Post-pandemic Office Spaces:
Considerations and Design Strategies for Hybrid Work Environments

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Abstract

This research investigated renovation considerations and design strategies for post-pandemic, hybrid office environment within an academic institution. The focus was on two case-study office spaces that are part of the same organization at the University of Utah, where the existing physical space was insufficient for future growth and non-functional for its novel, hybrid work mode structure. The objective was to evaluate the physical conditions of the existing office spaces, to investigate the employees' working patterns and office culture, and to propose renovation strategies that would meet both the current and the projected future needs that support a hybrid work structure.

The study was based on mixed-mode research methods, which included qualitative and quantitative methods. Qualitative methods included archival and empirical research of the existing office space conditions, as well as users' input through online survey and focus group interviews. Using the latest, as-built construction drawings and current state photographs, 3D BIM models of each of the two office wings were developed, inclusive of their structural elements, partition walls, existing lighting fixture locations and specific furniture arrangements. These models were then used for egress, circulation, daylighting, and existing space planning analysis. Literature review was also conducted, identifying rising trends and design considerations for hybrid office workflow. Surveys and focus group interviews were conducted with current employees of the two offices to evaluate work patterns and space needs through user insight. Meanwhile, quantitative methods included quantitative analysis of the survey and focus group interview results, computational modeling, and visualization of the existing and proposed design strategies, as well as a review and validation of final design's egress and accessibility compliance. Through several design option iterations, these results were used to provide space planning strategies and recommendations that meet the specific needs of these two office spaces.

The final design, which considered users' input regarding team dynamics, work schedules, and specific space and function needs, achieved a significant improvement in balances between team and individual space functions, private and public circulation, access to daylight and accessibility, while respecting the existing wall partitions, egress paths and occupancy counts. Moreover, the design solutions provided inclusive, comfortable, and functional spaces that catered to the specific work culture and individualized needs of employees. While this research focused on two specific case-studies, results demonstrate that through a user-integrated approach, significant improvements can be achieved to provide well-functioning spaces and a more comfortable and inclusive working environment. Additionally, the presented process that focuses on user-input and participation in the renovation design process can be applied to other existing, traditionally structured office spaces when transitioning to a hybrid office structure.

Keywords: office space renovation, hybrid office design strategies, post pandemic office design, flexible office space design, employee-engaged office design.

1. INTRODUCTION AND BACKGROUND

1.1. The Effects of COVID-19 Pandemic on Working Environments

The COVID-19 pandemic has had a significant impact on working environments around the world and has led to changes in the way we work, communicate, and interact with each other. Some of the key effects include an increased shift toward *remote work* and *hybrid work* modes, as opposed to the traditional, pre-pandemic office *work mode*. Remote work, where employees fully work from home or another remote location, was an accelerated model during the onset of the pandemic, as a forced, emergency measure to cope with health and safety in the workplace (Appel-Meulenbroek et al. 2022). Meanwhile, in the post-pandemic environment, many companies have been implementing a hybrid work model, where employees combine working from the physical office with working remotely. This was primarily a result of balancing both the opportunities and challenges of fully remote work, as hybrid work allows for maintaining the positive effects of remote work flexibilities while improving the negative impacts on in-person communication and collaboration with occasional work from the office (Eitland 2020, Babapour Chafi et al. 2022, Lang 2022 and Smite et al. 2023). Hybrid work model can also help prevent the negative effects of continued professional isolation on sense of well-being and career growth opportunities (Babapour Chafi et al. 2022, Lang 2022, Nakai et al. 2022, Tleuken et al. 2022, and Yang et al. 2022). At the same time, some organizations have been pushing for a full return to exclusive, in-office work mode. However, the current academic and industry projections are that the work culture has significantly shifted, and that the *hybrid work* mode and its various models are here to stay, with many benefits to both the employees and the work organizations (Appel-Meulenbroek et al. 2022, Babapour Chafi et al. 2022, Geertgens 2022, IWFM 2022, Howell 2022, Nediari et al. 2021, Roy 2022, Smite et al. 2023 and Vyas 2022).

1.2. Overview of History on Hybrid Work

Remote and hybrid work modes are not novel concepts. They have just been accelerated by the COVID-19 pandemic and have continued to be driven by advances in technology and changes in societal attitudes toward work (Appel-Meulenbroek et al. 2022). Remote work was until recently referred to as *telecommuting* or *teleworking*, described as practice of using technology to work from a remote location, originating in the early 1970's during the energy crisis when work travel was of significant concern and when computer technologies had allowed for remote operations (Torten et al. 2016). At that time, remote work was perceived as a revolutionary and promising concept for the future of

work; however, its initial implementation was much lower than anticipated due to the persisting rigidity of corporate office culture and legal liabilities associated with remote work (Torten et al. 2016). With more recent advancements in technology, such as the rise of high-speed internet and the proliferation of communication technologies, telecommuting (or remote working) had continued its slow, but inevitable growth in implementation. This was associated with reduced rigidity in corporate office culture, as companies began to recognize the benefits of remote work, such as cost savings, improved productivity, and access to a wider pool of talent (Appel-Meulenbroek et al. 2022 and Torten et al. 2016). This led to the implementation of hybrid work in the early 2000's, where a combination of remote and office work was being offered with increased flexibility and autonomy as a work-life balance benefit for employees (Appel-Meulenbroek et al. 2022). The hybrid approach allowed employees to pick the best of both worlds – fulfilling face-to-face meetings and collaborative tasks in person from the office while having flexibility to conduct individualized or travel-related tasks remotely and manage personal life responsibilities.

The study by Torten et al. (2016), which was published well before the COVID-19 pandemic and based upon a previous body of research on teleworking, investigated the effects of this work mode with a focus on employee satisfaction, performance, and productivity through an online survey method with employees from a wide range of companies across multiple industries in the United States. Its findings were that when employees are trained and experienced, and when the information and communication infrastructure are present and accessible, *telecommuting*, or *remote work*, offers significant economic advantages to both employees and employers, increased employee satisfaction and motivation, and benefits to the natural environment associated with reduced travel. It also emphasized that employee satisfaction is a critical component in job retention, terming this as "human capital," which hints to the already existing, though slower, cultural shifts within the workplace that offer flexibility in managing the increased demands of work schedules and work-life balance.

As the circumstances of the COVID-19 pandemic instituted recommendations and regulations for social distancing, corporate offices with already implemented flexibilities and supporting technology infrastructure had an easier time abruptly shifting to a fully remote work mode, while some other office structures had challenges and/or inabilities to quickly adapt. While many offices started to accommodate remote work, some for the first time, the remote or *work from home* (WFH) structure started to become

more permanent and popular. Many organizations also started to increasingly investigate the effects, including challenges and opportunities, of remote work on their organization to plan for a post-pandemic path forward. One such example is research done by Perkins and Will, an architecture and design firm with multiple offices located across six continents, which already had a flexible mode work structure implemented prior to the pandemic. Employees conducted work on laptop computers that could plug into any desk location or any room in the physical office and where employees could take their work home or another remote location and flexibly balance their full-time hours regardless of rank within the office structure. During the onset of the pandemic, in 2020, this organization conducted qualitative, online survey research, which was offered to 2,000 employees across all 25, global offices to evaluate the effects of WFH with the goal of learning how those results can shape their future approach of work mode and workplace design (Eitland 2020). With 75% participatory responses, their general summaries were that the pandemic-environment WFH model had offered numerous benefits, such as improvement on individualized task concentration and balance with non-work-related responsibilities. However, the long-term implementation of this exclusive work model poses risks of adverse consequences on mental health and well-being, such as reduced sense of connectedness and belonging, challenges in communication and collaboration, and a reduced sense of well-being and productivity associated with increased work hours, burnout, and difficulty of maintaining work-life balance. Their research results concluded with a projection for a more even distribution of time spent between remote work and office work in the post-pandemic future (Eitland 2020). Similar findings were concluded in a recent study by Babapour Chafi et al. (2022), where the same benefits and downsides of remote work were noted, and where an explicit notion of hybrid work mode was projected as an ideal balance between remote and office work modes. Additionally, study by Barriga et al. (2021) emphasizes the risks of personal responsibility conflicts and burnout associated with remote work, and the study by Yang et al. (2022) emphasizes the risks of cyber ostracism and additional risks associated with employee well-being, such as loneliness and procrastination in a fully remote work environment.

Thus, this balanced work mode, now more commonly referred to as *hybrid work*, is increasingly popular since it can balance the changing work culture and negative effects of remote work if the office spaces and integrated digital technologies are carefully designed and adapted to the diverse and evolving needs of the employees (Babapour Chafi et al. 2022). Hybrid work includes numerous and customized approaches to balances in

percentage of time spent between remote and office work settings, and also in percentage of employees who may predominantly work remote ("*remote-first*" hybrid model), roughly equally remote and from the office ("*standard*" hybrid model), or predominantly from the office ("office-first" hybrid model) depending on their roles, responsibilities, and individual circumstances (K-2 Space 2021a and 2021b). Thus, when it comes to designing for this work mode and its implementation, it is important for employers to consider the individualized needs of their organization and the individualized needs of employees, and not simply rely on trends.

