

DESIGN EFFICACY AT A DISTANCE: COLLABORATION BETWEEN REMOTE DESIGN TEAMS

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ABSTRACT

Design problems in the best instances are intensely complex and very demanding. Given that most buildings are unique – that is, not mass-produced – each design project must be considered as a precedent-setting experiment. While we learn from successes and failures, building projects remain distinct and demanding. Added to the conventional complexities is the distributed nature of design production in a globalized world. The present paper addresses several key queries: What are best practices in facilitating collaboration between remote design teams? What are the implications of working from home for design team members? While the practice of design has become increasingly digital, there are inherent tensions between the principals' insistence to work in the tangibility of the physical studio and the younger practitioners' preference to optimize flexibility via remote delivery. More significantly, what are the barriers and challenges to working on collaborative design projects globally, including but not limited to being overwhelmed by multi-tasking, power imbalances, different cultural dispositions, technical challenges, different time zones, data privacy and proprietary concerns, shifting from studio-based practice to online work, physical model making, communication pitfalls, screen burnout, and loss of personal/leisure time? Such important yet perplexing questions

loom large. The research involves literature reviews exploring the ways that design teams collaborate remotely. Building from this analysis, the paper delineates a number of familiar challenges and proffers solutions tackling design practice using remote teams. The research considers administration (design leaders and project managers) on one hand, and production (interdisciplinary design teams) on the other. Drawing upon organizational and human development theories, and utilizing the reflective practitioner's approach, the paper situates discussion within broader topics of human dignity, workplace psychology, career mentorship, and continuing education. Also examined are architects' persona, culture, practices and mindsets - crucial factors shaping the conduct of distributed design. Further, this paper elaborates on Zoom virtual collaboration platform with respect to suitability and effectiveness. In the end, a conceptual model and a setup for satellite studios for distributed design are proposed that aim improve communication, heighten collaboration and strengthen design in an increasingly complicated and interconnected ethos.

KEYWORDS

Architecture; collaboration; innovation; systems thinking; distributed design; culture.

1. INTRODUCTION

Designers need to collaborate to work on real-life problems that require a diversity of expertise, attitudes and styles:

Some of the forces driving increased collaboration in architecture and design are larger than the design disciplines by significant orders of magnitude. At every turn, we face problems that are simply too big to solve alone. Horst Rittel, the design theorist, coined the term wicked problems to describe these complications [that] have complex, contradictory, and interdependent variables and are difficult to solve because they are difficult to define (Rittel, 1973).

The need to collaborate with other disciplines practitioners and professionals who are external to the design teams means, often, utilizing virtual platforms.

The design process itself in providing a solution to a wicked problem is a wicked problem as it involves the complexities and the contradictions of human interactions. The process is equally important as the end design solution. Every wicked problem is a symptom of another problem; wicked problems have no solutions: "At best are only re-solved, over and over again...such as sustainable urban development, poverty, homelessness" (Olsen, 2022). Collaboration in physical studio space is already extremely challenging and the pandemic has pushed everyone, usually unwillingly, to think about how to make virtual and remote meetings effective and conducive.

Leadership and management capability are prerequisites for effective teamwork. Because the approach of many of the consultants arises from a dissimilar education and professional culture the patina of unity that overlays the joint work of a team may sometimes conceal a disappointment with the ideology, working methods, presumed superior status, and even remuneration of other members (Herbert, 2013).

In this paper, we start with a literature review and then propose a conceptual framework to depict the complex intertwined relations between location, virtual and familiarity, a complexity that cannot be simplified and addressed by a one size fits all solution. Our argument is to make the virtual platforms more like the studio space the design teams are familiar with. We will then present two ideas, a plugin for Zoom and suggestions to create more conducive satellite studios beyond a personal laptop.

