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Investigating Equitable Office Design: Addressing Women's Wellness in the Corporate Office through Human-Centered Design to Improve the Quality of Life for all Employees

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Abstract

The goal of this undergraduate capstone project is to investigate how open offices impact women in the workplace and to propose a prototypical alternative to an open office. Both a literature review and a research agenda were conducted, in order to gather information regarding this topic. The literature review outlined current research on the topic. It was found that, while open offices were originally designed to allow for equal workspace and greater collaboration, budget costs and private offices remaining in high demand diminished many of their positive qualities. Consequently, open offices began to rely on a hierarchical layout, which often causes gender segregation due to gender imbalance in the leadership of companies. Currently, open offices have issues regarding acoustic and visual privacy, uncomfortable interior temperatures, and gendered furniture. There are also often a lack of accommodations for women, such as lactation rooms. These issues often impact women more than men, resulting in a higher sick leave and heightened discomfort amongst women. The research agenda is organized and completed in three parts: an on-site observation, a survey, and interviews. The data collected often aligned with and substantiated the data from the literature review, confirming that both men and women experience discomfort in an open office environment, but the negative impacts on women are greater. While many people praised the open office environment for promoting teamwork and collaboration, it was also found that teams were often not placed together, and the opportunities for productive social interaction were often wasted on distracting conversations. The findings also highlighted elements of the

open office that were lacking, including privacy in circulation spaces, acoustical control, and spaces for quiet and private work. The final step to this capstone project implements the data and findings into a realistic application. The final creative agenda uses evidence-based design to propose a prototypical alternative to an open office, based on the concept of transparency, translucency, and opaqueness. Transparent and translucent areas utilize minimal to no partitions, but as spaces become more opaque, more partitions are employed. Workspaces are designed with visual and auditory privacy in mind, with many acoustical applications throughout the office space to dampen the spread of distracting noise. Rather than assigning employees to one workspace, everyone is encouraged to choose where they want to work based on their workstyle and privacy needs. Because this layout does not rely on a hierarchical divide of space, everyone is given the equal opportunity to use the office space as best fits their needs. This eliminates the gender segregation that a hierarchical layout often creates. Additional considerations for the needs of women in this prototypical office include two private wellness rooms that can be used as lactation spaces, private corridors with minimal site lines, and a warm and bright interior that combines both traditionally masculine and feminine aesthetics.

Keywords: office design, women in the workplace, open offices, open office layout, furniture design

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Introduction

This capstone aims to investigate how the built environment can impact the wellbeing of women working in corporate offices. In the mid-20th century, office design took a turn towards the open office plan, a layout that places all or most employees in an open space. This revolutionary idea was implemented in a time when men were the majority in the workforce. It was not until a decade later, in the 1970s, due to economic need and an increase in women attending college, that a larger percentage of women began entering the workforce. In the present day, many institutions continue to design their offices based on 20th century open office concepts. While noted for their efficient use of space and egalitarianism, these designs are not without their shortcomings, such as a lack of adequate acoustical and visual privacy. While these issues can impact anyone in the workplace, researchers have noted that in regard to acoustical concerns, for example, “women [are] reporting more noise disturbances in office environments,” which, for women in high complexity workplaces, “correlates with absenteeism” (Bodin et al. 162). Women tend to be more uncomfortable in the office than their male counterparts, leading to issues such as stress and possible increases in sick leave. As a result, open office designs can disproportionally impair workplace satisfaction and comfortability. This capstone will bridge the gap between women’s inequality and the built environment, identifying how office design can actively consider women’s wellness. A new framework conceived to solve open office plan shortcomings has the potential to improve the experience for all workers and create a more equitable workplace.

Literature Review

History of Open Office Design

In the post-World War II economic boom, corporations around the U.S. began constructing larger office buildings and campuses. While these buildings often had more space than pre-war offices, the underlying design remained the same, with private offices for managers and executives and an open bullpen for clerical workers. This hierarchical structure produced workspaces that reflected each workers' rank. Critics have called attention to the emphasis on status and how it "came to symbolize the creative stagnation in corporate America in the 1950s and 1960s" (Kaufmann-Buhler, "Progressive Partitions" 208). The open office concept emerged in part as a response to these issues.

The open office evolved from two office concepts: the Quickborner Team's office landscaping and Herman Miller's Action Office. Brothers Eberhard and Wolfgang Schnelle, who founded the Quickborner design team, developed the idea of office landscaping during the 1950s (*Fig. 1*). They removed all private offices and, instead, placed all workers into "irregular configuration with strategically placed plants, furniture, and freestanding screens to create modest privacy" (Kaufmann-Buhler, "Progressive Partitions" 209). These configurations were based on studies that tracked the people who were most likely to communicate and interact throughout the day. These people were then placed close together to make the office more efficient. The Herman-Miller Action Office, developed by Robert Propst in the 1960s, incorporated a more uniform layout, with workstations that were customizable and modular depending on the

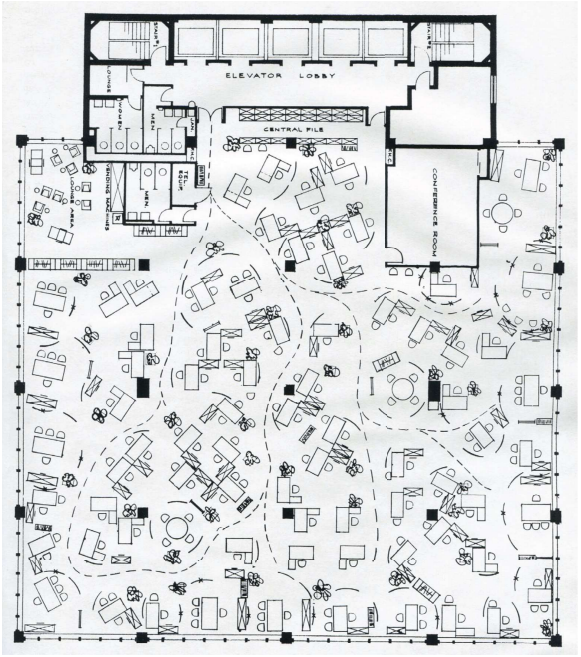


Fig. 1: Office Landscaping Plan (Kaufmann-Buhler, 2016)

preferences of each worker (*Fig. 2 and 3*). While some companies were concerned with maintaining a hierarchical layout, by the 1970s these two concepts merged, prompting an office landscaping approach with modular furniture. This is what became known as the open office design.

The first iterations of the open office succeeded for several reasons. By designing a layout that reflected the communication patterns in the office, rather than company hierarchy, offices "encouraged interdepartmental and intradepartmental communication and collaboration" (Kaufmann-Buhler, "Progressive Partitions" 212). As a result, the nature of work itself began to shift. Rather than a focus on each individual employee working on their own tasks, companies emphasized teamwork and group thinking. Because of this emphasis on collaboration, in which "all workers were (purportedly) thinking, collaborating, and making decisions, a number of American architects and designers argued that all workers were entitled to equally luxurious workspaces" (Kaufmann-Buhler, "Progressive Partitions" 213). In addition, modular furniture allowed employees to customize their workspaces without requiring special tools or know-how. Lastly, the concept succeeded because it easily allowed companies to adapt to change. "One of the greatest benefits of the open plan concept was its very impermanence and disposability," and was recommended to companies looking for flexibility (Kaufmann-Buhler, "Progressive Partitions" 216).

Fig. 2: Herman Miller Action Office (Kaufmann-Buhler, 2016)

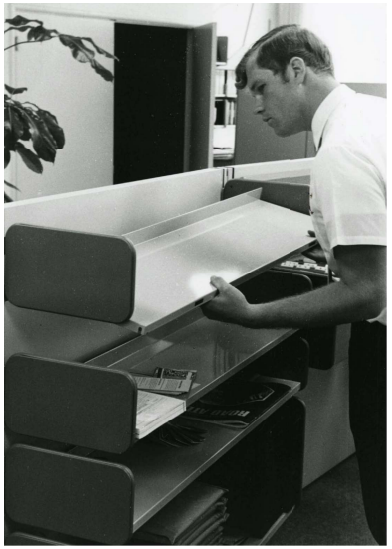


Fig. 3: Moveable Office Furniture (Kaufmann-Buhler, 2016)

Despite these many benefits of open offices, they were far from perfect. Their shortcomings emerged during the economic downturn of the 1970s. In 1971, the Weyerhaeuser Company opened one of the biggest office landscaping-style offices. Every employee, including executives, worked in an open space. As a result of the need to accommodate headcount growth, by 1977, Weyerhaeuser's average workspace size had shrunk from 210 to 145 square feet. The company, like others at the time, realized that they could squeeze more employees in an open office due to the smaller workspace footprint and increasingly inexpensive and portable furniture. While some designers warned that this idea would violate what the open office was originally intended to achieve, corporations continued to implement open office layouts for economic reasons. By 1980, “half of America’s white-collar workers were in open plan offices,” many of whom found themselves working in ever smaller spaces (Kaufmann-Buhler, “Progressive Partitions” 218).

As a response to shifting and shrinking workstations, many employees were being caught taking partitions, plants, and furniture into their workstations to personalize their space and give themselves more privacy. Because of this, “workers were often discouraged from altering the layout of their workstation and in some offices even told that they could not move furniture at all without permission from facilities management,” which rendered the modular furniture useless (Kaufmann-Buhler, “Progressive Partitions” 220). For the companies that still allowed

personalization, the introduction of personal computers complicated movable furniture systems. To accommodate the power computers need, office furniture often had to be anchored to the floor and could only be moved by professionals.

The social aspects of the workplace were also changing during this time. While senior leaders increasingly used computers, their jobs allowed them more freedom. Clerical workers, however, frequently found themselves stuck at their workstations all day. Concurrently, partitions were being made taller, with the goal of creating more privacy and blocking office noise. This resulted in the first iterations of cubicle design. Many of these lower level workers, however, saw the partitions as a barrier to socializing. Managers encouraged them to remain focused on their computers, and employees “were often subject to constant electronic surveillance” that tracked when they were working (Kaufmann-Buhler, “Progressive Partitions” 226). This neutralized the intended privacy of the high partitions, workers were being surveilled even if their managers could not make visual contact with their workstation-based employees.

Despite the lack of private offices in the original open office designs, private offices remained a popular amenity in the 1970s and ‘80s, and were most often reserved for those of high status in the company. This created a power imbalance, as “workers in executive and management

positions were disproportionately comprised of white middle- and upper-class men" and were therefore given more space and autonomy, but the lower level, clerical workers "were disproportionately comprised of women, people of color, and persons from the working classes" (Kaufmann-Buhler, "Progressive Partitions" 227). During the late 20th and early 21st centuries, usage of high partitioned cubicles and low partitioned open offices fluctuated, though both perpetuated these issues, as offices using either approach often regressed to a hierarchical layout.

Today, despite the fact that companies, especially tech, have adopted open offices that promote freedom for their employees, the phenomenon has not become ubiquitous. Many firms lack the resources to redesign and "continue to work within the confines of a dreary cube farm in tightly controlled jobs that offer little autonomy or freedom" (Kaufmann-Buhler, "Progressive Partitions" 228).

Current Open Office Design

In her articles studying office design, Swedish researcher Christina Bodin Danielsson categorizes open offices into three different sizes: small (four to nine people per room) (*Fig. 4*), medium (10 to 24 people per room), and large (more than 24 people in a room) (*Fig. 5*). She also studies “flex” and “combi-offices” that offer a more flexible layout, but are most often open in some way (*Fig. 6*). While her classification is subjective in some ways, they give a good understanding of size differences and how they impact the experiences of employees. There are also many different styles of open offices, which depend on use and types of partitions. While most investigative research on the topic does not specify the style in question, it is important to note that they differ in their degree of openness and, therefore, privacy. There are four styles that are most commonly used today: mid-height partitions (*Fig. 7*), low or glass partitions (*Fig. 8*), no partitions (*Fig. 9*), and hotelling (*Fig. 10*), which allows employees to pick where they work on a day-to-day basis.

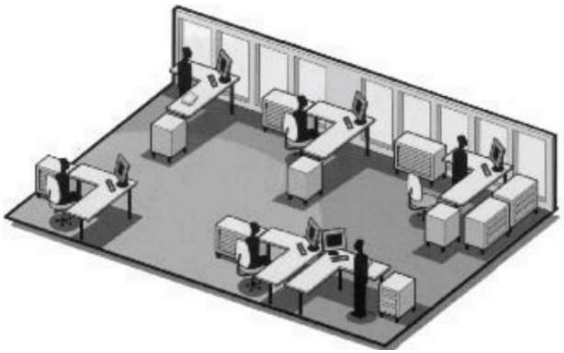


Fig. 4: Small Open Office (Bodin Danielsson, 2007)

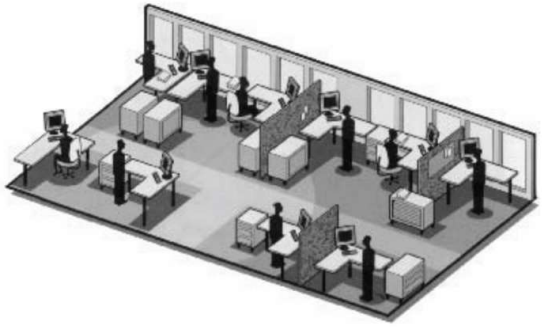


Fig. 5: Medium and Large Open Offices (Bodin Danielsson, 2007)

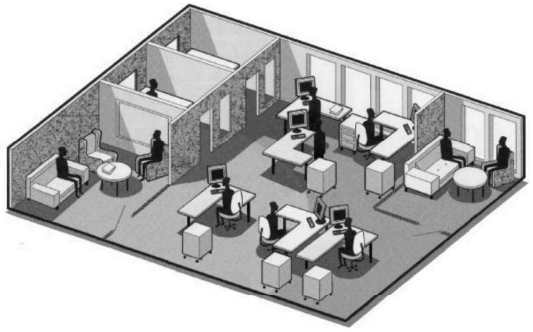


Fig. 6: Flex and Combi Office (Bodin Danielsson, 2007)

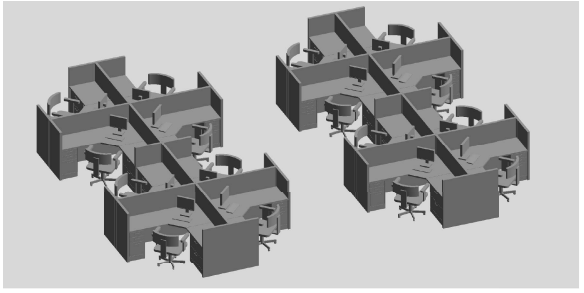


Fig. 7: Mid-Height Partitions (Author's Diagrams)

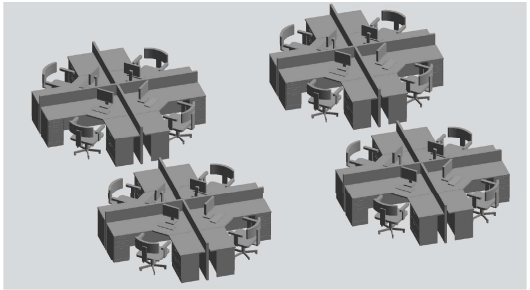


Fig. 8: Low-Height Partitions (Author's Diagrams)

Fig. 9: No Partitions (Author's Diagrams)

Fig. 10: Hotelling (Author's Diagrams)

Spatial Organization and Aesthetics

Varda Wasserman explores how gender stereotypes are perpetuated by the workplace environment in her article, “The Gendered Aesthetics of the Physical Environment of Work.” Wasserman notes how open offices in particular perpetuate social hierarchies, which are often gendered. She argues that in the modern workplace, “spatial segregation has become subtle and is manifested mainly through the occupational distinction between ‘men’s jobs’ (often senior positions) and ‘women’s jobs’ (mainly junior positions)” (Wasserman). Because managers and senior leaders are still mostly men, they are the ones who are most likely to work in private offices, while lower level workers, who are mainly female, are placed in open environments. These female workers are more likely to report visual privacy issues, a lack of temperature control, and noise disturbances. A suggested solution to this issue would be to avoid organizing the office by rank, as it can result in a gender imbalance. While some women have reported finding it empowering to work with most or all of the women in the office, that is not the case for all women.

