Architects Going Virtual

New Concepts of the Architects' Office & Work Methodologies in a Post-COVID-19 World

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The COVID-19 pandemic has drastically transformed the place and the way architects work. As a consequence of the pandemic and imposed restrictions, architects are scrambling to adapt to the challenges of new working formats transitioning to remote work. As such, the architects' tasks in the office which are categorized as design, communication, and workflow have had to adjust quickly to these new working conditions, with potentially lasting impacts on the profession as a whole. This paper explores the critical questions surrounding the architects' office and work methodologies in a post-COVID-19 world. It first seeks to understand how architects have adapted their offices from a physical and a remote or partially remote hybrid office. Secondly, it examines the change of work methodologies that integrate online technologies and digital communication resources that are required to effectively perform the design, communication, and workflow tasks remotely in an architectural practice.

With the architects' work going virtual, can architects effectively work remotely? What are the potential challenges and opportunities? The assumption is that it is feasible for the architects' office to transition to a fully remote work setup, but not without significant challenges, such as weakened communication and collaboration capacities between team members. The architectural creative design process requires a combination of planning and spontaneity, which working physically separated substantially removes. The need for social interaction and better strategies to address physical and mental wellness also becomes more acute. The use of an assortment of online cloud-based tools in virtual environments start to address these issues. With inherent limitations to remote work, there is a dire need for an integrated set of tools and technologies that would allow architects to pragmatically work together and work apart.

1. INTRODUCTION

The COVID-19 pandemic has transformed the place and way architects work. In Canada, a workplace lockdown came into effect starting March 2020, and office workers, including architects, had to quickly move out of their physical office to working remotely, often from home. According to Statistics Canada, from a survey conducted in January 2021, over 32% of Canadian workers have switched to fully or partially work remotely, compared to 7% one year earlier. An even higher number of architects have moved to a remote office over the period of the pandemic, with many considering staying remote even if the restrictions are lifted. According to a report published by the Ontario Association of Architects that surveyed 401 Ontario architects in August 2020, 65% of the respondents are currently working remotely, while 38% of them anticipate that remote working would become a permanent set-up even post-COVID-19. That being said, even prior to the pandemic, remote work using digital tools in virtual environments was increasingly being integrated into the architects' work formats. Publications on the best practice and effective uses of these tools and environments are scarce. This shift is now particularly significant as architects had to adapt to them overnight, without the slow transition period that was the case with the introduction of other new technologies, such as CAD (computer-aided design). Moreover, there is anticipation that this shift will impact more than just the work methodologies, but to a certain extent, the actual design and outcomes of buildings. This study aims to examine these key changes to introduce a set of best practice guidelines as a blueprint for architects' transition from

a physical office to a remote or hybrid (partially remote) office.

2. THESIS

This paper explores critical questions surrounding the architects' office and work methodologies post-COVID-19, by firstly seeking to understand how architects have adapted their physical and remote offices, in response to the transition to a full or partial remote work setup. Secondly, it examines the adaptation of work methodologies using digital tools in virtual environments. As a result of the COVID-19 pandemic, which is still ongoing at the time of this writing, new concepts of the workplace and work methodologies have affected all aspects of the architects' tasks, i.e., design, communication and workflows. We are hoping to answer the following three thesis questions: Can architects effectively work remotely after the pandemic and how? What are the potential challenges and opportunities of remote work for architects? What impact will the pandemic have on a changing workplace environment and design guidelines post-COVID-19?

Figure 2 below shows a conceptual diagram of an integrated virtual architects' office imagined by the faculty members at the RAIC Centre for Architecture at Athabasca University. The diagram shows an interconnected set of collaborative digital tools integrated within a cloud-based virtual environment. On the periphery, a satellite network of physical stations, which include the physical head office, remote and mobile offices, as well as connection to mobile devices (tablets, mobile phones), and peripherals (3D printers and plotters). This creates a global and ubiquitous network which is then injected by data information, such as digital twins that replicate and simulate physical buildings in the virtual environment, and smart technology capturing information from sensors.

