Assessment of Space Utilization Plan for CENTRO

Students:
Alexandra Y. Deng
Calvin Kocienda
Ian Mayer
Advisor:
Laura Roberts

CENTRO

WPI

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meet the TEAM

Alexandra Y. Deng
Class of 2021
Bioinformatics Major
ydeng@wpi.edu

Calvin Kocienda
Class of 2020
Computer Science Major
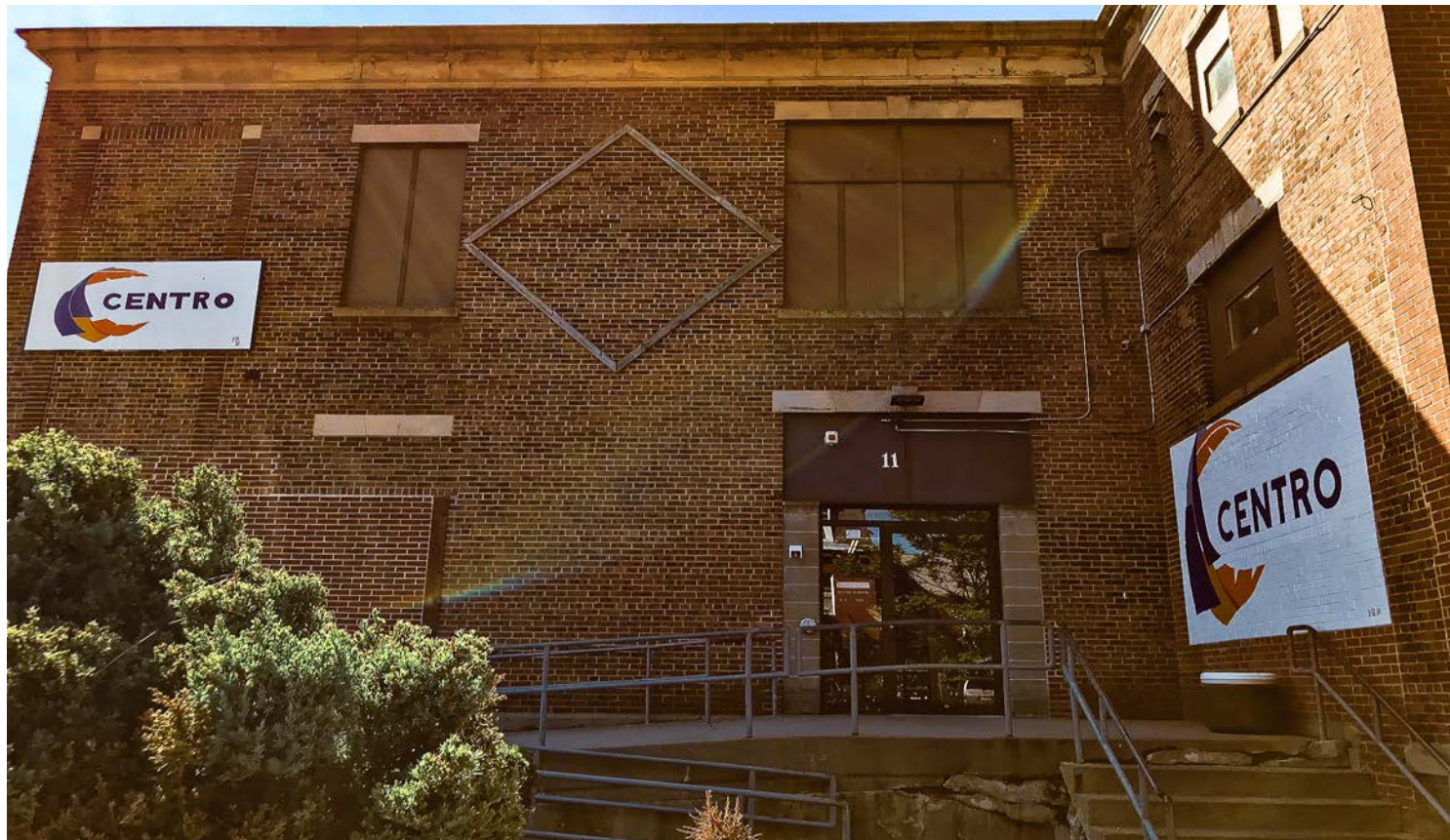*cakocienda@wpi.edu*

Ian Mayer
Class of 2021
Aerospace Engineering Major
iamayer@wpi.edu

the
Introduction

According to the Department of Homeland Security, the average amount of immigrants entering the US has tripled since 1965. Immigrants arrive in the U.S. with various skills. The highly skilled immigrants can start careers soon after their arrival and fit into the society, positively impacting the nation in economic and social aspects (Chassambouli & Peri, 2015). On the contrary, there are several immigrants that arrive to the US that face problems that they didn't face in their home countries, such as language barriers, or cultural conflicts (Segal & Mayadas, 2005). Worcester is a city whose immigrants face such problems. Immigrants make up about a quarter of the population of the city, with many facing these difficulties (Welker, 2018).

CENTRO, a non-profit community based organization located in Worcester, MA that helps immigrants; it employs a number of programs, including Food Donations, Adult Foster Care, and mentors for children, to help make the lives of immigrant families easier (CENTRO, 2019). However, an increasing number of immigrants to Worcester since CENTRO's inception in 1977 means that CENTRO's office building is experiencing growing pains, due to a lack of physical space within the building, and an unsuitable space arrangement plan for such an increasing number of employees nowadays. Additionally, in order to best help their clients and to allow CENTRO to expand with the needs of community, the space inside the office building must be planned to fit the current and future employees.

The situation leads to our goal for this project: to make recommendations to improve the utilization of CENTRO's office space, creating a more comfortable and efficient working environment for the current and future employees. Through field observation, focus groups and interviews, we found CENTRO's trouble with space usage came from the lack of conference space, underutilization of certain areas, and environmental distractions. The underutilization issue resulted from unsuitable arrangements of department location and furniture. Our suggestion to solve the problems includes rearrangements of department location and interior furniture.

To ensure feasible and long-lasting improvement, we recommend updates in policy for the organization and the evacuation maps in the building. With these modifications, CENTRO is able to accommodate and attract more employees, and better help both the clients and the employees already associated with CENTRO.
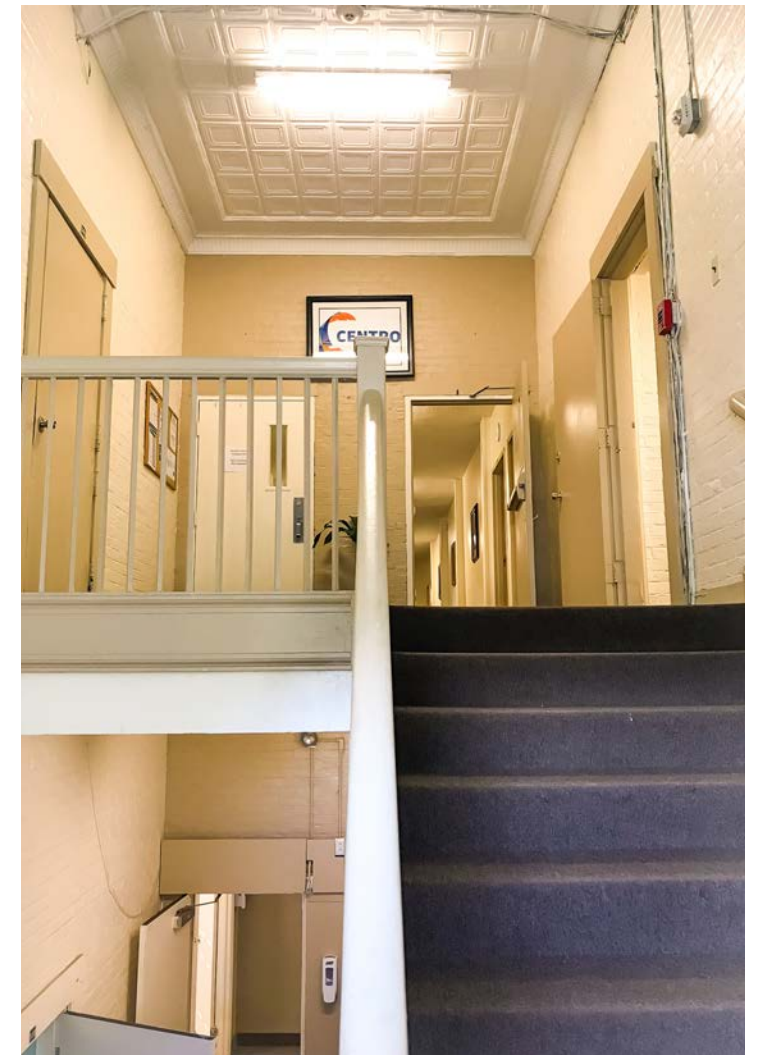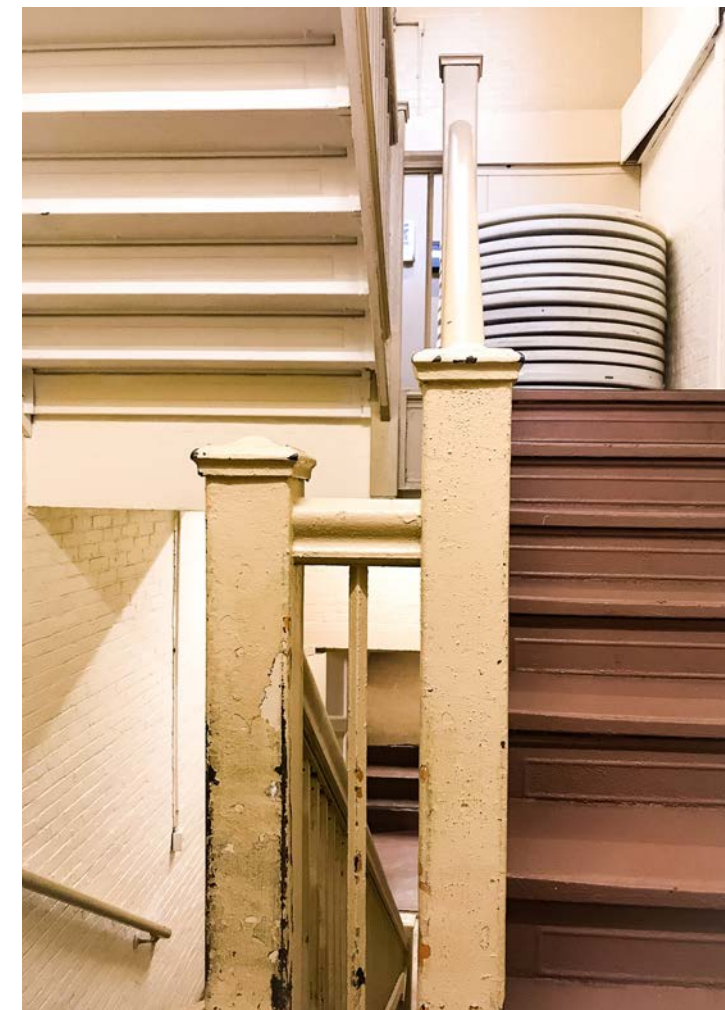
the Background

Open Office Design
Pros
Better communication
Flexibility
Aesthetically pleasing
Cons
Distractions
Lack of privacy
Stress

Closed Office Design
Pros
Distraction free
Privacy
Clarity of hierachy
Cons
Old-fashioned
Less communication
Huge space consumer

Hybrid Office Design
Privacy
Collaboration
Visually pleasing
Flexible space
Reduce distraction
Modern
Cost effective

Our Background Research

With the rapid development in architectural material and changes in production mode, open office design has been gradually replacing the more traditional closed office design for the past decades. However, recent studies debate on the effectiveness of open office design and suggest a balance of the two.

In this chapter, we explore the trend of office design and how each design aims to improve productivity. With the positive and negative effects of the open and closed designs, we show how the hybrid office design becomes the most suitable for growing companies.

[Left: Photo by Mark Sebastian on Foter.com; Right: Photo on Foter.com]

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Open Office Design

The Definition

In an open office design, one large room is divided into a few specific areas, sometimes with 30-60 inch partitions (Wagner & Watch, 2017). Almost 75% of the companies and organizations in the U.S. implement an open office design and consider it to be a "collaboration utopia" (Arahamian, 2018).

The Trend of Open Office Design

This design grew in popularity over the last few decades, gradually replacing the traditional closed office design. Gradual developments in technology and employee workplace preferences helped to spur this change (Bernstein & Turban, 2018; Wagner & Watch, 2017). Before the innovation of modern architectural materials such as reinforced concrete, glass, and even plastic, bricks were widely used to construct buildings, but limited the possibility for open office designs, which required support from beams, columns, and large windows. Now, modern technology and tools for construction enable open office concepts, by reducing the number of beams and supporting walls necessary (Rockfon®, 2012). With this modernization came changes in office design taste; most millennials, who were born after 1980, prefer social, flexible, comfortable, open, spacious, and collaborative spaces with modern technology (Wagner & Watch, 2017).