1.3. Challenges and Opportunities of Hybrid Work

As with any mode of work, the future oriented hybrid work mode poses some challenges and opportunities. One of the biggest challenges of hybrid work mode is maintaining effective communication and collaboration among employees who are working remotely and in-person. Another challenge is managing productivity and the well-being of employees. It can be difficult to manage and support teams when employees are working both remotely and in-person. Increased data oversight may make employees uncomfortable, while virtual meetings with management may feel more formal than a quick conversation in person. A recent study by Knight et al (2022) finds that colleague support, as opposed to management support, is critical to employee well-being to help prevent the sense of isolation and to help improve the sense of job satisfaction, which stresses the importance of ensuring easy and effective communication.

At the same time, it may be challenging to meet all employee expectations, and ensure hybrid schedules that offer ideal balances between remote and office work without excluding anyone or unintentionally limiting their career growth opportunities. Research by Appel-Meulenbroek et al. (2022) finds that employee choice for a work setting is influenced by the type of tasks that they need to perform, such as independent concentration work, communication and teamwork, or a combination of both, and their individual assessment of whether these tasks would be more productive from the physical office space or from a remote location such as their home. However, those choices may also lead to unintentional, demographic segregation of employees, which may have negative impact on long-term equity and career growth opportunities. Results of this study showed patterns where younger, male, higher education background and higher organization role employees working from the office, and patterns of older, female, lower education background, and lower organization role employees working from home were observed. Another important consideration is to ensure that those with invisible disabilities are not

unintentionally excluded. A recent study by Capuano (2022) finds that those with invisible disabilities may avoid returning to the office if that environment is no longer supportive. Another recent study by Nakai et al. (2022) warns of loss of productivity, loss of motivation, and increase in depressive symptoms among employees who may suffer from invisible or undiagnosed disorders, such as attention-deficit hyperactivity disorder (ADHD). Thus, it is critical that all individuals feel connected and supported within a hybrid organization.

This leads to the next challenge, maintaining office culture, specifically ensuring connectedness and a sense of belonging within the organization and inclusion in decision-making processes. It is important to consider the organization's unique culture and values, and to ensure that the implemented schedules as well as office design features continue to foster and strengthen those values (Fayard et al. 2021). A sense of impermanence, designated office space and constantly shifting schedules may cause employees to feel less connected and less part of an organization. This may be especially critical for primarily remote working employees. While there is a generalized assumption that independent concentration work is more associated with remote work or WFH, and that communicative and collaborative work is more associated with office space work, Appel-Meulenbroek et al. (2022) findings show that this is not the case for everybody. Thus, it is important to integrate both occasional and permanent work areas for both individuals and teams. To overcome these challenges, organizations need to develop clear policies and guidelines, and invest in technologies and tools that support communication and collaboration and bridge the "*hybrid divide*" between remote and office work employees (Cisco 2022).

Hybrid work mode also offers numerous opportunities, perhaps the most significant of which is increased flexibility, autonomy, and work-life balance. Hybrid work mode allows employees to choose when and where they work. It can also allow employees to manage their time more effectively and to meet personal and family responsibilities. However, with increasingly blurred lines between work and private life, it is important to provide office spaces that offer all employees an opportunity to conduct work from the office to support a healthy separation and balance between work and life activities. While there is a generalized assumption that independent concentration work is more associated with remote work or WFH, and that communicative and collaborative work is more associated with office space work, Appel-Meulenbroek et al. (2022) findings show that this is not the case for everybody. Thus, it is important for offices to be attractive and inviting to all employes, and to accommodate both independent concentration work and communicative teamwork

spaces and consider potential noise and/or visual distractions.

Another opportunity is that hybrid work mode can lead to reduced operating costs for organizations. With various and often rotating schedules and a generally fewer number of employees in the office associated with this work mode, there are opportunities for both reduced space needs, and reduced operation costs and other expenses associated with maintaining a physical office (Cisco 2022). At the same time, employees may feel discouraged from using the office if those spaces feel empty, inadequate, or less comfortable than their home or remote settings. Thus, it is also important to optimize the existing spaces and consider the types of tasks that employees perform, the level of collaboration that is required among individuals, teams, and within the organization, and the technology requirements, tools, and types of spaces that employees need to be successful (Babapour Chafi et al. 2022). An opportunity also lies in implementing more sustainable practices and policies. As hybrid work balances time between remote and office work, the reduced need and frequency of commute leads to a reduction of carbon emissions and transportation savings. This is also true for reduced need for work related travel, especially air travel, with implementation and accessibility of collaboration and communication technologies.

1.4. Hybrid Office Design Trends and Strategies

Before the COVID-19 pandemic, early 2000s had introduced the open office plan workspace design trend, when cubicles with space confining desktop computers were being exchanged for barrier-free spaces with open desk stations, breakout meeting rooms, and laptop computers that allowed employees to work in different areas throughout their day (Geertgens 2022, Nediari et al. 2020, and Nguyen 2018). These trends, along with implementation of non-traditional types of workspaces such as wellness rooms, fitness spaces, social gathering spaces, etc. supported the collaborative work concept and were considered as flexible, future-oriented design strategies that promote engagement in the workplace and well-being (Nguyen 2018). However, with the onset of the COVID-19 pandemic, recommended social distancing was an immediate challenge to resolve in these open plan environments, and in the post-pandemic work culture shift, these open plans are uncomfortably empty and uninviting. This leaves many open-ended questions such as how to maximize and optimize existing office space, how to integrate non-permanent, evolving trend functions and zones, and how to re-enliven the social atmosphere and office culture.

The study by Cheung (2021) focused on rising trends

for hybrid work modes where focus is on the holistic approach in flexibility for both employees and physical space and on a holistic approach to health and well-being of employees, the community, and the environment. Cheung (2021) predicts that as the boundary between work and lifestyle continues to blur, hybrid mode office spaces that provide healthy and inspiring environments will be of high priority and linked to both performance and resilience of work organizations. These overarching, holistic themes of flexibility, health and well-being were also summarized by Geertgens (2022), IWFM (2022), K2 Space (2021a and 2021b), and Rousell (2021).

Flexibility for employees may include accommodations such as accessibility and variety of work and play settings, ease and personalization such as comfortable and adjustable furniture, personal touches such as art and use of color, and availability and easy access to resources and technology. Meanwhile, flexibility of physical space may include flexible partitions and furniture arrangements for individualized and group work, and the integration of nontraditional office functions such as private call booths, collaboration hubs, social lounges, maker spaces, fitness spaces, meditation spaces, dinning spaces, outdoor spaces, etc. (Cheung 2021, IWFM 2022, K2 Space 2021a and 2021b). To support health and well-being of employees, some recommended strategies may include branding, color and signage for a sense of culture and belonging, spaces that maximize access to natural light and outdoor views, spaces that foster face-to-face connections, spaces that accommodate introverted and extroverted work habits, private and public spaces for wellness and recharge, and inclusion of biophilic design elements both for décor and open space zoning. To support health and well-being of the community and natural environment, office renovations should strive to meet sustainability certification standards such as LEED, BREEAM and WELL, consider up-cycling existing furniture and implementing materials with high recycle content, optimize interior design for natural light and ventilation, implement automated control systems, and include additional facilities that encourage active lifestyles and sustainable modes of commute, such as fitness areas, showers, locker rooms, and bicycle storage (Cheung 2021).

The following list outlines some additional strategies that can be considered in renovations of existing offices into spaces that accommodate hybrid work mode settings (Appel-Meulenbroek et al. 2022, Babapour Chafi et al. 2022, Cheung 2021, Cisco 2022, Fayard 2021, Geertgens 2022, Howell 2022, IWFM 2022, Knight 2022, Nediari et al. 2021, Rousell 2021, Smite et al. 2023, and Steelcase 2021):

- Accommodate both independent concentration work and communicative teamwork spaces.

- Limit auditory and visual distractions with furniture types and placement.
- Provide quiet areas and private spaces for high concentration work without isolating employees.
- Provide private conversation areas and areas with ample personal space.
- Provide collaborative, small, and large-group meeting spaces that promote socializing in the office.
- Equip spaces with easily accessible technology and tools to bridge the communication and collaboration gap between remote and office employees.
- Integrate technologies that show schedules, occupancy, and availability of office spaces.
- Provide comfortable, ergonomic, adjustable, and flexible furniture that can continue to adapt in an open office environment.
- Provide ample circulation area, prevent overcrowding, and increase personal space for sense of comfort, safety, and privacy.
- Provide access to outdoor views, optimize natural daylight, and integrate biophilic elements to support a sense of well-being.

1.5. Research Gaps and Objectives

The existing research indicates that hybrid mode transitions will continue to emphasize flexibility of space and integration of strategies that will support and positively contribute to employees' sense of well-being (Geertgens 2022, IWFM 2022, K2 Space 2021a and 2021b, and Rousell 2021). Existing studies also show that there is no one-size-fits-all method of adapting traditional workspaces into a hybrid office structure, and that careful attention must be paid to the individual office culture to ensure that adaptations will result in a more comfortable and inclusive working environment.

