

A Future Design Vision for Administrative Workspaces Post COVID-19 Pandemic

(A Case Study in Saudi Arabia)

Assist. Prof. Dr. Sherin Sameh

Assistant Professor – Bsc and Msc program Chair – Architecture Department,
Dar Al Hekma University

ssameh@dah.edu.sa

Assist. Prof. Dr. Maryam AlKhateeb

Assistant Professor – Interior Design Department – College of Architecture and Design,
Prince Mohammed Bin Fahd University

malkhateeb@pmu.edu.sa

Lect. Omar Mostafa Dakhil

Lecturer at Architecture Engineering Department – College of Engineering,
University of Prince Mugrin

o.dakhil@upm.edu.sa

Abstract:

The spread of COVID-19 worldwide has caused significant changes in all fields. Many businesses had to stop operating with their business-as-usual norms and transferred their employees to an online mode. The design of the workplace had to evolve to accommodate those changes. Many firms and offices have reverted to unusual measures to operate and to also maintain the required safety for their employees. This research investigates the impact of COVID-19 on the office space design, with a special focus on the kingdom of Saudi Arabia. The research engages stakeholders through surveys & analysis to reflect the different approaches and measures taken by firms and office-owners in order to guarantee a safe return to their employees to the office and in order to generate the required lessons to be learned. The paper adopts both a qualitative and quantitative methodology. The quantitative part of the study provides primary data related to the workspace environment, assessing its post status and highlighting the modifications made in order to comply with the new norms and requirements. On the other hand, the quantitative part of the study offers an in-depth study involving tailored interviews with business owners, in order to reflect on different adopted approaches and to create a better understanding of the post COVID emerging requirements. From the data analysis, the paper concludes with lessons learned that would improve the office workspace design, and to provide employees with a better and healthier working environment that can sustain any similar arousing situation and make the office design more efficient in the long run.

Keywords:

Office Design, Workspace Environment, Saudi Arabia, COVID-19, Social distancing

Introduction

On December 31, 2019, the whole world was focused on the shocking news related to the new coronavirus that was ignited in the city of Wuhan, China. On February 11, 2020, The National Health Organization named the disease: Coronavirus disease 2019 "COVID-19" (Huang et al. 2020). This Pandemic is considered the worst economy and health crisis that the world has

faced this century. High-income countries such as Europe and North America were also affected by this health crisis. Some countries face pandemics better than others, yet, all countries faced similar issues. COVID-19 proves that the world health system is still weak and needs many improvements and preparation to resist pandemics (SDG 2020).

The world economy suffered a massive decline due to the pandemic/crisis. Needless to say, that the remarkable decline was during and after the full lockdown, which created a negative impact on surviving businesses because of concerns surrounding the safety of the workplace during the first and second quarters of 2020. All countries had to ensure that sufficient resources are available for the health care systems. The worldwide lockdown started from about mid-March until mid-May. The economy has slowly begun to reopen and started to improve, but the recovery is still not sufficient. For example, retail and the workplace sectors remain depressed in most areas, but it is getting back to standard in some regions (WORLD ECONOMIC OUTLOOK REPORTS, 2020). The impact of the pandemic affects public health, economy, social stability, political, and geopolitical. Proper actions must be taken to manage the pandemic in the right way and learn suitable lessons to avoid repeating this crisis again in the future. Though essential, the lockdown approach is not ideal for dealing with such cases, forcing a huge decline in the economy (SDG 2020). Thus, to reactivate the economy, there should be suitable regulations to govern the safety of employees when they go back to work as usual.

Office workspace is like a community where people from different backgrounds collaborate in their work environment (AIA 2020). After the COVID-19 Pandemic people were very anxious about the situation after returning to the office in terms of employee safety and production. Essential questions like; are offices ready to reopen and operate again? Are employees willing to go back to work from the office? (Hermanmiller 2020). What would be the factors for significant changes in the offices? Yet, some challenges still face employees' return, like; childcare availability, limitation of public transportation, and issues with employees with particular health conditions. Thus, it is also essential to consider these factors along with the case that things will not be completely back to normal (Perkins and Will 2020). One way to do this is to assess the situation to determine which group in the organization has the priority to work from the office (Boland et al. 2020). This paper looks at the workplace status during the pandemic at different stages, how the workspace was affected and how it dealt with it, and the expected influence this has on the future of businesses and office design. The paper concludes lessons learned for designers and business owners to enhance the workplace environment post-pandemic and to assure that it becomes more sustainable in the long run.

Research Problems

The research problem can be identified in the following questions

1. What are the determinants governing the design of the internal office space?
2. What is the extent of the changes in the internal office space in light of the pandemic and its aftermath?

Research hypotheses

Monitoring and analyzing the emergent change on the internal administrative spheres allows setting a proactive design vision for the administrative spaces during the stages of the Covid 19 outbreak and beyond.