Fostering Collaboration

Wagner and Watch's study on the office design trends shows that open office design centers on fostering collaborative work in two major aspects. Firstly, the study finds that physically placing a team in one room offers more opportunities for people to communicate, which helps employees collaborate on work. This office place-ment also helps to reduce the illusion of staff hiearchy, which can make collaboration less intimidating. Secondly, the study claims that open office spaces are very flexible, and can be molded to suit multiple purposes.
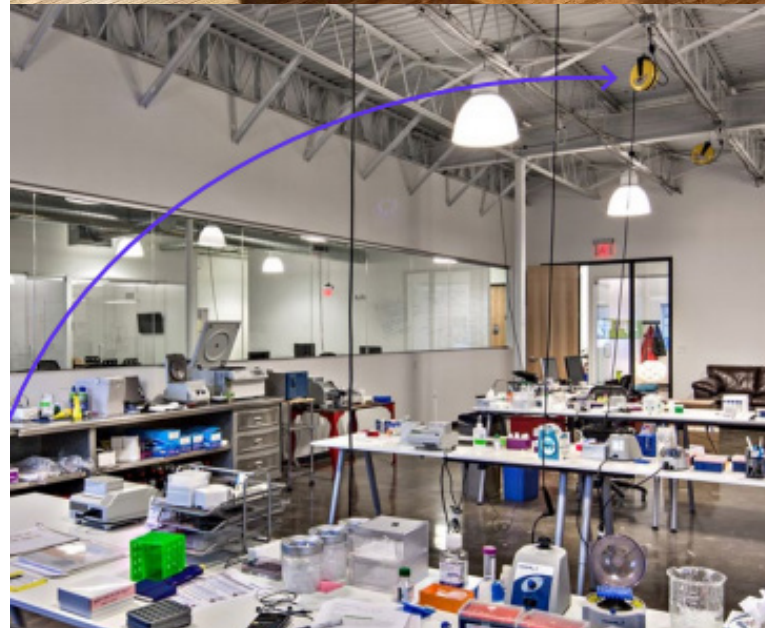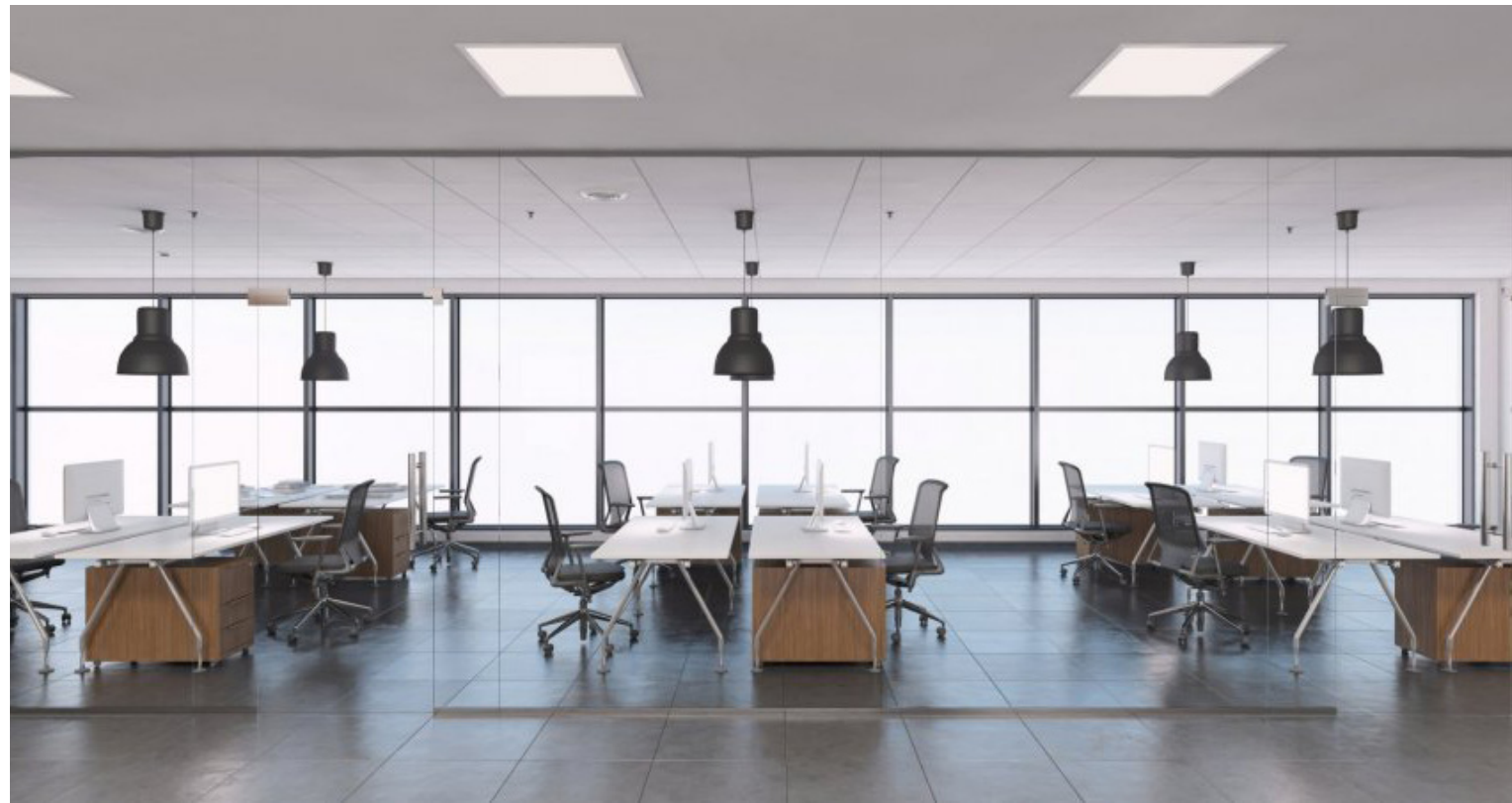
The 2017 study used the Advanced Manufacturing Research Centre (AMRC), a research center in the U.K., as an example. AMRC installed thick floor slabs to improve the efficiency of changing machines so that the research and development departments can do their job on industry-size machines in one place. By concentrating team members into one room and having the flexibility to adjust the space for various purposes, open office designs reach are able to cultivate workplace collaboration.

Benevolent to Physical and Mental Health

If designed properly, open office spaces can also be physically and mentally healthy for its employees. Clemens-Croome's book *Creating the Productive Workspace* (2000) states that productivity is the ultimate goal for any office, and productivity is significantly influenced by the employees' health. One such health benefit is the increased natural light that these offices receive through its large windows and fewer partitions (Rockfon®, 2012; Boubekri et al. 2014). Boubekri et al.'s study proves that an increased exposure to sunlight has a positive correlation with hours of sleep during the evening hours. Boubekri conducted a controlled experiment on 49 participants with 27 in windowless workplaces and 22 in workplaces with windows. Through questionnaires and actigraph studies, they found the workers in workplaces with windows had longer sleeping hours than the ones in windowless environment. Therefore, by maximizing the daylight exposure in the office, open office designs tend to improve employee health.

The Cons

However, fewer partitions in open office designs prove to be a double edged sword. Wagner and Watch (2017) claims that many employees in the study complained about noise pollution lack of privacy. Acoustic comfort has become a consideration for architects when designing an open office, and have implemented noise-absorbing fabrics on the walls (Rockfon®, 2012). In order to mitigate the trouble of "being sandwiched" with sufficient collaboration, Van der Voordt (1997) proposes flexible partitioning with seven methods of dividing rooms to foster the desired levels of social connections between workers. These methods separate or connect rooms for different activities, which increases privacy. Nowdays ground windows and portable room dividers are commonly used for partitioning (Wagner & Watch, 2017). However, building permanent or flexible walls increases the overall cost. If there is no immediate need for an open office design, then a closed office space might be better suited for the work environment.

the
Closed Office Design

The Definition and the Trend
Popularized in the late 60's, the closed office design, also called enclosed office or private office layout, creates partitioned office spaces with cubicles or panels for each employee in the building (Reddy, 2016). Reddy's study defines two types of closed office design. One is the portioned office, which gives private space for individuals, and the other type has different rooms for every department of the company in a separate space.

Beneficial for Individual Focus
Reddy's study finds that although the closed office designs are gradually replacing open office layouts, they are still favored by people who enjoy having private workspaces, and by companies that value individual achievements. One benefit that these more private work spaces can provide is a shield against noise pollution. As a central source of environmental stress in open-plan offices, noise pollution reduces the productivity of employees (Haapakangas et al., 2016). Belk's 2017 survey of 4000 high-performance employees from various fields showed that 58 percent wanted a quieter work space, and 62 percent considered their workspace to be too distracting. Reddy's study shows the nature of a closed office with private office spaces largely solves those concerns by reducing the number of outside disturbances, allowing employees to focus on their work.

Healthy Competition
Another subconscious advantage of closed office spaces are that they can increase workplace productivity by introducing an element of competition. Steers and Porter's study (1974) states that peer competition is an important source of employee motivation. The study describes company hierarchy as a "zero sum game", in which only one or a few employees can become executives, thus sparking a competitive environment to

increase the employees' motivation. Since executive offices are typically larger and more private, employees are driven to work harder in the hopes of being promoted, netting them a better workspace. (Reddy, 2016).
Closed workspace is beneficial for health, too. Reddy's study says the closed layout protects employees from catching communicable diseases.

The Drawback: Unsuitable for Collaboration
However, there are a few drawbacks to closed office designs, which make them often unsuitable to modern workplace environments, where collaboration is a necessity. (Reddy, 2016; Wagner & Watch, 2017). Reddy's study notes the following main issues with closed office designs. First, closed office designs make manager supervision inconvenient, as employees are often walled off from each other. This can lead to fewer supervisor check-ins, and employees becoming lazier, which hurts productivity. Second, the study identifies that walls and partitions prevalent in closed office designs can hurt the sense of community that open office spaces can foster. The individual focus of closed spaces leads to isolation, and can even lead to unhealthy competition amongst employees, hurting the chances of building an office community (DeFrank and Ivancevich, 1998; Reddy, 2016). DeFrank and Ivancevich's study suggests the cruciality of managers aiding their employees in developing skills and reducing excessive stress, as an example of the intimate relationship between collaboration and engagement, which is essential for most contemporary production mode. Consequently, the closed office design does not fit the companies that focus on collaboration but more on individual achievements.

For companies to increase its employees' motivation and engagement, it has to cultivate a sense of community within the office, otherwise mindless and reckless behavior occurs (Mintzberg, 2009). This directs to the need of a balance between collaboration and `individual focus, which architects met by the hybrid office design (Wagner & Watch, 2017).

the Hybrid Office Design

Blending the Two
Open and closed office space designs have many advantages and disadvantages that are opposites from one another. For instance, the near guarantee of privacy of closed office design fixes the lack of privacy brought by open office design, and the convenience of collaboration amongst employees of open office design alleviates the difficulty for communication in closed offices. A third type of design, called the hybrid office design, combines the best elements of open and closed office spaces (Wagner & Watch, 2017).

Distinction between Spaces
Wagner and Watch note that a hybrid office design balances social, and private spaces. The study also shows how architects are able to use hybrid designs to construct flexible workspaces. These architects construct the public and private spaces distinctively - areas requiring privacy have thick and noise-reduction walls while the areas aiming for openness have glass walls.

Summary

The Open Office Design	Closed Office Design	Hybrid Office Design
Pros	**Pros**	**Benefits**
Better communication	Distraction free	Privacy
Flexibility	Privacy	Collaboration
Aesthetically pleasing	Clarity of hierachy	Visually pleasing
		Flexible space
Cons	**Cons**	Reduce distraction
Distractions	Old-fashioned	Modern
Lack of privacy	Less communication	Cost effective
Stress	Huge space consumer	

Example of Implementation
When companies began to experience some of the drawbacks brought on by open office designs, many designers tried to implement such hybrid designs that helped to fix these problems. BESPOKE, a commercial real estate company, has a hybrid office design that has both open and enclosed work spaces. This layout encourages their employees to collaborate at these open spaces, and provides closed spaces for both relaxation and individual work. In the relaxation zones, BESPOKE has coffee machines, snacks, and even a simple kitchen for the employees. Having the relaxation zone separated from workplace helps employees stay focused. Additionally, these types of spaces also help supervisors keep an eye on their employees (BESPOKE, 2017).

Less Flexible but More Efficient
On the contrary, the flexibility in open workspace requires time to move office utilities around in order to meet different purposes. For example, as the 2017 study says, tables in an open workspace are put together when the company holds a meeting, but when the field workers come back to work, they have to move the tables all around to make it into an workspace. Further, if the tables are often moved around, they get old fastly and the company has to spend extra money buying new ones. In a hybrid office, the meeting space and workspace are arranged so that they no longer need rearrangement. Resulting in further improvements, the hybrid office hence becomes the more desirable design.