Wasserman argues that while open offices tend to adopt what is believed to be a neutral, uniform design, factors including culture, age, race, and gender change how a person may experience these spaces. This means that the design’s impact may not be neutral. Byproducts of the modern open office, such as a lack of visual privacy and the invasion of personal space by male coworkers, can change the ways in which women experience the office environment.

This phenomenon is explored in the article “Spaces That Matter: Gender Performativity and Organizational Space.” Melissa Tyler and Laurie Cohen use the short film, “Grey Area,” by Sofia Hulten as a way to prompt women in university offices to consider how the spatial organization of their workplace relates to their gendered experiences in the office (*Fig. 11*). In “Grey Area,” a woman wears a grey suit in an office, which camouflages her appearance wherever she steps foot. The film concludes with the woman becoming a trash can liner and throwing herself away.

According to Tyler and Cohen, women who were interviewed after watching this film tend to observe that the woman in the video seems trapped and appears to feel worthless. These female observers often compared these perceptions to their own office experiences. This includes reflecting on their tight, cramped spaces and feeling out of place or inadequate. One woman expressed that the lack of space in her office “suggests that [she is] not an important part of the organization, perhaps that [she] ought to do more. When people see [her] office, they think [she is] not important” (Tyler and Cohen 186).

Tyler and Cohen also noted that women often feel as if their spaces were being invaded by male coworkers, causing them to feel stressed and uncomfortable. One woman’s desk faced away from the circulation, around a corner. While most people who came to approach her would acknowledge their presence, she noted that several men would stand quietly behind her,

Fig. 11: Stills from “Grey Area” (Tyler and Cohen, 2010)

which made her feel uncomfortable. Because of these repeated interactions, she chose to flip her desk to face the other way. Other women experienced their male coworkers' papers and belongings spilling over into their workstations. Most felt too uncomfortable to say anything, but would try to tidy their coworkers' spaces when their coworkers were away. One woman had experienced these issues with her coworker for so long that she reflected that "it's just come to be seen as his space. [She] supposes [she] sort of [sees] it like that too. [She's there], but it's ... his space" (Tyler and Cohen 187).

Varda Wasserman also explores differing experiences in offices as they relate to layout, color, and finish choices. In general, "women tend to favour egalitarian norms in work groups and therefore tend to divide space in a more equal manner, whereas men prefer hierarchical power relations and thus tend to occupy as much space as possible for themselves" (Wasserman). Additionally, "studies found that women tend to gravitate toward homey and intimate designs with bright colours, whereas men tend to prefer dark colours, larger rooms, high-status symbols, and prestigious furniture pieces, particularly those incorporating leather and wood details" (Wasserman). Most offices are designed hierarchically, and often in a style that men prefer, meaning that women are more likely to feel uncomfortable in their offices. The ways women experience their offices were directly influenced by their experiences of being women in the workplace. While their experiences weren't homogenous, they revealed a lack of

ownership in their spaces and a desire to be seen as a professional, committed, and qualified employee. This constant fight to fit in, both spatially and aesthetically, was what made so many relate to the experiences shown in the “Grey Area” film.

Mothers and Menstruating Women

The experience of being a woman in the corporate office can be especially challenging because of the expectation to maintain workplace professionalism through pregnancy and menstruation. These natural occurrences can elicit heightened emotions, the need for more frequent bathroom breaks, and the elevated risk of bodily fluid leaks. Because “most US women, especially those with small children, moved into the paid labor force during the twentieth century,” considerations for how to make an easy and comfortable experience before and after birth are extremely important for the mental and physical wellbeing of menstruating women and mothers (Johnson and Salpini 481).

Currently the U.S. is one of seven countries that still allow unpaid maternity leave. Most women are only allowed six weeks of maternity leave, but many are forced to cut that time short because of financial considerations. Because of the pressure to return to work “most US women are still not able to meet recommendations in practice” (Johnson and Salpini 481). Additionally, certain federal and state protections only cover hourly workers, rather than women on a salary pay. For example, amendments to the Fair Labor Standards Acts “[require] employers to provide ‘reasonable’ break time (undefined and unpaid) and private (non-bathroom) space for breastfeeding workers to express milk for one year after a child’s birth,” but only for hourly female workers (Johnson and Salpini 481). It is also important to note that pumping milk is not the only task required of postpartum mothers at work. The process

also involves cleaning and sterilizing, and a new mother's pumping schedule often depends on her unique preferences and circumstances. If lactation rooms are provided for breastfeeding mothers, "the combination of an available lactation space and a refrigerator was associated with continued breastfeeding," compared to spaces with no cool storage provided (van Dellen et al. 3). For mothers who want to exclusively breastfeed but are required to go back to work, they must pump on schedule with the feeding times of their baby, which tend to be more frequent the younger the baby is.

In the article "Working and Nursing: Navigating Job and Breastfeeding Demands at Work," Katherine Johnson and Colleen Salpini interview new mothers about their experiences with pumping in their university offices. The offices had implemented lactation rooms back in 2008. Some rooms included free pumping kits. Most of the women studied were hoping to continue breastfeeding for at least a year, but were also unable to stay at home for as long as they hoped. This meant they would have to pump at work. The range of time commitments required to fulfill this need varied: "most women pumped twice daily at work; some pumped up to six times. Women spent an average of 27 minutes per pumping session, but this ranged from fifteen minutes to one hour" (Johnson and Salpini 486).

New mothers reported feeling a lack of privacy in their workstations. While the people in more

senior positions worked in private offices that better accommodated pumping behind closed doors, many women were in lower level positions and did not have that degree of privacy. Private offices also lessened the issue of finding time to pump, as the few women who occupied offices said that they were often able to do deskwork while pumping. While the provided lactation rooms were an option for the women without private offices, many of these rooms were too far away, did not provide sufficient privacy, or were too frequently occupied. Instead, one woman was told to use an empty private office by her boss. She learned to her embarrassment that the space was only semi-private because some still had a key to enter and would walk in while she pumped. Another woman, who shared an office with three men, hung a curtain for privacy and would pump in the room. Although “the situation was initially ‘bizarre’, and ‘awkward’, after a while everyone seemed ‘fine with it” (Johnson and Salpini 490). There were, however, women who could not pump despite these accommodations. They were forced to miss work to go home and pump, pump in their cars during their lunch breaks, or skip pumping altogether, making it more likely that their milk would dry up.

Varda Wasserman also outlines the challenges that working mothers face, no matter the age of their children. While breastfeeding at work is the most prevalent concern, “women still bear the primary responsibility for household affairs” (Wasserman). At the same time, growing demands in the workplace often require employees to stay at work later. Because women are often

responsible for communicating with babysitters, nannies, or daycares when they need to work late, they require an area conducive to making private phone calls. Women also are expected to be available for calls from schools and family members, “but the open-cubicle layout makes this much more difficult, and the result is that they feel their privacy has been significantly invaded” (Wasserman).

In the open office studied by Alison Hirst and Christine Schwabenland in the article “Doing Gender in the ‘New Office,’” proper accommodations were not made for women who were menstruating. While some offices offered free condoms in the men’s bathroom, they failed to provide menstrual product machines or free condoms in the women’s bathroom. An employee had to make a formal request for a vending machine to be installed, which would still require that women pay for their products.

Sick Leave Rates

In the article “Office Design’s Impact on Sick Leave Rates” Christina Bodin Danielsson et al. surveyed various Swedish offices on issues regarding sick leave, hypothesizing that office type may have an impact on employee sick leave requests. Previous research by Blank and Diderichsen indicated that women were more at risk of illness and were more likely to take sick leave. The survey results aligned with this research, with women having higher rates of short-term sick leave in the three typical sizes of open office layout. While it is not known exactly why women requested sick leave more often than men in the open office plans, the authors have two theories. The first is that there is “a higher sensitivity to physical stimuli or a greater importance of social support at work among women” (Bodin Danielsson et al., “Sickness Absence” 145). The second theory speculates that the “excess risk for sick leaves among women overall, which was found also in [the] study, may indicate a greater vulnerability to the negative environmental stimuli that may be found in traditional open-plan offices” (Bodin Danielsson et al., “Sickness Absence” 145). Some of these negative environmental stimuli that are often found in open office layouts include the lack of personal control, which can cause acoustic and visual privacy issues that have been found to impact women more frequently.

Fried et al. poses a different theory about why sickness absenteeism is higher among women in the workplace in the article “The joint effects of noise, job complexity, and gender on employee sickness absence: An exploratory study across 21 organizations — the CORDIS

study.” While both men and women may experience adverse health effects from poor workplace design, research has shown that “women take better care of their health, are more aware of their illness, and consult health services more often than men do” (Fried et al. 133). Because of this, women might be more likely to take a short sick leave in response to physical symptoms of a poor work environment. Those who take sick leave might cause their colleagues to fall behind. This may result in declines in productivity and perhaps even revenue. It also might increase the workload on those who take less sick leave, both men and women alike. If employers could reduce or eliminate the factors that contribute to sick leave, everyone would stand to benefit.

While neither article explored the impacts of motherhood, it is possible that the symptoms of pregnancy and the responsibility of mothers to run their households may also cause an increase in sick leave amongst female employees. “Pregnant women have on average higher sickness absence than non pregnant women” often because of the uncomfortable and distracting impacts of pregnancy on the body, such as nausea and back pain (Riek and Telle 118). After pregnancy, a higher sick leave rate among women could be due to “women's enhanced integration in the labour market without a corresponding decrease in their share of duties in the household and family. This 'double burden' or 'second shift' of women is believed to be related particularly to motherhood” (Rick and Telle 118). While the topic has not yet been

thoroughly studied in regards to sick leave, menopause and conditions such as endometriosis may also cause women to disproportionately take sick leave, or experience physical discomfort in the workplace.

Acoustical Control

Noise control is an extremely important consideration in office design, as noise is “the most common source of complaints in office environments” (Bodin Danielsson 618). Acoustical issues can impact an employee's perception of the office environment in two different ways: distraction and personal acoustical privacy. Companies often rely on open office layouts to fit as many people as possible into a finite space, sometimes having the majority of the employees all working in one large, open room. If there are not enough elements in place to absorb sound, noise will reverberate throughout the room, subjecting people to unintended eavesdropping of private conversations and the unwanted clattering and beeping of keyboards and computer sounds. Open offices that are not planned well also do not have enough areas to hold a private conversation or an impromptu small group meeting. In some cases, this may lead people to have meetings and conversations in open spaces. In other cases, people may avoid having these conversations altogether, as they feel stressed and uncomfortable when they are overheard. This may deprive companies and their employees of necessary communication.

Issues related to noise in the office “correlate[s] with lower job satisfaction” (Bos et al. 455). Concerningly, if exposure is chronic, potential for health related issues such as “cardiovascular disease, sleep-related disorders and impaired mental health” may be increased (Fried et al. 132). One theory regarding why noise can cause stress in the workplace is “because of its contribution to information overload at work” (Fried et al. 132). Because of this, people with

more complex jobs that require a higher cognitive load may be more susceptible to stress from noise distraction. While acoustics affect both men and women in the workplace, it has been proven that “women report more noise disturbances in office environments,” (Bodin Danielsson et al., “Office Type and Workplace Conflict” 162). This indicates that the acoustical issues often prevalent in open office plans are more likely to impact women, therefore causing them to be more stressed and less satisfied at work than their male counterparts.

“Workplace Satisfaction Before and After Move to an Open Plan Office - Including Interactions with Gender and Introversion” by Nathan Bos et al., reports on a study that was conducted regarding an American research laboratory’s move from shared offices, which held two to four people, to an open office plan (*Fig. 12 and 13*). The company had 70 employees in this particular office. The study revealed that, although men did not notice a difference between the acoustical privacy of the old and new office layout, women reported a decline in spaces with acoustical privacy. One woman, who was pregnant at the time, reported that she “wished she could make calls to her doctor on her desk phone as she had before” (Bos et al. 458). There were also significantly more women who reported having issues finding a place to have private conversations with coworkers about issues with staff and the workplace. Although the authors do not have concrete evidence for why women experience these differences, they hypothesize that it may be due to women being more sensitive to personal conflict.

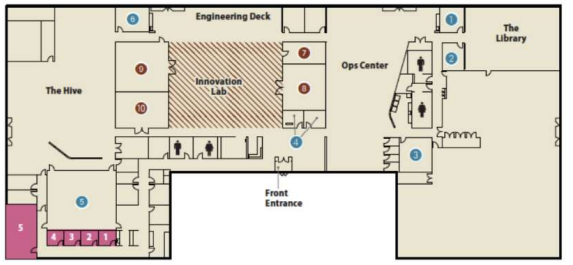


Fig. 12: New Office Floor Plan (Bos et al., 2017)

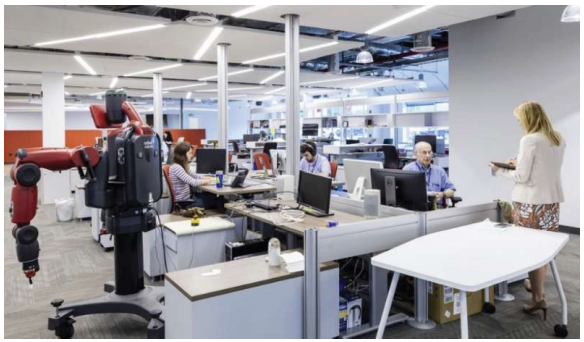


Fig. 13: Open Workspace in the New Office (Bos et al., 2017)

These outcomes are similar to those of Christina Bodin Danielsson's et al., in the article "The Relation between Office Type and Workplace Conflict: a Gender and Noise Perspective." In a survey given to different companies in Sweden with different office layouts, women tended to report more noise disturbances in the three sizes of open office layouts. The highest noise disturbances were found in small open office plans, with 59.5% of women reporting issues, compared to 46.1% of men. In medium and large open office layouts, 56.6% and 53.6% of women, respectively, reported issues compared to 45.6% and 44% of men. Based on these statistics, men in open office environments did not report as many acoustical distractions as women. The study compared the issues of noise disturbances to conflict that occurred in the office, hypothesizing that the less areas that can be used as a retreat from coworkers, the more conflicts will occur. The outcomes of the survey showed that, while men tended to have more conflicts overall, women's conflicts in the office correlated to layouts that produced more acoustical distraction. While it is not known exactly why these problems occur, the authors theorize that women are more sensitive to environmental stimuli due to findings that show "process information to be more detailed among women than men, resulting among women in a greater sensitivity to environmental factors" (Bodin Danielsson et al., "Office Type and Workplace Conflict" 169).

Visual Privacy and Social Interaction

Open office plans often have a large impact on how people are seen and interact with each other in the workplace. The goal of many open offices is to stimulate “fluidity” in the office, meaning that any person of any rank would feel more comfortable engaging their coworkers than in an office dominated by private offices. This is often achieved through large, open circulation areas and workstations that can be seen from many areas in the office. This can result in less visual privacy than if they were in cell-offices, for example. For some, the concept of feeling seen for most of the workday may be uncomfortable.

In the article, “Doing Gender in the ‘New Office,’” Alison Hirst and Christina Schwabenland explore how this discomfort impacted women working at a UK company on a much larger scale, often because of the social situations that a new open office environment created. The authors studied the company, which they referred to as “WCC,” over a three year period as they moved 1000 senior employees from six separate departmental buildings, to one building, consisting almost entirely of open office workstations. The design utilized a lot of glass, with the intended purpose being that everyone would be seen, both internally and by the public near the building. Additionally, the workstations were designed to be “neutral,” meaning that everything looked the same, no matter who was assigned to the space. The goal of these design choices was to support “physical proximity, allowed movement and opportunities for spontaneous interaction, and implied a lack of differentiation between roles — although differentiation might happen in

the context of particular projects, structures could dissolve and reform easily" (Hirst and Schwabenland 164). Although the people in charge of designing the new office building and organizing the move were made up entirely of men, the company advertised themselves as being focused on gender equality. Because of this, the researcher did not intend to focus the study on the difference in experience based on gender until she noticed feeling self-conscious in the open office. "She felt the need to become 'invisible' in the new space and what she considered to be the norm of self-presentation," which included wearing makeup every day and wearing pants suits rather than jeans (Hirst and Schwabenland 165). These experiences aligned with a theory by John Hassard et al., regarding how male bodies tend to disappear in their environments, whereas female bodies stand out.