Research objectives

1. Monitor and define the variables and priorities that must be taken into account when designing the internal administrative spaces.
2. Reaching design parameters for internal spaces that correspond to the stage of the outbreak and beyond.
3. Establishing an integrated and sustainable future design vision during the Covid - 19 and beyond.

Research Methodology

To achieve the research hypotheses, the following approaches are followed:

Analytical descriptive method: through an analytical study of the working space during COVID-19. The methods used included both qualitative and quantitative approaches. The qualitative part included theoretical and analytical approaches. The qualitative stage reviews the literature surrounding the office environment in Saudi Arabia in general before the pandemic and then reviews offices' global status during the pandemic. The quantitative stage depends on the results of an online survey that was created and spread through various media platforms to reach a variety of office users: business owners, managers, administrators, and other employees. The survey aimed to assess the reaction of the employees and business owners during and after the pandemic within their office space, hence reassessing and generating lessons learned to the required measures to operate a safe office space post the pandemic.

1. The Saudi Government Initiatives

In KSA, the government has put in place many measures to deal with the crisis. One of these measures was suspending all religious services, suspending the Umrah, and closing the major two holy mosques of Mecca and Medina.

The following timeline, collected from news articles and government announcements, illustrates an example of the lockdown phases applied in the city of Jeddah. The city of Jeddah is the main port to arrive in the cities of Mecca and Madinah and one of the most critical gates for the kingdom. Accordingly, The Ministry of Interior launched a series of step-by-step measures to limit the spread of COVID-19. Fig 1 below summarizes the gradual measures taken in the Kingdom of Saudi Arabia:



Figure 1 Timeline of lockdown phases applied in Jeddah, (Source: Author).

According to the Saudi Arabia Ministry of Human Resources and Social Development (HRSD 2020) guidelines report about the office public safety and occupational health for all employers that besides the basic safety instructions about washing hands and continuous sterilization of often-used surfaces such as devices, office, reception, printing machine, doors, and others, with providing hand sanitizers in hallways and workplaces (HRSD 2020).

2. Office design during COVID 19 internationally

2.1 Physical Control

Some general guidelines must be implemented during a viral pandemic in the work environment to reduce interaction between employees. It is vital to separate offices from each other by at least allowing 2 meters' distance between each workstation. (Hermanmiller 2020).

The bathroom and pantry rooms should be one of the first areas that need to be redesigned since both areas have higher levels of contact within users. Furthermore, both areas have related to people's cleanness and how they get to use the facilities. Minimizing the number of usable toilet units is one of the temporary suggested solutions (Architecturelab 2020). Fig 2 illustrates the social distance consideration method of letting 2 meters distance between each sink and toilet and installing a paper towels box for opening the door and a waste bin outside the entry door to throw them away after use. Besides, the long-term suggested method in shared spaces is to install a hand-free sanitizing system (Architecturelab 2020).

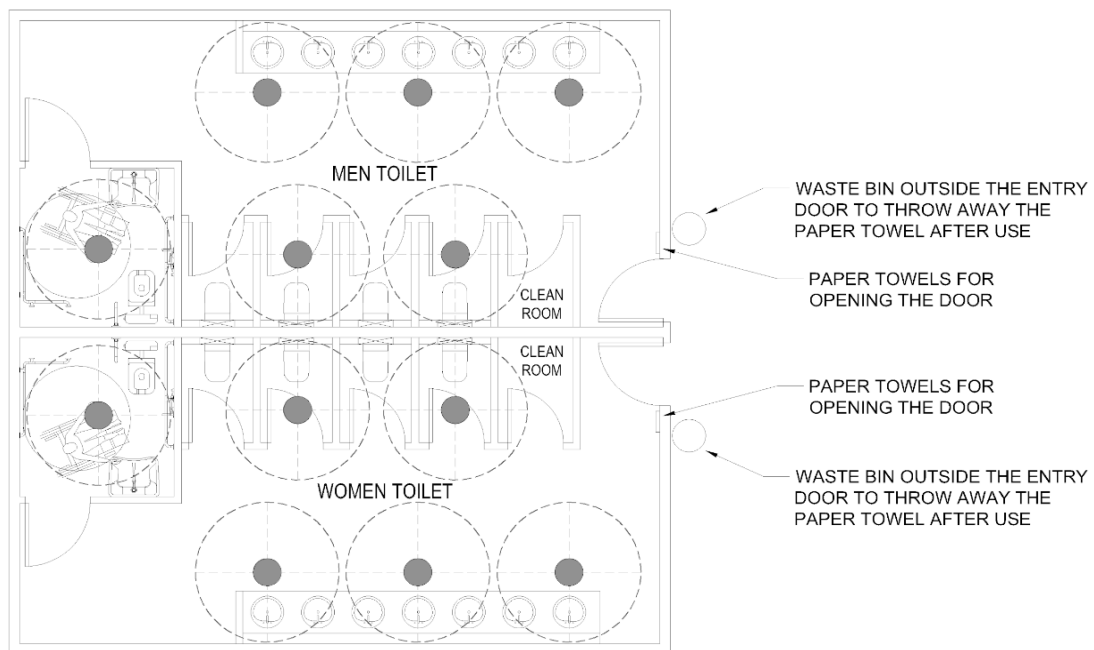


Figure 2 Public Toilets Social Distance Consideration (Source: Author)