2. LITERATURE REVIEW

There are a number of reasons design practitioners like other office workers prefer virtual meetings including but not limited to efficient screen sharing, saving on the time to commute to the physical office or the meeting venue; more reliability and less worry about traffic jams, road closures, inclement weather conditions; employee satisfaction and flexibility; less overhead cost for a larger head office, the opportunity for staff to travel and connect from different locations, attracting and employing global talent without need to incur immigration and moving expenses. There are substantial sustainable outcomes to virtual distributed work, less travel and prints mean decreased carbon emissions; and assuming every employee enjoys a conducive home or remote setup, going virtual and distributed can contribute to more equity in access to good job opportunities and ultimately a more socially just world.

While there are newly developed challenges human resource managers need to handle, unperceivable in the past, they are generally more at ease that the virtual platforms can have better surveillance to avoid the workplace complaints such as harassment when there is no physical co-presence in an office space with several blind spots!

However, we need to remember most design teams were forced to involuntarily go virtual

due to the recent pandemic restrictions and that there is still a strong desire, at least on the side of older practitioners to resume in-person studio work. This tension alludes to the generational difference of opinion on what will be a more conducive environment to work on design projects and collaborate with fellow practitioners. Unlike other office workers who can work on simple interface cloud-based applications, designers need more co-presence and more intense collaboration in their creative processes. There are of course certain segregated design tasks that can be distributed to individual team members, as in the case of larger design practices, but a portion of job satisfaction for designers is the opportunity to be involved and aware of the whole versus the delegated piece. It is much more challenging to start and onboard staff virtually from the outset than to shift the existing employees to the virtual platform. For more senior staff who are supposed to mentor the junior members, and who are

usually more inclined or required to work in the physical office space, the physical takes priority over the virtual. Remote workers sometimes feel ignored while their seniors cannot understand why a simple delegated task has taken so long and distrust and frustration build up.

While remote work allows organizations to offer their employees flexibility and harness global talent and markets for business growth, [the] inability to rely on physical interactions between employees imposes challenges specific to operations in highly virtual work environments. Among these characteristic issues are challenges associated with organizational socialization and organizational culture (Asatiani, 2021).

We need to wait and see if the dominance of virtual design work has shifted the weighting for each of the following synchronous and asynchronous means of communication.

Means of communication	Ease of use	Feedback	Interaction	Overview	Informal	Formal	Status
Dialogue	x	X	X	-	x	x	x
Group meeting	-	X	x	x	-	x	x
Informal meeting	-	X	X	-	x	-	-
Telephone	X	X	X	-	x	x	x
Facsimile	x	-	-	-	-	x	X
Postal mail	-	-	-	-	-	X	X
Project dossier	x	-	-	x	-	X	x
Email message	X	X	x	-	x	x	-
Messenger service	X	X	X	-	x	-	-
Video conference	x	X	X	x	-	X	x
Outlook calendar	X	-	-	X	-	X	-
Computer network	x	-	-	-	-	x	-
Project Website	X	X	-	X	-	X	X

X = high level, x = average level, - = low level

Table 1. Properties of synchronous and asynchronous means of communication (Otter & Emmitt, 2007)

The ability to do virtual work has posed new opportunities and challenges for design practices that were formerly location-based. The staff can now travel overseas and report to work on Zoom or Teams, utilize the company-provided laptops or access the office computers via VPN. Suddenly, local firms have found themselves to be international! There are certain considerations for the uncalled-for internationalization of practice and the managers are usually not well versed in all such implications:

1. Global structure
2. Data mirroring across international borders
3. Network security and data integrity
4. Software compatibility with consultants and associate architects
5. Imperial vs. metric units
6. Dealing with associate architects—culture and process differences and incompatibilities
7. Establishing a local office/practice
8. Dealing with differing client expectations
9. Language
10. Available “on-the-ground” technology (e.g., poor or nonexistent internet connections)
11. Time-zone differences
12. Local hardware

procurement 13. Software licensing 14. Different, less advanced design and documentation procedures—“dumbing-down” 15. Extreme “fast-track” 16. Crisis operations (Perkins, 2021).