To the Next Step

The major benefit of an **open office design** is an **increase in the amount of workplace collaboration**, which results in more engaged employees, leading to improved productivity if the jobs are community-based. Alternatively, the **closed office design** allows **a better focus on individual work** with its quiet and concentrated environments, improving productivity if the jobs are non-collaborative. The different approaches to productivity result in the extreme contrast between the pros and cons of the two, which are mostly complementary to each other. For most companies, productivity requires both collaboration and individual focus, which led to the popularization of the hybrid office design. For this project, we evaluated the space utilization at CENTRO and determined the most appropropriate office design for CENTRO.

[Photo by BESPOKE]   Photo by LYCS Architecture; Photo by OTJ; Photo by MEDIA PROFILE on Unsplash]

GOAL

To improve the utilization of CENTRO's office space, creating a more comfortable and efficient working environment for the current and future employees.

1. Evaluating the Current Design

a. Field observation with measuring the current floor plan
b. Focus group with employees about the pros and cons of their offices, and ideas about potential solutions
c. Semi-formal interviews with employees about their daily work and how often they use their offices

2. Developing the New Plan

a. Determine the **most suitable solution - rearrangements or renovations -** to the concerns of the current design
b. Rearrange **department location** floor by floor
c. Rearrange **furniture** for each room

3. Finalizing the New Plan

a. Plan **additional upgrades** on office devices, maps, architectural utilities
b. Estimate **the budget** of implementing the plan

The goal of our project is to make recommendations to CENTRO to improve their office space utilization. This will create a more comfortable and efficient working environment for current and future employees. To achieve this goal, we CENTRO's current floorplan, and developed a new space utilization plan. We conducted field observations and direct interviews of employees to acquire the background information we needed.

To develop a new space utilization plan, we identified the problems with the current office design via direct field observation and semi-structured interviews.

How does CENTRO currently utilize its space?

In order to observe how CENTRO currently utilizes its space, we used CENTRO's evacuation plans to help us create floor plans for each floor, and accurately measure the dimensions of each office and the furniture inside. Each team member was responsible for measuring one floor using a Bosch GLM 20 Compact Blaze Laser Distance Measure. The dimensions were used to create a floor plan by drawing in either AutoCAD 2020 and SolidWorks, based on the personal preference of each group member. The furniture was represented by blocks that could be moved freely when proposing the reorganization. The number of desktops, photocopiers, printers, and other office devices in each room were also counted.

In addition to the architectural floor plan, we obtained information about the allocation of each department in the building through semi-formal interviews, which we conducted by visiting each office and inquiring about the employee's department. The current location of each department helped us to rearrange the offices and furniture based on the needs of their job, such as moving employees with similar job functions to the same location.

How often are the office devices used?

Technology improve the productivity and are indispensable for employees, so we must understand the employees' demand for those devices including computers, printers, photocopiers and the phone line system. In addition to the locations of the devices, we asked employees about their frequency of usage, and if it was convenient for them to access the devices. The information identified the problems of the current number and allocation of those devices, also the rooms, or departments with higher demand for them. Meanwhile, we searched about any related technology that could improve the user experience.

"The people who face those problems every day are the ones who hold the key to their answer."

- The Field Guide to Human-Centered Design, IDEO 2015

OUR APPROACH

Evaluating the Current Design

Field Observation
Focus Groups
Semi-Formal Interviews

Evaluating the Current Design (Cont.)

*It is the employees who know best about the problems with the current design as well as the potential solutions.*

FOCUS GROUP ABOUT EMPLOYEES' OFFICE EXPERIENCE

What's the best thing you feel about your office? What is the worst thing?

We collected statistical information including the usage frequency for shared spaces like auditorium, conference rooms and the training room, the total number of CENTRO employees by department, number of field workers and volunteers. For inquisition, we contacted the Director of HR and the COO.

To gather input from the CENTRO employees, we conducted a focus group using the PollEverywhere software to collect statistical results and stimulate the discussion. Our questions to the participants focused on the benefits and concerns of the office building. In the focus group session, we asked about the employee's position, privacy needs, collaboration needs, and their opinions on the best and worst features of the current office design. We also asked employees to identify areas where they see wasted or misused space. Questions were given in multiple choice and free response format and were both read and shown on the monitor in the meeting room. Participants could see the percentage of each choice and vote on

each response, which helped the group to broaden the topics and acquire more information than expected.

To better understand the current state of space utilization, we compared the actual area of space in use and the amount of available space. we first conducted research about the space usage in each room through semi-formal interviews, during which we briefly visited each office and interviewed employees. We logged the positions of the employees and the frequent hours worked inside the office. These offices visits allowed us to look at the sizes and arrangements of furniture and enabled us to gain a better understanding on the current space usage.
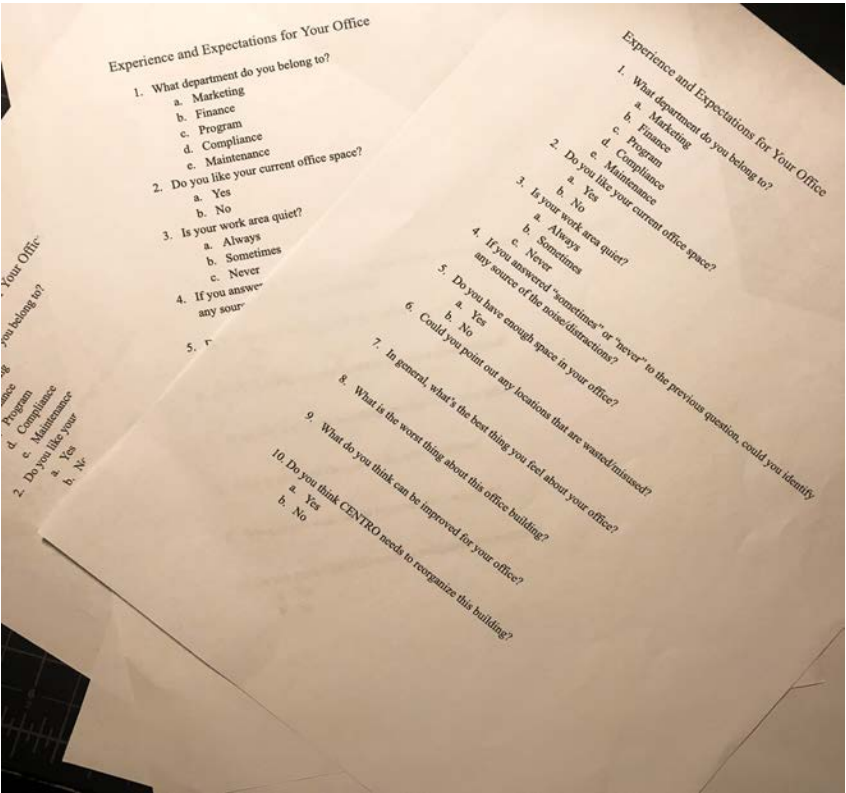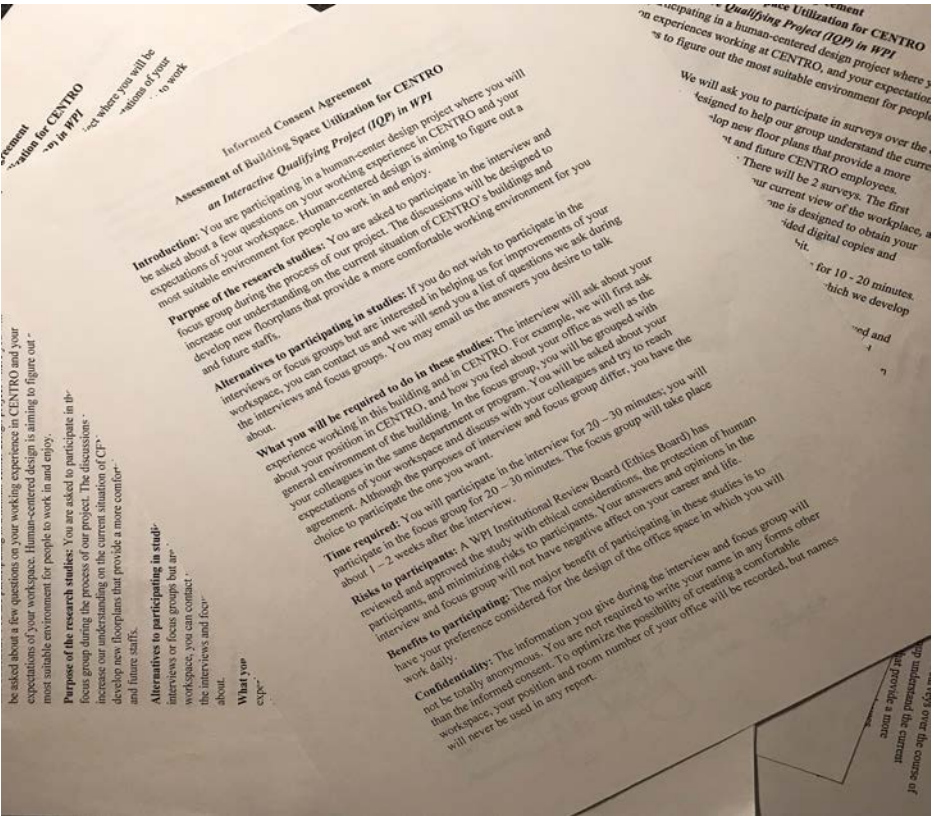
What do you think can be improved for your office? Do you think CENTRO needs to reorganize the building?

ABOUT THE EXPECTATION OF AN IDEAL OFFICE

In the same focus group session, we asked the participants about their expectation of an ideal workspace. We planned to meet the employees' expectation as possible, so we focused on 3 factors: the office environment, the location, and the level of collaboration needed.

For the office environment, we asked about the amount of natural light or lighting and the area of storage needed; for location, we asked about their willingness to move to another office room with potential benefits such as larger or more private space; we asked for the level of collaboration needed for their daily work.

As a transition to a broader discussion, we let the participants think about the best and worst thing they felt about their office. They could answer freely, pointing out whatever they thought of.

For more specific ideas, we asked the people who were unhappy about their current office about which specific office they liked. This question made the atmosphere more seriou since a sense of simulating the rearrangement occurred. In addition to their own offices, we asked about their opinions on the whole building, so that we gained a more rounded knowledge on the problems and the potential solutions.

The last two questions were designed to a broader and more practical level - their suggestions for renovation and opinion if a renovation was highly in need. The participants' answers to these questions actually gave potential solutions to the problems they pointed out when discussing about the current workspace, ultimately forming a prototype of the new utilization plan.
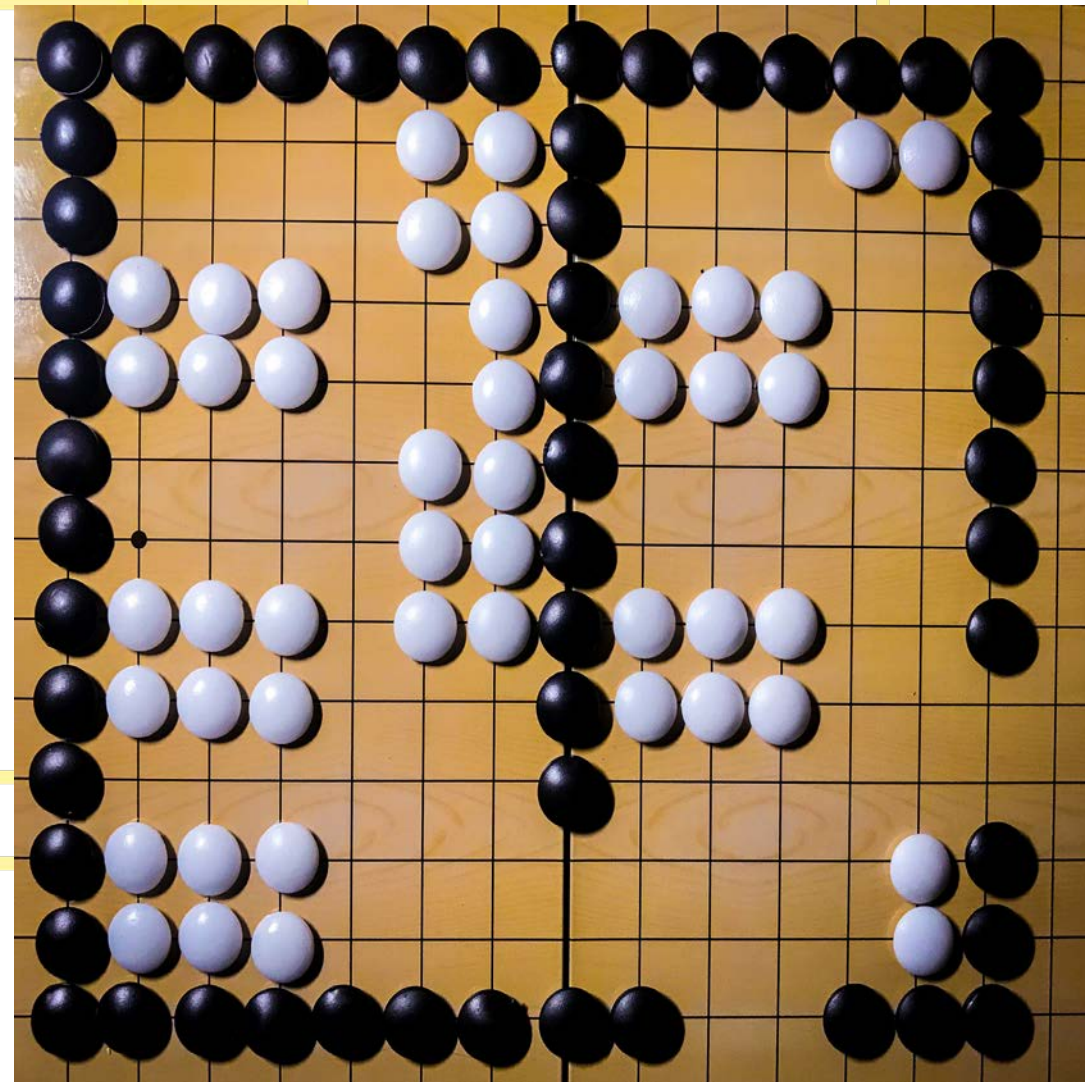
A.Y.D. (2019). *Proposing Rearrangement of Furniture* [Go, the board game].