2.2 Office Reconfiguration and Remote Work

After businesses had reopened under the pandemic threat, many companies started to reconfigure their office layout to minimize the risk of infection and protect their employees. The easiest way to manage capacity within spaces such as a meeting room, lobby, elevators, kitchen, or others to have a clear sign to identify the number of people that should

not be exceeded inside a specific room to ensure the social distance rule (Ludwig, 2020). Also, the in-advance meeting protocol while notifying security personnel or the responsible body in charge of monitoring the number of people accessing the building.

Recently, before the pandemic, the office was designed to increase density between employees and decrease space to lower down the overhead cost (AIA 2020). In a standard workstation office layout, the minimum square meter per person is between 4-7m². The figure increases depending on the office size, the number of meeting rooms, and the industry type. 7 m² might be too much for some office layout while too little for others. An office with 20 to 40 people requires 140 to 280 m² (Piekartz 2019).

After the pandemic had started, employees were in one of the following three categories: full-time from the office, full-time from home, and the third group full-time who worked both from home and the office (AIA 2020). As a result of the online work environment experience, companies may reduce the number of square meters leased due to the smaller number attending the office space. With Applications such as Zoom, Microsoft Team, and Google Meet, it is possible to work together remotely from home. Those Applications will eventually impact office space very similar to online shopping and how it affects retail. Companies usually lease an additional 20% more space for future expansion and new employees. If a company is not utilizing its space wisely, that will most likely influence its revenue costs (Lash 2020).

Fig 3 diagram shows a typical 250 square meter office layout for 40 people before the pandemic and after how 50 square meters become unnecessarily space and possibly cut down yearly rent, maintenance, facility cost, and bills by only allowing some department employees to work remotely such as marketing, IT, accounting, finance, and HR.

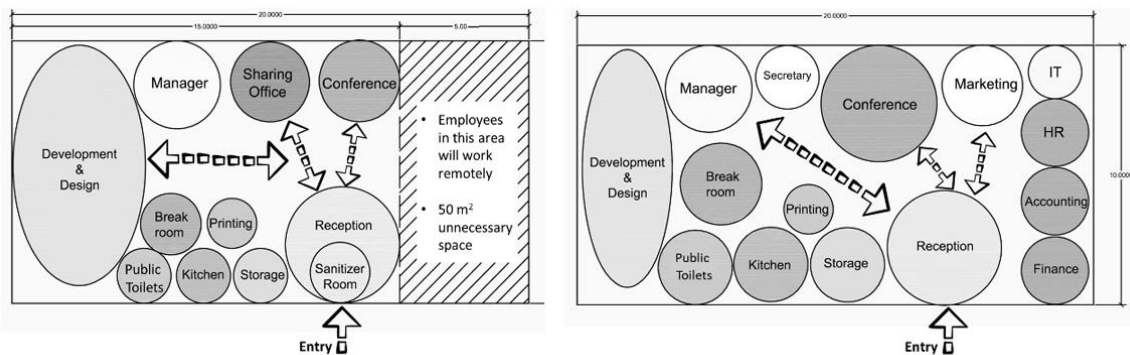


Figure 3 200 Square meter office layout before and after remote working (Source: the Author)

2.3 Smart Technology

With the changes occurring to the office design and people are more aware of the hygiene aspect required in the workplace to prevent the spread of this virus in particular and other viruses or germs in general. The involvement of technology is becoming more welcomed, where even some overlook personal cyber privacy in favor of their personal well-being (Kumar 2020; Muldowney 2020).

Artificial intelligence and the internet of things are becoming more and more involved in our daily lives. These assist us in doing our tasks, and their involvement in the workplace seems inevitable from the tools that can be found in the workplace before starting this COVID-19 Pandemic; swipe cards, automatic doors, and a lighting system connected with motion sensors.

With these and other tools, office users would have access to know how crowded the office space or the room they intend to use before heading to it (Caskey 2020).

Furthermore, mixed reality, which is not a novel thing in office collaboration approaches, is amongst the things that have been developed to enhance the working-from-home environment. This aims to make the employee feel more involved and engaged (Fereydooni and Walker 2020; Knierim and Schmidt 2020).

Moreover, with the advancement of artificial materials and materials technology, some materials were produced that can be considered, and self-cleaning and antiviral characteristics can provide a safer workspace for office users. These advancements in material and environment technologies would be a great helpful tool to the office workspace adaptation process to the new norm after the pandemic. For example, there is the Steelcase Workplace advisor that helps the administration and track the utilized workstations during the day.