When men running the office relocation originally interviewed employees about the possibility of an open office space, some women expressed concern about being seen at undesirable times and angles. Specifically, women were worried about wearing skirts around the office, especially when having to take stairs. Contrastingly, the only concern that was raised, perhaps in jest, by men about the lack of visual privacy in the new office was the lack of private areas needed to conceal an office affair. After the move, the architect described the feeling of being watched in the open offices as new but easy to get used to, comparing the experience to being at a "nudist beach" because "people's anxieties about being exposed will initially surface but

will then subside as exposure becomes part of shared [sic], unnoticed experience" (Hirst and Schwabenland 167). An ethnographic study done by Jack Douglas and Paul Rasmussen in 1978, however, indicates that the architect was incorrect. The results of their study showed that "naked people do continue to look at one another, although surreptitiously, and men in particular, often in groups, look obsessively at women" (Hirst and Schwabenland 167).

Although the architect's interpretation was flawed, he was still correct in his comparison, as many women reported feeling watched, specifically by men, in the new office.

> Visibility enabled these men to judge and rank women according to their sexual attractiveness, just like men on the nudist beaches described by Douglas and Rasmussen (1978). Although visibility placed curbs on this kind of behaviour — 'watching' had to be done surreptitiously — the building provided a space where it was much easier for men to exercise this kind of 'male gaze'. (Hirst and Schwabenland 170).

For example, one woman described her anxiety about walking into a different section of open offices. This stemmed from a past experience when the men in that area would stop to look at her and comment on her presence later. Other women expressed that there was no place in

the office where they did not feel watched, and many changed the way they dressed to present as more feminine and indicative of their status in the office, an attribute that occurred to more of them, compared to their male colleagues. This lack of privacy was especially a problem when a woman experienced a bad day in the office and wanted a place to collect herself. The only truly visually private place to retreat to was the bathroom, so she was left crying in a glass meeting room, where she could be seen by people in the workstations around her. Other women felt the lack of privacy even in the areas that were meant to be more public, like corridors and the atrium where many went to eat lunch. While these women may not have been aware of this, the researcher “often noticed men watching women walk through the long, uninterrupted spaces of the building, sometimes appearing to struggle between their wish not to appear rude and their wish to watch the woman,” which may have been the cause of the feeling of being on display in these public spaces (Hirst and Schwabenland 171). All of these observations and concerns prove the point originally made by the architect about the open office being like a nudist beach, as women were constantly being watched, commented on, and made to feel uncomfortable.

Rachel Morrison and Roy Smollan studied a New Zealand law firm, also moving to a new open office, in the article “Open Plan Office Space? If You're Going to Do It, Do It Right: A Fourteen-Month Longitudinal Case Study”. This move was considered to be very successful,

as the company invested a lot of time and money to make sure that their employees would feel comfortable in the new office. Employees were included throughout the design process to give input on workstation design, chair selection, and finish choices. After the move was complete, people said they felt more productive and closer to their coworkers. While the space was more open, people were pleased with the large planters and file cabinets that helped block lines of sight and provide more privacy (*Fig. 14*). There were also nearly 30 collab rooms for people to use for more focused work and private conversations (*Fig. 15*). Despite implementing what could be considered "best practices" in this open office design, women were the only ones to mention feeling observed in the office, both in positive and negative contexts. In fact, when researchers reviewed their data, "a word search for: 'watched', 'visible', 'privacy', 'exposed', and 'accountable' (all words used by women in this office) from within male responses, turned up 'privacy' (and none of the other words) just once as '[I dislike] the lack of privacy'" (Morrison and Smollan 7). The researchers hypothesize that this may be due to the fact that women tend to be more aware of how they present themselves because they have grown up with an awareness that people are judging their physical appearance more so than men do. Some solutions the authors propose to make women feel more comfortable is to give "female staff members the option of being closer to amenities, not having walkways directly behind their workstations, and/or increased privacy screening could be prioritized within such offices" (Morrison and Smollan 10).

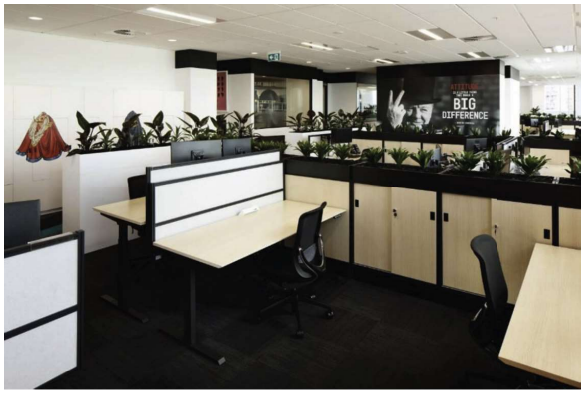


Fig. 14: Workstation Dividers (Morrison and Smollan, 2019)

Fig. 15: Collab Room (Morrison and Smollan, 2019)

Temperature Control

When the research laboratory that Nathan Bos et al. studied first moved to their new open office, the office temperature fluctuated significantly, as there were some HVAC problems that occurred in the first few months. Both men and women noticed these temperature fluctuations, but women were more likely to point them out as a problem. As the HVAC problems began to resolve, women continued to observe the office temperature being too cold for their liking, which was an issue that they had experienced in their old building and its shared office layout. This problem is likely due to the fact that “offices are kept at a temperature closer to the optimal for males than females; i.e. generally colder than females would prefer” (Bos et al. 458). The reason for this is explored by Boris Kingma and Wouter van Marken Lichtenbelt in “Energy Consumption in Buildings and Female Thermal Demand.” For most public interior environments, the temperature is set based on the metabolic rate of a 40 year old man who weighs around 155 pounds. This has been the standard for years, and little has been done to consider bodies of different sizes and metabolic rates. Nathan Bos et al. note that offices which employ several areas for personal temperature control are more successful at mitigating this issue, as the design relies much less on this arbitrary standard.

Furniture Design

In the article “If the Chair Fits: Sexism in American Office Furniture Design” Jennifer Kaufmann-Buhler presents her research of office furniture design from the 20th century, specifically relating to the gendered aesthetics of various furniture pieces. While her focus is on furniture that was designed before the 2000s, she argues that this research is still relevant in the modern day, as many furniture manufacturers still sell some of their older, more well-known items. Additionally, being that office furniture can be so expensive, it is often passed down through several different companies, getting years of use before being disposed of. So while many modern pieces of furniture are designed to be ergonomic and flexible to a range of body types, older pieces that are still in use today are more likely to be restrictive.

Kaufmann-Buhler argues that office furniture of the mid-to-late 20th century was designed to represent the hierarchy of the office, including the gender differences that could be seen within this hierarchy. Even in the new open office plans, which were designed to break down barriers and hierarchies, they “ultimately reproduc[ed] hierarchy and status through the strategic allocation of furniture and space” (Kaufmann-Buler, “American Office Furniture” 377). She cites the office desk as one of the most gendered furniture pieces. Henry Dreyfuss, an industrial designer during the post-war period, pioneered its design. He did the bulk of his research on how to design objects to specific body sizes and proportions, a lot of which was then adopted by designers and engineers of the time. There were, however, gaps in his research, as he

often only considered one set of proportions depending on the gender that he associated with a particular task. This included work surfaces for typing, which he only designed for a petite female body. Because of this, the recommended height for a typing desk was 26 inches, which then became a standard for most furniture manufacturers. This became a problem in the 1980s, when both men and women began using computers on a regular basis. Men were often unable to fit under a standard typing desk, which meant that their desks had to be redesigned to be more ergonomic.

Chairs also may have gender-related design and usage concerns. They “inscribed idealized and exaggerated bodies in their form” (Kaufmann-Buhler, “American Office Furniture” 380). To explore this, Kaufmann-Buhler compared two Knoll chairs: the Zapf Executive chair (*Fig. 16*) and the Model 46 secretary chair (*Fig. 17*). The Zapf was significantly bigger than the Model 46, which was typical at the time for executive chairs, as they were designed for men’s bodies. The Model 46’s design also was typical for its time. It was created to be similar to typing and sewing machine chairs of the past. The chair was also smaller in frame, revealing the body of the person sitting on it, with a design that mimicked the curves of a thin and curvy, young woman's body. In this way, its design reflects an idealized secretary’s body at the time. This more revealing design “reflected and reinforced this persistent culture of sexual harassment by treating women’s bodies as objects of display” (Kaufmann-Buhler, “American Office Furniture”

Fig. 16: Zapf Executive Chair (Kaufmann-Buhler, 2019)

Fig. 17: Model 46 Chair (Kaufmann-Buhler, 2019)

382). The two designs also perpetuated the expectation for each genders' seated posture, forcing the user of the Model 46 to sit up straight at the edge of the chair, whereas the user of the Zapf could relax and spread out. If a woman were to sit in the Zapf, it would most likely feel uncomfortably large, which is in many ways a reflection of the "uncomfortable and problematic contradictions women in leadership roles were navigating in their everyday experience. Sitting in a chair that is poorly suited to one's own body and size is a reminder that you do not belong in that chair" (Kaufmann-Buhler, "American Office Furniture" 384).

By the late 20th century, most manufacturers redesigned secretary chairs to be a broader "task" chair. These chairs were meant to be more of an all-purpose office chair, and were designed to better fit different body types. Despite this, many lines still offered an executive version of the task chair that was significantly larger in size. This remained the same even for lines that were designed to be ergonomic and flexible. These large executive chairs are some of the most famous for these office furniture manufacturers, and because of this, "historic conventions of chair size tied to gender norms of body size persist even in some office furniture that is manufactured and sold today" (Kaufmann-Buhler, "American Office Furniture" 387).

Case Study

Gerdenitsch et al. studied a company's transition to an activity-based office layout. Activity-based layouts are similar to the concept of office landscaping, as they are established by allotting different uses of spaces to different areas. However, rather than pairing teams together in pods as is done in office landscaping, all workspaces are unassigned, so people can work wherever would work best for them on any given day. Activity-based layouts often employ areas of open space for group work, but also allot space for private, quiet work. This allows for increased collaboration that is inhibited by cell-offices, but provides more control on the amount of personal privacy that an employee has, which is often lacking in fully open office layouts.

The redesign of the office implemented various elements to allow for easy movement to various workstations throughout the day. Some of these elements included personal lockers, laptops that could be connected to each workstation, and basic office equipment at each workstation. Different areas were designed for different workstyles and functions, with work spaces sized for one person all the way up to 28 people. The office was also redesigned to be more modern and colorful, and many sound absorbing materials were used in order to prevent noise distractions in the more open areas.

Employees were surveyed twice in regards to the design of the new office, once one month after the change, and once seven months after the change. When asked how the new office fit

the needs of the employees, most responded that they felt the redesigned office better suited the work that they were doing. Those who responded this way also tended to agree that they felt closer to and more satisfied with their teams. Additionally, most agreed that they were less distracted than they were in the previous office. While the second set of survey responses showed a slightly diminished satisfaction with the office, those who were originally most pleased with the layout continued to be satisfied with their workplace. This may be because, rather than choosing the appropriate workspace for the various tasks being done throughout the day, some people do not take advantage of the activity-based layouts, and remain in the same workspace everyday.

Activity-based layouts need to be studied further in order to better understand their benefits and impacts on employees, however the results from this study are largely positive. This may indicate that providing all employees with varied levels of privacy and workspace styles may allow people to be more productive and happy in their workplace. Rather than hierarchically designating workspace for each person and reserving private areas for executives, this design allows all people to have the opportunity to work in all areas.

Conclusion

The literature review outlines the various issues with the current open office environment, and how these issues disproportionately affect women. While the conception of open offices did not rely on the hierarchical structure of a company to delineate workspace, budget concerns and the continued appeal of private office space forced lower level workers, who were mainly women, into crammed, overcrowded, and poorly designed open spaces. Today, women are still being impacted by hierarchical layouts. Often exposed to auditory distractions and a lack of visual privacy, many women feel uncomfortable in open offices and consequently may take more sick leave due to the negative physical stimuli. These many issues highlight the areas to be addressed in the research and creative agendas, in order to find alternative solutions to a traditional open office layout.

Research Agenda

There are two goals of the research agenda of this capstone project. The first goal is to identify how open office layouts impact men and women in the workplace, in order to compare differences in gender. This research is specifically focused on sources of distraction in the office, stress caused from distractions, and visual privacy in different areas around the office. The second goal is to identify possible solutions to the problems that were identified in the literature review and research agenda, in order to help answer the research question: 'how can human-centered design improve the equity of corporate offices, through the lens of womens' wellbeing?'

Data was collected in three ways: through surveys, interviews, and observations. The public surveys were distributed to men and women who had worked in a corporate open office within the past 5 years. The survey included ranking questions about different aspects of the open office layout and open ended questions about the pros and cons of an open office. All responses were kept anonymous. Interviews were conducted in order to get a deeper understanding of womens' experiences in open offices. Questions were similar to those in the survey, but allowed participants to expand on their responses. An observation was conducted in the same open office that the interviews took place in, which helped to gather evidence that supported the womens' responses. Photos were taken to document the layout and design, and floor plans were analyzed regarding gender distribution throughout the office.

Survey Findings

An online survey was released on October 18th, 2022 on LinkedIn (Appendix C). The goal was to acquire responses from men and women in different industries and positions to respond about their experiences in open offices. The survey began with questions to understand the demographics of participants, followed by a series of ranking questions related to the layout of the open office. The survey concluded with three open ended questions about respondents' opinions on the open office, and what they would change about it if they had the opportunity. The survey received 74 responses over the course of a month, which was then split up based on gender in order to compare responses. The goal of gathering this data was to understand the common issues with open office design, and analyze the differences between men and women's responses.

Question One: What is your gender? (*Fig. 18*)

The majority of respondents identified as female, with 56.8% of women, 43.2% of men, and no non-binary people responding to the survey.

Question Two: What is the size of the open office that you most recently worked in? (*Fig. 19 & 20*)

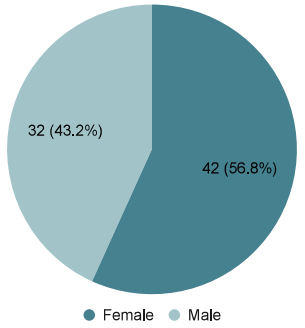


Fig. 18: What is your gender?

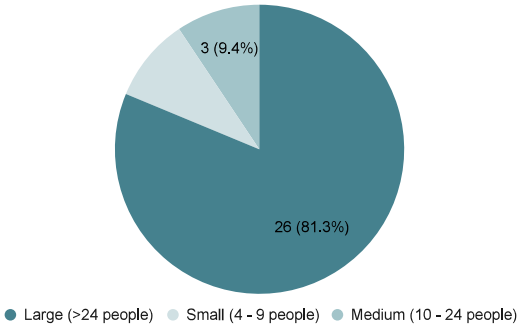


Fig. 19: Size of office - men

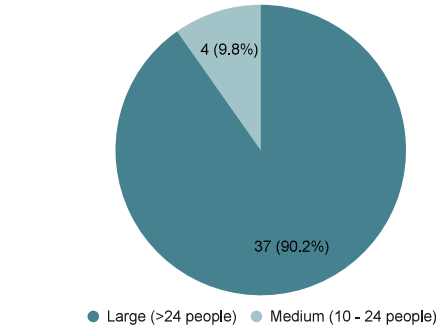


Fig. 20: Size of office - women

Overall, men worked in a greater range of open office sizes, although the majority for both men and women was a large open office.