We are looking at virtuality and distributedness and how the design process can have holistic quality under the new modes of work:

virtuality and distributedness can be defined as distinct continua which, when combined, can be used to describe particular work settings...four factors...impact organizational policy in terms of virtuality and distributedness: interdependence of tasks, nature of work, technological environment and temporal distance. Practical implications...Taking the perspective of individual designers working in remote teams... we found that team spirit, shared experience, trustworthiness, and transparency, as well as project management and related micro-practices, are perceived as central to building shared understanding in remote design teams (Kniel, 2021).

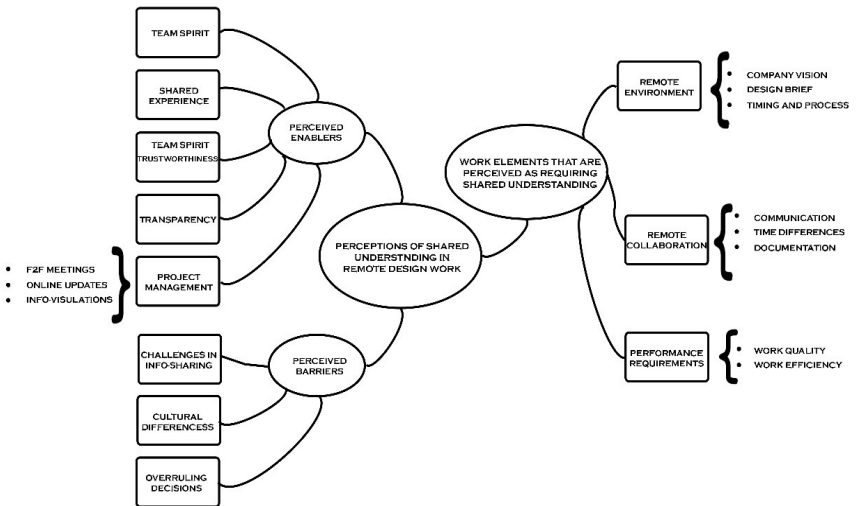


Figure 1. Code structure from thematic analysis (Kniel & Comi, 2021)

Drawing upon capabilities and human development theory, group potency and efficacy will translate into self-efficacy, providing an enabling environment where employees' skillsets, confidence, morale and aspiration are further developed and they have a higher degree of choices to make for their work and life options. Group potency is defined as:

'the expectations held in common by group members about the group's collective efficacy; that is, the group's overall confidence or "can do" attitude (APA, 2022).'

Efficacy is defined as 'competence in behavioural performance, especially with reference to a person's perception of his or her performance capabilities' (APA, 2022).

group potency and computer collective efficacy act as antecedents to virtual team efficacy, and virtual team efficacy is in turn predictive of perceptual and objective measures of performance. Further, consistent with efficacy theory...virtual team efficacy acts on performance outcomes through specific mediating processes (Fuller, 2006).

It is imperative for design managers to embrace the new virtual collaboration platforms, properly plan for them and only demand in-

person work where it contributes to team building, social bonding and onboarding of new staff. IT technology while ground-breaking needs to be properly tailored and executed.

strong relationships were observed between employees' remote work self-efficacy judgments and several antecedents, including remote work experience and training, best practices modelling by management, and computer and IT capabilities. Because many of these antecedents can be controlled managerially, these findings suggest important ways in which a remote employee's work performance can be enhanced, through the intermediary effect of improved remote work self-efficacy (Staples, 1999).

Linking self-efficacy to the capabilities and human development theory, where the end goal for a design team should not be only an award-winning design project, but more significantly the development of team members' capabilities and their sense of confidence, happiness and achievement.

Design policy [should be] based on the theory of social justice known as the 'capabilities approach', where the measurement of progress in development shifts from outputs such as GDP to indicators of increased capacity to achieve outcomes (Dong, 2008).