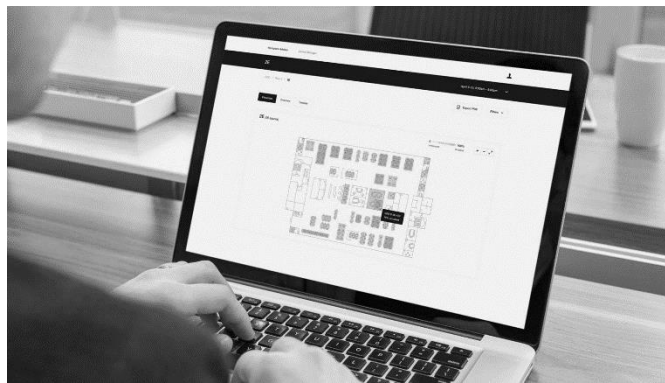


Figure 4 Steelcase Workplace Advisor (Steelcase official website)

Some offices took it upon themselves to utilize technologies and developed application that would help them know the offices' occupancy's load and the air and space quality. The following is an example from DLR Group.



Figure 5 Screenshot of occupancy dashboard developed by DLR Group

www.architectmagazine.com

2.4 Air Quality

In an office building, the air quality is 25% only fresh air, and the rest is recirculated and filtered again from the indoor air, which is already being exhausted by other occupants and sent back again to the building. If indoor air quality is not exchanged regularly, it can contain a significant amount of air pollution. Thus, a high air ventilation system effectively exhausts harmful air and only allows clean fresh air (Heinly, 2020). Ventilation and filtration can reduce the flying infection and the hazard of transmission through the air. A space without the AC system has lower resistance to infection because of the lack of ventilation and filtration. As a result, stopping the ventilation and air conditioning system is not recommended to lower the spread of the virus (Stewart 2020). The layout of the building, occupancy rate, and the type of HVAC system all matter when it comes to reducing the transmission of the virus. However, the improvement of outdoor ventilation and filtration does not prevent users from keeping social distance and wearing masks, cleaning hands, surface cleaning, and other essential regulations. (US EPA 2020c). Thus, commercial buildings must upgrade their HVAC system filter through an HVAC specialist (US EPA 2020a). Also, the partition can prevent virus transmission between spaces and decrease the airflow between people (US EPA 2020b). Fig 4 demonstrates the importance of air quality and filtration improvement within the space besides considering the office public safety general guidelines.

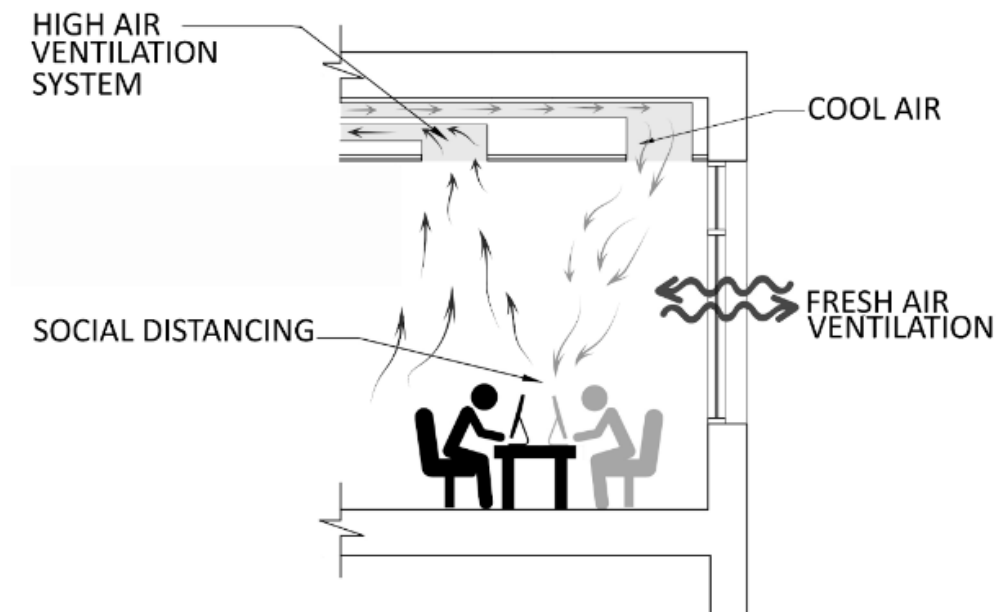


Figure 6 Air quality and filtration improvement within the space (Source: the Author)

2.5 Outsourcing

As a coping mechanism, companies have relied on remote work to continue the process of production. Also, the concept of outsourcing is one that became popular within the smaller business bodies, which can be considered as another way that can support businesses as a survival strategy.

Outsourcing is a business trend of allowing another company to provide a service or a product of an activity that could be done inside the house (Belcourt, 2006). Today, with technology, any

business can outsource almost any task to cut out the cost, improve efficiencies, and access external expertise, and focus on core activities (Tayauova 2012). Many departments can be outsourced online with the improvement of network technology. For example, IT business processes and HR, finance, sales and marketing, health and safety, and operational and outsources, and other departments can be easily outsourced and managed through the network. The reduction of cost because it is only paid when it is needed with little investment in equipment and staff and training (nibusinessinfo.co.uk 2020).