Question Three: Based on a linear scale, 1 being strongly disagree and 7 being strongly agree, rank the following statement: you are often exposed to a distracting and/or tiresome noise. (*Fig. 21 & 22*)

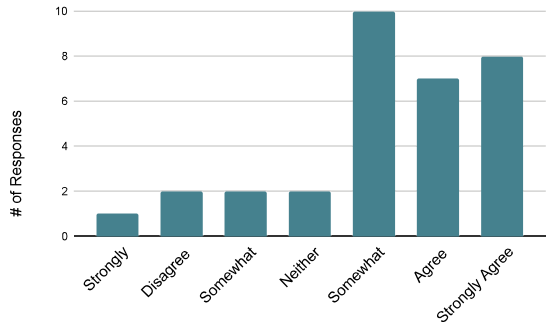


Fig. 21: Noise distractions - men

Both men and women tended to agree with this statement. While the majority of men somewhat agreed and the majority of women agreed, more women also disagreed with the statement. While it is not known why a greater majority of women disagreed with the statement, the fact that women tended to agree more strongly than men supports the research from the literature review that states that women tend to be more aware of noise disturbances in the workplace.

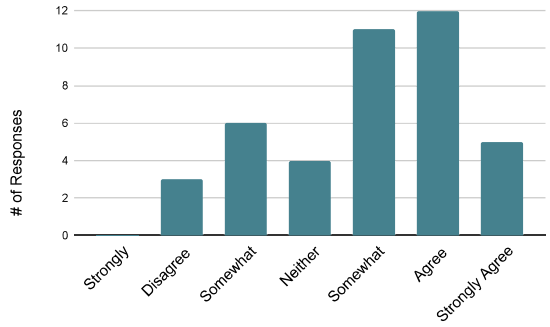


Fig. 22: Noise distractions - women

Question Four: Based on a linear scale, 1 being strongly disagree and 7 being strongly agree, rank the following statement: auditory distractions often make you more stressed and less productive. (*Fig. 23 & 24*)

While the responses from question three are supported by findings from the literature review, responses from question four differ from research about stress levels caused by noise

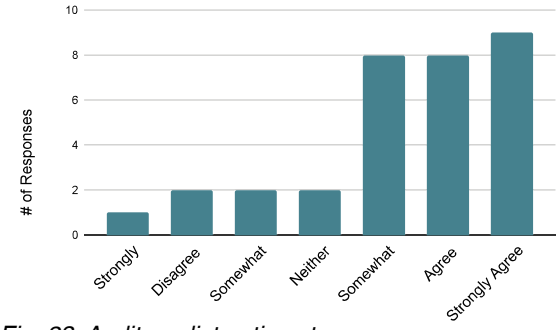


Fig. 23: Auditory distraction stress - men

disturbances. More men agreed with this statement than women, although both genders tended to agree with the statement. While the reason for this is not known, it suggests that everyone could benefit from an improved auditory environment in offices.

Question Five: Based on a linear scale, 1 being strongly disagree and 7 being strongly agree, rank the following statement: visual distractions often make you more stressed and less productive. (*Fig. 25 & 26*)

Both men and women tended to agree with this statement, although more men disagreed. This shows that visual privacy is important for both men and women to help lower distractions and the subsequent stress that is caused.

Question Six: Based on a linear scale, 1 being strongly disagree and 7 being strongly agree, rank the following statement: you are comfortable with the temperature that your workstation is kept in. (*Fig. 27 & 28*)

Both men and women agreed with this statement, although men tended to agree more strongly, and more women disagreed. This may be caused by offices being kept at a slightly cooler temperature than women are comfortable in, as research from the literature review suggested

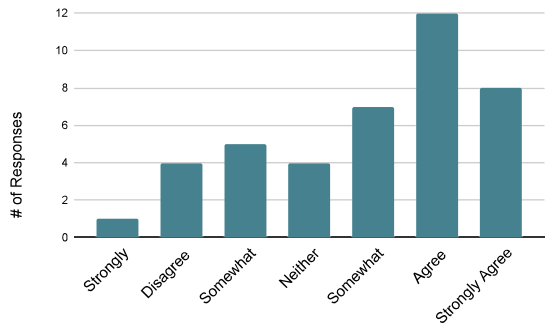


Fig. 24: Auditory distraction stress - women

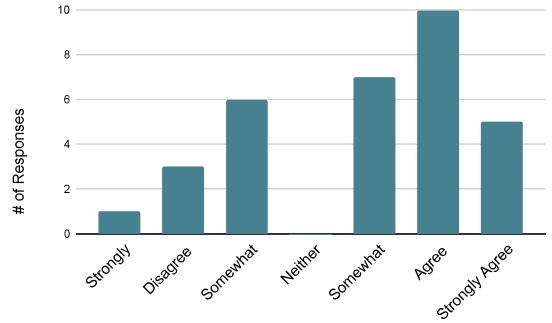


Fig. 25: Visual distraction stress - men

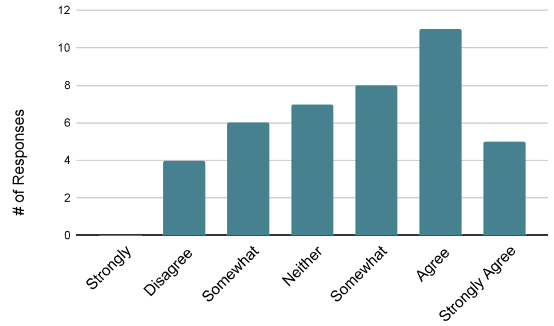


Fig. 26: Visual distraction stress - women

that women tend to prefer a higher indoor temperature because of their slower metabolism. This may be improved through the use of personal temperature controls.

Question Seven: Based on a linear scale, 1 being strongly disagree and 7 being strongly agree, rank the following statement: you are comfortable with the amount of visual privacy that you have at your workstation. (*Fig. 29 & 30*)

Both men and women disagreed with this statement, although men tended to disagree more strongly. While research from the literature review indicates that women tend to be less comfortable with the visual privacy that they have in the office, these responses suggest that this is a problem for men and women alike. Because of this, improving privacy in the workplace could benefit everyone.

Question Eight: Based on a linear scale, 1 being strongly disagree and 7 being strongly agree, rank the following statement: you are comfortable with the amount of visual privacy that you have in common areas (corridors, seating areas, stairways, etc.). (*Fig. 31 & 32*)

The responses from this statement differ significantly from question seven. While men tended to strongly agree with this statement, women tended to strongly disagree. This is backed by

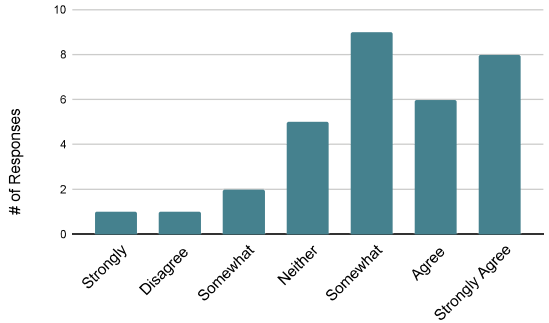


Fig. 27: Workstation temperature - men

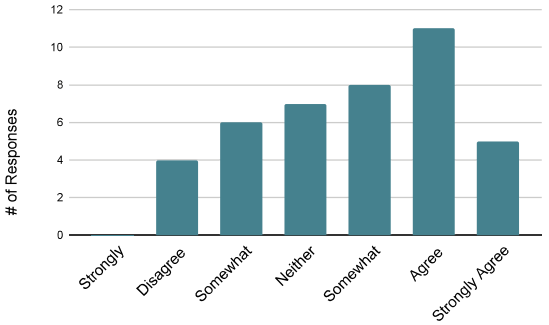


Fig. 28: Workstation temperature - women

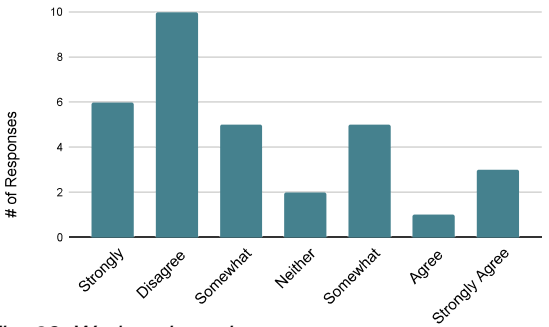


Fig. 29: Workstation privacy - men

research from the literature review which shows that women are more aware of how they are seen in public areas in the office. This can be due to noticing men watching them as they walk by, or because of self-consciousness about how they dress. Because of these findings, improving areas of privacy outside of the employees workstations will help women feel more comfortable in the office.

Question Nine: Based on a linear scale, 1 being strongly disagree and 7 being strongly agree, rank the following statement: there is a place for you to have a private conversation on the phone or with one other person. (*Fig. 33 & 34*)

While almost all responses from men showed agreement with this statement, women's responses were more varied, although the majority disagreed. This aligns with the research from the literature review that shows that women are less comfortable with having phone calls in an open office area, and would prefer to have private phone or meeting rooms in order to have conversations with doctors and family members.

Question 10: Based on a linear scale, 1 being strongly disagree and 7 being strongly agree, rank the following statement: there are supportive areas for small breakout meetings that are private from other people's conversations. (*Fig. 35 & 36*)

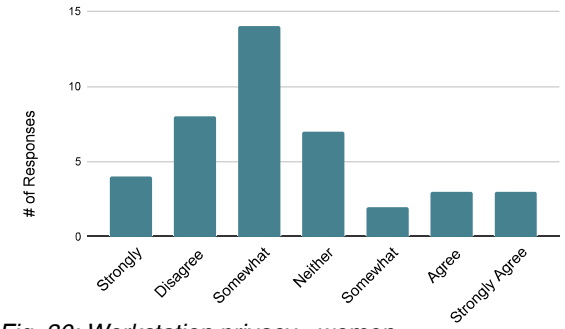


Fig. 30: Workstation privacy - women

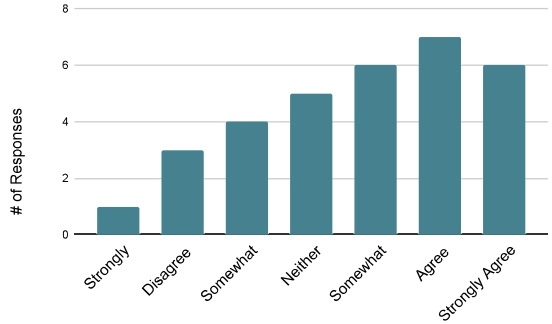


Fig. 32: Common area privacy - men

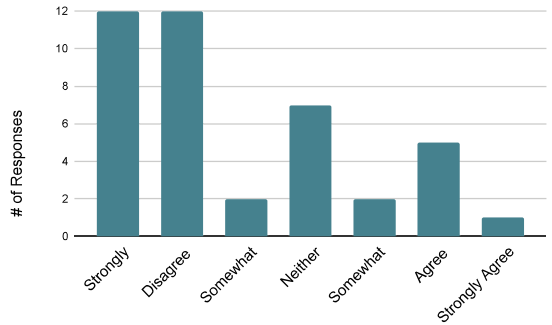


Fig. 33: Common area privacy - women

Both men and women overwhelmingly agreed with this statement. This may indicate that there are enough meeting rooms in open offices, but as shown in responses from question nine, there may not be enough smaller rooms, booths, or pods, for one-on-one phone calls and video conferencing.

Question 11: Based on a linear scale, 1 being strongly disagree and 7 being strongly agree, rank the following statement: you are satisfied with how the layout of your office contributes to your productivity. (*Fig. 37 & 38*)

The results from this question differ significantly from research from the literature review and data from previous questions in the survey. While both men and women tended to report issues with distractions and subsequent stress in open offices, and the literature review indicated that women tended to be more impacted by distraction, almost all women agreed with this statement. On the other hand, men had more varied responses, with most disagreeing. It is not known why such a significant difference was reported.

Question 12: In your opinion, what are the flaws in the layout and functionality of the open office you work(ed) in?

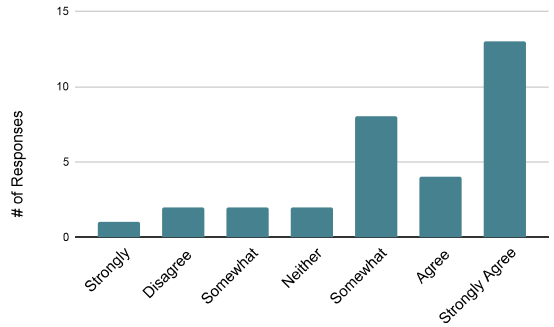


Fig. 34: Private phone conversation - men

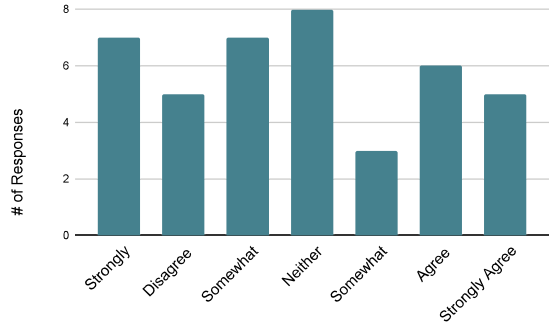


Fig. 35 Private phone conversation - women

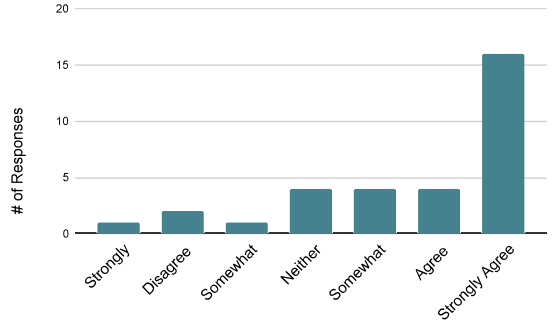


Fig. 36: Breakout meetings - men

In the first of the open ended questions, both men and women noted issues due to a lack of privacy and distractions in their open offices. Men's responses included 13 mentions of distractions and 14 mentions of a lack of privacy. Comparatively, women's responses included 18 mentions of distractions and 20 mentions of a lack of privacy. This aligns with findings that women are more likely to be impacted by distractions in the open office, and are more likely to notice a lack of privacy. However, these responses show that both men and women could benefit from additional privacy in order to boost productivity and comfortability. When speaking about wanting privacy in the workstations, one man noted that "employees dont [sic] crave privacy as a shield to slack off like many Execs [sic] and C-Suites may intimate. It's simply giving their employees the same privileges and benefits they give themselves–the ability to do their work without undue distractions." One woman also mentioned privacy as it relates to breastfeeding in the office, saying that "for working mothers that breast fed [sic] there was no private room to pump. You had to use your own office and locks sometimes malfunctioned." Additionally, two women mentioned temperature issues, but no temperature issues were noted by men. Other findings included a lack of personalization, wayfinding, and storage.

Question 13: What are the pros to the open office design that you work(ed) in?

Men and women both noted that open offices helped with team collaboration and building

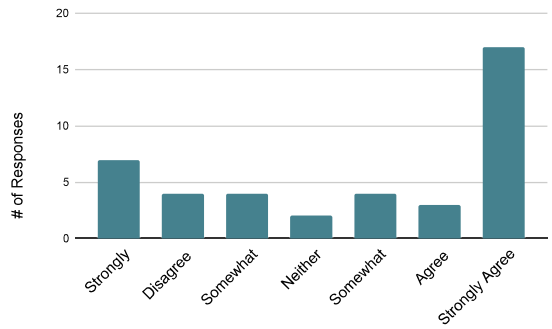


Fig. 37: Breakout meetings - women

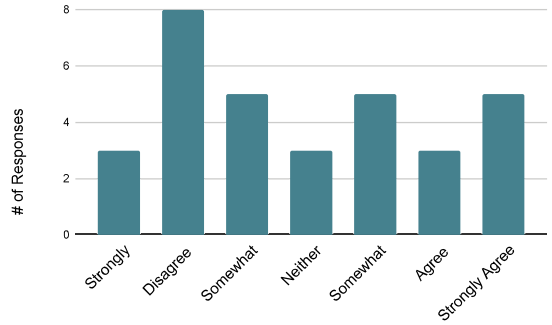


Fig. 38 Productivity satisfaction - men

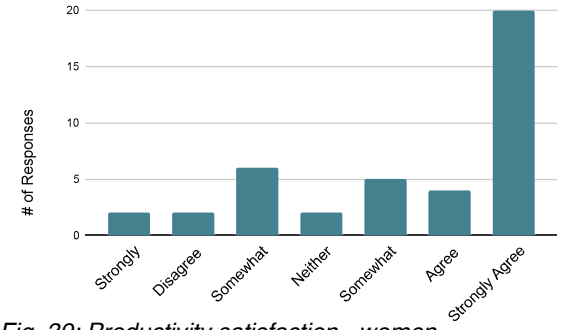


Fig. 39: Productivity satisfaction - women

relationships with coworkers. Interestingly, 10 men noted the collaboration benefits, compared to 20 mentions by women. There were also non-social related benefits noted, such as an increase in natural light, being able to see who was at work and busy on calls, and the efficiency of the space.

