Move, Collaborate, and Iterate: Improving the Work from Home Experience

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The coronavirus pandemic has caused a dramatic shift for knowledge workers around the world. People are working remotely from their homes for an extended period of time, causing several significant issues for well-being and productivity. In this position paper, we address the issues of reduced physical activity, spontaneous synchronous interactions, and feedback on work. For many workers, being confined to their home has eliminated much of the physical activity that was previously built into their day. To address this, we discuss technologies to support working on the move. Although video conferencing has served as an adequate replacement for in-person meetings, workers are missing the spontaneous and informal interactions that lead to diffuse thinking and novel ideas. Isolation at home also leads to a lack of feedback on work progress and accomplishments. We discuss technology-based solutions to tackle these issues, which can be applied to any remote working scenario.

1 INTRODUCTION

The COVID-19 pandemic has disrupted the regular routines of workers in nearly every industry. Leaving many without work at all or otherwise forcing people to work from home. In knowledge and information work in particular, working from home has become the new normal. This tidal shift presents an opportunity to look back at the standard workplace and consider where we can make improvements to our current and future work environments. For some companies, such as Twitter [23], working from home will continue after the pandemic is over, so it is also crucial for us to look deeper into the new challenges that are introduced when employees are geographically separated.

Working from home has introduced many changes for workers, eliminating the need to commute and necessitating the use of digital communication software for any collaboration. In this position paper, we will discuss the impacts and potential solution space for three major issues that we have identified: (1) physical activity, (2) synchronous collaboration and casual interactions, and (3) feedback on work progress.

The modern workplace before the pandemic, was already an environment with very little physical activity. By shifting work to home and eliminating commuting, many workers have now lost one of the only physically active components of their day. We consider active working solutions to this issue that can be applied to both the home office and the standard workplace.

Workers at home are physically isolated from their colleagues. Although the days may seem filled with interaction from back-to-back video conference calls, opportunities for informal conversation have been significantly impacted. We propose a solution to enable the kinds of casual interactions and spontaneous idea sharing that occur when workers are in the same physical location.

Finally, we will explore the lack of feedback experienced when working from home. Our work is much less visible when every employee is separated, so any casual recognition or feedback we normally receive from colleagues is missing from the home office. Fine grained and immediate feedback is important to enable workers to iterate on projects and feel satisfied in their accomplishments. How can we make our own work progress more visible to ourselves and our colleagues? We explore a tool to automatically provide feedback and potentially increase motivation.

2 WORKING WHILE WALKING

In the modern workplace we have intentionally designed an environment that requires very little movement. Digital communication and computer-based work mean that knowledge workers are stationary for most of the day. Office workers spend, on average, 71% of the workday sitting [8]. Moving office work to the home for the COVID-19 pandemic has only exacerbated this problem by eliminating opportunities for built-in physical activity.

Workers who typically use active transport means (i.e. walking or biking) to commute to work now find themselves needing only to commute to their kitchen table. This shift is particularly significant for cities where biking is frequent, such as the 168 European cities in which cycling is the most common mode of transportation for at least 25% of the population [11]. Even workers who regularly drive or take public transport would normally still accumulate some walking activity during the trek to and from the office.

Given that the regular work day mostly consists of sitting, and this problem has only increased due to the pandemic situation, how can we increase the amount of physical activity that is incorporated into the work day?

Walking meetings are one way to introduce movement into busy work schedules. Walking has been shown to reduce stress, weight, and risk of cardiac disease [5, 7], while improving mental health and creativity [16]. Recent work in HCI has explored walking meetings from several angles, addressing motivations [10] and persuasion [1], and exploring mobile [2] and infrastructure [9] prototypes. However, walking at work does not need to be limited to the traditional idea of a walking meeting, with colleagues strolling through a nearby park together. The concept can be extended to remote meetings, where participants can walk in separate locations with an audio connection. This is an extension of an idea proposed by Mueller et al. [15] where audio-connected users jogged together over a distance. Additionally, we can consider walking during work tasks in general, rather than just during meetings.

Advances in interaction technologies have significantly increased the feasibility of conducting work tasks on the move. Smartphones and tablets allow users to interact with visuals and documents in any location, and augmented reality (AR) can create more advanced visual experiences. Speech to text transcription already enables hands-free note-taking and conversation records, and use machine learning to develop intelligent artificial assistants to automatically record and annotate notes from meetings. A truly capable digital assistant, beyond our current technology level, would be able to appropriately answer emails and carry out tasks based on conversations with the user. From these examples, there is clearly a need for multiple modalities, particularly visual displays and audio input. Portable technology such as AR headsets, smart watches, and other wearables also expand our ability to be productive while in motion. Finally, smart interpretation of input is needed to fully implement complex tasks on the move.