3. Analysis

3.1 Survey Results

In July 2020, a survey was conducted and directed towards 200+ employees to discuss and assess the situation in different cities of KSA. Although the KSA government has taken lockdown measures; however, the lockdown period and restrictions differed from one city to another, mainly depending on the number of cases in each city.

The survey was tailored to assess different difficulties and precautions taken by employees, business owners, and companies in the light of the Pandemic. The results of the survey are deduced in the following part:

The majority of the answers came from employees with around 79%, and only 21% were business owners, as seen in fig 7. Fig 8 also illustrates that about 73% of employees had to work from home during the lockdown period.

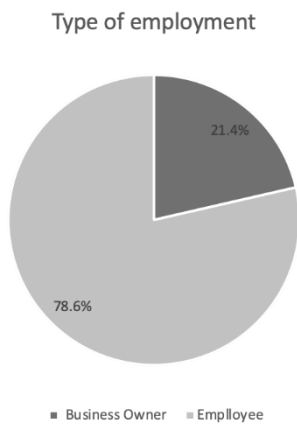


Fig 7: Employment type

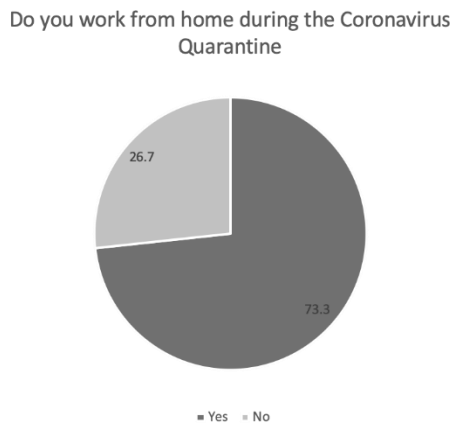
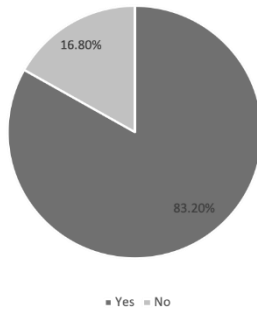


Fig 8: Working from home inquiry

In terms of employment status, some employees had lost their jobs due to the pandemic. It was also noted that a significant number of employees had to work from home, while a smaller fraction worked from the office, as seen in fig 10.

Employment statues after Coronavirus?



Is there a change in the number of employees after the Coronavi crisis?

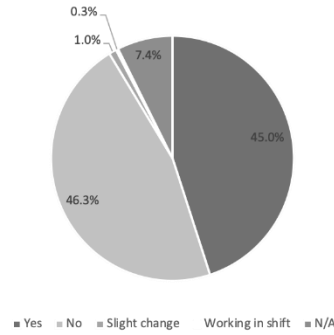
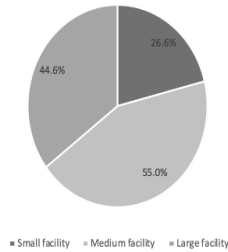


Fig 9: Employment status post the Pandemic **Fig 10: changes in the number of the employees post the Pandemic**

Most of the employees taking the survey were working at medium-size offices (this later became a trigger to focus on such facilities), with around 55% of them working in medium offices and about 45% working in large ones, as seen in fig 9. A remarkable result was that the productivity level during the lockdown and working from home was not affected; on the contrary, it was reported that companies were between keeping the same number of employees and between decreasing them. It was reported by a study conducted by Bloomberg that they felt that working from home resulted in working more hours than usual (Davis and Green, 2020). Most of the offices entail employees sharing their office space with other employees, with 56% of the surveyed employees indicating that their office space was a shared space, as seen in fig 13.

What is the size of the institution or facility in which you work for



How was your productivity during your work at home?

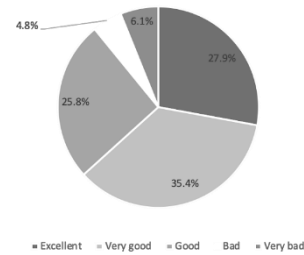


Fig 11: Office Size

Fig 12: Productivity Level During Lockdown

Do you have to work with people or staff in the same space?

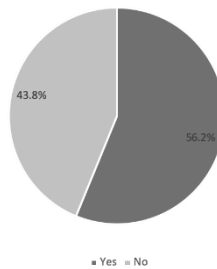


Fig 13: Sharing office space versus having private office space

It was also noticed that employees and users had realized the importance and the necessity of having a home office space post the lockdown, reflected in the results shown in fig 14 below. Needless to say, employees have also found advantages in working from home. For example, illuminating the commuting time and hence having more time at hand. Furthermore, fig 13 indicates 80% of the results showed that they prefer to work from home a few days of the week, even after the lockdown removal, as a long-term plan.