However, while many design firms have been ambitiously proposing new solutions for hybrid workspaces, studies on office setting renovation considerations and strategies for existing, traditionally structured office spaces for accommodation of a hybrid mode structure are extremely limited. Existing research either focuses on qualitative data surveys and focus groups to derive patterns on user experiences on work from home (WFH) methods (Eitland 2020, Nakai et al 2022, Oygür et al. 2022, Tleuken et al. 2022, Yang et al. 2022), while existing research on renovation or adaptation strategies for existing office spaces was primarily done by manufacturing and design practice industries (Cisco 2022, IWFM 2022, K2 Space 2021a, K2 Space 2021b, Rousell 2021 and Steelcase 2021). Recently published research by Appel-Meulenbroek et al. (2022) emphasizes that existing research focuses
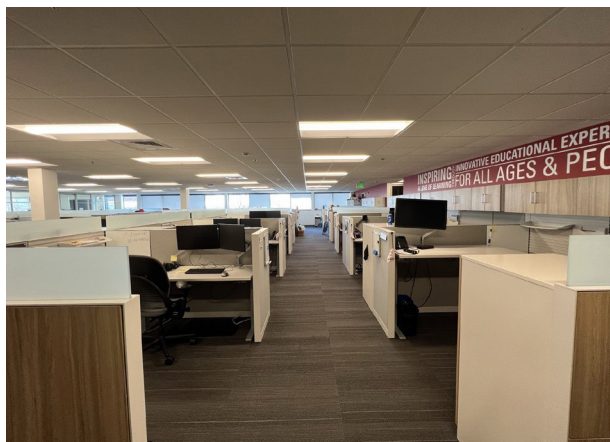
more on the WFH experience, but not as much on the qualities of office spaces in post-pandemic work. Thus, presently, as many organizations are considering best work modes for their operations, between fully remote, fully in-person, or some version of a hybrid work mode, research that evaluates considerations and strategies regarding hybrid work mode and hybrid office design is crucial.

Since studies on both employee preferences in post-pandemic, hybrid work mode settings and on hybrid office design strategies and recommendations are few, this research focused on investigating renovation strategies of two real-world, traditionally set-up offices at the University of Utah, with the following primary objectives:

1. to investigate existing conditions and users' perception of their office spaces,
2. to determine current and projected future work patterns and physical space needs for the investigated case study office spaces,
3. to determine employee (or user) perceptions of work culture and physical space needs for a hybrid working environment,
4. to provide space planning strategies and recommendations for hybrid office space design that meets current and projected future needs.

At the same time, the overarching goal of this research was to emphasize the importance of user input and user inclusion in the design process, and not simply relying on industry trends. While this research presents results of two specific case studies, the presented framework can be applied to other office adaptations and renovations, where organization's specific work culture and space needs are considered as a priority.

Through the processes of archival and empirical research of the existing conditions, literature review of the current trends in office space design, and online survey and focus group interviews with employees at these two offices, the study aimed to derive recommendations and guidelines for renovating existing office spaces that are inclusive, comfortable, and functional for current hybrid workflow patterns and characteristics.

1.6. Overview of Case Studies

The two case study office spaces are part of an administrative unit at the University of Utah in Salt Lake City, referred to as *Office A* and *Office B*. The two offices, while part of one organization, are located within different parts of the university campus and hosted in different typologies of buildings. Office A is hosted in an administrative and academic instruction building and Office B is hosted at the university's main library.

At the time of the study, these two offices had formally implemented a hybrid work structure and were looking into ways of adapting their existing spaces to the new work mode culture and functional needs. These offices, both primarily characterized by independent workstations and cubicles in an open space environment, were no longer functional for the organization's primary working mode, were no longer inviting for the organization's changed work culture, and no longer spatially sufficient for the organization's projected future growth. Figure 1 illustrates the general, existing interior conditions of these two offices.

The following figures illustrate the existing conditions regarding the current office space circulation patterns (Figure 2), distribution of individual and team spaces (Figure 3), and access to daylight (Figure 4) at the two case study offices, A and B. These figures were based on archival and empirical data collection and analysis, and point to some significant, existing limits to functionality of space and comfort.

Figure 1: Existing interior conditions of the two case study offices, **Office A** (left) and **Office B** (right).

COLOR LEGEND:
- PRIMARY CIRCULATION
- DISTRACTION ZONES
- SECONDARY CIRCULATION
- ENTRANCES
- EXITS

OFFICE A: EXISTING CIRCULATION

OFFICE B: EXISTING CIRCULATION

Figure 2: Existing conditions circulation and adjacency analysis for case study offices A and B.

Figure 2 illustrates that the existing, individual cubicle workstation arrangement for general staff is exposed to significant levels of noise and privacy distractions due to their adjacency to primary foot-traffic circulation at both office locations. A significant proportion of these individual workstations are also directly adjacent to the private offices of management and leadership staff, which may result in a lower sense of personal comfort due to visual exposure and oversight. This was somewhat less observed at *Office B*, where only a few workstations had this relationship, and where the private offices had solid doors and no glazed partitions. Another observation was the lack of a formal reception area at Office A, where the preference was to use office exits as primary points

OFFICE A: EXISTING SPACE DISTRIBUTION
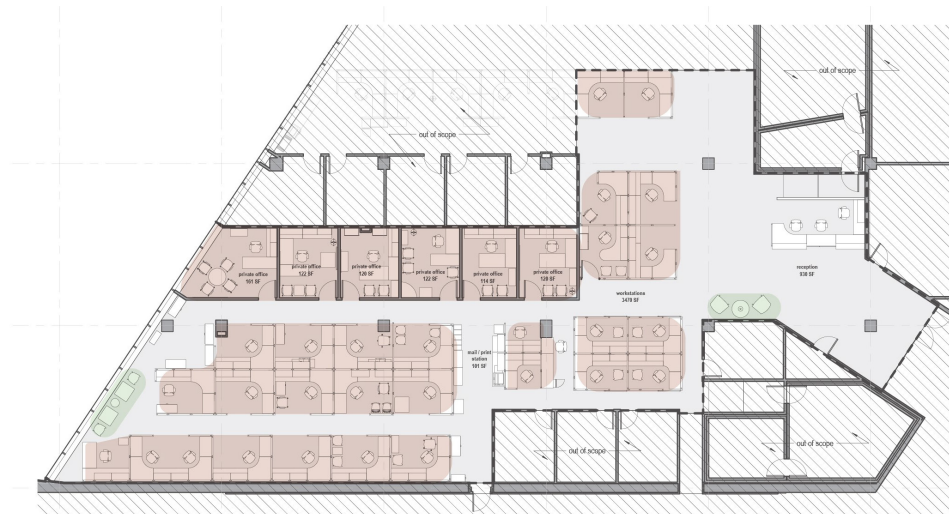
OFFICE B: EXISTING SPACE DISTRIBUTION

Figure 3: Existing conditions space distribution analysis for case study offices A and B.

of entry. This circulation pattern, as well as the adjacent break room, contributed to increased circulation and noise levels for the individual workstations in that floor area.

Figure 3 illustrates a very stark pattern regarding distribution and proportion of individual and teamwork spaces. At both office locations, individual workstations or individual offices were a predominant pattern.

While *Office A* did have one formal conference room, one casual team room, and a breakroom with a fully equipped kitchen, *Office B* did not have any of these small or large team spaces. There were only two open areas where a few chairs were placed for two individuals to have a seated conversation. It was evident that the disruptive circulation patterns, the lack of collaboration spaces, and lack of private meeting spaces may not work efficiently in a hybrid work mode where office

COLOR LEGEND:

⬤ DAYLIGHT ACCESS

OFFICE A: EXISTING ACCESS TO DAYLIGHT

OFFICE B: EXISTING ACCESS TO DAYLIGHT

Figure 4: Existing conditions daylight access analysis for case study offices A and B.

spaces increasingly become places for teamwork and collaboration, or places to conduct private meetings and virtual calls.

Figure 4 illustrates the existing distribution of daylight access. It shows that at Office A, general staff has the least access to views and daylight due to the perimeter of private, executive offices. It also shows that a significant portion of individual workstation cubicles on the righthand side of the illustrated plan are oriented with employees' backs facing the windows and with their computer monitors exposed to glare. Meanwhile, *Office B* had very limited access to daylight due to the north facing windows and a challenging, triangular floor plan. There, only one private office and four private workstations had access to views and direct exposure to daylight.