3. RESEARCH METHODOLOGY

Our research methodology consisted first of a comprehensive literature review of a series of report publications by the Royal Architectural Institute of Canada and the Ontario Association of Architects, as well as scholarly journals. Secondly, an open survey
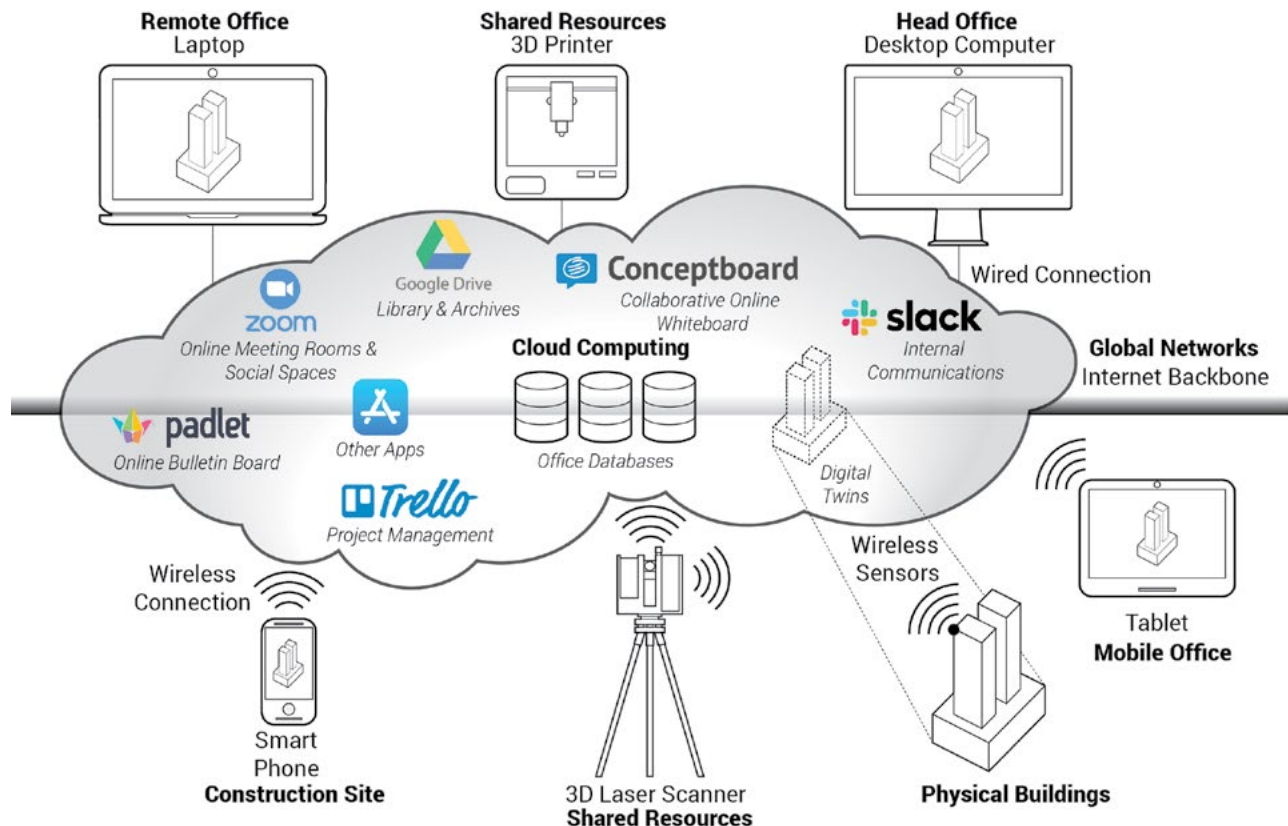

Figure 2. Conceptual Diagram of a Virtual Architects' Office. Source: Tsang, H., Madonna, V., MacLeod, D., Butler, T.

prepared by the faculty members at the RAIC Centre for Architecture at Athabasca University was distributed to Canadian architects who are members of the Royal Architectural Institute of Canada. Thirdly, an in-depth interview was conducted with an architecture firm.

The research team had initially laid out to study the adapted office layouts with different cases of fully and partially remote architectural offices. However, due to privacy, security and safety reasons during the pandemic, significant data was not obtainable at the time of writing this paper. A future stage of the research will look at the issues of the physical planning and layout of the offices.

4. LITERATURE REVIEW
A series of four COVID-19 pulse survey reports were published by the Royal Architectural Institute of Canada between March to December 2020. These reports present result summaries of surveys conducted within the approximately 5000 members of the institute on the current state of the architectural profession in Canada

amidst the pandemic. Each of the four surveys received over 200 responses. In the most recently released report published on February 11, 2021, it was shown that 25.1% of architects were "working remotely 100% of the time", 32.9% were working in a "hybrid model" which means that they are working remotely part-time, and 7.8% who have "always worked remotely". The total percentage of Canadian architects working fully or partially remotely is 65.8%.

