation evaluative framework, the PoE is ideally an assessment of the design’s ability to meet PDE objectives. As effective PoEs share a relationship with PDEs, the organization should consider the processes linked together, and should if possible retain a single firm responsible for both. The firm responsible for developing the PDE and establishing measurement parameters will be more familiar with the organization’s intentions, the design, and the office than a separate firm brought in post-implementation. This continuity occurred in the new open-plan design in Giddings and Ladinski (2016); the office design consultants remained engaged throughout the entire process and worked with the study authors to ensure the PoE evaluated the intended criteria. Additionally, in May, Reed, Schwoerer, and Potter (2004), the ergonomics consultant the organization hired to lead the workstation redesign

program assisted in writing the academic article itself. As many of the variables measured in the review articles are congruent with PoE variables of interest, collaboration between consultants and academic researchers to develop PoEs (and PDEs) may provide mutually beneficial opportunities.

7.6 Research Designs

The articles included in the review used a variety of qualitative and quantitative research designs, but there was less diversity in research methods. The majority of articles demonstrated a preference for quantization techniques and the use of quantitized data – qualitative data transformed into quantitative indicators to achieve more objective conclusions – as a primary source of information for analysis. The articles placed considerable value on the survey method; nearly all studies utilized surveys, in some cases as an exclusive tool for generating data. Interviews were also a popular method. While user perception is an important and necessary contributor to designing an office space, the unequal distribution of research methods suggests overreliance on surveys, introducing a level of subjectivity and uncertainty that may have compromised the results. Some articles noted that surveys could not sufficiently explain results. Appel-Meulenbroek, Groenen, and Janssen (2011, p. 132) conceded that their survey could not account for low usage of facilities with a themed, casual design; Langston, Song, and Purdey (2008, p. 64-65) likewise concluded that responses could have reflected perception over reality. In general, the articles recognized and acknowledged the potential for inaccuracy, bias, and erroneous correlation/causation conclusions, but continued to use surveys as a prominent tool for analysis, perhaps because as Rashid, Wineman, and Zimring (2009, p. 17) wrote in the limitations of their study's survey, "there are no better ways".

Despite the pitfalls of surveys, researchers should not discard them as a source of valuable data: survey results have a useful and relevant role in research with human participants. The issue emerging from the articles, and what this review recommends against, is relying on the survey as an exclusive method of research and an exclusive source of data. Surveys generally involved Likert or quantizable ordinal scales; these designs permitted statistical analysis of responses, but the conclusions were subject to the quality of the survey data and participants' ability to reliably produce consistent responses. While the review articles mostly focused on unique cases with the caveat that the parameters of every office are unique, relying too heavily on survey methods may further limit the ability to generalize or extrapolate results and conclusions.

This review additionally recommends adopting a mixed-method approach to research on office design when using surveys, combining surveys with quantitative methods. Mixed method approaches have the ability to assign relative weight or priority to each method, allowing researchers to de-emphasize the survey method and emphasize other methods in a single study if necessary. The mixed-method approach also offers the potential for more complete conclusions through complementarity – using multiple methods to generate different, complementary data about a single phenomenon – and for more objective conclusions through triangulation and comparison of qualitative and quantitative results (Plano Clark & Ivankova, 2016, p. 3). There is some precedent for this approach in office design research; Rashid, Wineman, and Zimring (2009); Steen, Blombergsson, and Wiklander (2005); Mullane et al. (2017); and Pugsley and Haynes (2002) all used surveys in conjunction with objective measurements to achieve comparative and complementary data. The design of these studies, despite the acknowledged

limitations, maintained a balance between subjective questionnaires and objective physical observations to create a nuanced analysis that surveys alone may not have produced. The results of this review indicate that the relationship between users and space contains qualitative and quantitative elements, and that it is difficult to capture with a single method.

The review results indicate that researchers studying office design impacts in public sector organizations have generally not designated the unique impact of public sector factors as the research focus. Outside of Kim and Young (2014) and publicly funded research, the articles in the review selected settings suitable for the research questions, as opposed to developing research questions around a public sector setting. This is not a fault in the approach – the chosen settings were appropriate for the research – but the positioning of the public sector setting as a means to an end instead of the focus of inquiry offers an opportunity for further study.