After Coronavirus quarantine, do you think it is necessary to have an office at home?

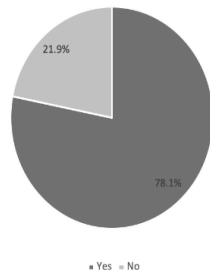


Fig 14: the necessity of having at home office

Would you prefer to work from home for a few days as part of your weekly work routine r. than working for a whole week at the facility or workplace?

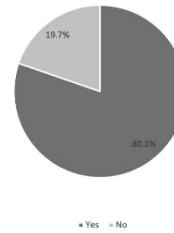


Fig 15: The preference for working from home for a few days a week as an ongoing routine

It was noted that although the more significant number of offices has induced a change in their layout as a part of the required measures taken to guarantee the social distancing necessary measures. A more substantial number of employees have reported that other safety measures have been taken within the office to assure employees' safety, as seen in Figure 16, 17.

Is there a change in your office space layout after returning to work at your workplace?

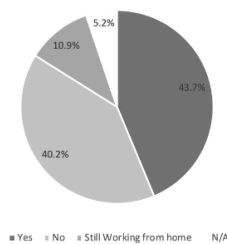


Fig 16: observed changes in the office layout post the lockdown

precautionary measures been in place and regulate staff distance for staff safety from the Coronavirus?

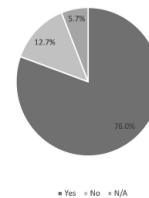


Fig 17: Observed measures taken to assure employees safety post the lockdown

67% percent of the employees reported that precaution measures were taken in their firms to sustain the employee's safety post the pandemic and avoid the disease's spread, as seen in fig 17. Most of these measures involved reducing surface contact, avoiding office crowds, as seen in fig 18-19, and adding a sterilization zone (Mud Room) at the entrance. The sterilization zone was also considered of a high importance, according to 70% of the interviewed employees as seen in fig 20.

Have adequate precautions been put in place for staff safety from the Coronavirus, such as surface contact and use of devices for more than one person?

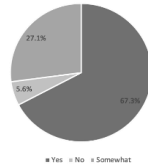


Fig 18: Firms Applying precautionary measure post COVID-19

Do you think it is necessary to provide a sterilization room before entering your workspace facility?

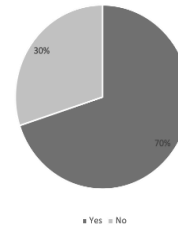


Fig 19: Necessity of adding a sterilization zone at the office entrance

Is there a specific range for the number of people in each office or space?

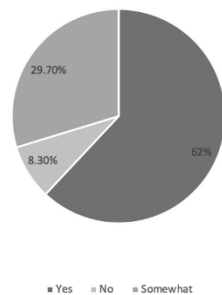


Fig 20: Restricting the number of employees in each space

3.2 Interview Results

The pandemic had impacted businesses affecting their financials and work environment. That impact resulted in beneficial lessons that can be passed to other industries, lessons that would function throughout the workspace even after the pandemic ends. After reviewing the literature, conducting a survey, and analyzing it alongside our own experience, 30 online interviews were conducted with business owners in Saudi Arabia.

Most interviewees believed that businesses should start to allow some departments to work remotely since the work efficiency and performance didn't decrease but instead improve if all of the home needed tools are available. While 33% are already outsourcing most of the operational work and only request them once they are required. Only a minority believed that businesses should remain all of their employees work on-site and refuse to accept the idea of remote working nor outsourcing to ensure that the quality of work is always at its highest standard.

It was concluded from the interviews that many departments could continue to operate from home without the work quality and performance being affected. That may increase the business revenue and decrease the yearly running cost regarding rental cost, facilities, bills, maintenance, equipment, overhead, and others. The departments that were allowed to work remotely even after the pandemic ends or even be outsourced were: IT, HR, accounting, finance, and marketing. Furthermore, it was suggested to limit some of the shared spaces, such as the meeting room and lounges.

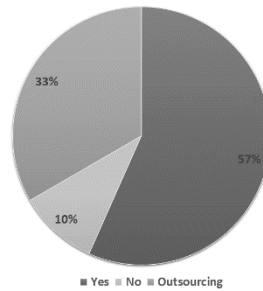


Fig 21: Business owner thoughts regarding if some of their businesses departments should continue working remotely after the Pandemic is ended

4. Conclusions

At the beginning of 2020, the COVID-19 virus has spread worldwide, affecting people worldwide, their economy, health, and lifestyle. This paper studied the influence of this virus had on the workplace in Saudi Arabia. Understanding the workplace needs and design options was the starting point for this study, then primary data was collected to update the workplace needs after it has been infected and influenced by the COVID-19 virus containment procedures. As it was noted, according to our survey, 73% of people were still working from home during the pandemic and occupancy rate is 83.30% with 89.1% level of productivity. Thus, working from home has the same productivity as working in the office.