The Ontario Association of Architects (OAA) also conducted a survey with its members on the state of the architectural profession during COVID in September 2020, which showed consistent results. With 401 responses, the report shows that 65% of Ontarian architects are working from home and that 68% of them "believe COVID-19 will lead to long-term changes in the way architecture firms practise". 334 respondents stated facing challenges of working remotely, and have identified the following major challenges: coordinating staff efforts, ensuring staff had the equipment they
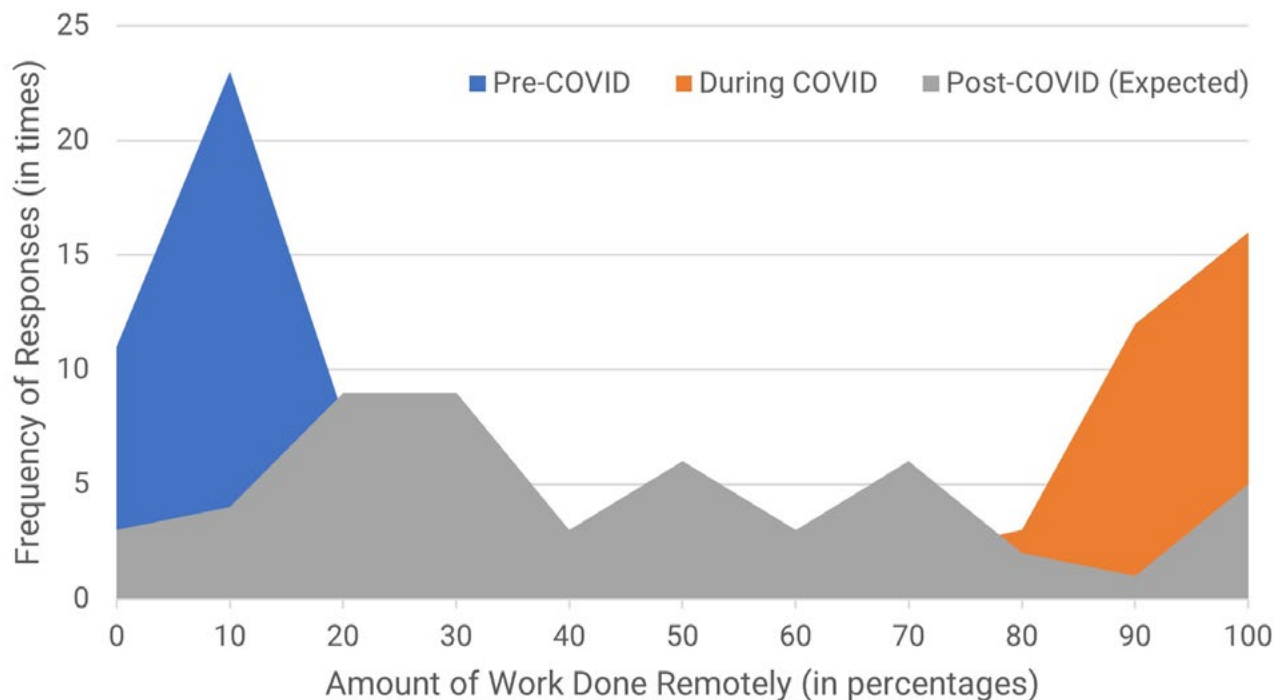