This review recommends researchers engage in office design research focused on unique public sector factors such as those found in Rainey (1989). While there is no doubt that public and private sector office designs share similarities, the processes leading to the end result are different enough to produce valuable research. As seen in TW3, political influence can play a role in public sector office design that does not appear in the private sector: the effects of shifting politics and political programs on office design appear unstudied. Similarly, the impact of “publicness” and public accountability on office design practices are additional unstudied areas. The outward-facing nature of public sector organizations and the requirement for responsibility to, in the case of government organizations, potentially millions of stakeholders are factors outside of private sector responsibilities. As a final factor for additional study, offices in public sector organizations – again, government in particular – operate in environments established through regulation and legislation. These offices may be subject to overarching regulatory standards, imposing an environmental constraint factor that inherently limits office autonomy and action (Rainey, 1989, p. 232). The depth and potential impact of uniform standards on office design occurs in the public sector in a manner not seen in the private sector and is an additional unique factor for potential research.

8.0 Conclusion

Many public sector organizations are moving towards shared, smaller, or open-plan office landscapes. Though trending in a similar direction, no two organizations, or the offices they create, are the same: the unique nature of offices resists perfect comparison. Although the aim of this review was to identify themes and develop recommendations facilitating effective office design – whatever the organization’s definition of effective is – the intent was not to condense office experiences into a universally applicable blueprint. Each office is a result of the design processes preceding it, and the culmination of the organization’s intended objectives, available resources, and overall direction. The intangible human elements – the culture, personality, and attitudes of all those involved – add an additional level of complexity to each office experience. Unique to the public sector, regulations and legislations can place further specific requirements on office design, as can sensitivity to political mandates and responsibility to the public. These factors together can make creating a positive office experience for organization and user alike an elusive and challenging process that organizations should consider with great concern.

As mentioned at the beginning of this review, the public sector’s rush to develop new office programs and implement new office landscapes is worrisome, particularly when the organization does not afford the impacts and consequences due care. The findings of this review suggest that the level of organizational attention to design and implementation processes correlates with the results. Although this may seem at first an obvious case of cause-and-effect, it seems to have nonetheless evaded many of the offices and organizations in this review. What is important about this relationship is that it establishes a basis for comparison. The purpose of this review was to discover commonalities between unique experiences connected to office design, and apply this knowledge to a simple to ask, yet difficult to answer question: what does, and does not, work? There are some findings – employees’ desire for privacy, for example – that are both ubiquitous and commonsense. There are other contrasting findings – such as open-plan designs causing decreased interaction – that are arguably more important as counterintuitive design issues. Despite the unique character of each office, this review has identified evidence of consistent positives and pitfalls in office design practices. These findings in isolation should not convince an organization to abandon its design; they are, however, a caution for unexpected results. For public sector organizations, hurried implementation with the expectation that the planned outcome will naturally materialize is indicative of insufficient consideration and may well turn the planned outcome into a poor one. While the trend towards new office designs will likely continue, public sector organizations that balance the obligations of their design programs with a willingness to integrate and adjust to the practices identified in this review will produce a more considered and effective result.

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("office design" OR "office layout" OR "workplace design" OR "workspace layout" OR "workplace layout" OR "workspace layout") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

("open plan" OR "open office" OR "open workplace" OR "open workspace") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

("physical work environment" OR "physical office environment") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

("post-occupancy evaluation" OR "post occupancy evaluation") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

"activity based office" OR "activity-based office" OR "activity based workplace" OR "activity-based workplace" OR "activity based workspace" OR "activity-based workspace" OR "activity based offices" OR "activity-based offices" OR "activity based workplaces" OR "activity-based workplaces" OR "activity based workspaces" OR "activity-based workspaces" OR "activity-based workspaces")

"hotdesking" OR "hot-desking" OR "hot desking"

"office concepts"

"office landscape" OR "office landscaping"

"physical work environment" OR "physical office environment"

("desk sharing" OR "desk-sharing")

("environmental psychology" OR "environment psychology") AND ("office" OR "offices" OR "workplace" OR "workplaces" OR "workspace" OR "workspaces")

("flexible office" OR "flexible offices" OR "flexible workplace" OR "flexible workplaces" OR "flexible workspace" OR "flexible workspaces")

("new ways of working") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

("non-territorial office" OR "non territorial office" OR "non-territorial offices" OR "non territorial offices" OR "non-territorial workplace" OR "non territorial workplace" OR "non-territorial workplaces" OR "non territorial workplaces" OR "non-territorial workspaces" OR "non territorial workspaces" OR "non-territorial workspaces") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

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("office concepts") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

("office landscape" OR "office landscaping") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