The literature review of international cases presented the design and technological solutions for some functional spaces in the office workspace. Alongside, there were governmental guidelines and regulations for the dynamics in public spaces, including offices. The analysis of these data has highlighted the lessons learned from this pandemic in relation to office design. Meanwhile, offices and companies must start to work on refabricating the office space and atmosphere to ensure a sustainable design beside the standard governmental guidelines such as the Air quality and filtration improvement within air quality and filtration improvement within the office space along with outdoor filtration.

It was necessary to reach specific results for the descriptive and analytical sides as follows:

1. Daily attendance rates for employees.
2. Required spaces and occupancy rates.
3. Developing an integrated and sustainable design vision that is flexible, and the application will be on the internal spaces of an administrative company before, during and after the pandemic.

5. Results

It was necessary to examine the measures taken in Saudi Arabia and across the world to accurately assess them and conclude the changes required to maintain the situation in the long run. The following aspects were generated after going through the available literature related to office design during the Pandemic, and they will be divided into five different domains as follows: physical control, entrances and circulation, air quality, office reconfiguration, innovative technology, and outsourcing. Therefore, the following are office design guidelines for future offices:

- Creating a pre-entry checkpoint (sterilization zone) at the office entrance to allow the transition between the outside of the office and the inside.
- Add baristas to avoid and limit the transition of germs due to employees using the same kitchen.
- Create a new office layout that entitles more spaces between employees, adding partitions when necessary and perhaps giving more room to each employee.
- Adding partition and creating neighborhood office design utilizing glass, partition walls, and greenery to help enhance the space's separation, privacy, and air quality.
- Allow remote working, rotation between employees, and open collaboration, which will require remote collaboration tools and dedicated spaces in the office so that employees working in the office could easily collaborate with others who are working remotely. This will also save on office space requirements and overcrowding the office.
- Utilize and enhance cubicle design to give more privacy to each employee yet also maintain an open space office design.
- Providing smaller meeting rooms that allow virtual collaboration and a smaller number of people to gather yet expand on virtual attendees.
- Conduct daily physical space checkups and enhance quality maintenance to sustain good hygiene and employees' health.
- Regular checkups and maintenance of HVAC systems to enhance and sustain the required air quality. This will also require the use and the regular maintenance of advanced filters in the HVAC systems.
- Utilizing technology, smart systems, and artificially intelligent systems to provide a safer and up-to-date working space. This will entail utilizing voice command technology, touchless ones, and sensors (social distancing sensors to monitor the distance between employees and avoid overcrowding).

6. Recommendations

The researcher recommends the following actions with regards to the following parties: -

1. The interior designer: Implement new regulations in their design of the office space. Respect and utilize the person per area ratio when creating their spatial design options, create spaces that are well ventilated and allow social distancing between users. Benefit from the new developed technological options to maximize the space use without compromising the office space environment.
2. Office owners: Upgrade and utilize new technologies in offices, monitor the office space occupancy, consider switching some employees to online mode work, upgrading the office space.
3. The Government: maintain the protocols that were generated from the start, such as, social distancing, caps on the numbers of employees and occupants of public spaces and office spaces, mandated vaccination, check-in apps like “Tawakalna” when entering public spaces and offices, etc...