Figure 3. Change in amount of work done remotely by architects in Canada. Source: Tsang, H., Madonna, V., MacLeod, D., Butler, T., Architects Going Virtual: Survey on How Architects are Adapting to Remote Work, 2021
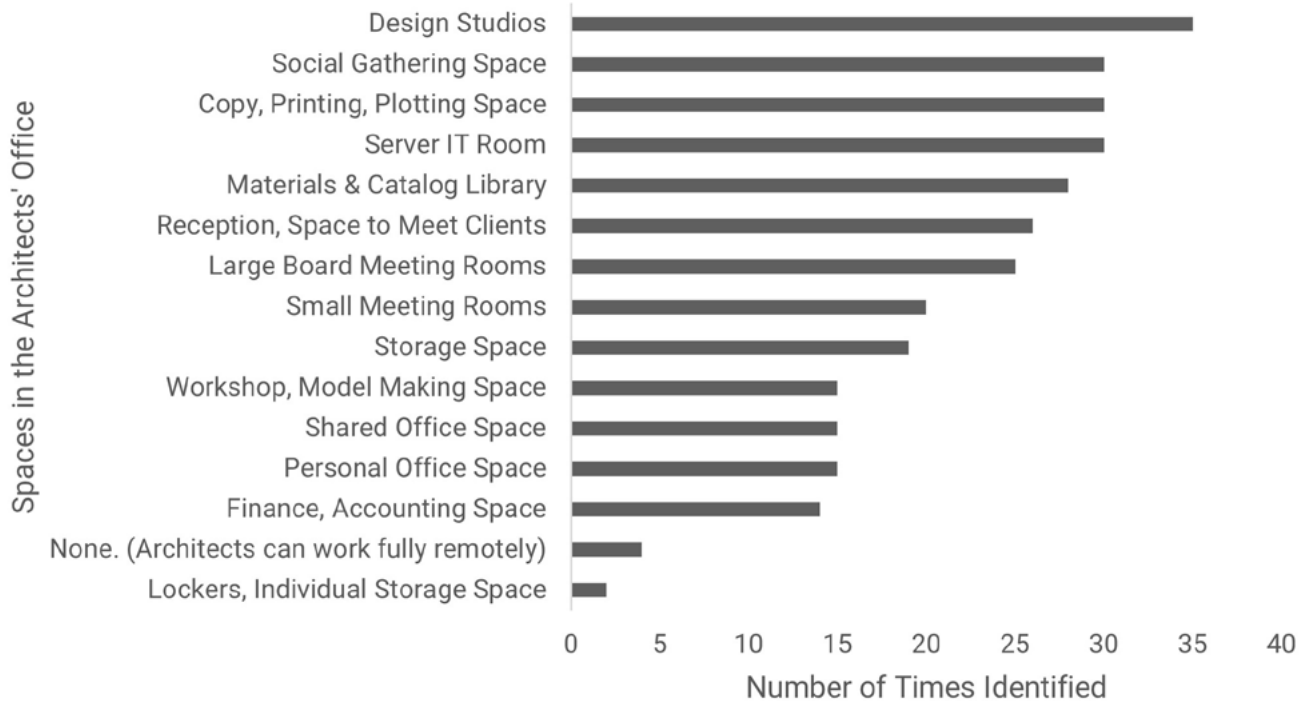
Core Program to Remain in the Physical Office

Figure 4. Core Programs to Remain in the Physical Office. Source: Tsang, H., Madonna, V., MacLeod, D., Butler, T., Architects Going Virtual: Survey on How Architects are Adapting to Remote Work, 2021

needed, issues with building departments, and trying to design remotely as the main difficulties.

In reviewing other publications, we found that there are many documented cases of architecture firms operating completely remotely, even prior to the COVID-19 pandemic. For instance, Sean Joyner, a faculty member at Woodbury University, published several articles on architects working remotely. In an interview between Joyner and remote-working architect Jennifer Kretschmer about her virtual architecture firm, she said: "The laws about remote workers, independent contractors vs. employees, gig economy, practice insurance, and contracts are constantly evolving. Firm owners need to keep up to date on what laws will affect their practice in choosing to move toward a virtual office with remote workers". Subsequently, in an interview with another remote-working architect Leah Alyssa Bayer of the virtual firm EVIA Studio, the main challenges of running a fully virtual firm were identified as "group events, physical wellness and client meetings". Further, architect and digital strategist Sara Kolata even argues

in her article that "architecture practices that embrace remote work will replace all the ones that won't".

5. OPEN SURVEY ANALYSIS

An open survey was created by the faculty members at the RAIC Centre for Architecture at Athabasca University and distributed to architects and members of the Royal Architectural Institute of Canada's membership through the RAIC Connects platform. The RAIC Connects platform is a virtual community where members of the association can discuss and share content on a common bulletin board. 50 responses to our survey were received as of June 14, 2021, at the time of writing this paper. The main findings of the survey are summarized below.