We propose that technology to support work tasks on the move would be a useful area of research for HCI. Exploring the design space of both co-located and remote active collaborative work opens up the possibility to integrate physical activity into the work day both in pandemic scenarios and in a standard office environment. Whether the user is working from the office, a distant sales call, or their living room, technology should enable productive tasks while in motion, freeing workers from their desks and encouraging physically active workplaces.

3 INTERACTIONS AND FEEDBACK

Interaction and feedback in the workplace are important for skill development and motivation. Most of what employees learn on the job comes from informal interactions with coworkers, and workplace feedback is a crucial component of this learning process [21]. Employee satisfaction is also highly correlated with communication and feedback [6].

In many knowledge-based professions it can be difficult to measure and identify how much work has been accomplished in a day. With nearly all work being carried out digitally, there are no physical indications of progress and workers are often frustrated by their apparent lack of accomplishments. This problem is amplified when employees are working separately in their homes. In a regular office setting, employees receive both explicit and implicit feedback on their work from colleagues and supervisors.

Explicit feedback is often facilitated by regular meetings and check-ins with project leaders and team members. Structured exchanges such as stand-up meetings are put in place to encourage information sharing and feedback [19]. This scheduled, explicit feedback is relatively easy to adapt to a fully remote office environment by continuing to have regular meetings via video conferencing. Implicit feedback, however, is more difficult to recreate in the home office.

Implicit feedback, in our case, refers to comments, observations, and other input from colleagues in the office that are generally received in an unscheduled, spontaneous manner. A brief chat in the hallway or a conversation during a coffee break can lead to valuable input from a coworker who has previously tackled a similar problem. Praise from an office neighbor can provide a welcome morale boost during a difficult workday. These informal interactions and feedback loops are often missing when working from home. In a home office, interactions with colleagues tend to occur through an increased reliance on email or during scheduled virtual meetings with a defined purpose or topic.

How can we recreate the spontaneous generation and cross-pollination of ideas that regularly happens when people work in the same physical location? And how can we provide motivating feedback to people who are working alone? The following two sections will explore each of these issues.

3.1 Synchronous Personal Interaction

In a regular office environment there are frequent spontaneous face-to-face interactions that are held without a meeting agenda and lend themselves to serendipitous collaboration and diffuse thinking. Although it is important to limit face-to-face interactions during the coronavirus pandemic, we can recreate other aspects of these conversations that are typically lacking while working from home.

Two crucial aspects of spontaneous face-to-face interactions are synchronicity and a lack of constraint. Synchronicity is important to stimulate idea flow and engage users in the conversation. When using asynchronous messaging services (e.g. Email) we revisit conversations intermittently and rarely make the exchange the full focus of our attention. To recreate the value of in-person conversations remotely, we must enable synchronous communication. Lack of constraint is the second important aspect. The coronavirus pandemic has led to a significant increase in video conference calling [24]. Video calls are synchronous and engage both auditory and visual senses, but in many cases only occur when a meeting is scheduled to discuss a particular topic. Using video conferencing technology in this way replaces meetings, but it does not replace spontaneous casual conversations.

How can we recreate the spontaneous, synchronous, unconstrained conversation environment remotely that is so effortless when people are in the same physical location?

We propose a customizable virtual office environment to encourage increased interaction between geographically distant workers. The concept of a virtual office has been explored in the past through prototypes and case studies

[12, 17, 18]. Media Spaces [4] and Montage [20] are two examples of prototypes that were explored in the early '90s to create multi-modal interaction links between distant teams. These concepts would benefit from a re-evaluation with modern communication technology. A virtual office system recreates many of the dynamics of a real office, and allows colleagues to interact in a more casual and spontaneous manner. When a user is logged into the system they can do work in their own virtual office. If they choose to leave their virtual door open, coworkers can "enter" their virtual office, which initiates a video call. Multiple coworkers can visit at once, and the system simply expands the video conference call to accommodate the additional visitors. Users can also choose to close their office door, so colleagues can "knock" to request a visit before a video call is initiated. In this way, coworkers can drop in on one another for short chats, to ask questions, or just to visit. The dynamics are representative of a real office space, and users are able to control their level of privacy and availability. Beyond personal virtual work spaces that coworkers can visit, there should also be virtual common rooms where people can gather.