7. References

- AIA. 2020. "Reopening America: Strategies for Safer Offices." AIA. <http://content.aia.org/sites/default/files/2020-06/BuildingTypeReport-Office.pdf>. /Accessed 13/10/2020
- Al-Asmari, M G H. 2008. "Saudi Labor Force: Challenges and Ambitions." 2. JKAU: Arts & Humanities. Vol. 16. /Accessed 25/04/2021
- Alwethainani, Mohammed, and Zuraina Bt Dato' Mansor. 2016. "LOCALIZATION OF WORKFORCE IN SAUDI ARABIA: HISTORICAL REVIEW OF THE PROBLEM 1*." 2. Special Issue Sci.Int.(Lahore). Vol. 28/ Accessed 25/04/2021
- Architecture lab. 2020. Workplace Dynamics And Office Design Post Covid-19 - Architecture Lab. Architecture Lab. <https://www.architecturelab.net/workplace-dynamics-and-office-design-post-covid-19/> Accessed 13/10/2020
- Boland, Brodie, Aaron De Smet, Rob Palter, and Aditya Sanghvi. 2020. Reimagining the Office and Work Life after COVID-19 | McKinsey. McKinsey & Company. <https://www.mckinsey.com/business-functions/organization/our-insights/reimagining-the-office-and-work-life-after-covid-19#>. /Accessed 13/10/2020
- Caskey, Mark. 2020. How Technology Is Helping Reimagine The Post-Pandemic Workplace. Work Design Magazine. <https://www.workdesign.com/2020/07/how-technology-is-helping-reimagine-the-post-pandemic-workplace/>. /Accessed 07/10/2020
- Fereydooni, Nadia, and Bruce N Walker. 2020. "Virtual Reality as a Remote Workspace Platform: Opportunities and Challenges." <https://www.microsoft.com/en-us/research/publication/virtual-reality-as-a-remote-workspace-platform-opportunities-and-challenges/>. /Accessed 07/10/2020
- Hermanmiller. 2020. "Embracing a New Reality Long-Term Strategies Short-Term Tactics Design Considerations Thought Starters Application Ideas for Physical Distancing p 27." /Accessed 13/10/2020
- HRSD. 2020. Preventive Measures in Workplaces - Saudi Center for Disease Prevention and Control. Saudi Center for Disease Prevention and Control. <https://covid19.cdc.gov.sa/community-public/preventive-measures-in-workplaces/>. /Accessed 13/10/2020
- Huang, Zixing, Shuang Zhao, Zhenlin Li, Weixia Chen, Lihong Zhao, Lipeng Deng, and Bin Song. 2020. "The Battle Against Coronavirus Disease 2019 (COVID-19): Emergency Management and Infection Control in a Radiology Department." Journal of the American College of Radiology 17 (6): 710–16. <https://doi.org/10.1016/j.jacr.2020.03.011>. /Accessed 13/10/2020
- Knierim, Pascal, and Albrecht Schmidt. 2020. "The Virtual Office of the Future: Are Centralized Workplaces Obsolete?" <https://www.microsoft.com/en-us/research/publication/the-virtual-office-of-the-future-are-centralized-workplaces-obsolete/>. /Accessed 07/10/2020
- Kumar, Pradeep. 2020. Arcadis Asia | COVID-19 | Workplace Design: Emerging Norms in Post COVID-19 World. ARCADIS. <https://www.arcadis.com/en/asia/our-perspectives/articles/workplace-design-emerging-norms-in-post-covid-19-world/>. /Accessed 23/08/2020

- Lash, Herbert. 2020. Coronavirus Set to Usher in Big Changes at U.S. Offices | Reuters. Reuters. <https://www.reuters.com/article/us-health-coronavirus-usa-officespace/coronavirus-set-to-usher-in-big-changes-at-u-s-offices-idUSKBN21Y334>. /Accessed 13/10/2020
- Lau, Wanda. 2020. Hold the Plexiglas: Re-Envisioning Office Design During and After COVID-19 | Architect Magazine. Wwww.Architectmagazine.Com. https://www.architectmagazine.com/design/hold-the-plexiglas-re-envisioning-office-design-during-and-after-covid-19_o. / Accessed 12/06/2021
- Muldowney, Susan. 2020. How COVID-19 Will Impact Future Trends in Office Design | INTHEBLACK. Intheblack.Com. <https://www.intheblack.com/articles/2020/08/01/covid19-future-trends-office-design>. /Accessed 25/04/2021
- Nibusinessinfo.co.uk. 2020. Online Outsourcing. Nibusinessinfo.Co.Uk. <https://www.nibusinessinfo.co.uk/content/online-outsourcing>. /Accessed 13/10/2020
- Perkins and Will. 2020. Road Map for Return. Perkins and Will. <https://perkinswill.com/road-map-for-return/>. /Accessed 13/10/2020
- Piekartz, Matthijs. 2019. How Many Square Meters of Office Space Do You Need per Person? - SKEPP. SKEPP. <https://skepp.com/en/blog/office-tips/this-is-how-many-square-meters-of-office-space-you-need-per-person>. /Accessed 14/10/2020
- SDG. 2020. Sustainable Development Report 2020. SDG. <https://dashboards.sdgindex.org/>. /Accessed 13/10/2020
- Steelcase.com. 2021. Collaborative & Social Space Design After COVID-19 | Steelcase. Steelcase.Com. <https://www.steelcase.com/research/articles/topics/post-covid-workplace/better-together-future-shared-spaces-office/#example-2-open-space-cafe>. / Accessed 12/06/021
- Stewart, Erica. 2020. “ASHRAE Position Document on Infectious Aerosols.” ASHRAE. https://www.ashrae.org/file-library/about/position-documents/pd_infectiousaerosols_2020.pdf. / Accessed 13/10/2020
- Tayauova, Gulzhanat. 2012. “Advantages and Disadvantages of Outsourcing: Analysis of Outsourcing Practices of Kazakhstan Banks.” Procedia - Social and Behavioral Sciences 41 (January): 188–95. <https://doi.org/10.1016/j.sbspro.2012.04.023>. /Accessed 13/10/2020
- US EPA, OA. 2020a. “Air Cleaners, HVAC Filters, and Coronavirus (COVID-19).” US EPA, OA. <https://www.epa.gov/coronavirus/air-cleaners-hvac-filters-and-coronavirus-covid-19>. /Accessed 13/10/2020
- US EPA, OA. 2020b. “Indoor Air and Coronavirus (COVID-19).” US EPA, OA. <https://www.epa.gov/coronavirus/indoor-air-and-coronavirus-covid-19>. /Accessed 13/10/2020