Architects have moved to a remote office during the pandemic, and are undecided whether they will be going back to a physical office post-COVID-19. Figure 3 shows the results of the amount of the architects' work being done remotely at three stages in time: before, during and after the COVID-19 pandemic. The results for after the pandemic are predictions. Breaking this
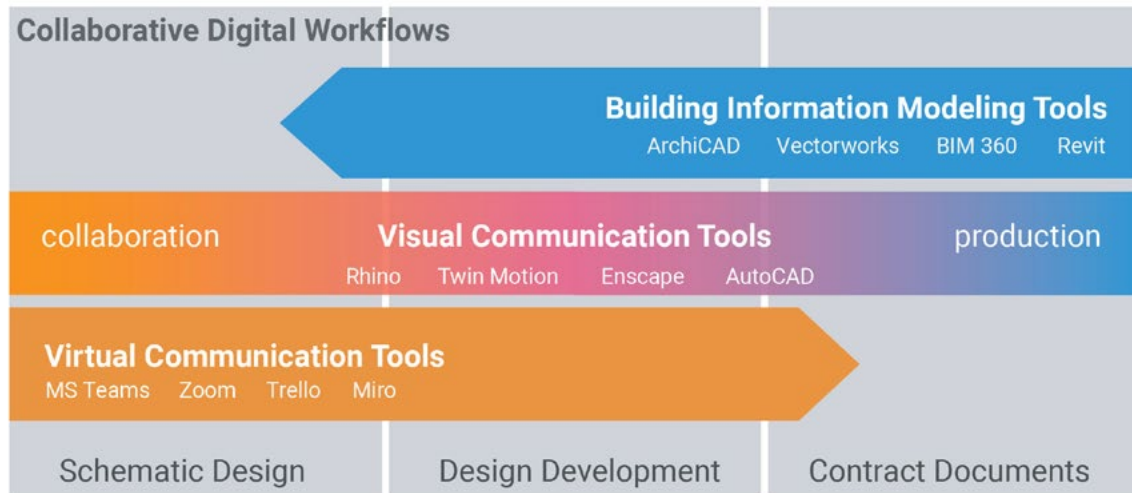
Figure 5. Time shift in Collaboration and Production Tools Used Throughout the Architectural Design Phases. Source: Tsang, H., Madonna, V., MacLeod, D., Butler, T.

information down, before the pandemic, most architects answered that the amount of remote work performed was approximately 10%. During the pandemic, close to two-thirds of them stated that they were working 100% remotely. After the pandemic, architects do not seem to agree on how much work will be done remotely, as the answers were spread evenly between 20-100% of work done remotely.

Further, Figure 4 shows the results from our question asking which functions in the architectural firm need to be executed in the physical office. The design studio came up at the top, being mentioned 31 times, followed by the server IT room, the copy, printing, and plotting space.

The survey also asked architects to identify the technology and software that are currently being introduced in response to the shift to remote work. As a result, several common cloud-based software were identified and categorized in the architectural tasks of design, communication and workflow. For design tasks, the ability to have multiple users work on a single file simultaneously and to share a common folder were identified to be the key functions needed. As for software used, AutoCAD seems to remain the mainstream software to produce 2D drawings, and Sketchup is still to be used for preliminary 3D massing, however, there does seem to be a surge in the use of BIM 360 in the earlier design stages. Many respondents also mentioned the

use of collaborative virtual drawing concept boards, such as those on Miro, Google Jamboard and ZOOM. These tools allow multiple users to draw and exchange ideas by contributing to the same illustration or diagram. For communication tasks, the most popular software being used by architects is ZOOM, followed by MS Teams, Slack and Google Meet. Many have commented on the practicality of drawing tools within the videoconferencing software, such as the annotation tool in ZOOM. This function can be used to red-mark drawings by drawing on top of the shared image. For workflow tasks, most firms rely on the apps available within Microsoft Outlook or Google Suites to organize team workloads and manage projects. Other software such as Ajera and Bluebeam that are developed for project management offers the capability to collaborate on schedules and coordinate tasks, optimizing the sharing of information and productivity.

6. CASE STUDY ANALYSIS

An interview was conducted with an architectural firm that served as a case study in order to capture focused information on what firms have done to cope with the COVID-19 pandemic and how they intend to operate post-COVID-19. The case study identified: 1) work methodologies, such as work shifts, balancing a partially remote hybrid format and work-life balance; 2) the physical office and the home office, such as the issues surrounding the work environment, access to equipment and wellness, both mental and physical.

The case study interview was conducted with a mid-size design firm, Moriyama & Teshima Architects. The firm is located in Toronto, Ontario, with a second office in Ottawa and employs approximately 65 people and offers architecture, master planning and urban design, interior design, and program development. The firm has been operating as a hybrid and full remote work model providing professional services over the duration of the pandemic, following provincial government restrictions. The interview took place during the pandemic on April 28, 2021, and involved a principal of the office who is currently based in Toronto.

The case study's questionnaire was designed to learn about the impacts of the COVID-19 pandemic on architects' professional practice and workplace in Canada and the challenges or potentials found in remote work for architects. The interview focused on four primary areas:

- Changes in the physical and remote office
- Changes in the architects' work methodologies
- Alternative solutions and remote work technologies
- Challenges and opportunities

Changes in the Physical and Remote Office
Before COVID-19, approximately 10% of the staff was occasionally working remotely. During the pandemic, daily working functions shifted 100% to remote working. During acceptable periods, when workers were able to return to the workplace, about 5% of the personnel continued to work in the physical office occasionally. In shifting to remote work, two primary considerations emerged.