There are many open research questions surrounding this potential communication tool. How does the ability to virtually visit colleagues impact idea generation, productivity, and group morale? How should the interface be designed to be unobtrusive while working, but accessible enough to encourage use? Does this virtual office system effectively recreate the dynamics of a real office, or are the social dynamics altered in some way?

Designing systems to enable spontaneous personal interactions across remote distances can be valuable not only during a pandemic, but any situation where coworkers are geographically separated. There are many companies with teams in multiple locations that need to work effectively together. Increasing the interpersonal social dynamics of these teams could lead to more creative and productive collaborations across geographic boundaries.

3.2 Visible Feedback on Achievements

A lack of workplace feedback can have a negative impact on worker satisfaction and motivation [6]. It is important for workers to conceptualize their progress on projects and iterate on tasks. It is also often difficult to track accomplishments in the modern workplace, since a majority of our work is carried out digitally.

Virtual dashboards are a common tool for displaying corporate performance data such as sales and expenses. Personal dashboards are sometimes implemented for sales teams, since performance can be quantified relatively easily based on sales numbers, customer conversions, and similar metrics. Personal dashboards have also been explored for employee social media accounts [14] and tracking software projects [22]

Imagine a personal performance dashboard that is useful for any position in an information industry. Which metrics are the most useful to display? The answer is highly dependent on the position and industry, but a customizable personal dashboard could be developed by tracking activity on an employees computer and automatically converting the activity into quantifiable metrics. Bardram and colleagues proposed an Activity-Centric model that could work together with this concept to further increase productivity [3]. Ideally, the dashboard should show both tasks that are in progress as well as recent accomplishments. Figure 1 shows a personal performance dashboard for a hypothetical researcher.

An important aspect of progress tracking is to give the user an indication of how much that they have already accomplished, instead of just presenting a growing list of tasks to be done. The aim for these progress trackers is to serve as positive reinforcement, acting as "To Done Lists" to conceptualize how much the user is accomplishing on a daily and weekly basis. Customizable personal dashboards could provide workers with automatic and continuous feedback on their projects. Studies show that fitness trackers increase motivation for physical activity [13], so it is conceivable that this could transfer to work activities. How to select the best metrics to display, the most effective interface design, and the frequency with which to display the information to the user are all open research questions.
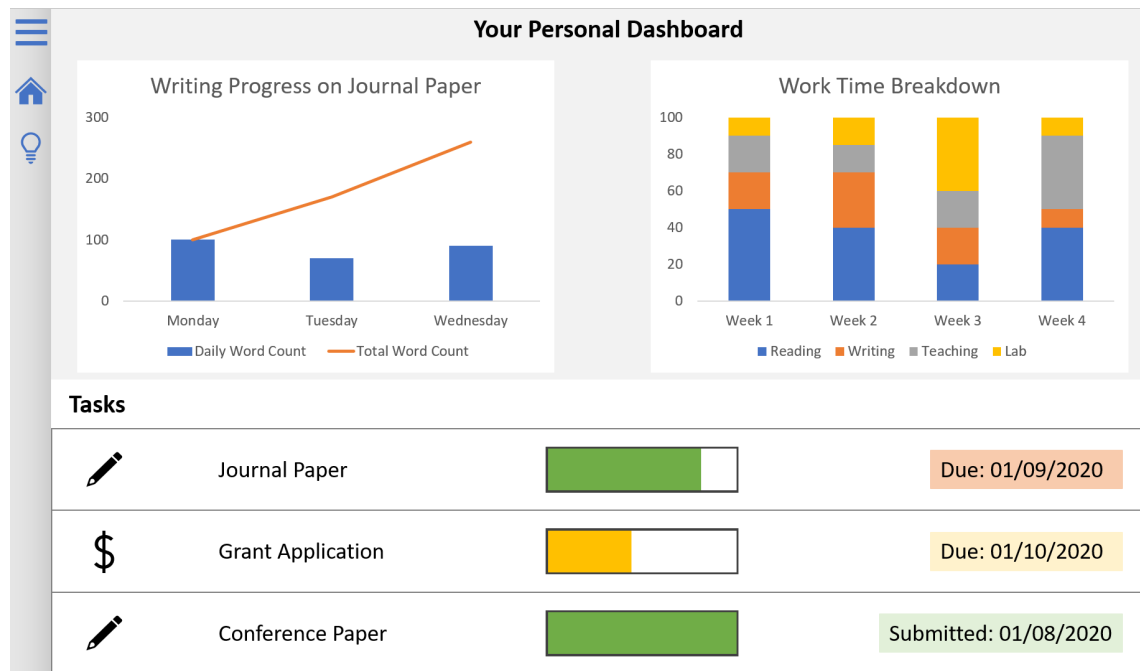
Fig. 1. Example Personal Dashboard for a hypothetical researcher.