Question 14: If you had the opportunity to change the layout and design of the open office you work(ed) in, what would you change?

Overall, the majority of people suggested that their open office needed more privacy, either through higher partitions between workstations, more small conference rooms and phone booths, or, more drastically, to eliminate the open office altogether and go back to private offices. These responses did not differ drastically between men and women, although women more often suggested implementing small breakout spaces and private rooms. Many people suggested that, rather than setting workers up in a bullpen layout, placing teams of people together in small pods of workstations would help people be more productive and cause less distractions. One person also brought up the furniture in the open office, noting that the chairs for everyone but the executives were not ergonomic enough, and it would be better if there were multiple chair options that could be switched out based on personal preferences.

In general, the survey findings often aligned with the research that was found in the literature review. Overall, issues with privacy and noise distractions seem to be the most prevalent issues that people face in the open office environment, with men and women responding differently to how these issues impact them. With the data to highlight the most common problem areas in an open office, and the suggestions made for ways to improve these layouts, the research agenda will help inform possible solutions that will be addressed in the creative agenda.

Interview Findings

One-on-one interviews (Appendix D) were conducted following a site visit at the Rochester office for the architectural firm CPL. The company had recently moved from an office that consisted of mainly private offices to an open office layout in a new building. At the time of the interviews, the company had been in the new office for about seven months. Three women were asked a series of nine questions about how their experiences changed during and after the move. Interviewee one was younger and newer to the company, having recently graduated from college. Interviewee two and three were older and had worked at the company for several years. Interviewee three was also one of the leaders for the move to the new office and was integral in many of the design decisions that were made.

Question One: How has the move to an open office changed your experience in the office?

Interviewee one remarked that she felt as though she was dressing nicer than she did in the old office, which she felt was because she was more aware that she would be having encounters with the higher-ups in the office. She also noted that there were more distractions throughout the day. Interviewee two has been working at CPL for her whole career, and found the move refreshing. She felt like she could collaborate with her team more often, and had a greater pride in their workplace. She too noticed distractions, although in her opinion they did not increase from the old office to the new office, they just changed. While these changes did not seem to

bother her, she did note that she tries her best not to look up at the people who are walking past and through the door near her workstation. Interviewee three also mentioned the increase in distractions, which she felt was because of the increase in people around her. Specifically, noise distractions were a problem for her, as the people sharing her space tended to be louder than those who were nearby in the old office. Some of the positives she noticed were the use of the new break areas and outdoor spaces.

Question Two: Describe the most common distractions that you face in the office.

Interviewee one found that most of her distractions were caused by the lack of visual privacy in the open office. Because people are more easily seen, she noticed that more conversations were happening in hallways and at workstations, which can be distracting both when she gets caught up in a part of the conversation when she is busy, and when a conversation is happening near her while she is trying to focus. Interviewee two answered that she does not often face distractions in the workplace. Contrastingly, interviewee three noted that the immense amount of technology in the office is the biggest distraction for her. She remarked that she felt as though there are very few places to escape constant emails and chat messages throughout the day, which slows her down.

Question Three: How do distractions impact your focus and mood?

Interviewee one continued discussing the social distractions in the office, describing her anxiety when she is busy and walking around the office. Because she is aware that she can be seen and possibly be engaged in a conversation by certain people, she has created a systematic route to avoid social interaction when she does not have the time. While interviewee two rarely encounters distractions, when they occur she becomes upset and attempts to build barriers from the distractions around her, whether it be auditory or visual. Interviewee three also experiences negative emotions related to distractions. She noted that a bad work flow brings her mood down.

Question Four: What is your average level of stress in the workplace, on a scale of one-10, 10 being the greatest amount of stress?

Interviewee one ranked her daily stress as two to three out of 10, interviewee two gave her stress a four out of 10, and interviewee gave her stress an eight out of 10.

Question Five: What are the most common causes of the stress that you ranked in the previous question?

Again, interviewee one mentioned the unwanted social interactions that she experiences to be a source of stress, as well as stress from deadlines. Interviewee two's stress most often stemmed from issues that are related to the design process of projects. Interviewee three said her stress, which was highest of the three, was caused by almost everything. Specifically she pointed out her workload, the overstimulation caused by the technology around her, communication issues, and her personal expectations.

Question Six: Describe what you would do if you had to take a private phone call during work, for example, a call with a doctor or family member. Would you feel comfortable taking the call at your desk?

Interviewee one responded that she would absolutely not consider taking a personal call at her desk. Instead, she would find the nearest empty conference room and use it to take the call, as the office currently does not have phone rooms or pods. Interviewee two, however, would feel comfortable having private calls at her workstation. Interviewee three agreed more with interviewee one, stating that in most cases she would not take a personal call at her desk. She did remark that the new office has more areas to take a private call than before.

Question Seven: What is your experience like, visually, in the open office? Do you feel like

you have enough privacy?

Interviewee one believes that there is not enough visual privacy in the new office, which, as she answered in previous statements, often causes her stress and distracts her throughout the day. Interviewee two does feel she has enough privacy, which she credits to being very comfortable working for a company for as long as she has and knowing almost everyone in the office. Similarly, interviewee three does not feel like she needs visual privacy in order to stay productive, but she recognizes that others do. She notices that she is seen, but not necessarily in a bad way.

Question Eight: What is your experience like, acoustically, in the open office? Do you feel like you have enough privacy?

Interviewee one responded that the acoustics in the office are fairly well maintained, although she was unsure whether this was because people are being more quiet than they were in the old office or if it was due to the lower ceilings preventing sound transfer. Interviewee two did not notice any issues with noise, as noise does not often bother or distract her. Interviewee three wishes she had more acoustical privacy in the area near her workstation because of the noise that is created by constant conferencing calls.

Question Nine: If you had the opportunity to change the layout and design of the office, what would you change?

Interviewee one suggested that there be more flexibility for privacy, more wayfinding around the office to help people who get lost, and a less monochrome design. Interviewee two would change the collaboration areas so that they are not in the main path of travel, and would hopefully be used more often. She would also make the office less divided, with more of an open spine connecting everyone together. Interview three would add phone booths and areas for work away from desks and technology. She also hopes to integrate white noise and film on some of the glass panels. She wondered if there was a way for the office to look and feel open while also giving people the visual privacy that many want.

The interviews with women from CPL helped to inform how differing personalities and workstyles changes how people experience their workplace. Interviewee one tended to want the most amount of privacy, whereas interviewee two and three did not feel as though they needed privacy. Interviewee one also struggled with the social implications of an open office, whereas interviewee two liked the sense of collaboration. Their suggestions for improvement aligned with responses from the survey, and relate to alternative work areas and rooms for private conversations or focused work.

Observation Findings

A one hour observation at CPL's new office was conducted on October 12, 2022. The goal of the observation was to see how an open office functions and to see if any issues would be visible. It is important to note that the company implemented a hybrid work option after the covid-19 pandemic, which meant that about a third of the employees were working remotely rather than at the office at the time of the observation.

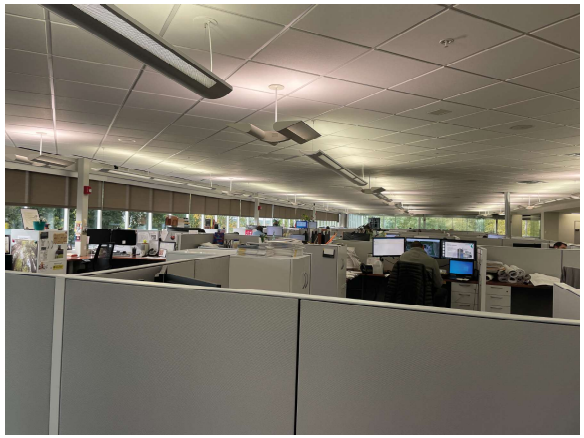


Fig. 39: CPL's Open Office, 2022

The office was very quiet, which employees seemed to be acutely aware of, as people would talk in low voices - sometimes at a whisper - when having conversations with the people nearby them. Because of the low volume of voices, the HVAC noise could be heard loudly in the nearby area. Ambient noise such as typing, mouse clicking, doors opening, and meetings occurring in the conference rooms could be heard around the office. Visually, the workstations had partitions that were low enough to allow most people to peer over their computer screen to observe their surroundings (*Fig. 39*). The researcher quickly became aware of who was watching as they walked by, with most people looking up from their work to see who was passing. Those who had private offices did not have any privacy film on the glass panels, and also appeared to be distracted by people passing by (*Fig. 40*). While most people seemed to go back to their work only a few seconds after being distracted, one man decided to exit his private office to speak with this researcher. This was a surprising interaction, as it occurred in one of the main circulation areas, which most people seemed to avoid having conversations in. The man

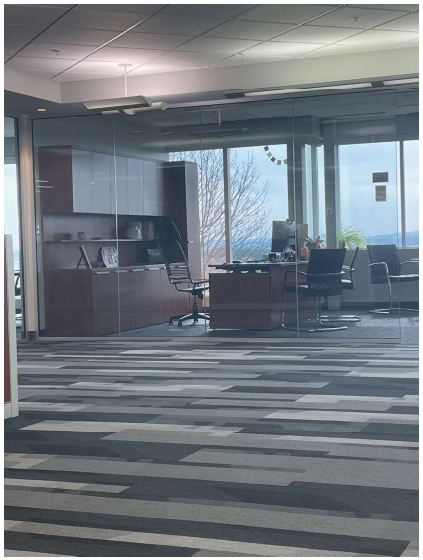


Fig. 40: A Private Office with Glass Partitions, 2022

asked why the researcher was there and what was being studied. When asked about his opinions about the new office design, he said that he would guess 95% of the people are happy with their new workstations.

When observing all the private offices throughout the building, it was found that nine had men working inside, nine were empty, likely due to hybrid workers, and three had women working inside. This aligns with the hierarchy of the company, as most of the senior leaders, engineers, and architects are men. For those working in the open area, teams were spread out across the building, and people were often grouped together with people they do not normally work with. Workstations were a grey color, a design that was very homogeneous, although many decorated their desks. There was often a spillage of personal belongings and papers on the workstations, likely due to a lack of storage for the large sets of documents used by designers, architects, and engineers. One man had begun to spread papers across the floor of his workstation, as he seemed to run out of space on his desk (*Fig. 41*). There were many seating areas around the office, but none of them were used by employees. Most people stayed at their desks to work unless they were going to a meeting. Some members of the interior design team, all of whom are women, also gathered to work together in their allotted shared workspace. There were two lactation rooms (*Fig. 42*) provided for breastfeeding women, although they were both used mostly for storage, rather than as a comfortable room to have some privacy.

Fig. 41: Storage Issues in Workstations, 2022

Fig. 42: Lactation Room, 2022

Conclusion

The research agenda findings align with the data collected from the literature review and confirm the hypothesis that open office design negatively impacts women more than men. The survey and site visit also highlight some of the negative impacts that open offices have on men, which often align with the issues that women face, but impact men to a lesser extent. Therefore, it can be argued that addressing the design flaws that negatively impact women will also help men feel more comfortable in their office environments. The survey results show that both men and women experience issues with a lack of privacy and, consequently, an overwhelming amount of distractions. The most common benefit people identified regarding open offices were the opportunities for teamwork and bonding, but many noted that teams were not sat together, which made teamwork more challenging. All of these observations regarding open office design suggest that giving employees more privacy, while also allocating space for collaboration amongst team members may help to improve the experience in the workplace. According to the responses from the interviews, a woman's experience in the open office may also depend on her personality and workstyle. Because of this, giving people multiple different areas to work, with varying levels of privacy, the open office may be able to cater to more workstyles. These improved experiences would be beneficial for both men and women, but may benefit women more as they are more likely to be impacted by the poor design of open office spaces.

Creative Agenda

Introduction

The original concept of the open office was successful because of its emphasis on communication patterns and equal working space. Inspired by this concept, an alternative to an open office layout is used to give every worker areas of transparency, translucency, and opaqueness, depending on the work they are doing and their privacy preferences. This office layout takes into account the design of an office landscape, providing workspaces that foster efficient office communication. This design specifically addresses issues faced by women in the office, such as a lack of privacy, invasion of work and personal space by men, and improper accommodations for the various stages of motherhood.

The creative agenda proposes a prototypical office for a small architectural firm with eight employees. Rather than relying on a fully open office concept, this office focuses on evidence-based design strategies to inform an activity-based layout. This layout will provide different areas for different work, work style, and privacy needs. Certain design features such as private corridors, strong acoustical properties, and equitable furniture allotment is implemented in order to foster a more comfortable built environment. The ultimate goal of the project is to design an office that addresses the challenges faced by women, while also creating a comfortable and efficient office space for all employees, in order to answer the research question: how can human-centered design improve equity of corporate offices, through the lens of women’s wellbeing?

Programming and Pre-Design Phase

Typical open offices allow around 100 square feet per employee. For an eight person company, a total of at least 800 square feet would be required for workspaces. Additional square footage is required for common areas, conference rooms, storage, toilet rooms, and other auxiliary spaces. The proposed design is activity-based, rather than having assigned workstations, thus additional square footage is required for the extra, flexible workspace. The proposed floor plan is 3,420 square feet and is on the second floor of a two story office building. Calculated using the IBC occupant load factor for business areas, the occupant load for the office is 22.8. There is one connecting stair and elevator for the tenants of the building.