2. RESEARCH QUESTIONS AND METHODS

This study implemented mixed-mode research, which included qualitative and quantitative methods for architectural research (Aksamija, 2021). Qualitative methods included archival and empirical research of the existing conditions, and conventional and summative thematic analysis of the user-input qualitative online survey and focus group interviews (Bazeley 2013, Hsieh and Shannon 2005, and Stuckey 2015). Meanwhile, quantitative methods included quantitative analysis of survey and interview results, computational modeling and visualization of the existing and proposed design strategies, and review and validation of final design's egress and accessibility compliance. Figure 5 lists the research questions and their associated research methods, with detailed steps of research described below. The general survey and focus group interview structure is illustrated in Figure 6, while Figures 7 and 8 summarize the general survey and focus group interview questions.

Step 1: Latest available construction drawings, current photographs, and measurements of the two office locations were collected and used to analyze architectural design and interior design features of existing conditions, and to develop 3D BIM models of the two offices and all their spaces using Revit software. These models included building enclosure elements, structural elements, partitions, ceilings and locations of existing lighting fixtures, and existing furniture types and layout to represent current state of these two offices and analyze their circulation patterns, daylighting and access to light, and space use distribution. This step helped answer research question 1.

Step 2: An anonymous, online, quantitative, and qualitative general survey was distributed to all employees across these two case study offices. The purpose of the survey was to gain insight on general patterns regarding the current work culture characteristics and workplace environments. The general survey included three categories of questions and helped assess general aspects regarding the current work patterns and characteristics, working environment and culture, and participant demographics among the two case study offices.

Survey responses were analyzed both qualitatively and quantitatively, depending on the category of questions. Quantitative questions were tabulated using percentages of responses, while qualitative questions were analyzed using summative content analysis, which involves counting and comparisons of similar responses for open response questions (Hsieh and Shannon 2005). All questions of the general survey included an option to not answer undesirable questions and an option to

provide a short response in addition to available answer choices where appropriate. Data collection for the survey was conducted between January and March of 2022.

The results of this step helped answer research questions 2 and 3. Figure 7 depicts general survey questions, while analysis results are shown in Table 1 and Figures 9, 10, 11 and 12.

Step 3: Based on results from steps 2 and 3, a series of qualitative, focus group interviews were conducted for a detailed assessment of current and projected future working patterns and characteristics, and specific workplace environment limitations and space needs. Seven focus groups were conducted, where the number of the focus group interviews was based on a number of volunteers from all tiers of the organization. Focus group interviews included general staff and management level employees, and included diverse pool of participants, such as teams that work primarily in-office, teams that work hybrid schedules, teams that work primarily remote, and teams that work across mixed modes. Thus, the resulting number of focus groups included employees between each predominant work mode (remote, hybrid, and in-office) and by team organization structures between these two case study spaces. The questions for focus group interviews included two general categories, like the qualitative categories of questions in the general survey, on patterns regarding the current work modes, characteristics of the working environment and culture.

All focus groups were held remotely, using recorded Zoom meetings that were transcribed and anonymized. Similar to the general survey method, participants were informed that their participation was voluntary and not required. Each group interview was limited to one hour. Data collection for the interviews was conducted between March and April of 2022.

The results of this step helped define specific patterns of work culture and space needs at the two case study office locations, and helped answer questions 2, 3 and 4. Figure 8 shows focus group interview questions and Table 2 indicates thematic analysis results.

Step 4: Literature review of existing academic publications and industry reports was conducted to evaluate current, post-pandemic trends for office space design. This step also helped answer research questions 2, 3 and 4.

Step 5: Using results from Steps 2, 3, and 4, five varying design options were presented for each office location, which included different levels of proposed renovation, such as design options with changes to existing non-
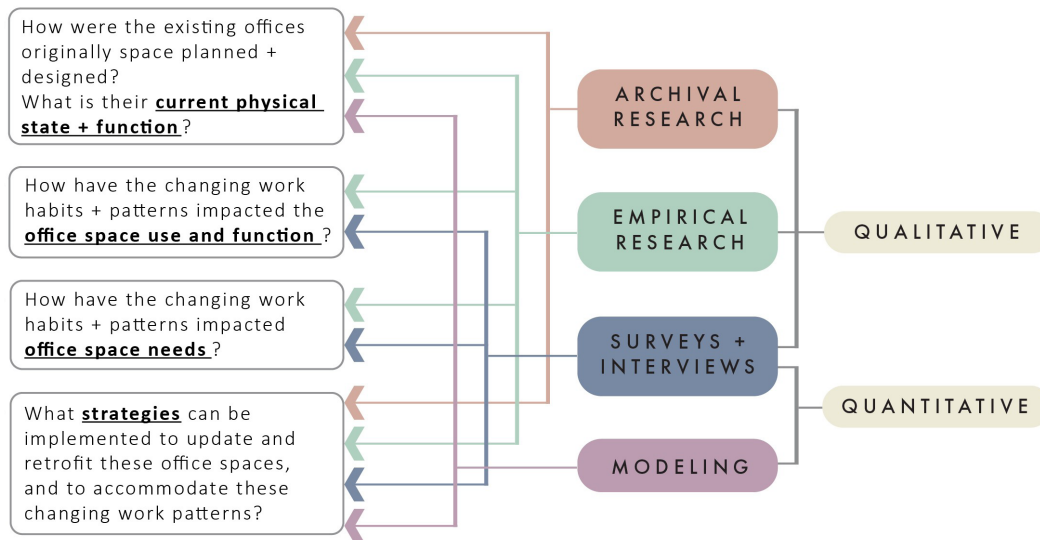
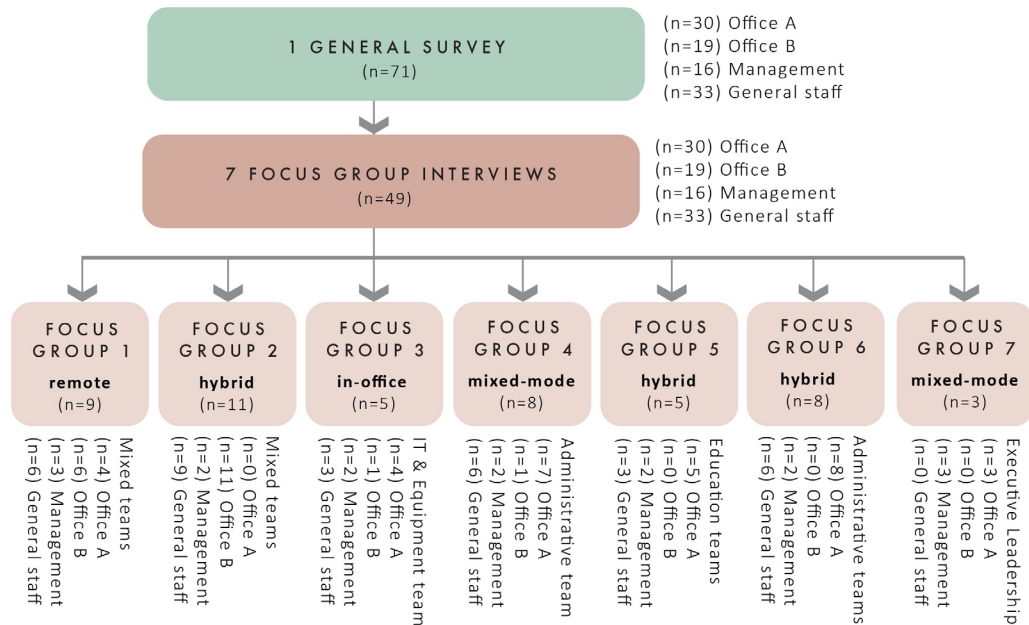**Figure 5:** Research questions and methods diagram.

Figure 6: Characteristics of the general survey and focus group interviews.

structural partitions and plumbing, design options with minimal changes to existing non-structural partitions, and design options with no changes to existing state of partitions or plumbing. These results were presented to the management and leadership team for review and feedback and were refined into the final design option for each office location. The review and validation process also helped with the assessment of specific team needs and schedules, and budgetary limitations, so that the final design and layout of these office spaces was adapted to the specific culture and specific needs of the organization and its users. This step helped answer question 4.

Step 6: The final design was additionally compared against latest available permit drawings of each office location to ensure that the new interior layouts maintain equal occupancies and do not alter egress paths or accessibility to egress. Then, a package of architectural drawings, visual renderings, and furniture schedules with proposed recommendations were issued to the organization for their use and continued work.

3. RESEARCH RESULTS AND DISCUSSION

3.1. General Survey Results

Of about 120 employees between these two office spaces, 71 (59%) participated in the anonymous online survey. The survey's results showed that among the participants, nearly all were full-time employees. Majority of participants identified as female (62%). In terms of ethnic background, majority of participants were Caucasian (85%). While all age groups were represented, most participants were between the ages of 25 and 54 years. Also, the majority of participants hold university degrees, and are either recent hires, with 0-2 years of employment (33%) or long-term

employees, with 10 or more years of employment (28%). Similarly, while all tiers of employment categories were represented in the survey, majority of participants were general staff (64%), and majority were employed at Office A (80%), which was reflective of the general office structures and number of employees between these two locations. The demographic results are summarized in Table 1.