4 THE FUTURE WORKPLACE

The workplace as we know it has been largely disrupted by the COVID-19 pandemic. Many knowledge workers are operating remotely from their homes while companies attempt to continue to foster productive environments. Despite certain positive aspects of working from home, there are several issues that arise when workers are not operating in the same physical space.

In this position paper we explored three prominent issues that arise in home office scenarios: reduced daily physical activity, spontaneous interactions, and feedback. These three issues are essentially separate, but all affect both work productivity and employee well-being. We have proposed solutions to each of the issues raised, and identified potential directions for future research projects. In designing the future of work, it is crucial that both well-being and productivity are included as key design components.

ACKNOWLEDGMENTS

REFERENCES

[1] A. Ahtinen, E. Andrejeff, C. Harris, and K. Väänänen. 2017. Let's walk at work: persuasion through the brainwolk walking meeting app. In *Proceedings of the 21st International Academic Mindtrek Conference on - AcademicMindtrek '17*. ACM Press, Tampere, Finland, 73–82. https://doi.org/10.1145/3131085.3131098

[2] A. Ahtinen, E. Andrejeff, M. Vuolle, and K. Väänänen. 2016. Walk as You Work: User Study and Design Implications for Mobile Walking Meetings. ACM, Gothenburg, Sweden, 1–10. https://doi.org/10.1145/2971485.2971510

[3] Jakob E. Bardram, Steven Jeuris, Paolo Tell, Steven Houben, and Stephen Voida. 2019. Activity-Centric Computing Systems. *Commun. ACM* 62, 8 (Aug. 2019), 72–81.

[4] Sara A. Bly, Steve R. Harrison, and Susan Irwin. 1993. Media spaces: bringing people together in a video, audio, and computing environment. *Commun. ACM* 36, 1 (Jan. 1993), 28–46. https://doi.org/10.1145/151233.151235

[5] John P. Buckley, Alan Hedge, Thomas Yates, Robert J. Copeland, Michael Loosemore, Mark Hamer, Gavin Bradley, and David W. Dunstan. 2015. The sedentary office: an expert statement on the growing case for change towards better health and productivity. *British Journal of Sports Medicine* 49, 21 (Nov. 2015), 1357–1362. https://doi.org/10.1136/bjsports-2015-094618 Publisher: BMJ Publishing Group Ltd and British Association of Sport and Exercise Medicine Section: Consensus statement.

[6] Melanie Bull and Tim Brown. 2012. Change communication: the impact on satisfaction with alternative workplace strategies. *Facilities* 30, 3/4 (Jan. 2012), 135–151. https://doi.org/10.1108/02632771211202842 Publisher: Emerald Group Publishing Limited.

[7] Lucas J. Carr, Kristina Karvinen, Mallory Peavler, Rebecca Smith, and Kayla Cangelosi. 2013. Multicomponent intervention to reduce daily sedentary time: a randomised controlled trial. *BMJ Open* 3, 10 (Oct. 2013), e003261. https://doi.org/10.1136/bmjopen-2013-003261 Publisher: British Medical Journal Publishing Group Section: Public health.

[8] Stacy Clemes, Sophie O'Connell, and Charlotte L. Edwardson. 2014. Office workers objectively measured sedentary behavior and physical activity during and outside working hours. (Jan. 2014). https://repository.lboro.ac.uk/articles/Office_workers_objectively_measured_sedentary_behavior_and_physical_activity_during_and_outside_working_hours/9624851 Publisher: Loughborough University.

[9] Ida Damen, Rens Brankaert, Carl Megens, Pieter van Wesemael, Aarnout Brombacher, and Steven Vos. 2018. Let's Walk and Talk: A Design Case to Integrate an Active Lifestyle in Daily Office Life. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems (CHI EA '18)*. ACM, Montreal QC, Canada, 1–10. https://doi.org/10.1145/3170427.3174353

[10] Ida Damen, Carine Lallemand, Rens Brankaert, Aarnout Brombacher, Pieter van Wesemael, and Steven Vos. 2020. Understanding Walking Meetings: Drivers and Barriers. In *CHI*. ACM, Honolulu, HI, USA, 14. https://doi.org/10.1145/3313831.3376141

[11] EPOMM. [n.d.]. TEMS - The EPOMM Modal Split Tool. http://www.epomm.eu/tems/index.phtml Library Catalog: www.epomm.eu.