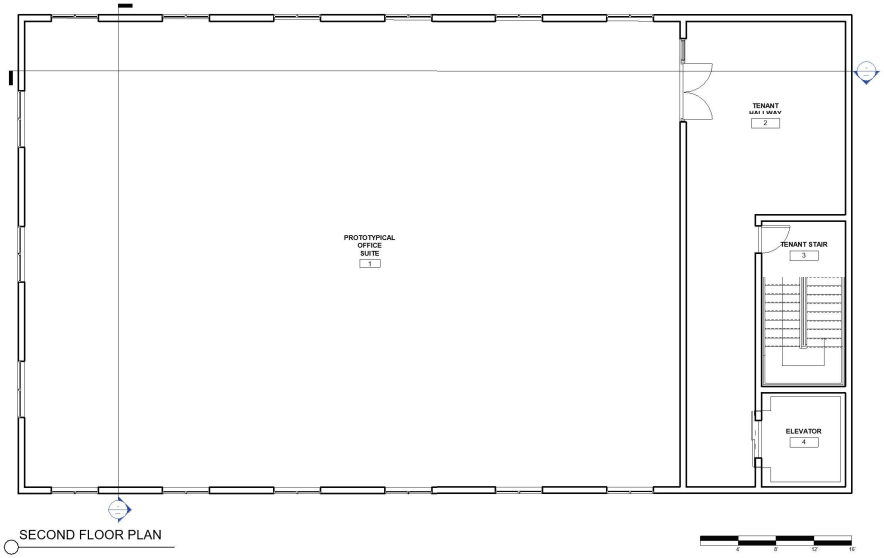


Fig. 43: Prototypical Office Building Floor Plate

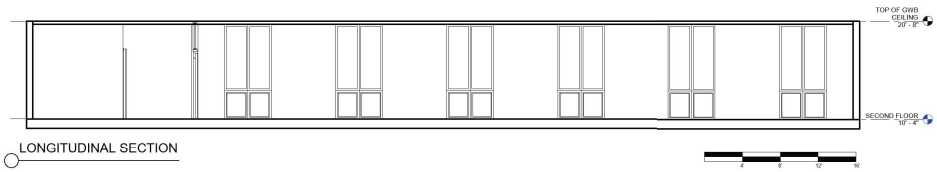


Fig. 44: Prototypical Office Building Longitudinal Section

Fig. 45: Prototypical Office Building Latitudinal Section

An architecture firm located in a traditional open office building would assign workspaces based on the hierarchy of the company (*Fig. 46*). The higher-ups of the company would work in large, comfortable private offices with more expensive and higher quality furniture. The lower an employee is in the hierarchy, the more likely they would be placed in a less desirable workstation with less privacy, more distractions, and smaller spaces. If this company also experiences a gender divide within

this hierarchy, as many companies still experience today, this would put women at a disadvantage. An activity-based approach, however, does not rely on hierarchy to divide workspace (*Fig. 47*). Rather, every employee is given an equal opportunity to choose where they want to work throughout the day. This layout allows for greater flexibility, focus, and collaboration amongst team members. There is also a greater emphasis on ancillary spaces, such as group work areas, phone pods, and wellness rooms. Even if a company were to experience a gender divide, it would not impact the overall experience within the office environment

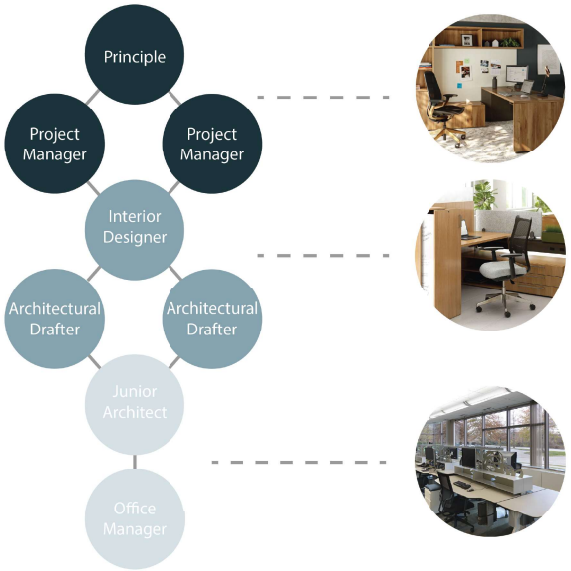


Fig. 46: Traditional Architectural Firm Hierarchy

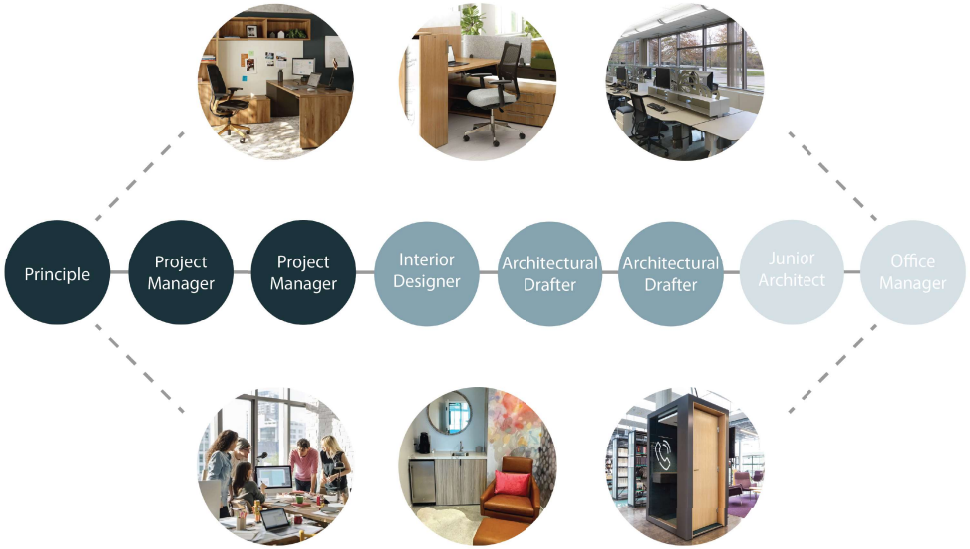


Fig. 47: Office Hierarchy in an Activity-Based Office

Space planning began with defining what rooms and areas were necessary for the prototypical office design. Because the prospective user is an architecture firm, areas for hand drafting, building and displaying physical models, and storing sample binders were included along with the typical office building requirements, such as private offices, workstations, and a kitchenette. Due to the nature of an activity-based layout, a storage locker area is also required, because employees are not given their own personal workspace with storage for their belongings. Additional considerations for the needs of employees included the addition of wellness rooms, which can function as both a rest space and a lactation room. These spaces were then categorized in order to align with the concept of transparency, translucency, and opaqueness (*Fig. 48*). Spaces that required the most privacy and confidentiality were considered opaque, and areas designated for group work and office function were considered to be transparent or translucent. These rooms were then organized into a programming chart (*Table 1*) in order to establish the typical number of users, estimated square footage, and furniture and equipment needs for each room.

Fig. 48: Privacy Diagram

Table 1: Programming Chart

Room Name	Quantity	Number of Users	SQFT	Furniture and Equipment
Opaque - Private				
Utility Room	1	1	30	Floor sink & storage
IT Room	1	1	60	Storage
Toilet Room	2	1	80	Toilet, sink, mirror, product dispensers
Wellness Room	2	1	80	Sink, mini-fridge, storage with pumping kits, soft seating
Phone Pod	2	1 - 2	60	Phone pod as furniture
Private Office	3	1	90	Desk, task chair, soft seating chair, docking station for personal laptops, 1-2 stationary monitors, storage with basic supplies
Conference Room	1	12	260	Conference table, conference chairs, monitor with hybrid capabilities, credenza, storage
Translucent - Semi-Private				
Mail/File/Print Room	1	1 - 5	100	Printers, storage, small worksurfaces
Kitchen/Break Room	1	1 - 4	150	Refrigerator/freezer, microwave, coffee station, dishwasher, cabinets, dining table, dining seating
Partitioned Workstations	5	5	36	Desk, task chair, docking station for personal laptops, 1 stationary monitor, storage with basic supplies
Personal Storage	1	1 - 5	100	Personal lockers, soft seating
Transparent - Public				
Entrance/Waiting	1	1 - 3	100	Soft seating
Drafting Area	1	1 - 8	200	Modular work tables for small group work and large group work, task chairs, storage, worksurfaces, monitors with hybrid capabilities
Sample Library	1	1 - 8	100	Storage, worksurfaces

Bubble and zoning diagrams (*Fig. 49 & 50*) were used in order to establish adjacencies. Based on the findings from the literature and research agenda, one of the goals of the design is to minimize sight lines in corridors. Women reported feeling overly exposed and watched by the men in their workplace in large, open corridors. In order to keep the corridors as private as possible, a central private zone is formed with all three private offices, the conference room, and the semi-private kitchenette. Louder, busier areas of the office are grouped together to consolidate the noise, and all the self care areas are placed together in order to minimize sight lines and circulation around those areas.

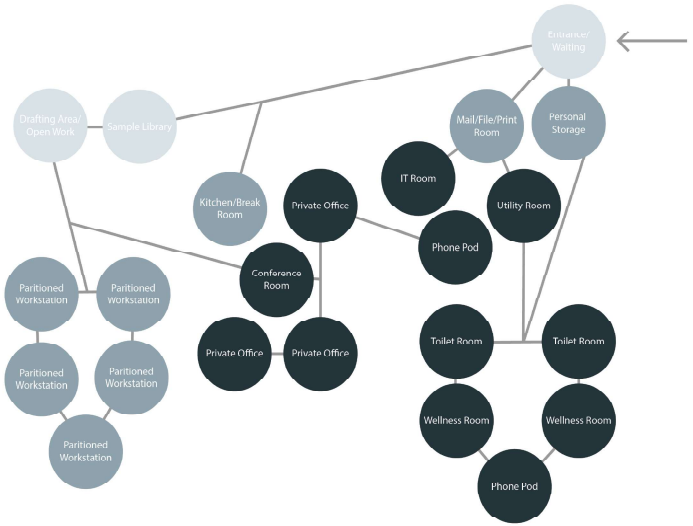


Fig. 49: Bubble Diagram

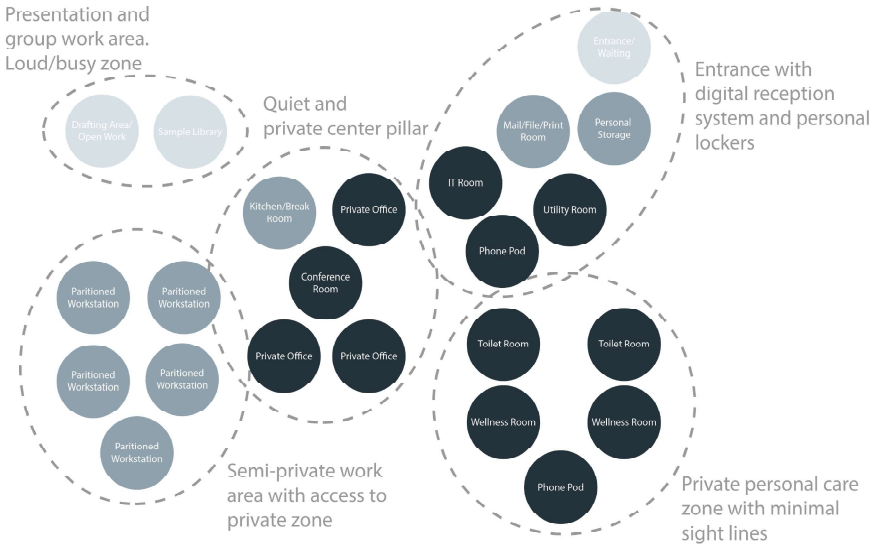


Fig. 50: Zoning Diagram

The bubble diagram was translated onto the floor plan and made into 2D and 3D block diagrams (*Fig. 51*) in order to establish room sizing and paths of travel. The final layout includes a separate, private corridor to the self care rooms, with direct access to the storage lockers, giving employees the opportunity to retrieve any personal belongings before using the toilet or wellness rooms. The 3D axonometric views represent the level of privacy of the rooms. The taller, opaque blocks represent the fully enclosed rooms that would have the most amount of privacy. The blocks become more transparent and shorter the more public the room would be, representing the lack of partitions and walls to enclose the space.

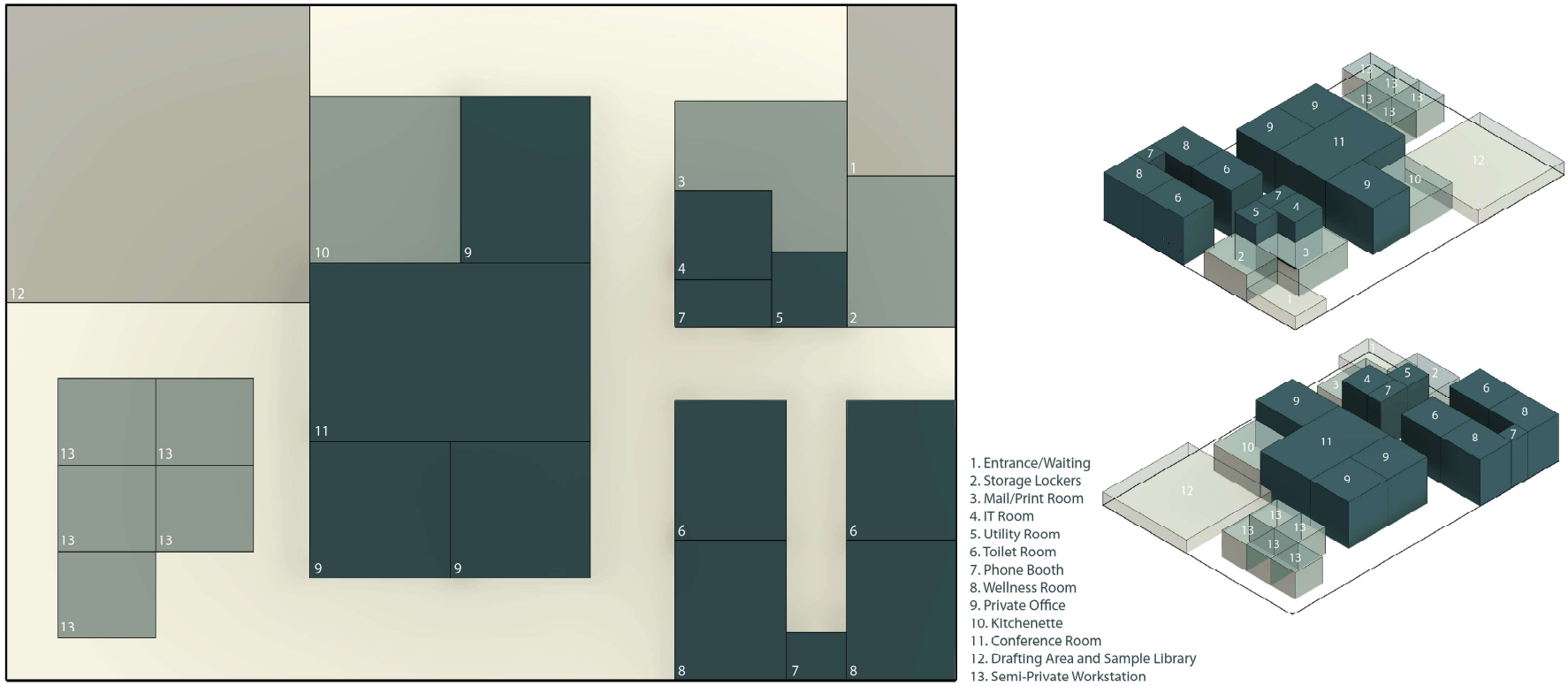
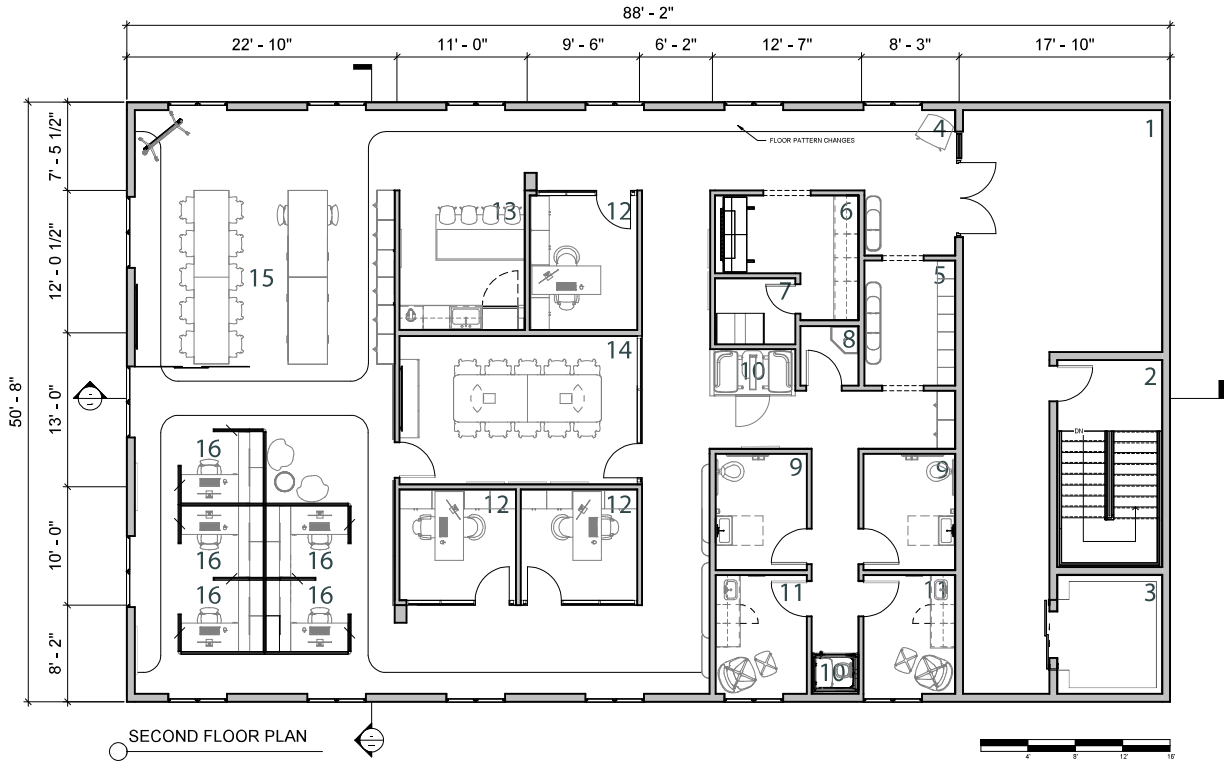