Summaries regarding the first category of survey questions reflected the already implemented hybrid work-mode structure and the generally positive attitudes and preferences for this mode of work. Figure 9 shows that most of participants (51%) already work under a hybrid structure, where they shift between in-office and remote work either per specific schedule or at will. It also shows that the currently employed work mode for each category (whether predominantly hybrid, remote, or in-office) is satisfactory for an overwhelming majority (90%) of participants, between very satisfactory (66%) or satisfactory (24%). When asked which mode of work participants would prefer, regardless of their current work-mode, the majority similarly selected a hybrid work mode (58%). Comparing the top and bottom charts of Figure 9, a higher percentage of participants would prefer to work remotely or hybrid schedules, and a lower percentage of participants would prefer to continue working solely from the office. This informed that increased flexibility is desirable even for employees who currently work predominantly remote or predominantly from the office.

Figure 10 shows how frequently and for how many hours participants typically work from the physical office spaces. It informed that for those who work either a single day (18%) or just two to three days (35%) from the office, there may be some opportunity to

Table 1: Participant demographics with highest values for each category highlighted in color.

Gender	Age	Ethnic Background	Education Level	Years Employed	Employment Category	Office Location
62% Female	**1%** 18-24 years	**85%** Caucasian	**6%** High school degree	**33%** 0-2 years	**64%** General staff	**80%** Office A
34% Male	**24%** 25-34 years	**1%** Asian	**1%** Trade school	**28%** 2-5 years	**23%** Management	**20%** Office B
1% Non-conforming	**27%** 35-44 years	**7%** Mixed race	**41%** Bachelor's degree	**7%** 5-8 years	**13%** Leadership	
3% Non-disclosed	**35%** 45-54 years	**7%** Non-disclosed	**39%** Master's degree	**4%** 8-10 years		
	10% 55-64 years		**7%** Doctoral degree	**28%** 10+ years		
	3% Non-disclosed		**6%** Non-disclosed			

* Total number of participants = 71

* Employment status of participants = 99% full-time

GENERAL SURVEY

QUESTION CATEGORY 1

working patterns & characteristics

23 QUANTITATIVE QUESTIONS
- Employment status, category, and years of employment.
- Current team structure and primary mode of work.
- Primary work responsibilities and work patterns.
- Assessment of current work-mode and preferences.
- Time typically spent at the physical office.
- Impacts of remote work on individual and team work.
- Dependency on specialized equipment, furniture or technology that is only available at the formal office.
- Preference on permanent versus flexible workstations.

1 QUALITATIVE QUESTION
- Specific recommendations that would positively impact workflow at the formal office space.

QUESTION CATEGORY 2

workplace environment

20 QUANTITATIVE QUESTIONS
- Level of satisfaction with current state of office space.
- Rating of office environmental criteria, such as welcomeness, comfort, privacy, noise, access to daylight, and social culture.
- Level of desirability for spaces such as gender-neutral restrooms, shower and locker rooms, communal kitchen, outdoor space, and exercise, wellness, prayer and/or meditation spaces.

3 QUALITATIVE QUESTIONS
- Described spaces or qualities for improvement.
- Recommended additional spaces.

QUESTION CATEGORY 3

demographics

4 QUANTITATIVE QUESTIONS
- Gender identity, age group, ethnic background, and education level.

Figure 7: Categories and summaries of the general survey questions.

FOCUS GROUP INTERVIEWS

QUESTION CATEGORY 1

working patterns & characteristics

5 QUALITATIVE QUESTIONS
- Described primary work mode (remote, hybrid, in-person) and typical work patterns.
- Assessed satisfaction with current work mode and work patterns.
- Described ideal and most productive work mode.
- Imagined and desired use of the formal office space in the future.
- Assessment of foreseen challenges and opportunities with hybrid work mode.

QUESTION CATEGORY 2

workplace environment

5 QUALITATIVE QUESTIONS
- Assessed productivity with the current office space setups.
- Described physical features and qualities of current office spaces that are no longer functional or efficient, and also those that could be maintained as is.
- Assessed accommodation of current office space designs for individualized needs, which may vary by gender, age, culture, or disability.
- Assessed comfort in the current office environment, and description of what could positively contribute toward a healthy work culture.
- Described suggestions on design features or types of spaces that would contribute to current work mode and organization culture.
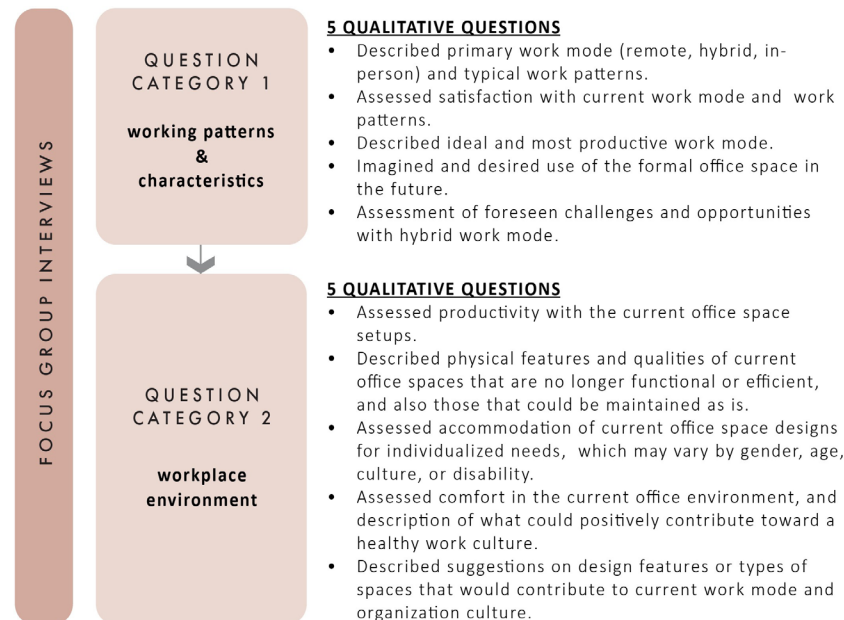
Figure 8: Categories and summaries of the focus group interview questions.

share workspaces and alternate work schedules. It also informed that for those participants who come to work from the office, they typically work nearly a full day (39%), a full day (51%), or longer (3%).

Figure 11 summarizes the questions regarding the breakdown between independent work and teamwork patterns and assesses whether employees typically work with each other or also with outside clients. It also summarizes questions regarding their perspectives on the impact of remote work on both their individual work and teamwork performance. Results showed that many participants work both individually and with teams (48%), and that a very significant proportion of participants work with small teams (35%). Figure 11 also shows that the majority of participants (62%) do work with outside clients. These patterns informed that the current layout of office spaces that lack collaboration and team spaces may no longer be suitable for the predominantly hybrid and collaborative work mode environment. Lastly, results showed that remote work either positively impacted individual work performance (55%) or had no impact on individual work performance (24%), but that these percentages were not as positive or strong when it comes to collaboration or teamwork. These results helped determine that inviting and well-functioning office spaces are necessary for this organization and its work culture, and that both high-focus, individual workstations and small team zones or rooms were necessary.

The following figure, Figure 12, summarizes the qualitative responses for survey questions where participants were given an opportunity to provide feedback on general areas that may need improvement and on specific types of spaces that they would like to see at their respective office spaces. These charts quantified the number of times participants made note of these categories. Regarding areas of concern, they illustrate that the predominant issues were the quality of artificial light and access to views and natural light, lack of privacy and exposure to noise and distractions, and the need for more comfortable, ergonomic furniture. Regarding specific types of spaces that are currently unavailable, most requests were made for private call booths or private face-to-face meeting spaces, individual workstation zones, small team collaboration zones, a client greeting area or a casual gathering space, a designated eating area or pantry (specific to Office B only), and a quiet, resting area.