The first consideration included the technology required to shift to a remote work environment. This was reasonably unproblematic as the office and workflow were already digital before the COVID-19 pandemic. Some staff members were already equipped with portable devices, and others were provided with remote computer access through software.

The second consideration included staff establishing space in their homes in order to accommodate a remote office. This may have included dedicating an area that was free from distractions, has access to high-speed internet as well as proper equipment, such as ergonomic furniture.

Changes in the Architects' Work Methodologies
Overall, the transition from working in the physical office to a remote office had not impacted the work quality; however, the production of work was affected and the collaboration process was impacted.

Staff involved with highly productive work, such as the execution of contract documents, found that remote working was beneficial in that there were fewer interruptions that occurred, throughout the day. However, the management of teams and the younger staff was more time-consuming as the ability to monitor workflow and progress was reduced.
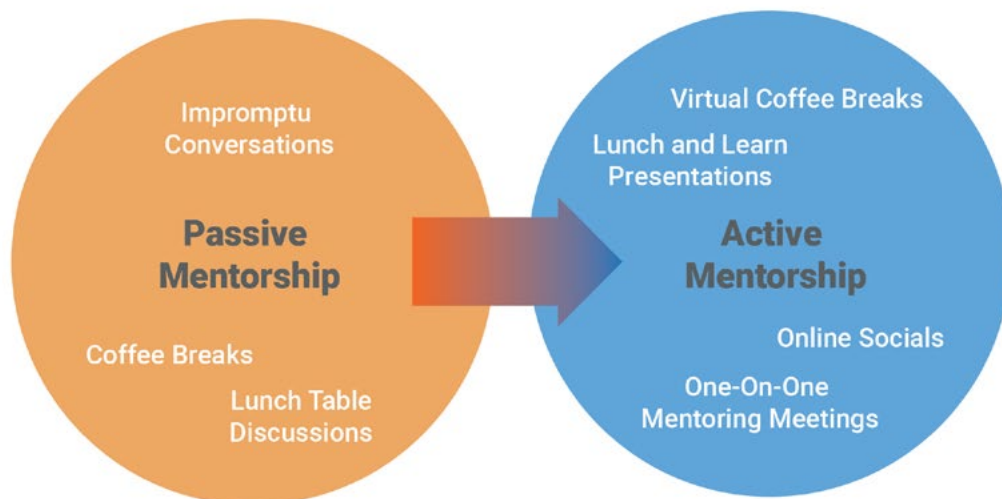

Figure 6. Passive Mentorship and Active Mentorship. Source: Tsang, H., Madonna, V., MacLeod, D., Butler, T.

In other ways, it was noted that the pandemic had reduced productivity – primarily architects who were dealing with the complexities of working from home, such as small children and taking care of sick relatives. As well, the boundary of the workday has been challenged in that there was no more division between work and life.

Overall, the office culture was challenged with remote work. Aspects that foster creativity, such as ad hoc conversations and overhearing conversations, had to be managed differently. As well, it was more challenging to determine the overall well-being of staff.

Alternative Solutions and Remote Work Technologies
Before remote working, collaborative digital design tools were already used to communicate with staff internally and collaborate with consultants and clients. Communication and collaboration tools such as MS Teams and Trello, which is software that is used to help manage workflows within teams, were already in use; however, they are now being implemented on all projects and are used longer throughout the project, into contract documents and perhaps even being integrated to contract administration.

Building Information Modeling, also known as BIM programs, like Revit, are starting to be used earlier in the design process. See Figure 5. This is primarily because of their ability to connect to cloud-collaboration networks such as BIM 360. This also allows multiple people to work collaboratively on the model as updating in real-time while adding comments and markups.

Challenges and Opportunities
Several opportunities and challenges emerged from shifting to a remote work environment. Some staff found that remote working was more productive. These were senior staff or those working on production work such as contract documents or administrative work. This was primarily due to fewer impromptu interruptions that can occur in a studio environment. Also, many favoured not having to commute to work every day and found that the time could be more productive towards work or more personal time.

Amongst the staff, however, there was a feeling that the social aspect was missing. In particular, the younger personnel expressed feeling disconnected. Onboarding new employees, mainly to make them feel welcome and acquainted with the office, was also made challenging by remote working. Consequently, the approach to design collaboration had to be done differently. It had to be more organized and structured. Whereas before, people would turn and ask each other questions, now every conversation needs to be signalled in advance.

7. KEY FINDINGS
Some synergies can be drawn between our studies, and help us draw certain outcomes from this research. Several themes have emerged as the drivers to successfully operate remotely as an architectural practice.