("office space") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

("open-plan office" OR "open plan office" OR "open office")

("physical work environment" OR "physical office environment") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

("post-occupancy evaluation" OR "post occupancy evaluation") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

"activity based office" OR "activity-based office" OR "activity based workplace" OR "activity-based workplace" OR "activity based workspace" OR "activity-based workspace" OR "activity-based offices" OR "activity-based offices" OR "activity-based workplaces" OR "activity based workplaces" OR "activity-based workspaces" OR "activity-based workspaces"

"hotdesking" OR "hot-desking" OR "hot desking"

"office concepts"

"office landscape" OR "office landscaping"

"physical work environment" OR "physical office environment"

("desk sharing" OR "desk-sharing")

("environmental psychology" OR "environment psychology") AND ("office" OR "offices" OR "workplace" OR "workplaces" OR "workspace" OR "workspaces")

("flexible office" OR "flexible offices" OR "flexible workplace" OR "flexible workplaces" OR "flexible workspace" OR "flexible workspaces")

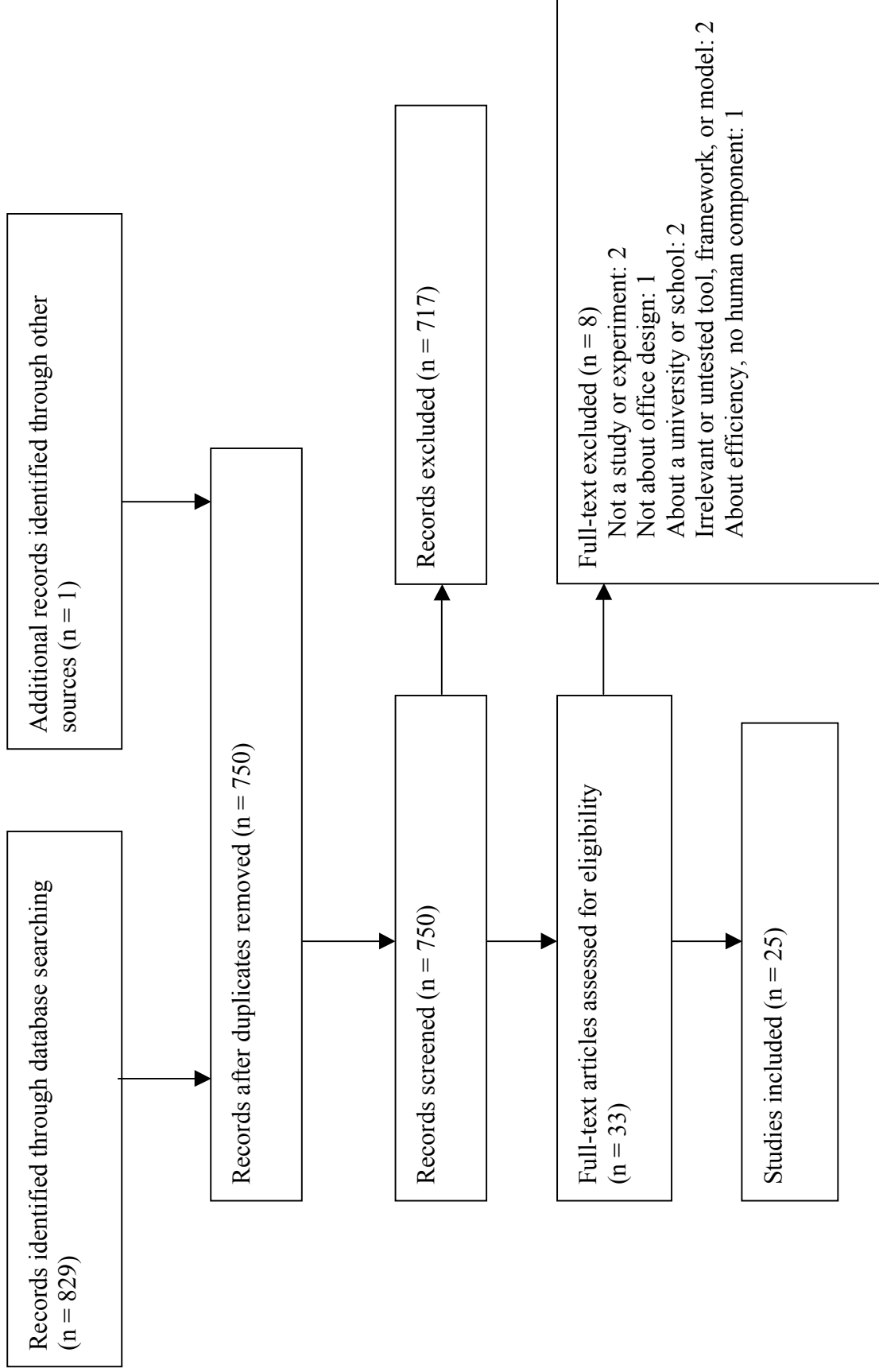
("new ways of working") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