These patterns strongly reflect the existing state analysis of Figures 2, 3, and 4, and gave insight that reconfiguration of interior layouts is necessary to reduce disruptive circulation patterns, to offer a more balanced proportion of individual and team spaces, and to propose spatial layouts that provide more equitable access to view and daylight and to orient furniture in ways to reduce and prevent glare.
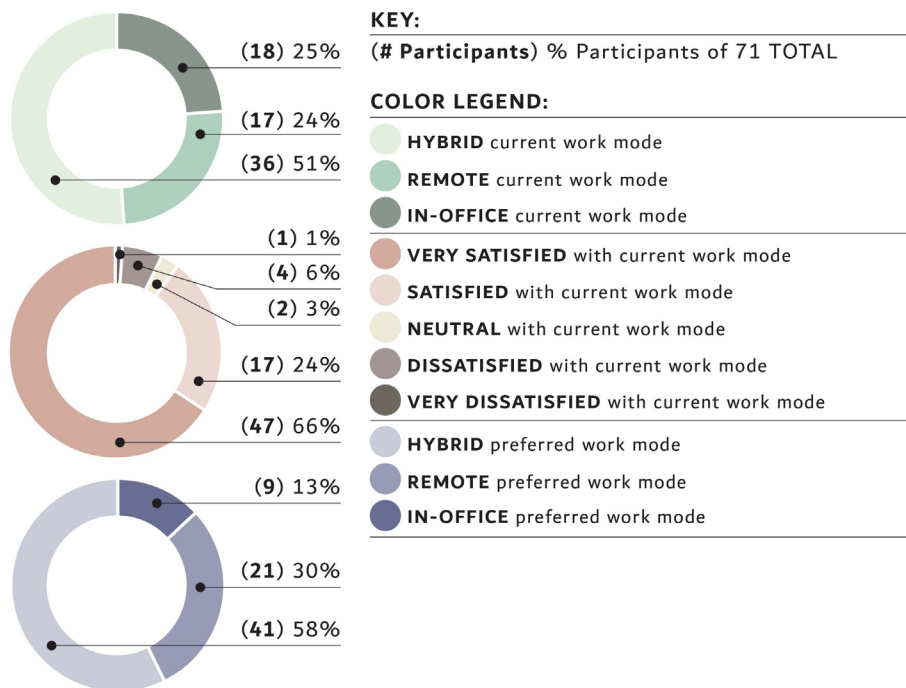

Figure 9: General survey results summarizing current and preferred work modes.
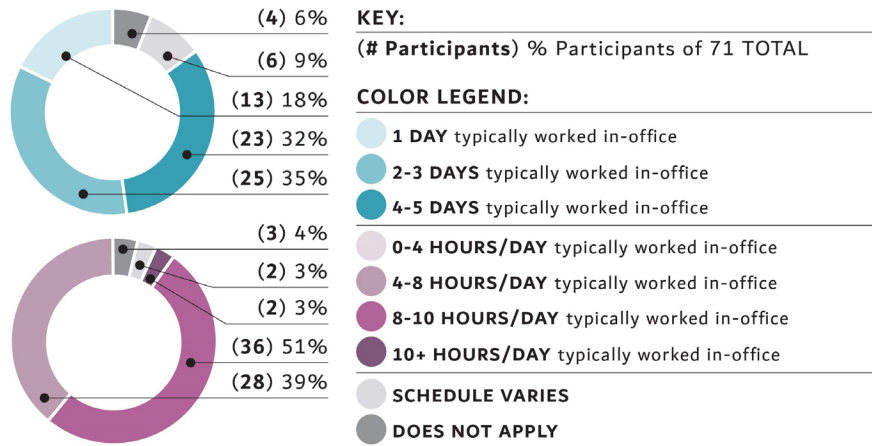
KEY:

(**# Participants**) % Participants of 71 TOTAL

COLOR LEGEND:

1 DAY typically worked in-office

2-3 DAYS typically worked in-office

4-5 DAYS typically worked in-office

0-4 HOURS/DAY typically worked in-office

4-8 HOURS/DAY typically worked in-office

8-10 HOURS/DAY typically worked in-office

10+ HOURS/DAY typically worked in-office

SCHEDULE VARIES

DOES NOT APPLY

(4) 6%
(6) 9%
(13) 18%
(23) 32%
(25) 35%

(3) 4%
(2) 3%
(2) 3%
(36) 51%
(28) 39%

Figure 10: General survey results summarizing current work patterns at the physical office spaces.

KEY:

(**# Participants**) % Participants of 71 TOTAL

COLOR LEGEND:

INDIVIDUAL + TEAMWORK primary work pattern

LARGE TEAMS primary work pattern

SMALL TEAMS primary work pattern

INDIVIDUAL WORK primary work pattern

INTERNALLY + EXTERNALLY focused work

EXTERNALLY focused work

INTERNALLY focused work

POSITIVE IMPACT of remote work on teamwork

NO IMPACT of remote work on teamwork

NEGATIVE IMPACT of remote work on individual work

DOES NOT KNOW

DOES NOT APPLY

POSITIVE IMPACT of remote work on teamwork

NO IMPACT of remote work on teamwork

NEGATIVE IMPACT of remote work on teamwork

DOES NOT KNOW

DOES NOT APPLY

(10) 14%
(25) 35%
(34) 48%
(2) 3%

(16) 23%
(11) 15%
(44) 62%

(4) 5%
(9) 13%
(2) 3%
(17) 24%
(39) 55%

(2) 3%
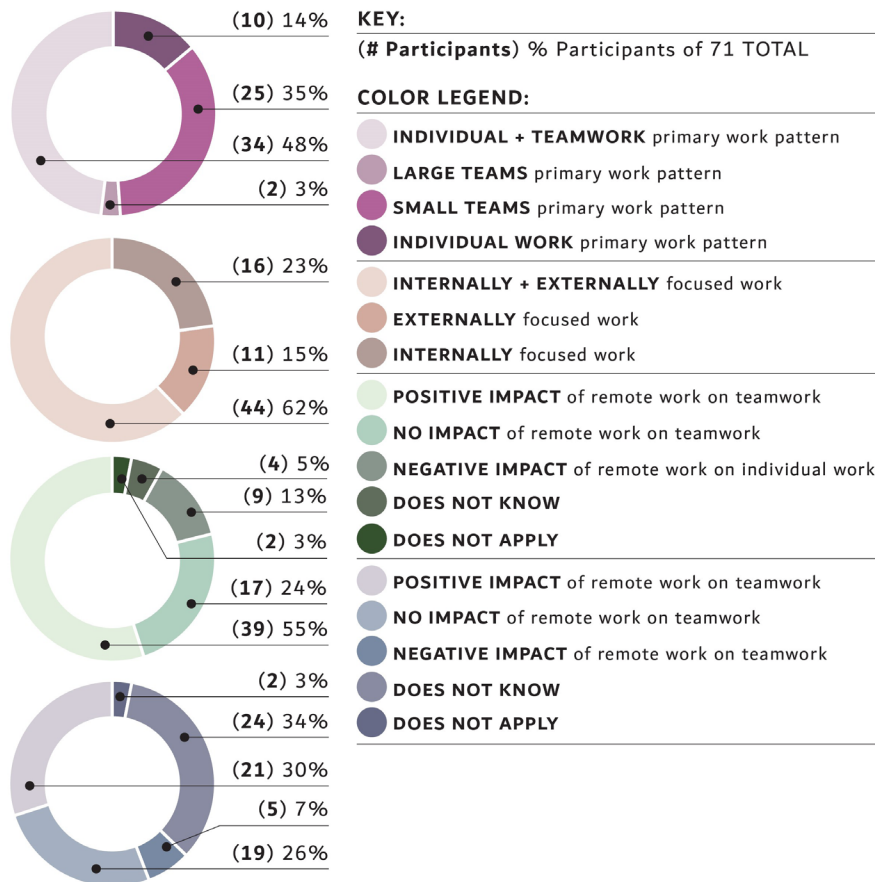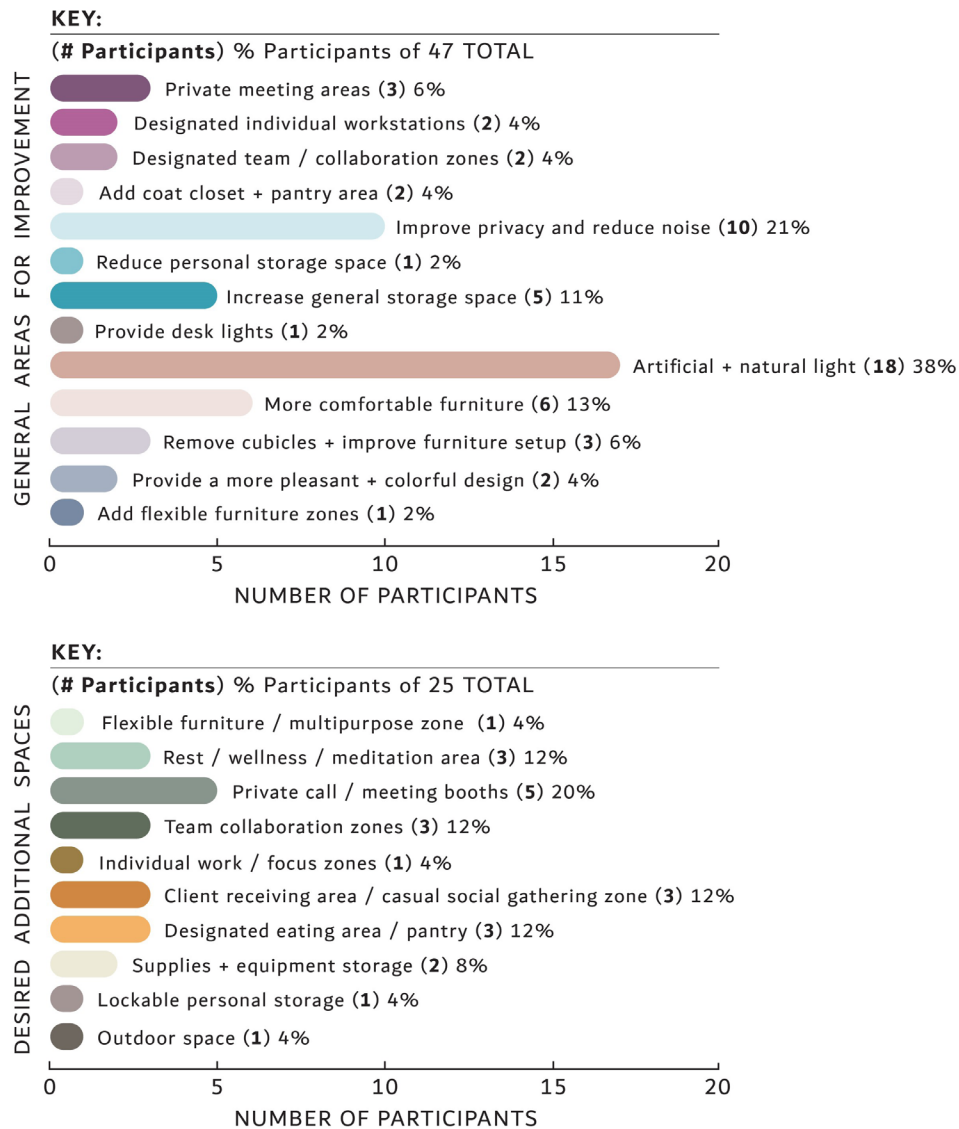(24) 34%
(21) 30%
(5) 7%
(19) 26%