Fig. 51: Block Diagrams

Final Design

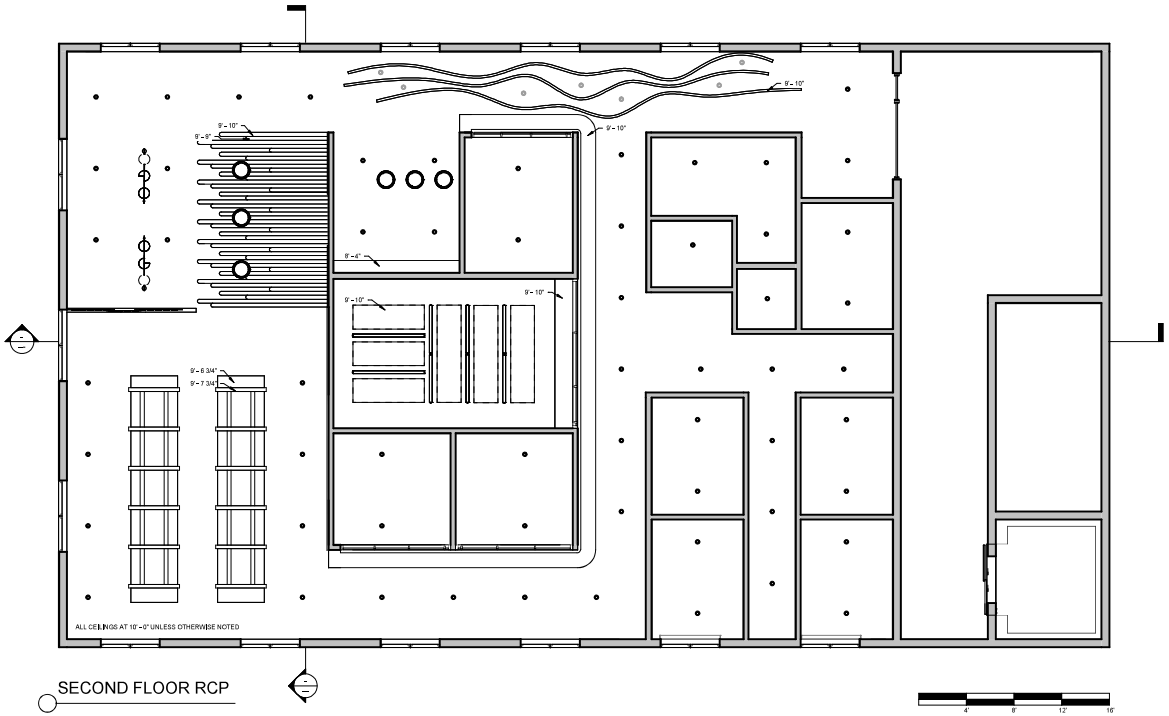
The final floor plan (Appendix E) includes four different areas for work: a group drafting area, semi-private workstations, private offices, and phone booths (*Fig. 52*). The group drafting area features a large work table with enough room to seat all eight employees and extra space for guests and clients. The semi-private workstations are built from the Action Office system by Herman Miller, harkening back to the flexible furniture used in the original open office concept.



1. Tenant Hallway
2. Tenant Stair
3. Elevator
4. Entrance/Waiting
5. Storage Lockers
6. Mail/Print Room
7. IT Room
8. Utility Room
9. Toilet Room
10. Phone Booth
11. Wellness Room
12. Private Office
13. Kitchenette
14. Conference Room
15. Drafting Area and Sample Library
16. Semi-Private Workstation

Fig. 52: Floor Plan

In the private offices and phone booths, personal temperature controls allow users to change the temperature in the room or pod, in order to accommodate differing thermal needs. The phone booths featured are two different models of Framery pods. One is a single working pod that can be used as a micro office or phone pod. The second is a slightly larger pod with soft seating and a center table. This can be used by one or two people for meetings or private work.



LIGHTING LEGEND	
•	FOCAL POINT RECESSED DOWNLIGHT
•	FOCAL POINT CEILING MOUNTED DOWNLIGHT
O	SANTA & COLE PENDANT DOWNLIGHT
	OBLURE TRAPEZE TRIPLETTE PENDANT DOWNLIGHT
	COOPER LIGHTING LINEAR DOWNLIGHT

Fig. 53: Reflected Ceiling Plan

There are three different models of task chairs in the floor plan: the Herman Miller Aeron, the Herman Miller Embody, and the Knoll Life. All three of these chairs are ergonomic and highly adjustable, in order to fit the needs of the users' bodies. The goal of offering different seating options is to allow employees to move the chairs around to the different working areas, in order to sit in the chair that best suits their needs. Giving the most options for adjustability and flexibility allows for a more equitable allotment of furniture - as no one has to sit in a chair that does not fit the size and function of their body and the work that they do.

The literature review findings suggested that women are more sensitive to auditory distractions in the office, which causes an increase in stress. This can impact overall performance, as well as wellness, as it can result in an increase in sick leave. In order to combat this problem in the larger open areas of the office building, the reflected ceiling plan (*Fig. 53*) features several felt clouds and baffles that are designed to absorb distracting sound reverberation.

The size of the prospective company is small, so there is no designated receptionist or reception area by the entrance. Instead, there is a tablet outside of the front entrance, which allows guests to ping a specific employee, or the entire office, to alert them to a person waiting to enter. There would also be swipe access at this door for the employees to enter. There is a small seating area by the entrance in the event that a guest has to wait to be greeted after being allowed into the office (*Fig. 54*).

Fig. 54: Entrance and Waiting Area

The toilet rooms are both equipped with free menstrual product dispensers. Down the same private corridor, the wellness rooms (*Fig. 55*) can be used by everyone in the office as a place to rest and relax. In the instance that someone needs space to breastfeed in the office, both rooms have all the equipment necessary to accommodate them. This includes free pumping kits and instructions, a mini refrigerator, and a sink for sterilization.


Fig. 55: Wellness Room

In order to allow natural light into the private offices (*Fig. 56*), glass is used on the walls facing the windows. However, in order to fit the

privacy needs of the rooms and meet the goal of keeping the corridors free from major sight lines, switch-glass technology is employed within the glass, which can be switched on with a push of a button in the office (*Fig. 57*). This allows for flexibility for the user within the private office and provides diffused natural light into the room.

The design of the office is bold, bright, and biophilic. One of the goals of the design is to create an alternative to the typical neutral and hierarchically designed offices.The literature review indicated that men tend to prefer materials and finishes that show power and authority, such as leather and dark tones. Instead, this prototypical office mixes traditionally masculine and feminine colors to create a rich texture and color palette. Research also showed that women prefer homey designs, which is why biophilic elements were introduced. For instance, over the semi-private workstations there is a hanging plant display (*Fig. 58*). Not only do the plants create a calming environment, but they are also great sound absorbers, which is helpful in more of the open areas of the office. The system uses Biotile and ceiling mounted irrigation systems to keep the plants alive

Fig. 56: Private Offices - Switch-Glass Off

Fig. 57: Private Offices - Switch-Glass On

with minimal care needed. The semi-private office partitions are five feet tall, with glass openings at the tops of the ones perpendicular to the desks in order to allow the natural light into the workstations.

The drafting and sample area (*Fig. 60 & 61*) is designed to allow everyone in the company to gather together for creative work, but it can also act as a more informal conference room due to the wall mounted monitor and large table space. There are several different felt solutions, including wallcovering, wall panels, and partitions, in order to absorb sound when the area becomes noisy. The wallcovering can be used to pin up drawings for display or presentation. The partitions are hung from the ceiling and are moveable, acting as an additional flexible privacy solution depending on the type of work that is being done. The sample library has bookshelves to fit sample binders and books, as well as several different sizes of drawers to fit larger sized samples. There are two standing and stool height work surfaces that can be used to spread out project materials, drawings, or physical models for presentation.

Fig. 58: Semi-Private Workstations

Fig. 59: Seating Area

Fig. 60: Drafting Area

Fig. 61: Sample Library

Fig. 62: Conference Room

Fig. 63: Kitchenette

Conclusion

The goal of the creative agenda portion of this undergraduate capstone project was to design a prototypical alternative to an open office plan for a small architectural firm. Using evidence-based design, the final proposal uses an activity-based layout to improve the office experience for women. Research showed that negative impacts of poor office design typically influence women more than men. Addressing these issues, however, positively affects everyone in the office, as both men and women are negatively impacted by stressors such as auditory distraction, a lack of visual privacy, non-ergonomic furniture, and a lack of temperature control. While the focus of this capstone project was on a small scale office proposal, many of the same techniques can be applied to large office spaces. While a full activity-based layout may not work best for the function of a large company, teams can be grouped together with different areas for working both in groups and individually. In this arrangement, office communication will be fostered amongst team members working in close proximity, but people will still be able to choose what level of privacy they want on a daily basis. Other important considerations include the level of noise in open areas of the office, sight lines in public corridors, and the inclusion of wellness and lactation rooms. The final proposal includes all of these considerations, but on a smaller scale, in order to foster comfort, and the subsequent productivity, of women in the office.

Appendices

Appendix A

Annotated Bibliography

Bodin Danielsson, Christina, et al. "Office Design's Impact on Sick Leave Rates." Ergonomics, 27 Jan. 2014, https://doi.org/10.1080/00140139.2013.871064.

Bodin Danielsson outlines a study done in Sweden about sick leave rates and the differing impacts on men and women in different kinds of offices. She studied three different sizes of open offices, and found that women were more likely to take sick leave compared to men. Women were also more likely to take sick leave in all three open office sizes in comparison to the traditional private cell-office layout. It was hypothesized that this is because women are more sensitive to the physical environ ment and the negative impacts of an open office.

Bodin Danielsson, Christina, et al. "The Relation between Office Type and Workplace Conflict: a Gender and Noise Perspective." Journal of Environmental Psychology, 5 May 2015, https://doi.org/10.1016/j.jenvp.2015.04.004.

In this article, different Swedish offices are studied regarding noise, conflict, and gender differences. It was found that women report more noise disturbances than men and that they are more likely to report noise disturbances in open offices. Although men report more workplace conflicts than women, the open offices had higher rates of conflict for women, which is thought to be caused by the increased noise disturbances.

Bodin Danielsson, Christina. "Office Experiences." Product Experiences, Elsevier Science, 2007, pp. 605–628.

This article features figures that are good examples of the offices that Bodin Danielsson studies in her research. Because two other articles authored by Bodin Danielsson are featured in the paper, the figures give a good foundation and context for what is being described in her research, and the classifications that will be used in the research agenda portion of the manuscript.

Bos, Nathan, et al. "WORKPLACE SATISFACTION BEFORE AND AFTER MOVE TO AN OPEN PLAN OFFICE - INCLUDING INTERACTIONS WITH GENDER AND INTROVERSION." Human Factor and Ergonomics Society, 2017, https://doi.org/10.1177/1541931213601594.

A research company's move to an open office is studied in this article. Employees were surveyed about noise, temperature, and office aesthetics. It was found that women were more likely to find noise to be a distraction in the new open office. They were also more likely to struggle to find private areas for conversations and phone calls. Issues related to temperature discomfort were also found to carry over from the old office to the new office, and is suggested to be caused by temperatures being set for the comfort of most men.

Fried, Yitzhak, et al. "The Joint Effects of Noise, Job Complexity, and Gender on Employee Sickness Absence: An Exploratory Study across 21 Organizations — the CORDIS Study." Journal of Occupational and Organizational Psychology, 2002, https://doi.org/10.1348/09631790260098181.

Fried et al. describes the relationship between noise distributions in the workplace and negative health effects. Chronic exposure to noise has been linked to adverse health effects. It has also been found that women are more likely to be affected by noise disruptions, especially those with more complex jobs. This is because they often require more focus because the work they do is more difficult. Noise pulls this focus away, making them more stressed and more likely to experience sickness. The authors also hypothesized that women are more likely to take sick leave because they are more likely to be aware of the negative impacts of stress on their health.

Gerdenitsch, Cornelia, et al. "Need–Supply Fit in an Activity-Based Flexible Office: A Longitudinal Study During Relocation." Environment and Behavior, 2018, https://doi.org/10.1177/0013916517697766.

This article outlines a case study conducted regarding activity-based offices. This information will be used as an example of a successful alternative to a traditional office. Elements of the design choices will help inform the later creative agenda.

Hirst, Alison, and Christina Schwabenland. "Doing Gender in the 'New Office.'" Gender, Work and Organization, vol. 25, no. 2, Mar. 2018, https://doi.org/10.1111/gwao.12200.

Hirst and Schwabenland study a UK company's move from private to open offices. It was found that women were more uncomfortable in the new office because of a lack of privacy. Many women noted feeling watched, feeling uncomfortable wearing skirts, and observing men pointing them out verbally as they passed by different workstations. There was also an issue with a lack of tampon dispensers in the women's bathrooms, but free condoms were being given out in the men's bathrooms. The authors' argument is that gender stereotypes are perpetuated by office design, which enforces gender inequality.

Johnson, Katherine M., and Salpini, Colleen. "Working and Nursing: Navigating Job and Breastfeeding Demands at Work." Community, Work & Family, vol. 20, no. 4, 2017, pp. 479-496. ProQuest, https://doi.org/10.1080/13668803.2017.1303449

This study took place in a university office regarding women who were planning to breastfeed while working. The university provided a few lactation rooms for new mothers, but there were issues with access, the rooms being overbooked, and women not having enough time to leave their workstations. While some had private or semi-private offices that allowed them to work while they pumped, others had to leave work to pump at home or in the car. These disruptions caused stress, and the lack of

time to pump created a higher risk of their milk drying up prematurely.

Kaufmann-Buhler, Jennifer. "If the Chair Fits: Sexism in American Office Furniture Design." Journal of Design History, vol. 32, no. 4, 14 June 2019, https://doi.org/10.1093/jdh/epz022.

This article overviews the history of office furniture and how it had perpetuated gender inequality in the office. Kaufmann-Buhler focuses most of her study on the mid-to-late 20th century, but argues that this information is still relevant in the modern day, as office furniture is often passed down and some famous designs are still being sold by well known manufacturers. The two pieces of office furniture that are studied are the typing desk and the chair. Kaufmann-Buhler outlines how the design of the typing desk was restricted to only women's body types, which became a conflict when computers began to be implemented. She also compares a secretary and executive chair, how the design reflects the ideal body type of the person sitting in each chair.

Kaufmann-Buhler, Jennifer. "Progressive Partitions: The Promises and Problems of the American Open Plan Office." The Journal of the Design Studies Forum, 07 Jun. 2016, https://doi.org/10.1080/17547075.2016.1189308.

The history of the open office is outlined in this article. Kaufmann-Buhler describes the two office layout styles that eventually were combined to become the open office: the Quickborner Team's office landscaping and Herman Miller's action office. She then

discusses the flaws that eventually came with the increased implementation of the open office, which eventually led to the cubicle design. She argues that in the modern day, companies use open offices to reflect the hierarchy in the office, which conflicts with the original goal of the open office: to break down barriers and give everyone equal working space.

Kingma, Boris R M, and van Marken Lichtenbelt, Wouter D. "Energy Consumption in Buildings and Female Thermal Demand." Nature Climate Change, Aug. 2015, https://doi.org/10.1038/nclimate2741.

This article discusses temperatures of public buildings, and how the metabolic rate of a male body is used as the standard. This standard temperature is often too cold for women, as they are smaller in body size and have a different metabolic rate. The authors suggest implementing more personal controls, especially in offices, to provide more personalized comfort.

Morrison, Rachel L, and Smollan, Roy K. "Open Plan Office Space? If You're Going to Do It, Do It Right: A Fourteen-Month Longitudinal Case Study." Applied Ergonomics, 26 Aug. 2019, https://doi.org/10.1016/j.apergo.2019.102933.