Developing the New Space Utilization Plan

Rearrangement or Renovation
Department Locations
Furniture Arrangements

Using information about the current state of the building, measurements of each floor and data from the employee focus group, we designed new space utilization plan. During our development of the reorganization, we proposed solutions to the problems with the current design and ways to make improvements .

Addressing Employee Concerns

We identified two major ways to address employee concerns including rearrangement and renovation of office utilities. Rearrangement referred to reorganizing the positions of each department and the furniture in the room. Renovation referred to fixing architectural defects and purchasing new office devices. We prioritized rearrangement to avoid disrupting the employees and to minimize the cost.

Proposing Rearrangement of Offices

With all the data gathered, we began to develop a plan for rearranging the current office space. First, we identified the unmovable areas such as maintenance room and air conditioning roms, excluding from the rearrangement plan. Second, we highlighted the locations that were highly discussed in the focus groups and interviews, making notes about the problems on each room. For example, employees in the same department needed to be moved closer together, and departments with too little or too much space should be located to an appropriately sized space. We also considered partitions and combinations of the rooms to propose a hybrid office design that would improve the space utilization at CENTRO.

Proposing Rearrangement of Furniture

With limited space, the arrangement of furniture can affect the availability of space for every employee. Using information from the focus groups and interviews, we accommodated the employees who required private or shared offices.
In private offices, we arranged the furniture in a way that the areas for working and for storage were ample and balanced. In shared offices, we considered a balance between privacy and fostering a sense of community. For rooms with windows, rearrangements were made to maximize the possibility of obtaining natural light. For the rooms without windows, we considered placing the desks and workstations under areas with the strength of light that makes people most comfortable and efficient.

To ensure the feasibility of the reorganization plan and to gather information for improving the proposal, we gathered feedback from CENTRO employees during official meetings and semi-formal interviews.

We made copies of every single map on the walls, and drew the up-to-date floor plans in a similar way as the old evacuation maps. We added the department assignment of each room, both the current and our proposed ones, so that the employees know better about where they are.

We searched for the price of our proposed renovation, e.g. fixing the building utilities and buying new furniture, and portable room dividers, etc., and summarized our calculations in the Recommendations.

Finalizing the New Space Utilization Plan

Additional Upgrades
Budget Estimation

Planning Additional Upgrades

For rearrangement plan to function as expected, we planned to upgrade the evacuation maps in CENTRO's office building. Since the room partition on the current evacuation map did not match the actual situation while the general architectural structure was correct, we renewed each evacuation map with the exactly identical route but an up-to-date background. This would ensure the safety of the building.

In order to give employees more flexibility and create more flexible workspace for field workers in the building, we developed a Work-From-Home Policy. We interviewed the directors as well as staff of each department about their necessity to work in their office, and consulted the CEO to determine the feasibility of the policy. Also, we interviewed employees from other organizations or companies who worked from home about their experience and any technology they used to connect to the companies' server and to communicate with their colleagues.

Developing Estimated Budget

When developing the rearrangement plan, we minimized the unnecessary modifications to reduce the cost. Once our group finished the proposal plan, we predicted the cost for implementation. Our cost analysis went in detail about the cost of each renovation we plan to do to the current CENTRO workspace, with the merits and drawbacks balanced.

The list included a breakdown of where the predicted cost is coming from - materials, human resources, and possible influence on daily work process - as well as alternative ways to reduce the cost.

The budget list enabled us to make sure that the cost of the new design was flexible during our process of developing and revising our plan. More importantly, it would enable CENTRO to reduce any cost which they might considered unnecessary. This will allow them to implement the new plan so that to maximize the space utilization of their office building.

Using the data collected from our investigations of CENTRO's current layout, and from focus groups and interviews, we identified the main problems affecting CENTRO's current space utilization efficiency to be:

Lack of Conference Space
Three meeting rooms
2nd floor- large & small meeting room
1st floor - training room

Environmental Distractions from
Meeting rooms
Windows
Phones

Underutilization of Space
Offices with too few or too many empoyees
Offices not used daily
Problems with furniture arrangements
Problems with department location

[The drawing is an imitation from the cover of IDEA 2015.4]

Lack of Conference Space

During our research, we identified the lack of conference space to be one of the urgent issues, as claimed by 60 percent of the participants of the focus groups and interviews who frequently met with clients. As CENTRO is a client-focused organization, there is a extremely high demand for conference rooms.
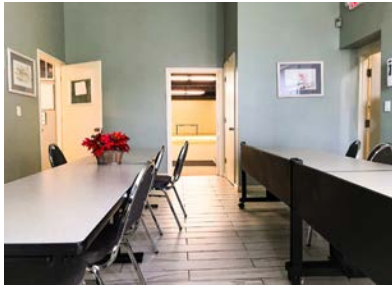
The training room: three doors connected to the kitchen (left), the auditorium (middle), and the hallway (right).

Three meeting rooms

Currently, there are two meeting rooms on the second floor, one large meeting room located next to the CEO's office with a TV monitor, and one smaller meeting room located next to the three executive offices by the stairs. Participants in the interviews stated that on average, the large meeting room was used at least four times a week, and each meeting lasted for an hour to even a few days, depending on the sort of the meeting. The room could accommodate up to 10 people, which was enough for administrative meetings, but for department meetings or employee training sessions, which could have 5 to 30 people, the training room or the auditorium was utilized. Employees, typically high level executives, also utilized their private offices to meet individually with other employees and clients to ensure privacy.

Rush hours

Despite these current options, we found a high demand for meeting rooms within CENTRO seldom being met. Employees described "rush hour" moments where several meetings occurred simultaneously and there were not enough available conference rooms. Employees who needed to meet with more than two clients at once often struggled in finding an available conference space.

The **major reason** for CENTRO's lack of meeting spaces was underutilization of the available spaces. The large meeting space on the second floor was considered to be the only "real" meeting space and every other space was used as a last resort.

Small meeting room

The small meeting room had issues with privacy, noise pollution, lighting, and necessary technologies such as monitors.

Traning room

The training room on the first floor had a monitor but was often excluded as an ideal meeting room due to its location and the arrangement of the furniture inside the room. With its furniture being arranged in rows, the room was already filled up with the desks, which limited the possibility for rearrangement. The training room was also located close to the auditorium and cannot be used during events due to excessive noise.

[The small meeting room: three offices on the left; no technologies; surrounded by cabinets.]

Environmental Distractions

Our research identified several environmental distractions within certain rooms at CENTRO. These distractions were frustrating for employees and hindered productivity.


Meeting room
Air conditioning controls located inside the meeting room created a chain reaction problem that affected the entire office. During crowded meetings the room would become uncomfortably hot. Meeting attendees would use the AC controls to lower the temperature, which lowered the temperature of the entire second floor. This resulted in uncomfortable temperature for other employees on the second floor.

Phones
Switched-on speakers announced voice messages
- **Noise** for other employees in the office
- **Lack of privacy** for the recipient
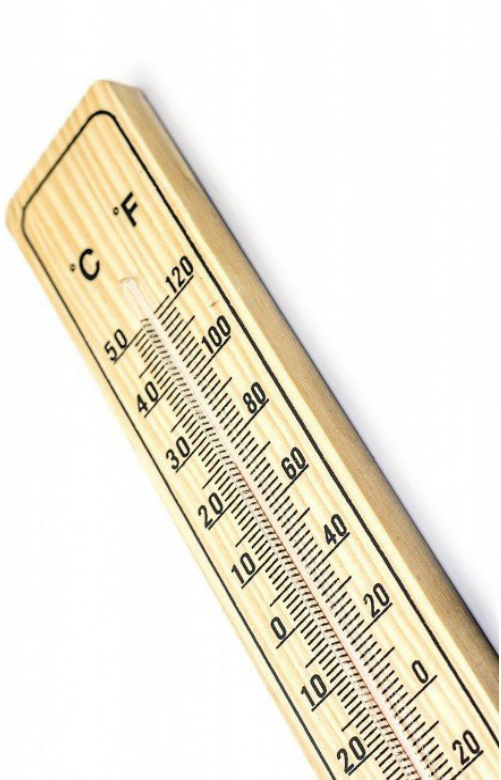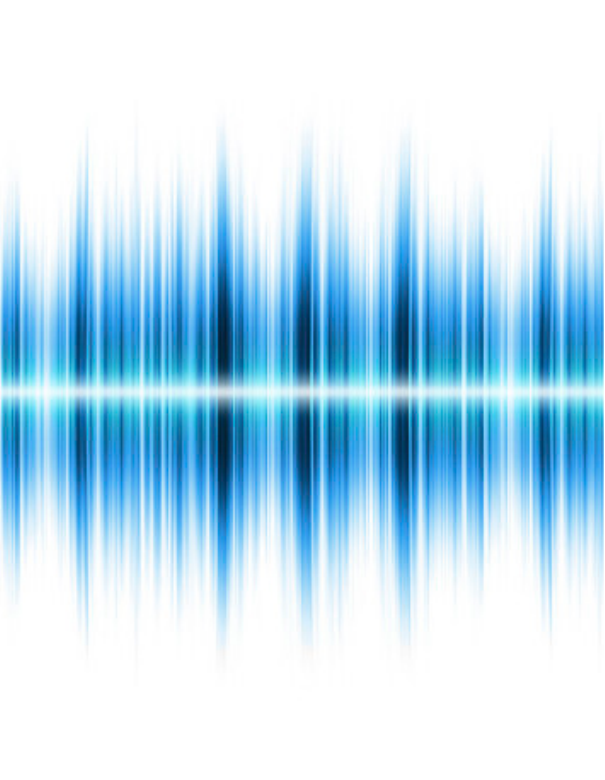
Windows

Shared windows led to no privacy
- Room 214 and 214A & Room 217 and 218
- Conversation could transmit from one room to the other

Leaky windows brought noise and uncomfortable temperature
- Noise pollution from outside of the building
- Air with unsuitable temperature from the outside

1

2

3

4

Many food storage were in the hallway (Fig.5), while there are still many spaces in B002 and B007 (Fig.3 & 8).
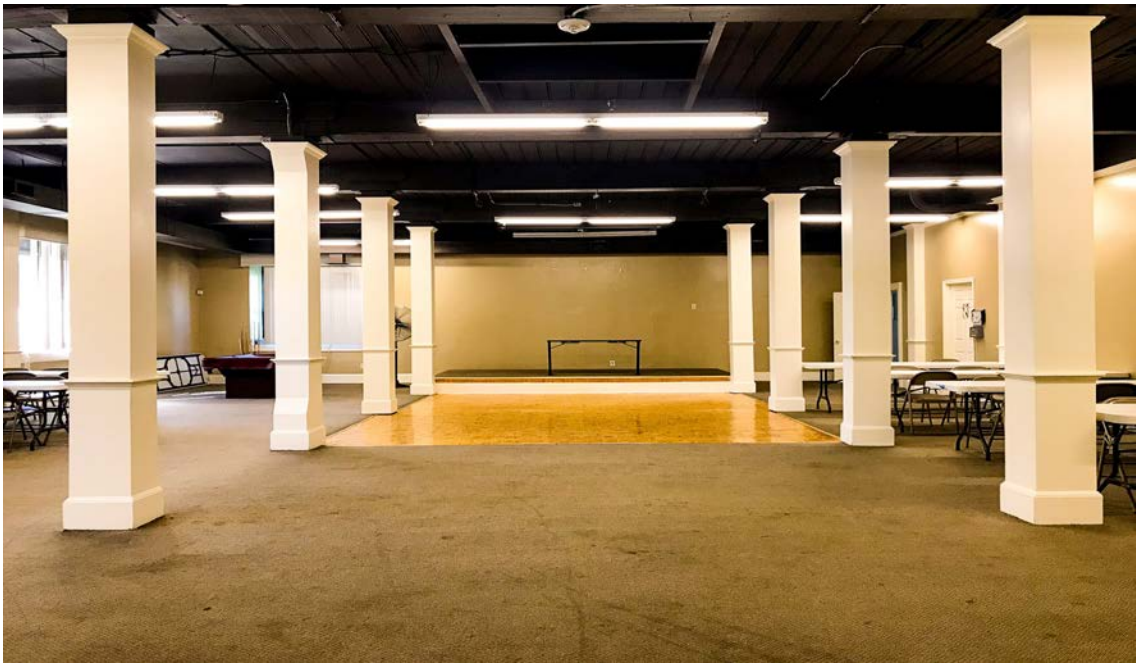
Underutilization of Space

Our research showed underutilization of space at CENTRO was a major concern due to rooms with low usage, poorly arranged furniture, and employees within the same department working in different locations.