Figure 11: General survey results summarizing demands for individualized vs. collaborative work and the impact that remote work has had on both individual work and teamwork.

KEY:

(# Participants) % Participants of 47 TOTAL

GENERAL AREAS FOR IMPROVEMENT

- Private meeting areas (**3**) 6%
- Designated individual workstations (**2**) 4%
- Designated team / collaboration zones (**2**) 4%
- Add coat closet + pantry area (**2**) 4%
- Improve privacy and reduce noise (**10**) 21%
- Reduce personal storage space (**1**) 2%
- Increase general storage space (**5**) 11%
- Provide desk lights (**1**) 2%
- Artificial + natural light (**18**) 38%
- More comfortable furniture (**6**) 13%
- Remove cubicles + improve furniture setup (**3**) 6%
- Provide a more pleasant + colorful design (**2**) 4%
- Add flexible furniture zones (**1**) 2%

NUMBER OF PARTICIPANTS

KEY:

(# Participants) % Participants of 25 TOTAL

DESIRED ADDITIONAL SPACES

- Flexible furniture / multipurpose zone (**1**) 4%
- Rest / wellness / meditation area (**3**) 12%
- Private call / meeting booths (**5**) 20%
- Team collaboration zones (**3**) 12%
- Individual work / focus zones (**1**) 4%
- Client receiving area / casual social gathering zone (**3**) 12%
- Designated eating area / pantry (**3**) 12%
- Supplies + equipment storage (**2**) 8%
- Lockable personal storage (**1**) 4%
- Outdoor space (**1**) 4%

NUMBER OF PARTICIPANTS

Figure 12: General survey results summarizing general aspects that may be improved and specific types of spaces that may be added to the existing offices.

3.2. Focus Group Interview Results

The general survey results set precedent for the focus group interviews, so that a more in-depth insight may be gained on the previously expressed issues at the two respective office spaces. Of about 120 employees at the two office spaces, 49 (41%) volunteered for participation in focus group interviews. Table 2 summarizes the eight general themes, or *patterns*, that inductively emerged from the interviews, the majority of which were common to both case study offices, but to different degrees of importance.

In addition to these general themes shared among both case study offices, there were also a few additional patterns in focus group results regarding the unique conditions of each case study. The specific requests for *Office A* included: 1) a formal reception space, and 2) an open space for large staff meetings outside of the break room with kitchen. The specific requests for *Office B* included: 1) a break room or pantry area with kitchen appliances (ideally with plumbing fixtures for a full kitchen, but at least with a refrigerator and a coffee machine), and 2) a casual lounge and flexible meeting spaces.

Table 2: Focus group interview themes, general and common to both case study offices.

#	Pattern	Description	Focus Group #	(n) and %N (N=49)
1	True hybrid work-mode	• Desire to work from the office 1-3 days a week for fully remote group to alleviate sense of isolation and feel integrated within the work organization. • Similarly, desire to work from home 1-3 days a week for the fully in-office group to also benefit from occasional flexibility and comfort of working from home.	1 - remote 3 - in-office 4 - mixed-mode	n = 22 %N = 45%
2	Shared workstations and private offices	• Openness for shared individual workstations on an alternating or scheduled pattern among general staff. • Similarly, there is openness for shared private, executive offices on alternating schedules among leadership staff, and for multifunctionality of those more private and daylit rooms. • Suggested display of schedules.	1 - remote 2 - hybrid 4 - mixed-mode 5 - hybrid 6 - hybrid 7 - mixed mode	n = 44 %N = 90%
3	Removal of "cubicle farms" and area zoning by teams with color and "home-like" décor	• Generally negative attitude toward cubicle farms, or large areas of open desk stations out of concerns for privacy and noise distractions. • Preference for designated permanent team zones to alleviate sense of non-belonging and temporary presence at the office. • Ideally, team zones will be cognizant of inter-team dynamics and follow practical adjacencies. • Also, team zones should allow for more personal and welcoming touches of color and décor to express team identities.	1 - remote 4 - mixed-mode 7 - mixed mode	n = 20 %N = 41%
4	Private call "pods", team "touch-base" spaces, and "flex" spaces.	• Need for private call spaces, and spaces for quick, in-person, face-to-face conversations with clients or colleagues that are not disruptive to the cohort due to large volumes of virtual calls and visits. • Similarly, there is a need for small- and large team meeting spaces, that are not necessarily formal like a conference room, but flexible to serve as team "touch-base" or "huddle" spaces, mixed-mode meeting spaces and spaces for social gathering.	1 - remote 2 - hybrid 6 - hybrid 7 - mixed mode	n = 31 %N = 63%
5	Daylighting + views	• Need for reoriented workstations to reduce glare. • Similarly, there is a need for a redistribution of workstations to optimize access and equity of daylight and views to outdoors. • Need for improved distribution, quality, and color of artificial lighting, as some workstations have very little access to light and others are burdened by too much, cool tone light. • Suggested desk lamps and shading devices or screens.	1 - remote 2 - hybrid 4 - mixed-mode 5 - hybrid 6 - hybrid	n = 41 %N = 84%
6	Privacy and reduction noise	• Need for reoriented workstations to accommodate more visual privacy of monitor screens. • Need for reduction of foot-traffic and noise from colleagues who either have visitors or are on virtual calls. • Sometimes there are five or more persons on the same virtual call while seated in their individual, adjacent cubicles, which can be very disruptive.	1 - remote 2 - hybrid 4 - mixed-mode 5 - hybrid 6 - hybrid	n = 41 %N = 84%

| 7 | Shared equipment and supplies storage, and reduction of personal storage | • Need for designated equipment and supplies storage to alleviate visual clutter and improve organization of office.
• Need for shared team storage.
• Additionally, there is a need for designated printing, copying, faxing equipment and kitchen appliances to reduce burden on power from individually owned equipment.
• Expressed openness to reduce general personal storage, much of which is unused.
• In return, suggested personal lockers, mailboxes, and personal, lockable, and moveable storage to accommodate a hybrid, flexible schedule and reduce the need of carrying all personal items home. | 1 - remote
2 - hybrid
4 - mixed-mode
5 - hybrid
6 - hybrid | n = 41
%N = **84%** |
| 8 | Improved accessibility and wayfinding, and more comfortable furniture | • Need for accessible, automated entries at both offices with improved wayfinding signage for visiting clients.
• More open space for circulation and between individual workstations to accommodate social distancing.
• Need for equitable distribution of standing desks and need for seating space for visitors and clients.
• Similarly, there is a need for reduction of tall cubicles that limit visibility and wayfinding for those in a wheelchair or of short stature. | 1 - remote
2 - hybrid
5 - hybrid
6 - hybrid
7 - mixed mode | n = 36
%N = **73%** |

** Total number of participants = **49***
* Refer to Fig. 6 for total number of participants in each focus group.
* Focus groups 2, 5, 6 and 7 already work hybrid work-mode schedules and were thus not included in pattern #1.

The general findings of the focus group interviews reiterated the areas of concern that resulted from archival and empirical analysis, as well as the general survey. The results also helped assess the nuanced areas of concern among the different teams and their different work patterns in more depth, and to assess the participants' general attitudes toward some of these foreseen changes for their close-knit organization and culture. The interview process helped understand that while there was general enthusiasm behind updating and renovating of the formal office spaces, there was also an expressed fear of uncertainty, such as uncertainty regarding where one may need to situate on an unplanned basis if there are no permanent workstations, how schedules would be assessed, whether one would be able to keep some personal belongings at the office, etc. There was also expressed fear of losing the sense of belonging and the tight-knit work culture if "everything" is temporary and constantly changing. Thus, most of the expressed concerns revolved around logistics associated with hybrid work mode, and senses of certainty and belonging within a changing work culture. This informed that while there was general enthusiasm and excitement around renovations and improving of the organizations' physical office spaces, design strategies had to include user input on their work patterns and social structure, as well as their suggested strategies. These interviews helped the research team gain trust within the case study work organization and assure the participants that the resulting design proposals will indeed reflect their specific needs and not disrupt their culture and connection to the organization.