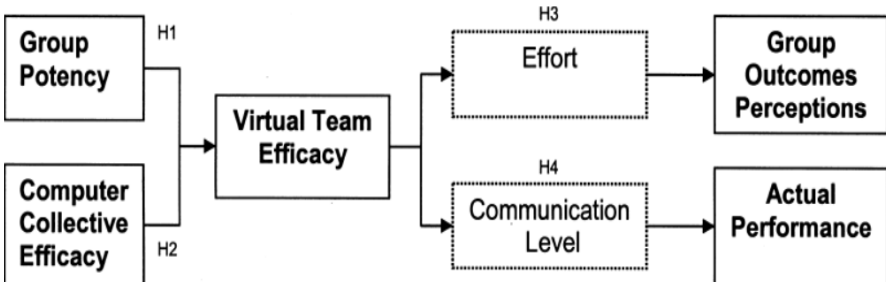


Figure 2. Research model (Fuller et al, 2006)

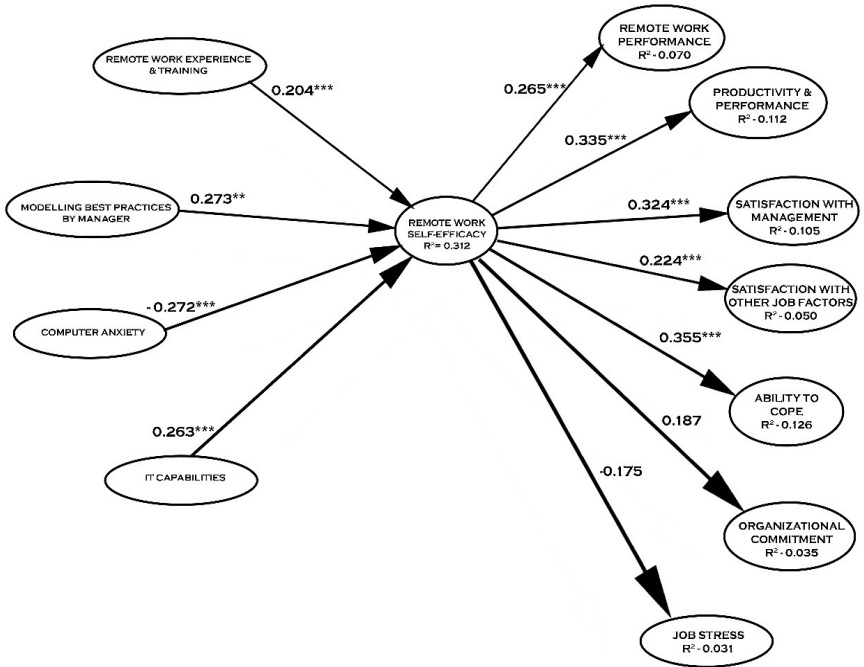


Figure 3. Self-efficacy model for remote workers in virtual environments (Staples et al, 2022)

In the last two and half years, going virtual, was a survival mechanism for design firms during lock-downs and staff sick leaves. During our conversations with many design firm principles in Alberta, they confirmed the loss of revenue and performance by adopting virtual collaboration platforms. We need to ask if virtual collaboration can lead to the overall performance of design practices and their ability to innovate and retain their competitive edge:

Design management and innovation give companies competitive advantages. In this scenario, the involvement of employees in [the] generation of innovation is an important factor to be developed within the organization (Silva, 2017).

Any technology that can help designers be more aware of one another and better simulate the physical studio practice can potentially be conducive.

It is critical for geographically distributed designers to accurately perceive and comprehend other remote team members' intentions and activities with a high level of awareness and presence as if they were working in the same room. More specifically, distributed cognition places emphasis on the social aspects of cognition and asserts that knowledge is distributed by placing memories, facts, or knowledge on objects, individuals, and tools in the environment they work. This paper proposes a new computer-mediated