Rooms with Too Few or Too Many Employees

Usage efficiency From our field observation and research, we found some areas with an inappropriate proportion between the size and the number of employees. For example, there were large rooms with few employees and small rooms with too many employees. In the basement we noticed unorganized storage areas.

Basement
Primary Use: Storage and food pantry

Room	Primary Use	Status	Consequence
B002	Food & furniture storage	Furnitures are disorganized and taking up space	Can be used better for more storage
B003	Storage	Broken pipes; poor lighting	Can be renovated for meeting space
B007	Food storage	Many space unused	Can be used for more storage

First Floor
Primary Use: Client meeting space and additional offices

| Room	Primary Use	Status	Consequence
105	Storage	Storing stuff that are neither important nor oftenly used	Can be used for office space
Training Room	Employee training	Seldom used; not suitable for meeting space	Can be rearranged into meeting room
106	Event hosting	Used for only a few times a week	Can be used for flexible workspace

5

6

7

Second Floor
Primary Use: Workspace for program directors and staff

Room	Primary Use	Status	Consequence
201	Small meeting room	Seldom used	Can be used for office-espace
208	Marketing Dept.	Only two employees insde	Too few employees
212	DCF Dept.	Only two employees insde	Ten workstations wasted
219	Finance Dept.	Only two employees	Too few employees
220	CBHI Dept.	Eight employees, each two shared one desk	Too crowded
224	FSS Dept.	Five employees in the 390 sq. room	Too few employees
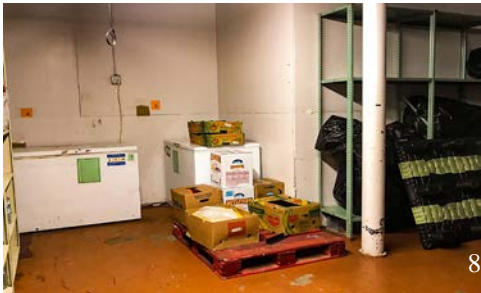
8

1. Staircase next to the auditorium.
2. The auditorium
3. B002
4. B003
5. Hallway next to B002
6. Room 212
7. Room 212
8. B007
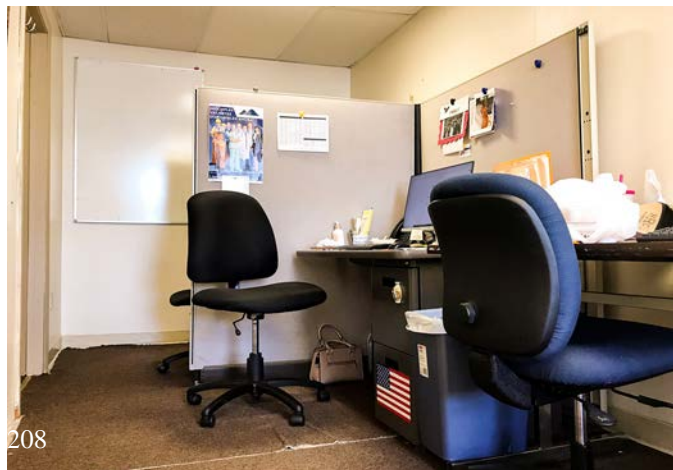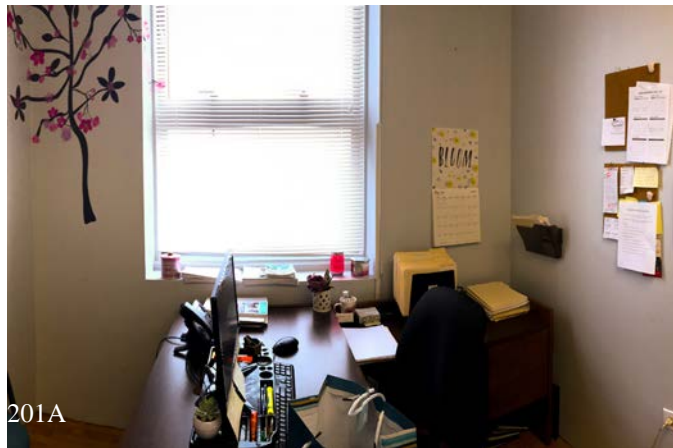
Offices Not Used Daily

During our observations, we also noticed the offices assigned to individual employees were **often not used daily**. These employees were usually field workers or staff that worked with CENTRO's clients.

Through interviews, we found that the employees of Room 102B, 201A and 201C used their offices only twice a week. Also, Room 205 was not assigned to anyone because CENTRO planned to use it for a new director.

Problems of Furniture Arrangement

As noted previously, sometimes five to eight employees would share one office space, making the space rather crowded and messy. The clutter came about due to the inefficient arrangement of furniture such as desks, shelves, and cabinets. We observed rooms 208, 220, and 224 to be the ones with the most severe problem.

Room 208 - Marketing Department

- Four Desks: two marketing employees, one volunteer, one unassigned
- Placement of four desks along one side of a long narrow room decreased utilization
- Room located too far from hallway printer thus requiring a printer in the room, decreasing available space

Room 220 - CBHI

- Two employees sharing one desk
- No privacy: people in the back row can peek at the computer screens of the ones in the front
- Less accessibility: people sitting by the aisle hindered the ones by the walls

Room 224 - Family Support Service

- Desks in rows offered no privacy
- Arrangement of storage furniture made the room disorganized

Besides the rooms described above, we also found the following offices with furniture arrangement issues.

201A

224

208

208
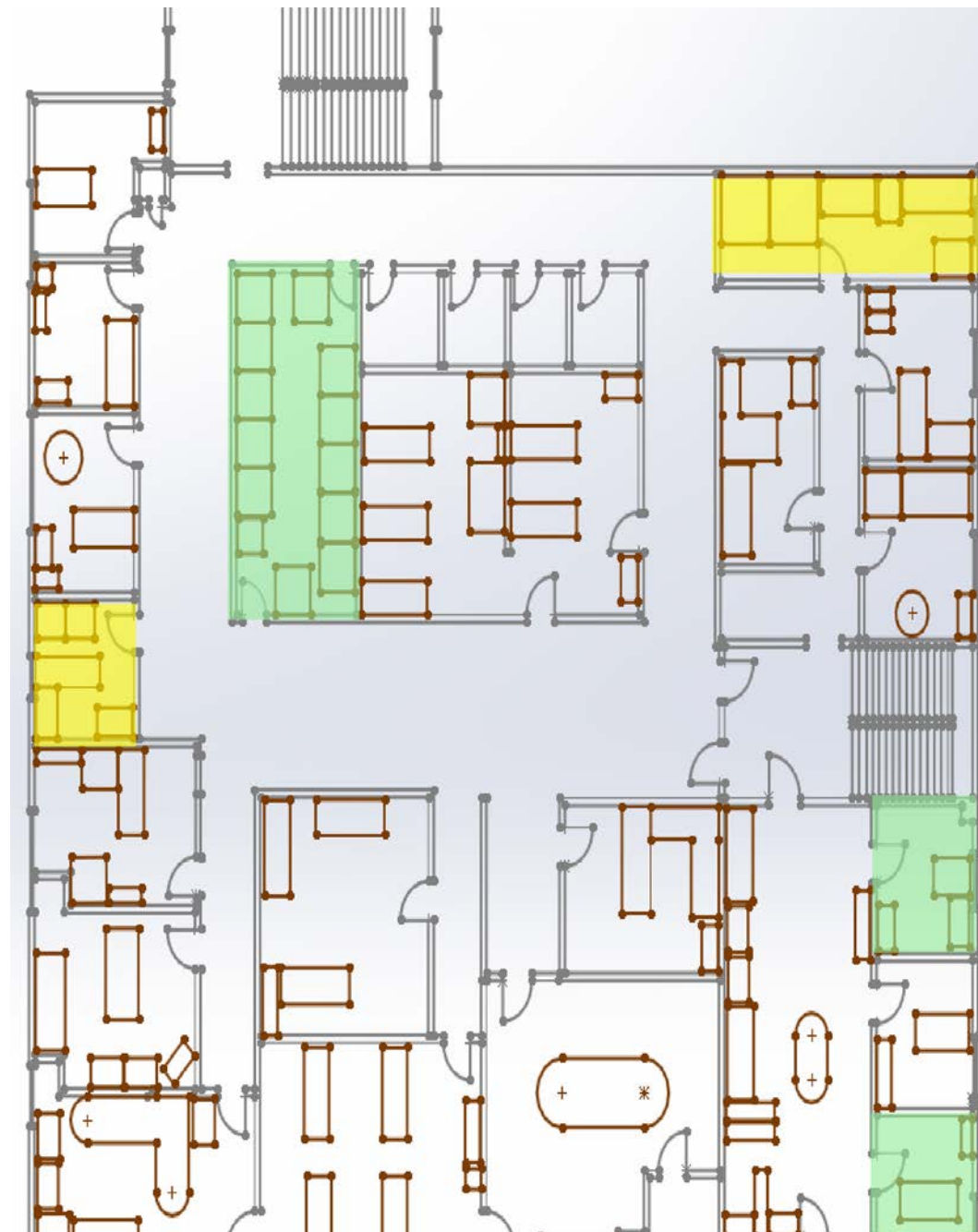
Problems of Department Location

Our research found that many offices in the same or similar departments were placed far from each other, negatively impacting the efficiency of collaboration in CENTRO. Several departments had office spaces located far away from the cooperative ones.

First Floor
Health Clinic
CENTRO's new health clinic was planned for Room 108, which is located at the far end of the auditorium. Placing the clinic in Room 108 would make it far from the reception and waiting area, and a patient would have to walk through the currently vacant Room 107 to access the clinic.
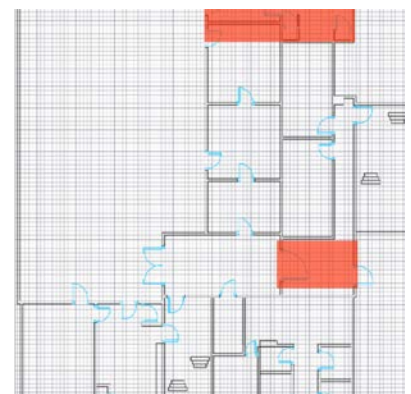
the
Recommendations

To address space utilization issues at CENTRO, we recommend the rearrangements and renovations floor by floor and several long-term upgrades for the office building including policies and safety maps.

Basement

The basement has several problems most of which stem from and inefficient use of the storage space available. We suggest to address the problems by rearranging certain rooms for additional storage spaces.
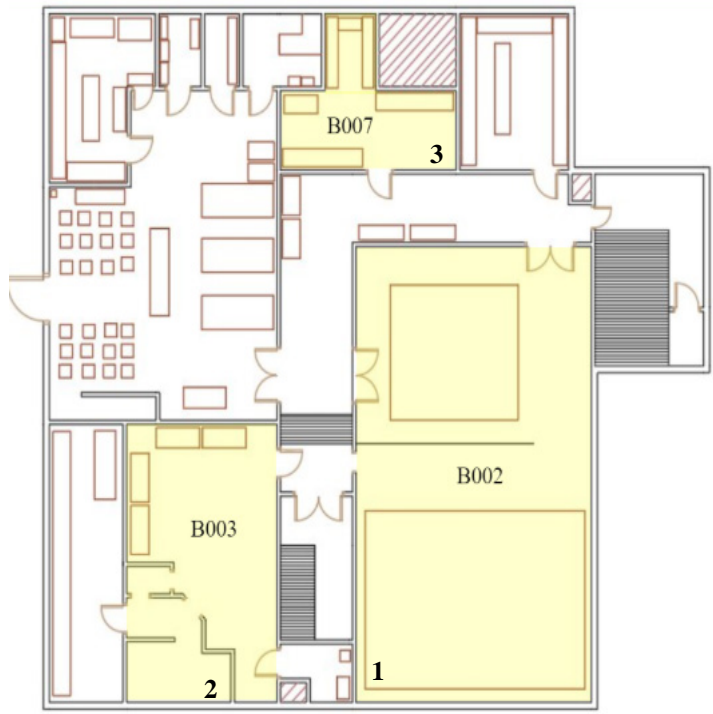
The original floor plan of the basement

The concerns of the current floor plan

1. There were many empty floor spaces, and the furniture is not organized well, taking up a lot of space.
2. Only four shelves inside, and the pipes need to be fixed to make better use of the room.
3. Though the room is well-organized, there is still empty space for more storage.