This study followed what was considered to be a successful move to an open office by a New Zealand law firm. The office used plants and filing cabinets to give employees more privacy at their workstations, and employees were allowed to give input during

the design process regarding furniture and color selection. Many people were happy with the new office and felt more productive and close to their coworkers. However, women were aware of a lack of visual privacy, which was not an observation that men had. The authors hypothesized that this is due to a difference in upbringing, and that women are taught to be more aware of their appearance.

Tyler, Melissa, and Cohen, Laurie. "Spaces That Matter: Gender Performativity and Organizational Space." Organization Studies, 2010, https://doi.org/10.1177/0170840609357381.

Tyler and Cohen use a short film to study how women experience offices, and how office design perpetuates office stereotypes. Stills of the short film, which shows a woman in a grey suit blending into different office environments, were shown to women in a university office. Many of the women compared the stills to their own experiences of feeling uncomfortable and unwelcome in their offices. Many report issues with male coworkers invading their privacy and personal space, and feeling pressure to decorate their workstations in a certain way.

Van Dellen, Sjoukje A, et al. "Effects of Lactation Room Quality on Working Mothers' Feelings and Thoughts Related to Breastfeeding and Work: a Randomized Controlled Trial and a Field Experiment." International Breastfeeding Journal, 2022, https://doi.org/10.1186/s13006-022-00499-0.

This article helps inform what may need to be included in a lactation room in order for it to be most successful for breastfeeding mothers. Most important for this research is the information regarding cold storage for breastmilk. This data is paired with additional research that has been done regarding womens' experiences while breastfeeding in the workplace.

Wasserman, Varda. "THE GENDERED AESTHETICS OF THE PHYSICAL ENVIRONMENT OF WORK." 2020.

This article outlines how offices are gendered in their design. Wasserman explores issues regarding hierarchical and gendered layouts, which often places women in open spaces, the misconceptions regarding "neutral" office design, the pressures of being a mother in an open office environment.

Appendix B

Prospectus

Interior Design Capstone Prospectus

Capstone Candidate: Jacqueline Collins

School: College of Art and Design, School of Design Rochester Institute of Technology

Program: Interior Design

Capstone Title

Investigating Equitable Office Design: Addressing Women's Wellness in the Corporate Office through Human-Centered Design to Improve the Quality of Life for all Employees

Research Question

How can human-centered design improve the equity of corporate offices, through the lens of womens' wellbeing?

The Capstone Justification

This capstone aims to investigate how the built environment can impact the wellbeing of women working in corporate offices. In the mid-20th century, office design took a turn towards

the open office plan, a form of office layout that places all or most employees in one open space. This revolutionary design was implemented in a time when men were the majority in the workforce. It was not until the 1970s, due to economic need and an increase in women attending college, that a larger percentage of women began entering the workforce, over a decade after the boom in open office design. In the present day, many institutions continue to design their workspaces based on 20th century open office concepts. While noted for their efficient use of space and egalitarianism, these designs are not without their shortcomings, such as a lack of adequate acoustical and visual privacy. While these issues can impact anyone in the workplace, researchers have noted that in regard to acoustical concerns, for example, “women [are] reporting more noise disturbances in office environments,” which, for women in high complexity workplaces, “correlates with absenteeism” (Bodin et al. 162). Women tend to be more uncomfortable in the office than their male counterparts, leading to issues such as stress and possible increases in sick leave. As a result, open office designs can disproportionally impair workplace satisfaction, comfortability, and perhaps even advancement. This capstone will bridge the gap between women’s inequality and the built environment, identifying how office design can actively consider women’s wellness. A new framework conceived to solve open office plan shortcomings has the potential to improve the experience for all workers and create a more equitable workplace.

Literature Review

The literature review will be conducted in order to obtain the most up-to-date research about the topic. A preliminary review of the history of open offices and their modern-day counterparts highlights common issues regarding open offices, and how they impact women in particular. Jennifer Kaufmann-Buhler's article, "From the Open Plan to the Cubicle: The Real and Imagined Transformation of American Office Design and Office Work, 1945-1999" helps to paint a picture of some of the issues faced by workers in the very first iterations of open office designs, although this was during a period of time where fewer women were working. Open offices became increasingly popular after World War II because the design fit more workers in a smaller footprint, allowed for a visual hierarchy of departments and position, discouraged excess social activity, and encouraged workers to keep their workstations clean. While businesses often preferred this uniform design, individual workers expressed issues of "increasingly less autonomy" and feelings of being "imprisoned in the overly controlled office environment" (Kaufmann-Buhler 23-24). Workers felt over-monitored by managers and unwelcome in the office. Shifting to the study of present day open-offices through the lens of women's experiences, specifically, the article "The Relationship Between Office Type and Workplace Conflict: A Gender and Noise Perspective," notes that in the workplace, "women are more stressed and have less good health and higher sickness absenteeism" (Bodin et al. 162). These forms of stressors are most common amongst open-office plans, as they often

cause excess noise and minimal amounts of visual privacy. In the article “Doing Gender in the ‘New Office’” the researchers evaluating the characteristics of a new open office plan “often noticed men watching women walk through the long, uninterrupted spaces of the building, sometimes appearing to struggle between their wish not to appear rude and their wish to watch the woman” (Hirst and Schwabenland 171). This is corroborated by many of the women in that particular office, who reported feeling watched, and experiencing a lack of privacy. In fact, many felt pressured to change their way of dress, wanting to be noticed less and appear more feminine. From this initial research, it is clear that open-offices are a major cause of discomfort amongst women in the workplace. Some of the design changes that may be considered are quieter workstations, an increase in areas designed for privacy and small gatherings, and flexible, adjustable furniture for all office types.

Research Agenda

There are two goals of the research agenda of this capstone project. The first goal is to identify how open office layouts impact men and women in the workplace, in order to compare differences in gender. This research is specifically focused on sources of distraction in the office, stress caused from distractions, and visual privacy in different areas around the office. The second goal is to identify possible solutions to the problems that were identified in the literature review and research agenda, in order to help answer the research question: 'how can human-centered design improve the equity of corporate offices, through the lens of womens' wellbeing?'

Data will be collected in three ways: through surveys, interviews, and observations. The public surveys will be distributed to men and women who had worked in a corporate open office within the past 5 years. The survey will include questions about different aspects of the open office layout and the pros and cons of an open office. All responses will be kept anonymous. Interviews will be conducted in order to get a deeper understanding of womens' experiences in open offices. Questions will be similar to those in the survey, but will allow participants to expand on their responses. An observation will be conducted in the same open office that the interviews take place in, which will help to gather evidence that supports the womens' responses. Photos will be taken to document the layout and design, and floor plans will be analyzed regarding

gender distribution throughout the office. A case study of a successful open office will also be analyzed for possible solutions, although there have yet to be any case studies that specifically focus on gender in the open office.

Creative Agenda

The creative agenda will culminate in a theoretical model proposed as an alternative to the traditional open office plan, in order to address issues found in the research. This design will focus on a small corporate office space intended for a company of around 10-15 male and female employees. Implementing lower stress built environments within the office will not only make the female employees feel more comfortable and less stressed, but will also reduce discomfort and distraction among male employees as well.

Summary

The goal of this capstone project is to investigate how open office layouts may create unnecessary stress and discomfort among female employees. The surveys and interviews will indicate the various issues in an open office environment, and the ways in which they may be addressed, which will aid in the design for the Creative Agenda. The Creative Agenda model will address the various issues found in the literature review and research agenda, proposing a new office plan that helps reduce workplace stress.

Appendix C

Survey Questions

Respondent Information:

1. What is your gender? (Options: male, female, nonbinary, other:)

2. What is the size of the open office that you most recently worked in? (Small: 4-9 people, Medium: 10-24 people, Large: >24 people)

Please rank the following statements as they relate to the open office you most recently worked in (strongly disagree, disagree, somewhat disagree, neutral, somewhat agree, agree, strongly agree):

3. You are often exposed to a distracting and/or tiresome noise

4. Noise distractions often make you more stressed and less productive

5. Visual distractions often make you more stressed and less productive

6. You are comfortable with the temperature that your workstation is kept in

7. You are comfortable with the visual privacy that you have at your desk

8. You are comfortable with the visual privacy that you have in common areas (corridors, seating areas, stairways, etc.)

9. There is a place for you to have a private conversation on the phone or with one other person

10. There are supportive areas for small breakout meetings that are private from other people's conversations

11. You are satisfied with how the layout of your office contributes to your productivity

Open Ended Questions:

12. In your opinion, what are the flaws in the layout and functionality of the open office you work(ed) in?

13. In your opinion, what are the benefits to the layout and functionality of the open office you work(ed) in?

14. If you had the opportunity to change the layout and design of the open office you work(ed) in, what would you change?

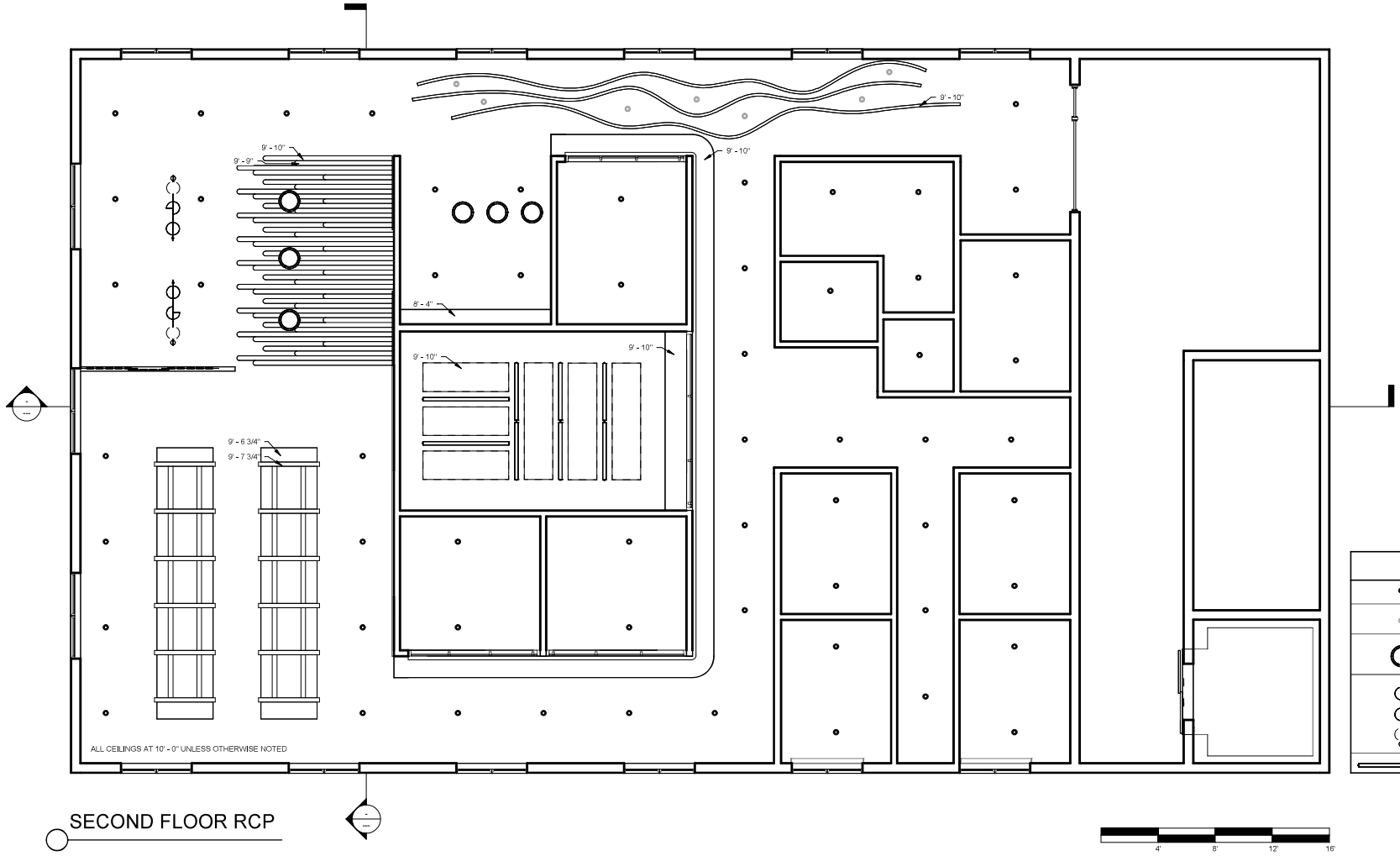
Appendix D

Interview Questions

1. How has the move to an open office changed your experience in the office?
    A. Ask about changes in dress, distractions, and social habits if not mentioned
2. Describe the most common distractions that you face in the office.
3. How do distractions impact your focus and mood?
4. What is your average level of stress in the workplace, on a scale of 1-10, 10 being the greatest amount of stress?
5. What are the most common causes of that stress?
6. Describe what you would do if you had to take a private phone call during work, for example, a call with a doctor or family member. Would you feel comfortable taking the call at your desk?
7. What is your experience like, visually, in the open office? Do you feel like you have enough privacy?
8. What is your experience like, acoustically, in the open office? Do you feel like you have enough privacy?
9. If you had the opportunity to change the layout and design of the office, what would you change?

Appendix E

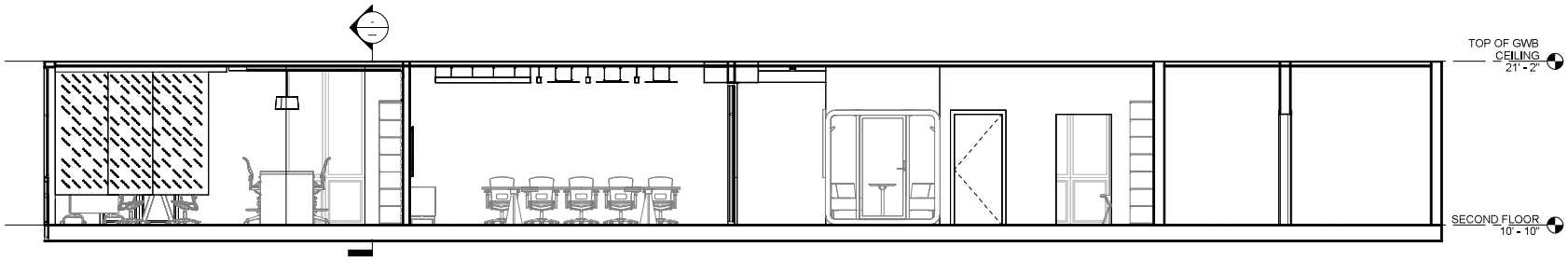
Final Architectural Drawings



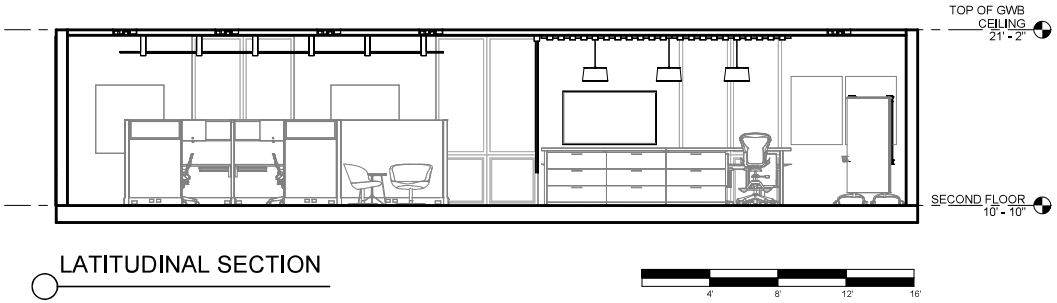
LIGHTING LEGEND	
	FOCAL POINT RECESSED DOWNLIGHT
	FOCAL POINT CEILING MOUNTED DOWNLIGHT
	SANTA & COLE PENDANT DOWNLIGHT
	OBLURE TRAPEZE TRIPLETTE PENDANT DOWNLIGHT
	COOPER LIGHTING LINEAR DOWNLIGHT

SECOND FLOOR RCP

4' 8' 12' 16'



LONGITUDINAL SECTION



LATITUDINAL SECTION