Diagnosis	Requirements
Scope: They have multifunctional and with great power of articulation feature as interact with several clients and several areas internally.	- Create an innovation process that fits within the scope of work; - Take advantage of this interaction with the various Stakeholders.
Planning: Do the agenda planning but during the day changes occur as immediate demands arise.	- Have a flexible interaction regarding deliveries and dates; - Have activities and deliveries not weigh and do not crash into the daily routine
Safety: Due to security factors and internet connection planning agenda is carried out via the system, but prefer to print and load physically. Similarly prefer to perform the bureaucratic activities at home.	- Create a program that does not require that the team has connection / interaction during the field day; - Think of interactions beyond the computer; - Provide tools that do not endanger their safety.
Idea Generation: New ideas are generated by the field work or for questions and customer demands. Thus the group is composed of people who have ideas proactively and those who are passive because they depend on the verbalization of clients.	- Encourage the creation beyond the field; - To stimulate the generation of ideas to solve problems/ needs.
Labor demand: Routine causes are always in the field with little time or a few stops on the base to concertation times. Furthermore, consider that there is work overload, large displacement and high concentration of night demand.	- Encourage participation in small time slots available; - Reconciling the high demands program; - Make sure they can devote exclusive time to interact with innovation.
Motivations: Group demonstrates motivation towards professional growth, benefits package the company and time for leisure and family. Also, they want to interact and feel part of the process and see it as recognition.	- Promote the role in relation to the professional growth; - Make the involvement in the process will not interfere in; the free time: - Make them involved in the whole process.
Digital interaction: Group has technological tools (notebook, tablet and mobile) but have appreciation for the role. Regarding the innovation initiatives, the group demonstrates little affinity interactions in digitals but state research that has no difficulty.	- Provide a program that does not depend exclusively on the computer; - Provide personal interactions and materials with tactile elements.

Table 2. Diagnosis and requirements (Silva et al, 2017)

remote collaborative design system, TeleAR, to enhance the distributed cognition among remote designers by integrating Augmented Reality and telepresence technologies. This system can afford a high-level externalization of shared resources, which includes gestures, design tools, design elements, and design materials. This paper further investigates how this system may affect designers' communication and collaboration with a focus on distributed cognition and mutual awareness. It also explores the critical communication-related issue addressed in the proposed system, including common ground and social capitals, perspective invariance, trust and spatial faithfulness (Wang, 2014).

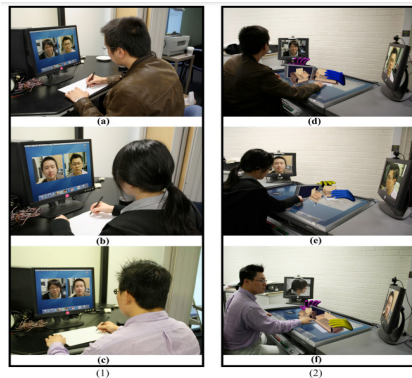


Figure 4. Traditional method (1) versus the teleAR (2) (Wang et al, 2014)

However, the additional technological requirements, the equipment, the internet speed to accommodate additional video streaming and at the same time the digital file content can become a challenge. Designers already deal with great complexity; any complicated technology will take away from the required flawless process of design and the comfort they need to enjoy during design. Even prior to going virtual, working with design teams dispersed in multiple locations with different cultural, educational and linguistic backgrounds is challenging.

design thinking in co-located and remote working environments? This paper demonstrates the perceived difficulty of different design activities and how they compare to one another. A framework comprising nine individual design activities is used to map out [the] experiences of six multicultural, distributed student design teams (Tuuli Utriainen, 2017).

Hybrid work environments can be good responses. It can be accommodating a number of staff who prefer physical space in the office while allowing the rest to work remotely; or, allowing flexibility to work remotely from home or farther, coming to the office for important in-person meetings and socializing. Virtual can also occur from separate offices and desks

within a physical office, preventing healthcare measures, better sound insulation and privacy and screen sharing without the need to get too close. Meluso et al (2022) identify such flexibility with Buchanan's third and fourth orders of design (Buchanan, 2001):

virtual forms of collaboration— simultaneously liberating and frustrating—are here to stay. Workers' frustrations demonstrate that challenges remain for work and its design in increasingly "hybrid" collaboration— work in which some people, interacting face-to-face, are co-located while others with whom they work are remote. Using Buchanan's four orders of design, in conjunction with management and information systems scholarship, we present a framework for improving these virtual forms of collaboration (Meluso, 2022).