Ideas from the employees

- *Make more office space in B003?*

  B003 is not an ideal workspace for employees. Though the lighting can be renovated, lack of natural light negatively impacts physical and mental health.

- Make it a meeting space?

  Technology devices, i.e. monitors and projectors must be installed to the room. Also, the ceiling must be renovated.

Proposed plan and the benefits

1. **Organize** the furnitures, sort them according to their functions - desks, tables, cabinets, and chairs, etc., and their sizes with the larger ones placed at the back. Also, **make use of the cabinets, closets, and shelves** to help organize the food storage.

2. There are **two options**:

   a. Move the shelves in B007 and refrigerators in the hallway to B003. This frees up the space of B007 for storage from Room 105 and for extra storage based on the needs.

   b. Fix the pipes, lighting, and ceilings, and add tech gears to make it a meeting space.

3. In Step 2, B007 has the current storage moved to B003 and can be used for either **additional storage** or **workspace for the food pantry staff**, so that they do not need to work in the food distribution area.

4. B009 is not officially assigned, and it can also be a **workspace for the food pantry staff**. Though not working at the desk often, the food pantry staff can have **more privacy** and the computers as well as file cabinets are **more secured**.

Larger figures are provided in Supplementary Material.

The proposed floor plan for the basement
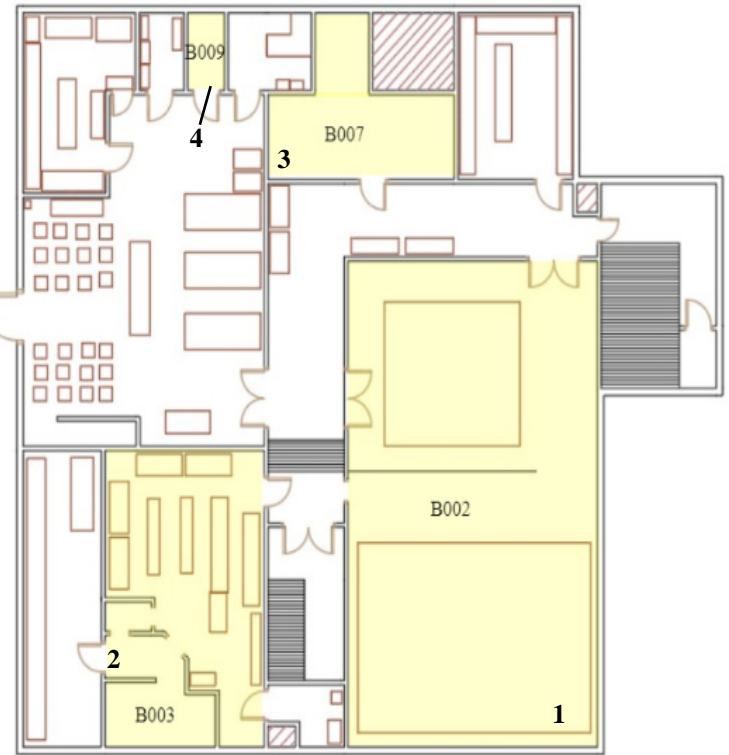
First Floor

The main problems with the first floor were its underutilization of space, and its department allocations.

The concerns of the current floor plan

1. The auditorium is only used for a few times a week, when it is not in use, there are lots of space available.
2. Room 107 & 108 are planned to be the health clinic, yet it is inconvenient to access for the less-abled clients.
3. Room 105 stores neither very important nor frequently used stuff, which is a waste of this nice location.
4. The training room is seldom used. For meetings, it is inconvenient because of desk arrangements. Training programs are always not held.
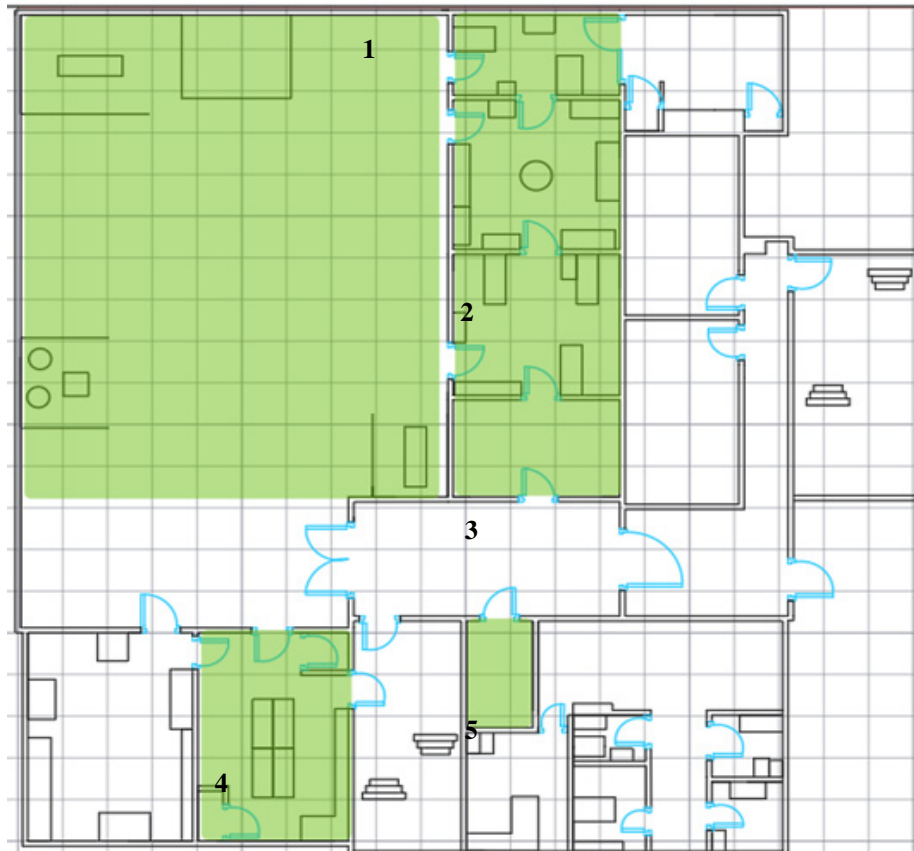
Proposed plan and the benefits

1. In the auditorium, add portable room deviders to make meeting space, flexible workstations, and a lounge for the employees.
2. Open a door between Room 107 and 104, and move the furniture currently in Room 104A to 107 & 108. This provides more natural light and space for the employees.
3. Place the health clinic in Room 104A, and remove the door for entering the inner rooms. This makes the health clinic more accessible for the clients, as it is right next to the reception and waiting area.
4. In the training room, place the four tables together to make it a meeting room. If there is a training program, simply move the tables into two rows.
5. In Room 105, move the storage to the Basement - B003. The room will be free for extra office space, potentially the doctor's office and his/her file or medicine storage.
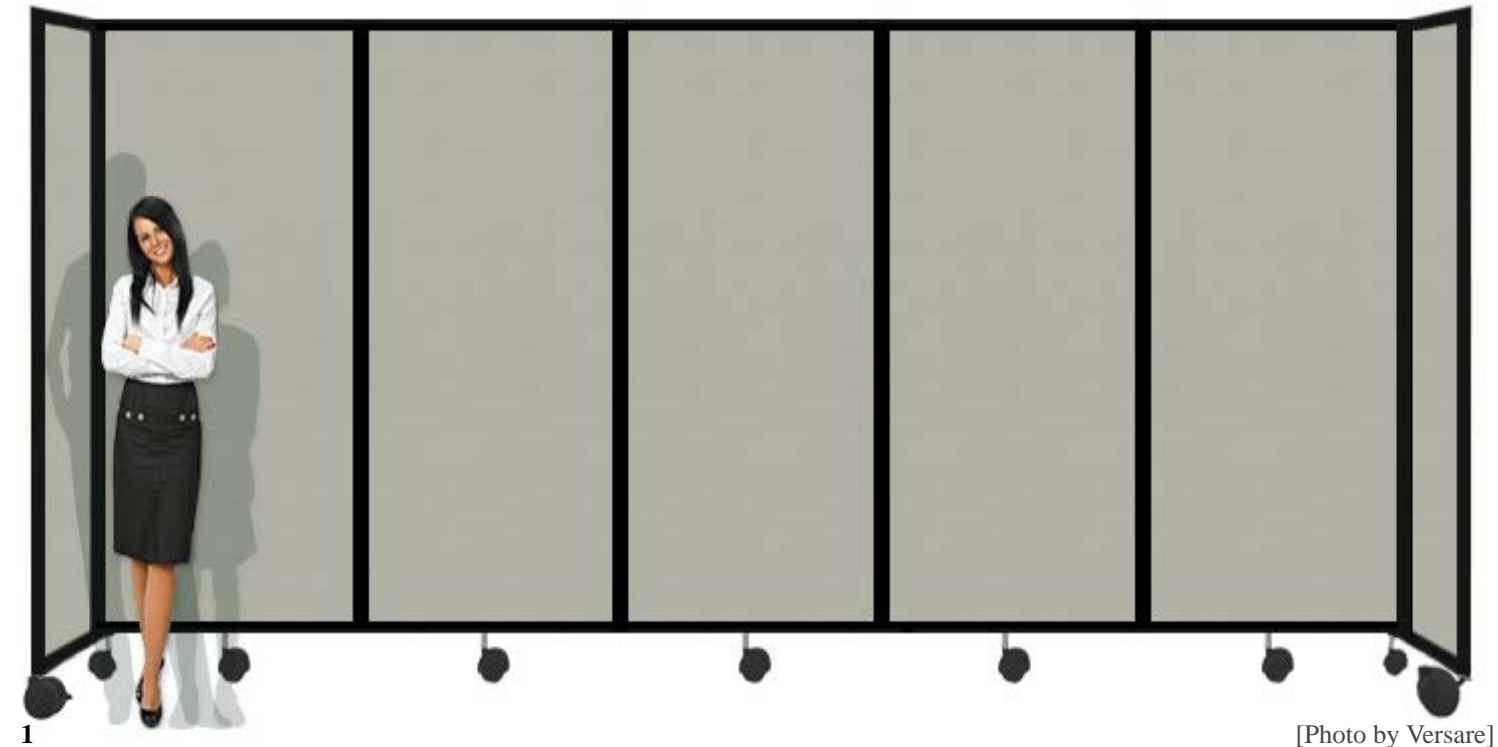
[Photo by Versare]

Recommendations for room dividers

1. **StraightWall® Wall-Mounted Sliding Partition** (× 4)
   Manufacturer: Versare
   Material: Acoustical fabric
   Size: 5' × 15'6"
   Price: $ 1159.00 without tax (× 1)
         $ 4646.00 without tax (× 4)
   Extra option: Wall-Mounted or not
2. **Woodfold Series 240V: Vinyl Laminate** (× 4)
   Manufacturer: Folding Doors Room Dividers
   Material: Hardwood & flexible vinyl
   Size: 10' × 10'
   Price: $ 1543.10 without tax (× 1)
         $ 6172.40 without tax (× 4)

While the **Woodfold Series 240V: Vinyl Laminate** is more solid and provides more privacy, it is ~ $ 1500 more expensive than the **StraightWall® Wall-Mounted Sliding Partition.** But, **StraightWall®** has higher flexibility and easier to implement. Therefore, we recommend **StraightWall®** unless there is a high demand for privacy in the meeting and relaxation areas

[Photo by Folding Doors Room Dividers]

For the second floor, our findings show that it had all the issues we encountered - lack of conference space, underutilization of space, and environmental distractions. To solve the problem, we recommend rearrangement of department locations and of furniture arrangements.