("non-territorial office" OR "non territorial office" OR "non-territorial offices" OR "non territorial offices" OR "non-territorial workplace" OR "non territorial workplace" OR "non-territorial workplaces" OR "non territorial workplaces" OR "non-territorial workspace" OR "non territorial workspace" OR "non-territorial workspaces" OR "non territorial workspaces") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

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("office design" OR "office layout" OR "workplace design" OR "workplace layout" OR "workspace design" OR "workspace layout") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")
("office space") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")
("open plan" OR "open office" OR "open workplace" OR "open workspace") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")
("post-occupancy evaluation" OR "post occupancy evaluation") AND ("bureaucracy" OR "government" OR "governance" OR "local authority" OR "public administration" OR "public management" OR "public sector")

Appendix B: PRISMA diagram



Appendix C: List of Included Studies

Author	Country	Method	Themes ¹	Responses ²	%	Followup ³	Recommend
(Appel-Meulenbroek, Groenen, & Janssen 2011)	Netherlands	Qual	P, T, Con	434	42	No	Yes
(Brunia & Hartjes-Gosselink 2009)	Netherlands	Qual	T, Con	-	-	No	No
(Brunia, de Been, & van der Voordt 2016)	Netherlands	Qual	P, CM	1780	52	Yes	Yes
(Costa & Villarouco 2012)	Brazil	Mixed	Com	-	-	No	Yes
(Crouch & Nimran 1989)	Australia	Quant	P	174	29	No	No
(Giddings & Ladinski 2016)	UK	Quant	P, CM	124	100	Yes	No
(Hirst 2011)	UK	Qual	P, T, Con	-	-	No	No
(Houghton, Foth, & Hearn 2018)	Australia	Qual	T	47	100	Yes	No
(Jaffri 2015)	Pakistan	Quant	Com	Unknown ⁴	-	No	No
(Kim & Young 2014)	USA	Quant	Com	740	69	No	No
(Lahtinen, Ruohomäki, Haapakangas, & Reijula 2015)	Finland	Qual	CM	91	60	Yes	Yes
(Langston, Song, & Purdey 2008)	Australia	Quant	Com	Unknown ⁵	-	No	No
(May, Reed, Schworer, & Potter 2004)	USA	Quant	Com	230	78	Yes	Yes
(McCarrey, Peterson, Edwards, & von Kulmiz 1974)	Canada	Quant	P	1130	53	No	No
(Meijer, Frings-Dresen, & Sluiter 2009)	Netherlands	Quant	Com	349	40	Yes	No
(Meiners 2015)	USA	Qual	Con	-	-	No	No
(Mullane et al. 2017)	USA	Quant	IB	1312	36	No	No
(Pinder & Byers 2015)	UK	Qual	P, Con	-	-	No	No
(Pugsley & Haynes 2002)	UK	Quant	P, IB, CM	48	89	Yes	Yes
(Rashid, 2013)	USA	Quant	IB	284	60	Yes	Yes
(Rashid, Wineman, & Zimring 2009)	USA	Quant	P, IB	Unknown ⁶	-	Yes	No
(Steen, Blombergsson, & Wiklander 2005)	Sweden	Quant	IB	1155	74	No	No
(Stellman, Klitzman, Gordon, & Snow 1987)	Can/USA	Quant	Com	1032	86	No	No
(Tharr & Tubbs 1998)	USA	Quant	P	-	-	No	Yes
(Zalesny & Farace 1987)	USA	Quant	P, T	472	100	Yes	No

¹ P - Privacy, T - Territoriality, Com - Comfort, Con - Conduct, IB - Interaction Behaviour, CM - Change Management.

- ² Fields with "-" indicate that a survey was not used.
- ³ Longitudinal Study or Post-Occupancy Evaluation.
- ⁴ Population size unknown; 185 participants.
- ⁵ Population size unknown; 2994 participants.
- ⁶ Population size unknown; 86 participants.