Based on our own experience, the constant need to stare at a screen, when working remotely, forced by the need to be there to respond and not to ignore one's colleagues, is a major cause for concern. Many complain that virtual work, striving to maintain the coworkers' trust, is more cumbersome than the physical space where co-presence, our body language and other non-verbal clues help us be more comfortable. It is not easy to demonstrate one has taken a washroom break rather than a walk when one is online.

Design Activity	Description
Re(defining) the problem	Working on the problem space and redefining what the team is solving
Grasping external knowledge	Expert interviews, and research, need finding and benchmarking
Knowledge pooling	Sharing results with the team, putting up gathered material on walls and whiteboards, saturating information
synthesis	Working with the gathered materials, getting out key insights, seeing patterns and making sense of what has been done so far
Making decisions	Selecting next steps with the team, converging, path selection
Ideation	Coming up with multiple solutions, flaring, divergent thinking, brainstorming
Concept specifying	Focused work, concept development, getting from a low resolution to a higher resolution
Making* it tangible	Prototyping, realizing, building
Testing & user feedback	Testing concepts and prototypes, gathering feedback, learning from the prototypes

Table 3. Design Activity Framework (Utriainen, 2017) * original text read as 'imagin'

daily communication quality was associated with daily performance and burnout... Task interdependence moderated the relationship between communication quality and performance, such that the relationship was stronger when task interdependence was higher than when it was lower. Task interdependence also moderated the relationship between supervisor-set expectations and performance such that the relationship was stronger when task interdependence was lower than when it was higher (Shockley, 2021).

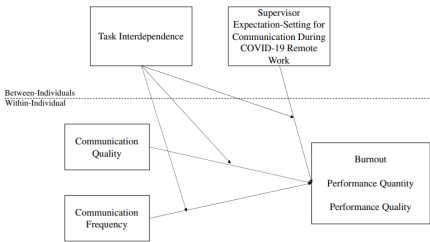


Figure 5. Study theoretical model (Shockley et al, 2021)

3. DISCUSSION

We propose a conceptual framework to depict and correlate Remote-ness, Virtual-ness and Familiarity, the farther a designer is from the centre in this 3D diagram, the more challenging is self-efficacy. We attribute distance to the base office or between a designer with their immediate colleagues to **location**, the farther colleagues are, the more difficult it is to communicate. Location can be gauged as the same office, same city, same region (e.g. North America or Europe), or same time zone to different global locations with different time zones. Working in the same physical office beside others can be coded as least virtual, to flexible hybrid schedules to completely **virtual**. The more virtual a designer the more challenging it

is to socialize with the team and be fully aware of the overall team dynamics. We can attribute prior experience with the practice and colleagues, professional practice protocols, educational, cultural, linguistic and technical backgrounds to **familiarity**, the more familiar the design the easier it is to collaborate. The compatibility of design production and representation between physical and virtual colleagues is a source of discomfort. People who prefer in-person work are used to working on hard copies and physical models while tech-savvy younger people do not need to print hard copies for design development, for example.

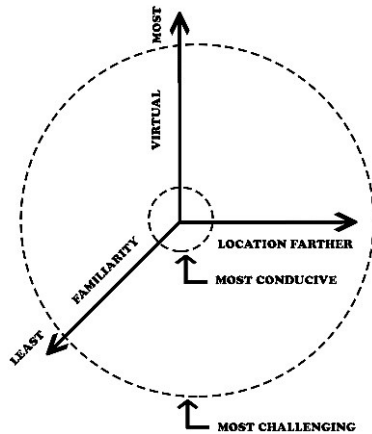


Figure 6. Draft conceptual framework depicting the relation between remote-ness, virtual-ness and familiarity

We need to identify and retain the achievements and potentials of virtual design collaborations and when it is not possible to bring practitioners together in a physical space to socialize and co-create, provide technological, managerial and physical adjustments to remote designers' workspace to make the virtual more like the studio.