Integrating Physical Space and Virtual Space
It is apparent that the majority of the architects' tasks can, in effect, be performed remotely. Our findings indicate that architects feel more in control of their work and staff when at their physical office. Principal architects felt like they needed to be at the headquarters to properly manage their teams, and to be surrounded by the equipment and resources provided by the office. That being said, those who preferred working remotely felt a better sense of productivity and flexibility, and believe that as long as a strong connective environment is available with the supporting software, that it is indeed feasible to work completely remotely on a day-to-day basis. Construction site visits, as well as certain client meetings, would still require some physical presence from the architect.

Social Interaction and Collaboration
It was identified in our survey that even though design teams can be connected and collaborate through digital platforms, the qualitative social interaction of being in the same physical space is lacking. While most architects felt like teamwork was possible through the internet, the lack of spontaneous conversations and body language, as well as opportunities to socialize with their peers have deterred team bonds that contribute to building a strong company culture. New forms of interactions have emerged, with a focus on intentional meeting opportunities. These are also facilitated by new social engagement tools, such as avatar-based virtual rooms, video chat rooms, and smartphone apps such as Slack. Many architects also identified the importance of meeting and connecting with clients to build a relationship of trust.

Remote Work and Equity
Working remotely assumes that everyone has adequate living conditions that can adapt to provide a home office. This includes the physical space being free of distractions, access to the internet, and access to an area that promotes mental and physical wellness, such as natural light and ergonomic furniture. This may not

be the case for some, and issues of equity should be addressed. This raises questions of equity, in that not everyone may have a designated space in their homes, or might perhaps have other distractions such as children or taking care of family members or pets, in which it is not possible to separate work and personal life for a healthy work-life balance. As well, this assumes that people have living conditions that can accommodate remote working. Further, it has also become the architect's own responsibility to uphold security and safety while working from home.

Physical and Mental Wellness
With regards to the remote office, it is noted that issues of physical and mental health and wellness are severe. The COVID-19 pandemic and resulting isolation due to remote work have been major causes of stress, and many architects have identified this as a major challenge. Architects typically spend many hours working on the computer, sketching on the drawing table or model making, all of which require high levels of concentration. However, as mentioned earlier, not everyone would have an adequate workspace, with access to natural light and views, an ergonomic working station, quality air circulation, and be free from distractions. These are the main factors for productivity, concomitantly, are also the causes of physical and mental illnesses.

Mentorship and Apprenticeship
Mentoring is a tradition of the architectural discipline, and is a critical part of gaining experience and practice. For architects, mentorship and apprenticeship are essential to an architectural intern to provide on-the-job training as part of the learning process. The current process in the design profession relies heavily on passive mentorship that occurs in a collaborative studio environment. This passive mentorship occurs in such instances as overhearing a conversation, discussions at the lunch table or going out and grabbing a coffee. In a remote work environment, passive mentorship must be replaced by strategic active mentorship opportunities such as organizing online social events, virtual coffee breaks, virtual seminars and one-on-one meetings between senior and junior staff. Figure 6 shows this transition between passive to active mentorship and provides some examples of these activities.

Moving to a Hybrid Working Model
Moving into the future, there is a recognition that a partially remote hybrid model of working in architectural practice is likely the direction the profession will take. Staff will be able to work from home more frequently as

the technology, with its many offerings, is currently in place and continues to advance. The physical office will potentially soon transform into a social and collaborative hub. Workstations will become non-dedicated and likely reduce in size. Equipment, such as computers, will be portable, and cloud-based servers will be more widely implemented. In our study, we identified that the core programs to remain in the physical office are: creativity collaboration spaces, such as the design studios; the spaces that require large floor areas for specific equipment, and robust IT server rooms.

8. DISCUSSION OF RESULTS
Upon critical reflection, the study we conducted can be improved in two ways. 1) The case studies would be better represented if expanded further to include more of a spectrum of firms, of different sizes and regions. 2) The timing of the surveys was produced during the pandemic, therefore a follow-up of the study should be conducted after the restrictions of the pandemic are lifted to better reflect the post-COVID-19 conditions.

9. CONCLUSION
Architects are going virtual. Although this trend began well before the COVID-19 pandemic, the transition to remote work has definitely sped up as a consequence of the lockdowns due to the pandemic. Therefore, in this paper, we have attempted to answer the questions of: can architects effectively work remotely, what are the potential challenges and opportunities, what has changed in the office and work methodologies? Through our literature review, open survey and case study, we have identified what is working and what is not with regards to remote work for architects. Remote work has worked better than expected for most. In contrast, many challenges pertaining to remote work were also identified, pointing to the notion that the need for a physical office would be unchanged, but the function of the office may have shifted to become a collaboration and social hub, rather than house personal workstations. In any case, it is clear that in a post-COVID world, remote work will remain a permanent work format for architects. This paper has provided some clues as to how that could be done. The technology surrounding the internet of things is constantly evolving, so there is no doubt that this trend towards remote work for architects will carry on.