[12] Shinkuro Honda, Hironari Tomioka, Takaaki Kimura, Takaharu Ohsawa, Kenichi Okada, and Yutaka Matsushita. 1997. A virtual office environment based on a shared room realizing awareness space and transmitting awareness information. In *Proceedings of the 10th annual ACM symposium on User interface software and technology (UIST '97)*. ACM, Banff, Alberta, Canada, 199–207. https://doi.org/10.1145/263407.263547

[13] Ara Jo, Bryan D. Coronel, Courtney E. Coakes, and Arch G. Mainous. 2019. Is There a Benefit to Patients Using Wearable Devices Such as Fitbit or Health Apps on Mobiles? A Systematic Review. *The American Journal of Medicine* 132, 12 (Dec. 2019), 1394–1400.e1. https://doi.org/10.1016/j.amjmed.2019.06.018 Publisher: Elsevier.

[14] Shiri Kremer-Davidson, Inbal Ronen, Avi Kaplan, and Maya Barnea. 2017. "Personal Social Dashboard": A Tool for Measuring Your Social Engagement Effectiveness in the Enterprise. In *Proceedings of the 25th Conference on User Modeling, Adaptation and Personalization (UMAP '17)*. ACM, Bratislava, Slovakia, 122–130. https://doi.org/10.1145/3079628.3079664

[15] Florian Mueller, Shannon O'Brien, and Miles Thorogood. 2007. Jogging over a distance: supporting a "jogging together" experience although being apart. 2579–2584. https://doi.org/10.1145/1240866.1241045

[16] Marily Oppezzo and Daniel L. Schwartz. 2014. Give your ideas some legs: The positive effect of walking on creative thinking. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 40, 4 (2014), 1142–1152. https://doi.org/10.1037/a0036577

[17] Claudia Schremmer. 2006. Case study for a virtual office tailored to the digital media production industry. In *Proceedings of the 20th conference of the computer-human interaction special interest group (CHISIG) of Australia on Computer-human interaction: design: activities, artefacts and environments - OZCHI '06*. ACM Press, Sydney, Australia, 349. https://doi.org/10.1145/1228175.1228242

[18] Markus Sohlenkamp and Greg Chwelos. 1994. Integrating communication, cooperation, and awareness: the DIVA virtual office environment. In *Proceedings of the 1994 ACM conference on Computer supported cooperative work (CSCW '94)*. ACM, Chapel Hill, North Carolina, USA, 331–343. https://doi.org/10.1145/192844.193041

[19] Viktoria Stray, Dag I. K. Sjøberg, and Tore Dybå. 2016. The daily stand-up meeting: A grounded theory study. *Journal of Systems and Software* 114 (April 2016), 101–124. https://doi.org/10.1016/j.jss.2016.01.004

[20] John C. Tang, Ellen A. Isaacs, and Monica Rua. 1994. Supporting distributed groups with a Montage of lightweight interactions. In *Proceedings of the 1994 ACM conference on Computer supported cooperative work (CSCW '94)*. ACM, Chapel Hill, North Carolina, USA, 23–34. https://doi.org/10.1145/192844.192861

[21] S.I. Tannenbaum, R.L. Beard, L.A. McNall, and E. Salas. 2010. Informal learning and development in organizations. *Learning, Training, and Development in Organizations* (Jan. 2010), 303–332.

[22] Christoph Treude and Margaret-Anne Storey. 2010. Awareness 2.0: staying aware of projects, developers and tasks using dashboards and feeds. In *Proceedings of the 32nd ACM/IEEE International Conference on Software Engineering - Volume 1 (ICSE '10)*. ACM, Cape Town, South Africa, 365–374. https://doi.org/10.1145/1806799.1806854

[23] Twitter. 2020. Coronavirus: Staying safe and informed on Twitter. https://blog.twitter.com/en_us/topics/company/2020/covid-19.html Library Catalog: blog.twitter.com.

[24] Zoom. 2020. A Message to Our Users. https://blog.zoom.us/a-message-to-our-users/ Library Catalog: blog.zoom.us.