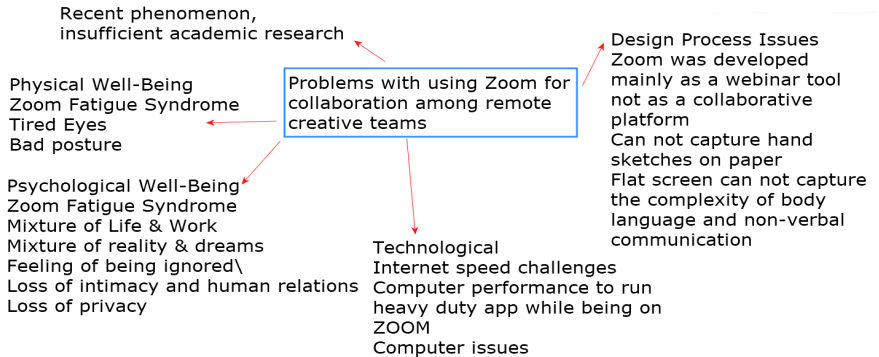


Figure 7. Challenges with using Zoom for design team collaboration

4. DESIGN SOLUTION

4.1. Affinity: A Plugin for Zoom

We are proposing additional capabilities on Zoom to better facilitate design teams' online collaboration.

Our proposed design solution is to create a plugin for Zoom that can allow team members to populate their profiles beyond a simple thumbnail side screen to represent who they are, their work, capabilities, achievements, and personal profile voluntarily shared in different levels of exposure, and also the context within which they work. This way one does not need to verbally share this background information with colleagues, but something readily available when a colleague is curious to find out.

4.2. Zoom User Profile Now Button

Customizable

Different Exposure levels: Manager(s), colleagues, friends: Hierarchy of Share

How do you feel today? Pull-down menu

What is going on with you and your family right now? e.g. celebrating a daughter's birthday, going to the mountains over the weekend

Available? Select time slots with priorities to talk to others

I will be back in 5 minutes

Upload your family/loved ones' pictures

Local Weather: auto-update hyperlink

Local News Headlines: auto-update hyperlink



Figure 8. Affinity plugin Profile mode

4.3. Studio Mode Button

Will Expand as another user places the cursor on your profile picture

Customizable

Automatically upload pictures of your current projects

Upload your favourite pictures

Ambient sounds

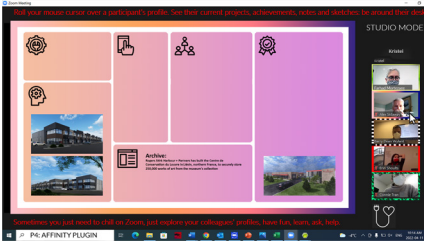


Figure 9. Affinity plugin studio mode

5. CONCLUSIONS

We also propose design firms need to reconsider the virtual, remote work and it can not be simply an employee working on their laptop or connecting through VPN. The workspace must be defined as a satellite studio and meticulously designed to represent the design establishment's vision, values and brand, to create a more conducive co-creating environment while still allowing the design to deal with minimum technology. Equipping the satellite studio with an appropriate desk, proper paper-size printer, 3D printer and even a coffee maker and a mini fridge and the IT infrastructure for colleagues to send prints directly to one's desk or replenish the mini fridge, office supplies, and cheer one another by sending goodie bags! There should be a plan view camera to allow designer sketch their thoughts versus the awkward act of scanning it and sending it to colleagues. The remote and virtual are here to stay, we can no longer treat them as an afterthought, we need to design them!

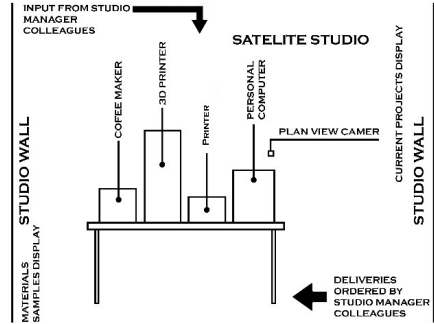


Figure 10. How to better setup satellite studios

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