Second Floor
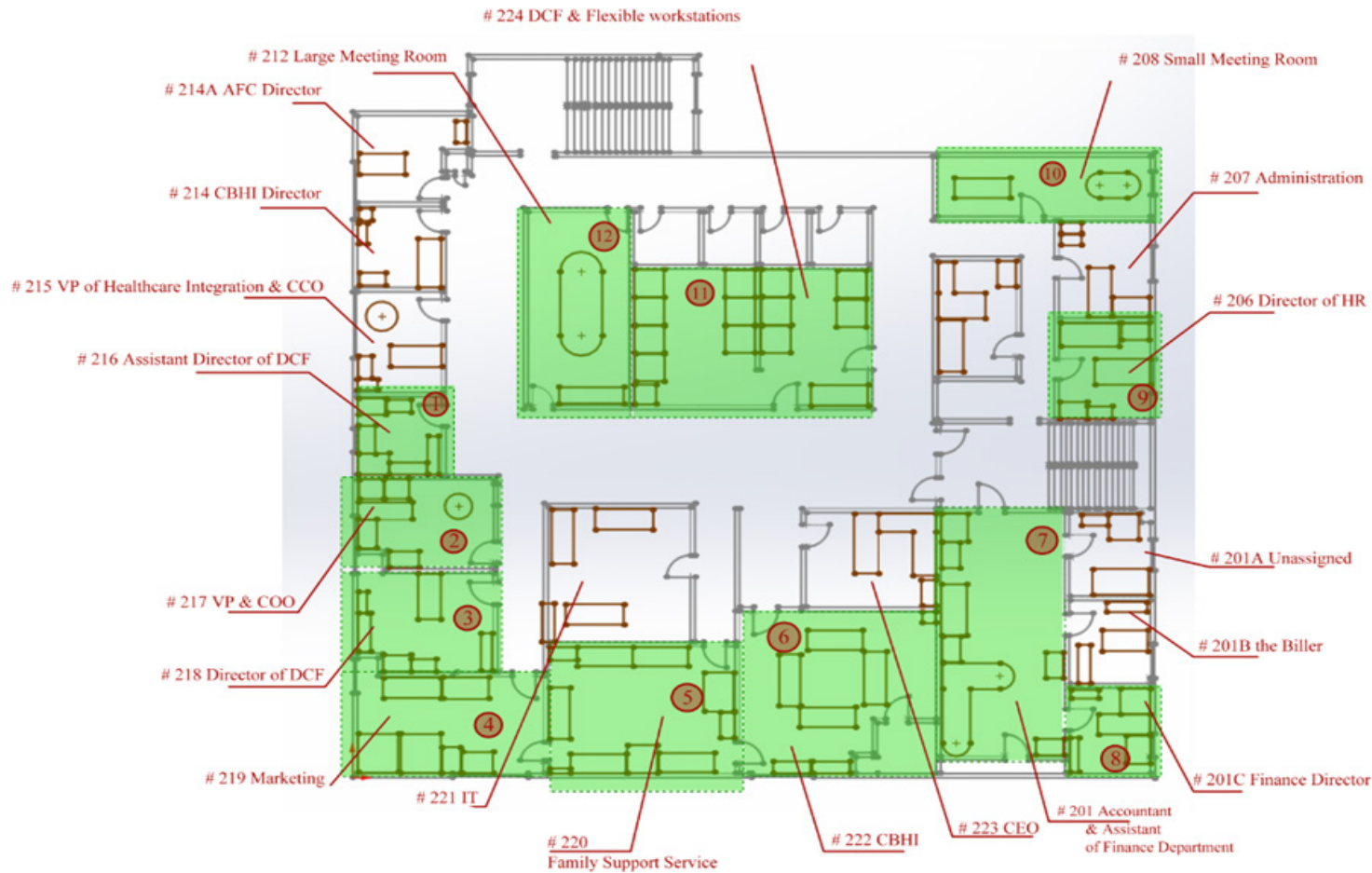
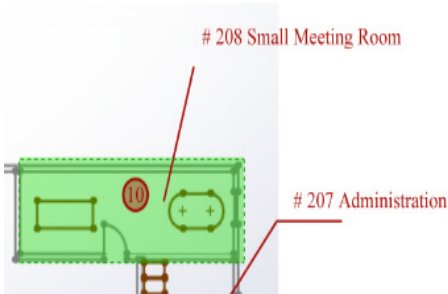## Proposed plan and the benefits

Department Location
1 & 11. The DCF Assistant Director would be closer to the DCF staff.
2 & 4. The COO is closer to the Marketing staff.
3 & 11. The DCF Director would be closer to the DCF staff.
7 & 8. The Finance Dept. - the Director, Assistant Director, Accountant, and Biller - would be gathered in one place.
9. The HR Director would be closer to the entrance and the small meeting room, being more convenient to hold meetings. Moreover, the new room is much brighter.

Reduced Environmental Distraction - AC
12. The large meeting room is moved away from the air conditioning room, so that there will not be inconsistent temperature change caused by meetings.
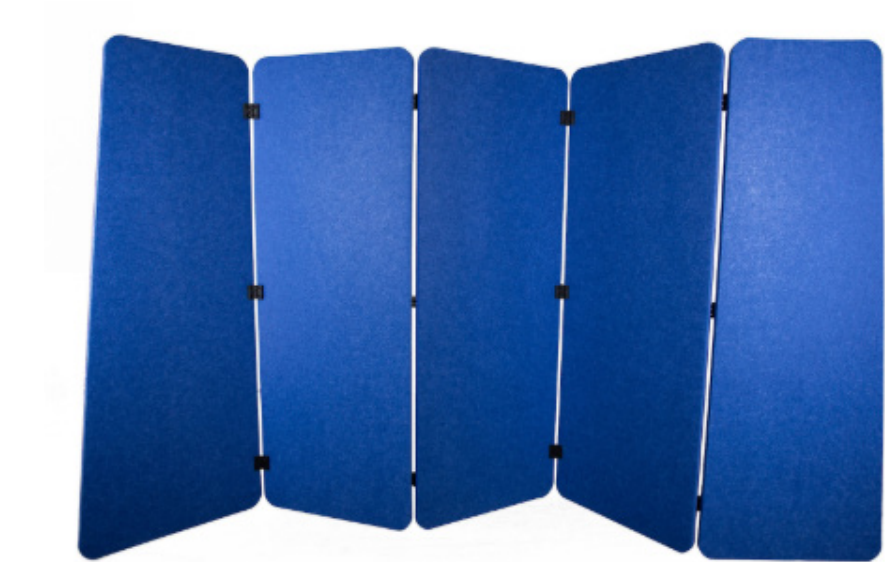
[Photo by Versale]

Suggested room divider

SoundSorb VersiPanel ($\times$ 1)
Manufacturer: Versale
Material: High-density polyester
Size: 5' $\times$ 10'
Price: $ 349.00 without tax

Proposed plan and the benefits (cont.)

Furniture Arrangement
4. Two desks are placed on one side, so each employees have more space.
5. Desks face to the walls, creating more shared space and personal space for each employee.
6. Place the desks in a sqaure as shown. Though the CBHI employees still shared desks, each person now have larger space and more mobility.

The concerns of the current floor plan
1. Shared windows between Room 214 and 215, and between Room 216 and 217 brings noise to the rooms.
   The distance between the supervisors and staff of Finance and of DCF Dept. is too far.
2. Only two DCF staff using the room with twelve workstations.
3. Two staff share one desk, and desks in rows make personal space too small and inconvenience to move.
4. Attendees of meetings control the air conditioner.
5. Small meeting room is seldom used
6. The room is too crowded with four desks in one row.

Extra meeting space
10. The small meeting room is moved to Room 208, which accomodates two tables. Each table can hold a meeting of up to five people. By having a portable room divider, the room now creates two meeting space. Proper tech gears like a monitor or simple tools like a white board should be implemented for this room.
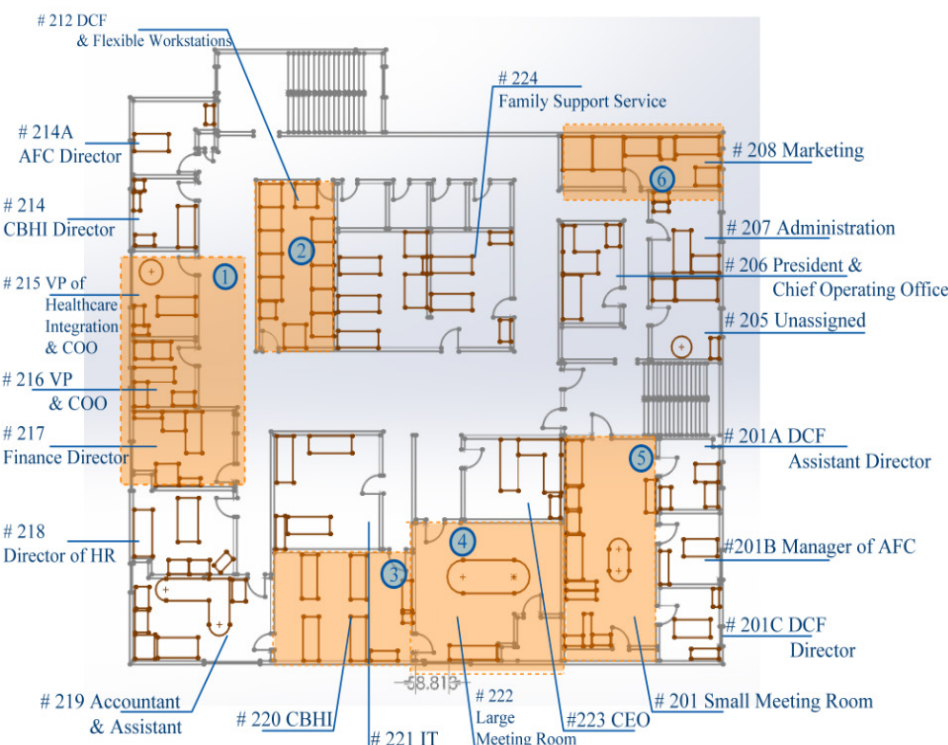
[Three updated evacuation maps of the 2nd floor - Room 201, 217, and 224. The one below is a map without routes]
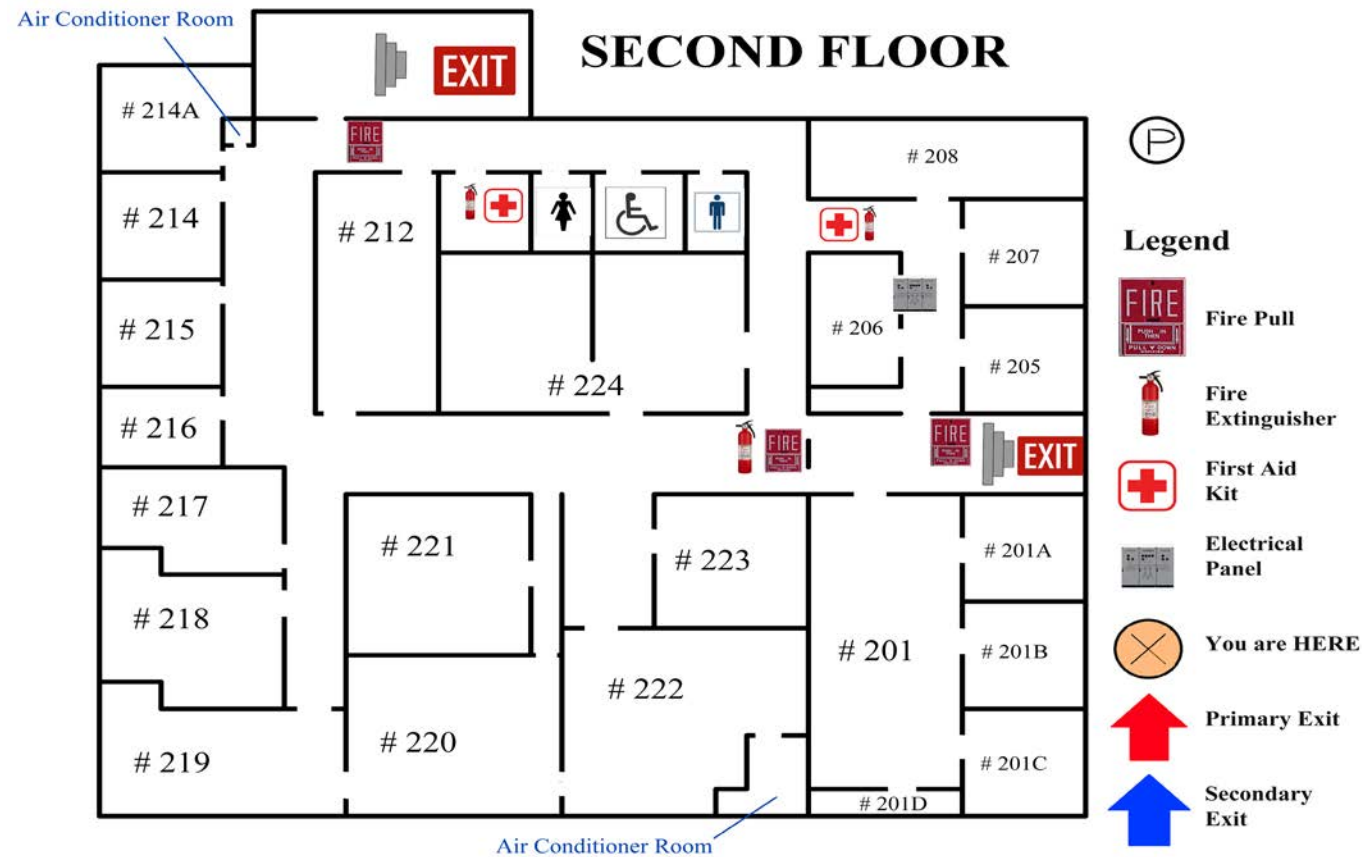
Updated evacuation maps

During our visits, we found the out-of-date evacuation maps in the building. Evacuation maps are very important for the building's safety. Therefore, we recommend to post the updated maps, especially for the 2nd floor where most staff are located, inside the building. We also made maps without routes for CENTRO's future change in the safety routes.