Looking at the results of Table 2, Pattern 2 had the highest discussion rate of 90%, which was not expected but a reflection of the overwhelmingly positive attitudes toward sharing of individual workstations, including private executive offices for a more equitable access to office resources and better sense of productiveness among all tiers of employees. The second highest discussion rate was reflected in Patterns 5, 6, 7 at 84%, which emphasize the importance of addressing access to daylight and views, privacy and noise disruptions, and redistribution of storage space. The third highest discussion rate was reflected in Pattern 8 at 73%, which similarly emphasized the importance of accessible space planning and circulation, and accommodation with comfortable furnishings. Authors deemed each theme as equally important and sought to implement each of the 8 themes, or patterns, in all iterations of the proposed design options. The final design option is described in detail in the following section, with the specific patterns from Table 2 emphasized. For brevity of this paper, the various iterations of design options that led to the final design will be part of a future, supplemental publication.

3.3. Proposed Renovation Design Strategies

While the study sought to accommodate every aspect of these focus group patterns, including the case study specific items, some desirable strategies were beyond the scope of this study, such as addressing the quality of artificial lighting, quality and distribution of ambient temperature, and quantity of electrical outlets. However, most user input patterns were possible to address and integrated into the final design.

In total, roughly five different interior design options were developed for each case study office, which were presented to the leadership and management teams of the organization for discussion and review. Design options included plans where the interior, non-load bearing partitions were reconfigured and where plumbing changes were integrated, and also options where none of the partitions were altered and where no plumbing fixtures were added or changed. Once presented, due to budgetary reasons, the leadership team of the organization expressed a strong preference with further optimization of the design options where no partitions are altered and where no plumbing strategies are introduced.

Additionally, some limitations were introduced, such as maintaining specific private, executive offices per original design and configuration – specifically the corner executive office at Office A (as hatched with linework in Figure 13) and the full row of private offices at Office B (as hatched with linework in Figure 14). This eliminated an opportunity to make those oversized rooms into shared, team spaces. Additional limitations included maintaining the core spaces at Office A per the existing configuration, which includes the already existing break room and kitchen, printing and supplies area, and workstations for the AV/IT team (also hatched with linework in Figure 13). This request meant that a formal reception area, which originally used to be in this part of the floor plan, could not be re-introduced and that the circulation path could not be opened up for easier wayfinding and proper entrance zone at this office. Similarly, regarding *Office B*, given the inability to introduce plumbing fixtures, such as a kitchen sink or a dishwasher, the participants' requests for a formal kitchen and eating area could not be met. Thus, some of the specific needs at each case study office could not be resolved, and those optimal design options were eliminated.

However, significant improvements were made, and the final design options, as illustrated in Figures 13 and 14, were once more reviewed and approved by the organization's leadership and management teams. As shown in these final figures, at both case-study locations, improved circulation, privacy, and reduction

of noise distractions were achieved with rearrangement of the furniture layouts in such ways to create barriers against those distraction areas. These examples include: (a) private, sound isolated office pods (Pattern 4), (b) markerboard screens at open desk stations (Pattern 6), (c) moveable, sound absorbing partitions (Pattern 4), (d) personal storage locker rows (Pattern 7), and (e) colorful finishes and plants (Pattern 3).

Workstations have been zoned by teams and clustered in groups of 2, 4 and 6 independent workstations with team "touch-base" tables for 2 to 4 individuals in between these smaller team zones (Pattern 3). This method allows for all open space workstations to remain unassigned to individuals, but rather assigned their specific team (Pattern 2), allowing for a shared, hybrid scheduled work mode (Pattern 1). The workstations have all been oriented in a way to provide privacy from passersby and the adjacent private offices (Pattern 6). They also include moveable screens which can help adjust privacy needs, reduce glare, and allow for reconfiguration (Pattern 6). Additionally, care was taken to ensure that each team pod or zone includes at least one to two private call pods immediately adjacent to the workstations (Pattern 4), as well as team storage shelving, lockers, and personal moveable and lockable storage cubbies (Pattern 7). This helped both with an improved function and redistribution of existing storage space.

Regarding proportions of individual and team spaces, significant improvements were made to introduce more team spaces and areas compared to the original design configurations while providing a higher quantity of individual workstations. This process of rezoning the open floor area and repurposing what were private offices into shared offices or small team meeting spaces (Pattern 4), was especially uninhibited at Office A, but more limited at Office B where most of the original private offices had to remain. However, even at office B, the individual workstations have been reconfigured into open team pods, with flexibility for individual and team areas, compared to the isolating, rigid, and oversized individual cubicles of the original setup.Both offices gained flexible zones that can accommodate casual gatherings for large and small groups or serve as casual workspaces. These "flex" zones (Pattern 4) have been intentionally placed adjacent to windows to provide an area for all with access to direct daylight and outdoor views (Pattern 5) (highlighted with dark green for large team areas in Figures 13 and 14). Additionally, at Office A, where most of the previously private offices were converted to either shared office spaces or small team meeting rooms, accessibility to views and daylight was more equally distributed. Similarly, at both offices, clusters of workstations have been reoriented to prevent glare on computer monitors, and the general

1 ORIGINAL DESIGN

1 NEW DESIGN

2 ORIGINAL DESIGN

2 NEW DESIGN

COLOR LEGEND:

- PRIMARY CIRCULATION
- DISTRACTION ZONES
- ENTRANCES
- EXITS
- DAYLIGHT ACCESS
- INDIVIDUAL SPACES
- SMALL TEAM SPACES
- LARGE TEAM SPACES
- ORIGINAL VIEWS
- FINAL DESIGN VIEWS

OFFICE A: CIRCULATION

OFFICE A: SPACE DISTRIBUTION

OFFICE A: ACCESS TO DAYLIGHT

Figure 13: Office A final design plan diagrams and interior views that illustrate original and new design strategies.

1 ORIGINAL DESIGN

1 NEW DESIGN

2 ORIGINAL DESIGN

2 NEW DESIGN

OFFICE B: CIRCULATION

OFFICE B: SPACE DISTRIBUTION

OFFICE B: ACCESS TO DAYLIGHT

COLOR LEGEND:

- PRIMARY CIRCULATION
- DISTRACTION ZONES
- ENTRANCES
- EXITS
- DAYLIGHT ACCESS
- INDIVIDUAL SPACES
- SMALL TEAM SPACES
- LARGE TEAM SPACES
- ORIGINAL VIEWS
- FINAL DESIGN VIEWS

Figure 14: Office B final design plan diagrams and interior views that illustrate original and new design strategies.

redistribution of furniture and removal of tall, cubicle partitions have significantly opened up both office plans (Patterns 3 and 5). This allows for more visibility, easier orientation, and unobstructed daylight distribution. It is important to note that these reorganizations of space at both locations were verified against latest permit approved egress code plans to ensure that occupancy calculations and egress path distances are not changed nor affected by the new proposed layouts or occupancy counts. Additionally, circulation spaces and furniture specifications that meet accessibility guidelines were implemented for all types of spaces to ensure a more welcoming and inclusive working environment. These diagrams will also be included in a supplemental future publication.

3.4. Limitations and Recommendations for Future Research

While this study presents a methodology that can be applied to additional case studies and other building typologies, and may lead to similar and generalizable findings, it is important to emphasize that this study is limited to two specific case studies, both part of an academic setting, and both located in the United States. Future research should include additional office space environments in different building typologies, and in different parts of the nation and beyond, as overall working culture and office culture may have significant impact on user preferences related to work settings. Future publication related to this specific study will include an expanded focus on the iterative design process and impacts of user-input in selecting the optimal design options related to this specific area of research.

4. CONCLUSION

Overall results of this study showed that traditionally set-up offices tend to be non-functional and undesirable for conducting work in a changing work culture and increasingly implemented hybrid work structure. Offices are increasingly becoming places for team collaboration, client meetings, and occasional independent work, where individualized tasks are continuing to be primarily conducted remotely or from home. Thus, offices that do not implement a balanced proportion of individual workstations and team gathering, as well as socialization spaces, may not be adaptable to these changing work patterns if they primarily implement the more traditional set-up of individual workstations with very collaborative spaces, and often too formal meeting spaces.

This study shows that through a user integrated approach, where employees' work patterns and needs are carefully considered and incorporated into proposed spatial reconfiguration and repurposing strategies,

even without changes to partitions or existing utilities, significant improvements can be achieved to provide well-functioning spaces and a more comfortable, equitable and inclusive working environment. The implemented, inductive qualitative and quantitative research approach with anonymous general surveys and series of focus group interviews helped assess the important areas of improvement at the case study offices. Results met the specific current and projected future space needs, and achieved improved circulation, privacy, and daylight distribution.

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