By extension, we are working on a future paper that explores the impact of the pandemic on architectural education and the way architecture students are now using their homes as classrooms and design studios. Further, we are now reflecting on the next steps forward

of implementation in the design profession, leading towards developing new best practice guidelines for the restructuring of the architects' physical and remote offices of the future.

ENDNOTES

1. Statistics Canada, "Study: Working from home: Productivity and preferences," Statistics Canada, 2021. https://www150.statcan.gc.ca/n1/en/daily-quotidien/210401/dq210401b-eng.pdf?st=dAWIL-td.

2. Ontario Association of Architects, "COVID-19 Survey: Sharing the Findings," Ontario Association of Architects, 2020. https://oaa.on.ca/whats-on/news-and-insights/news-and-insights-detail/COVID-19-Survey-Sharing-the-Findings-.

3. Royal Architectural Institute of Canada, "COVID-19: Updates, Information, and Advocacy," Royal Architectural Institute of Canada, 2021. https://raic.org/news/covid-19-updates-information-and-advocacy.

4. Ontario Association of Architects, "COVID-19 Survey: Sharing the Findings," Ontario Association of Architects, 2020. https://oaa.on.ca/whats-on/news-and-insights/news-and-insights-detail/COVID-19-Survey-Sharing-the-Findings-.

5. Ibid.

6. Sean Joyner, "Running a Virtual Architecture Practice with Jennifer Kretschmer," Archinect, 2020. https://archinect.com/features/article/150189860/running-a-virtual-architecture-practice-with-jennifer-kretschmer.

7. Sean Joyner, "Managing a Virtual Design Studio with Leah Alyssa Bayer," Archinect, 2020. https://archinect.com/features/article/150190602/managing-a-virtual-design-studio-with-leah-alissa-bayer.

8. Sara Kolata, "Architecture practices that embrace remote work will replace all the ones that won't," Sara Kolata, 2020. https://sarakolata.medium.com/architecture-practices-that-embrace-remote-work-will-replace-all-the-ones-that-wont-d90178fe067a.

9. Tsang, H., Madonna, V., MacLeod, D., Butler, T., "Architects Going Virtual: Survey on How Architects are Adapting to Remote Work," 2021. https://docs.google.com/forms/d/e/1FAIpQLSeUWx3IDA4TlRQXa_Jm-MWTRknEg4S-Et3fHz0ymDdxLoDRtw/viewform?usp=sf_link.

BIBLIOGRAPHY

Joyner, Sean. "Managing a Virtual Design Studio with Leah Alyssa Bayer," Archinect, March 24, 2020. https://archinect.com/features/article/150190602/managing-a-virtual-design-studio-with-leahalissa-bayer.

Joyner, Sean. "Running a Virtual Architecture Practice with Jennifer Kretschmer," Archinect, March 17, 2020. https://archinect.com/features/article/150189860/running-a-virtual-architecturepractice-with-jennifer-kretschmer.

Ontario Association of Architects. "COVID-19 Survey: Sharing the Findings," Ontario Association of Architects, September 29, 2020. https://oaa.on.ca/whats-on/news-and-insights/news-and-insights-detail/COVID-19-Survey-Sharing-the-Findings-.

Royal Architectural Institute of Canada. "COVID-19: Updates, Information, and Advocacy," Royal Architectural Institute of Canada, August 24, 2021. https://raic.org/news/covid-19-updates-information-and-advocacy.

Statistics Canada. "Study: Working from Home: Productivity and Preferences," Statistics Canada, April 1, 2021. https://www150.statcan.gc.ca/n1/en/daily-quotidien/210401/dq210401b-eng.pdf?st=dAWIL-td.

Kolata, Sara. "Architecture practices that embrace remote work will replace all the ones that won't," Medium, April 12, 2020. https://sarakolata.medium.com/architecture-practices-that-embraceremote-work-will-replace-all-the-ones-that-wont-d90178fe067a.

Tsang, Henry, Veronica Madonna, Douglas MacLeod, Trevor Butler, "Architects Going Virtual: Survey on How Architects are Adapting to Remote Work," Google Form, 2021. https://docs.google.com/forms/d/e/1FAIpQLSeUWx3IDA4TlRQXa_Jm-MWTRknEg4S-Et3fHz0ymDdxLoDRtw/viewform?usp=sf_link.