Long-Term Improvement

To ensure the long term benefit, we suggest the following upgrades on evacuation maps and Work-From-Home Policy.

Work-From-Home Policy

When conducting semi-formal interviews with several employees, we noticed that many of them mentioned that company policy was the only reason they came into the office every day. Therefore, we drafted a work-from-home policy that CENTRO can implement at their discretion. The policy states that any employee meeting the following **five criteria** can work from home.

1. They are not meeting with a client that day.
2. They do not need to access any documents that CENTRO has at the office.
3. They do not need to meet with any employees during the day, whether it be for a meeting, or for a progress report.
4. They are not needed to maintain the office of CENTRO. This pertains to IT, the front desk, janitorial staff, and other such maintenance staff that are needed during the day.
5. They must have a computer and an Internet connection independent of CENTRO.

If an employee meets these criteria, they can ask their manager about an opportunity to work from home. If the manager finds the employee eligible for the policy, based on the criteria and the trustworthiness of the employee, the employee may work from home.

In order to stay connected with CENTRO at all times, we recommend that CENTRO implement the following technologies in place.

An **IRC server** allows employees to chat with each other from anywhere. We suggest CENTRO use **Slack**, as it is an industry staple, and is intuitive to use. For additional connection, we also recommend CENTRO employees to have a **work phone**, or phone numbers particularly for work.

A **VPN** increases security for accessing CENTRO documents from outside the building. We recommend CENTRO use **Hotspot Shield**, as it is cheap and reliable.

the
Estimated Cost

In order to ensure the feasibility of our recommendation, we estimated the cost of each renovation through research.
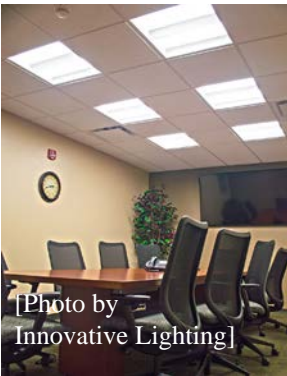
Basement

Pipe Fixing

[Photo by Tenaquip]

$ 120 -170[1]
Hourly rates
$ 60 - 65
Plumbing work
$ 95

Lighting[2]

[Photo by Innovative Lighting]

Installation
$ 100 - 200/electrician
Wiring into ceiling
$ 70 - 140/light
Moving around joists/wires
$ 200+

Dropped ceiling

[Photo by Lowe's
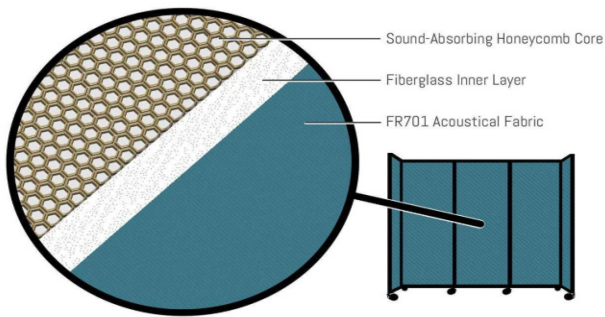
$ 92.83 / 48 sq. ft.[3]

First Floor

Door opening

[Photo by Emeralddoors]
$ 120 - 200[4]

Potential extra cost
Hotspot Shield VPN

Hotspot Shield

$ 240 / yr[7]

StraightWall® Sliding Partition (× 4)

Sound-Absorbing Honeycomb Core
Fiberglass Inner Layer
FR701 Acoustical Fabric

$ 4646.00[5]

or
Woodfold Series 240V: Vinyl Laminate (× 4)
$ 6172.40 [6]

Second Floor

SoundSorb VersiPanel (× 1)

$ 349.00[8]

[Photo by Versale]

Potential extra cost

Dell 55" 4K Conference Room Monitor (C5519Q)

[Photo by Dell]

BUSINESS REVIEW
JANUARY - MARCH 2018

$ 899.00 (was $1149) [9]

Total cost:
Minimum
$ 5697.83
with potential extra purchase
$ 6836.83
Maximum
$ 7524.23
with potential extra purchase
$ 8663.23

1. thumbtake.com , 2019; 2. homeadvisor.com, 2019; 3. Lowes.com; 4. homeadvisor.com   5. versare.com; 6. foldingdoorsandroomdividers.com; 7.hotspotshield.com; 8.versare.com; 9.dell.com

Reference

Abrahamian, A. (2018). *Everyone Hates the Open Office: It Doesn't Have to be That Way. Bloomberg Businessweek*. Retrieved from: https://www.bloomberg.com/news/articles/2018-05-01/everyone-hates-the-open-plan-office-it-doesn-t-have-to-be-that-way.

BESPOKE. (2017). *The Hybrid Office: A New Trend in Commercial Real Estate.* Retrieved from: https://bespokecre.com/hybrid-office-new-trend-commercial-real-estate.

Bernstein, E.S., & Turban, S. (2018). The Impact of the 'Open' Workspace on Human Collaboration. *The Royal Society*. https://doi.org/10.1098/rstb.2017.0239

Boubekri, M. et al. (2014). Impact of Windows and Daylight Exposure on Overall Health and Sleep Quality of Office Workers: A Case-Control Pilot Study. *Journal of Clinical Sleep Medicine, 10(6), 603 - 611.* http://dx.doi.org/10.5664/jcsm.3780.

Belk, W. (2017, March 15). 58% of High-Performance Employees Say They Need More Quiet Work Spaces. *CNBC.* Retrieved from: https://www.cnbc.com/2017/03/15/58-of-high-performance-employees-say-they-need-more-quiet-work-spaces.html.

Chassambouli, A., & Peri, G. (2015). The Labor Market Effects of Reducing the Number of Illegal Immigrants. *Review of Economic Dynamics. 18(4).* Retrieved from: https://econpapers.repec.org/paper/redappend/15-99.htm

CENTRO. (n.d.). *About Our Multiservice MA Community-based Organization.* Retrieved from: http://www.centroinc.org/history/

Clemens-Croome, D. (2000). Creating the Productive Workspace, 2nd Edition. *London: Taylor & Francis.* Retrieved from: https://www.researchgate.net/profile/D_Clements-Croome/publication/320268217_Creating_the_Productive_Workplace_3rd_Edition_95_new_Routledge_2018/links/59ee6357aca272029ddf6f60/Creating-the-Productive-Workplace-3rd-Edition-95-new-Routledge-2018.pdf

DeFrank, R.S. and Ivancevich, J.M. (1998) Stress on the Job: An Executive Update. *Academy of Management Perspectives, 12(3).* https://doi.org/10.5465/ame.1998.1109050

Haapakangas, A. et al. (2016). Benefits of Quiet Workspaces in Open-Pan Offices - Evidence from Two Office Relocations. *Journal of Environmental Psychology. 56, 63 -75.* https://doi.org/10.1016/j.jenvp.2018.03.003

IDEO. (2015) *The Field Guide to Human-Centered Design.* Retrieved from:http://www.designkit.org/resources/1

Mintzberg, H. (2009). Rebuilding Companies as Communities. *Harvard Business Review.* Retrieved from: https://hbr.org/2009/07/rebuilding-companies-as-communities.

Rockfon®. (2012).*Can Employees Finally Fall in Love with Open-Plan Offices*. Retrieved from:http://rwiumbraco-rfn.inforce.dk/media/921489/inspired%20by%20you%202012-10%20grp.pdf

Reddy, C. (2016). *Advantages and Disadvantages of Closed Office Layout.* Retrieved from: https://content.wisestep.com/advantages-disadvantages-closed-office-layout/.

Segal, U., & Mayadas, N. (2005). Assessment of Issues Facing Immigrant and Refugee Families. *Child Welfare League of America. 84(5): 563-583.* Retrieved from: https://www.researchgate.net/publication/7337291_Assessment_of_issues_facing_immigrant_and_refugee_families

Steers, R.M. & Porter, L.W. (1974). The Role of Task-Goal Attributes in Employee Performance. *Psychological Bulletin, 81(7), 434 - 452.* Retrieved from: https://psycnet-apa-org.ezproxy.wpi.edu/fulltext/1974-33359-001.pdf.

Van der Voordt, T.J.M., Vrielink, D., & Van Wegen, H.B.R. (1997) Comparative Floor Plan-Analysis in Programming and Architectural Design. *Design Studies. 18(1): 70 - 76.* Retrieved from: http://bk.home.tudelft.nl/fileadmin/Faculteit/BK/Over_de_faculteit/Afdelingen/Real_Estate_and_Housing/Organisatie/Medewerkers_RE_H/Personal_pages/VanderVoordt/General_list/doc/1997-DesignStudies_Comparativefloorplananalysis_Voordtetal.pdf.

Wagner, J. & Watch, D. (2017). *Innovation Spaces: The New Design of Work.* Retrieved from: http://www.urbaninsight.co/pdf/cs_20170404_innovation_spaces_pdf.pdf.
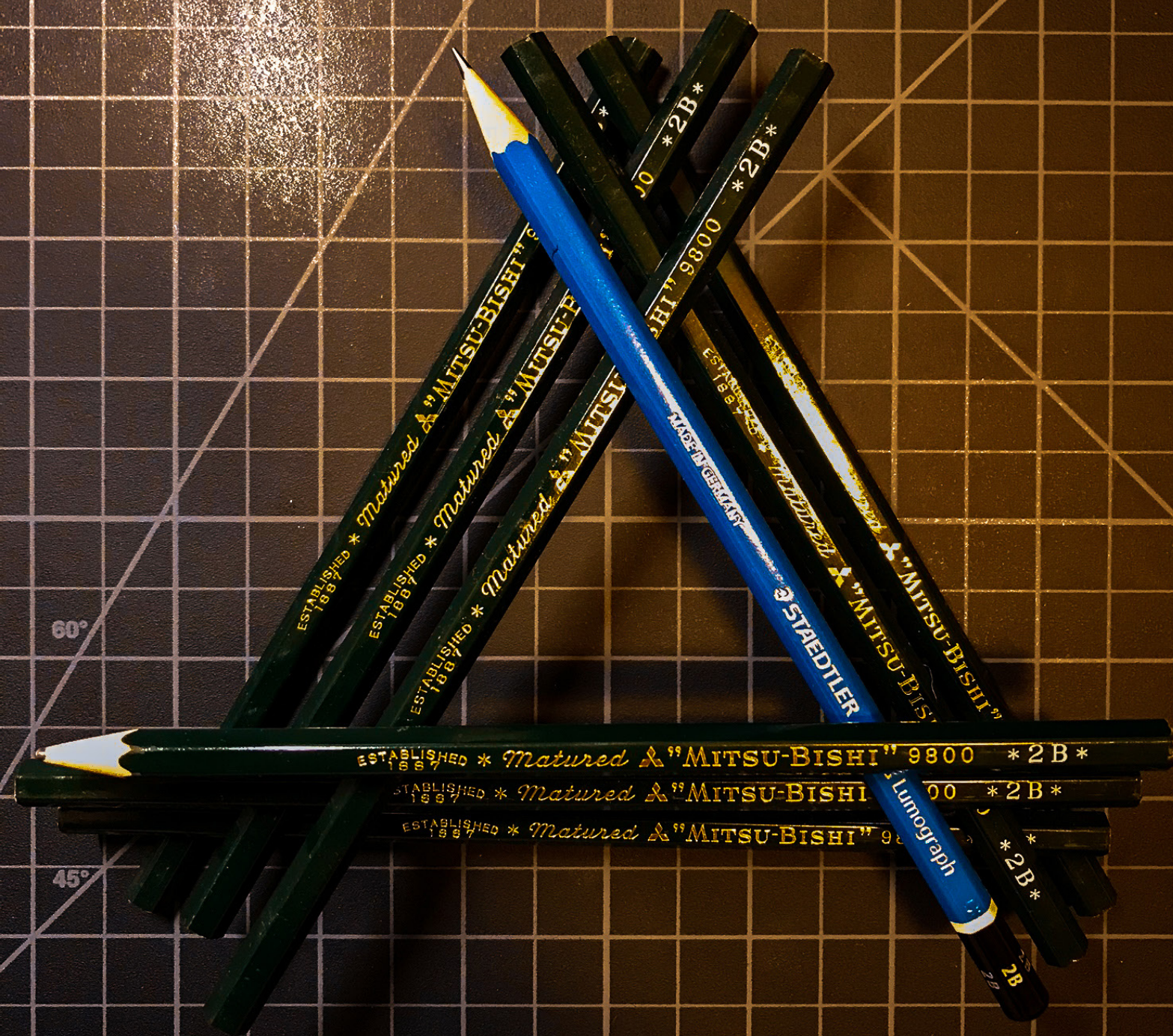
Acknowledgements

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