Envisioning, designing, and implementing the user interface require a comprehensive understanding of interaction technologies. In this forum we scout trends and discuss new technologies with the potential to influence interaction design. **— Albrecht Schmidt, Editor**

Technologies for Healthy Work

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The majority of interactive systems are designed to support specific tasks. Evaluations are typically aimed at how well the systems support these tasks and create positive user experiences. A text-input technique is evaluated on input speed and ease of use concerning the immediate goal at hand. However, a larger context is being ignored. If the new technique is used as a general text-input method by a user, how will this impact the person over the next 20 years? How will it affect their cognitive abilities and health? Most of the time, we simply do not ask these questions, despite their obvious importance. By optimizing for specific tasks and designing for a short-term context rather than looking at the bigger picture, we create amazing and engaging technologies that may really harm us in the long term. Many technologies are sparking concerns about their long-term harm, including social networks, writing tools, entertainment systems, and games.

At the same time, technologies are now available that increase our degrees of freedom when designing interactive systems. Sitting at a desk and writing with a keyboard or reading documents on screen, sitting in a room to watch a presentation—all are ubiquitous practices in our workplaces and schools. Historically this was understandable, as writing by hand at a desk or a blackboard was efficient. However, with new technologies such as speech input, automatic transcription, large screens with high resolution, and wearable displays, we should fundamentally question how we design systems. We should ask which technologies both support the task and keep us healthy in the long term.

NO MOVEMENT REQUIRED

The history of our working lives has followed a steady trajectory toward little to no movement. In the earliest days, most jobs were manual jobs, from blacksmithing to farming. Over time we have developed increasingly sophisticated technologies to reduce the amount of physical effort required in the workplace. Today, over a quarter of the work we do is sedentary [1], which has introduced new health problems despite the benefits from reducing the amount of heavy and demanding physical labor in the modern economy.

This transition toward reduced movement in the workplace has occurred in more subtle ways too, beyond the obvious increase in office jobs relative to the past. Work within the office was once carried out completely by hand, and we delivered papers to colleagues by walking to their offices. Today, email, video conferencing, and ergonomic keyboards have reduced our movement significantly, and the trend is continuing in this direction. Voice interfaces such as Amazon's Alexa are growing in sophistication and usefulness, and more subtle interaction mechanisms like gaze tracking are beginning to enter the commercial space. With such advances, less and less physical effort is required. Looking further into the future, the vision of direct brain-computer interaction could remove the need for physical interfaces, allowing users to simply sit and think to accomplish their tasks.

Insights

- → Historically we have designed movement out of the workplace.
- → We can design technologies to support physical activity at work.
- → The HCI community should design for both productivity and physical and mental health.

REINTRODUCING THE PHYSICAL

Advances in interaction techniques are exciting and full of potential, but it is important to take a step back and examine our trajectory. Reducing the amount of manual labor in the workplace makes our lives easier, but it is resulting in a large portion of the population that does little significant movement at work for days at a time. We need to focus our attention and research on developing ways to intentionally reintroduce physical activity into the workplace.

A useful perspective on this issue arises when we examine the goals we set while designing technology. What do we optimize for when we design technologies to support people doing work? Efficiency? Productivity? Convenience? User experience? This list seems obvious, but who benefits from these targets? The history of the modern workplace is a story of apparently easier working conditions for staff and increased productivity

IMAGE BY NIK SVOBODEN / SHUTTERSTOCK.COM

from the standpoint of companies. Physical health has made gains in importance in the past 100 years, but primarily within the narrow view of workplace safety. Is it still enough to head in this direction?

What would the design targets look like if we instead optimized for the needs of people, the needs of the human in the workplace? Physical and mental health? Meaningful human interaction? Happiness? Personal growth? In the real world, the challenge moving forward will be to incorporate these human-centered goals with the original goals of productivity and efficacy.

HEALTHY TECHNOLOGIES FOR THE WORKPLACE

What kinds of technologies can we develop with workers in mind to improve physical and mental health in the workplace? In our lab we currently explore how technology can be used to move toward a more humane workplace and healthier work practices. The following explains this in three concepts.

Example: Walking meetings. In ancient Greece, Socrates, Aristotle, and other scholars would walk while they discussed, taught, and learned. In contrast, today we conduct meetings and classes indoors seated firmly in chairs. There has been a recent push toward increasing mobility through standing desks and walking seminars [2,3]. What technologies are required to support walking meetings so that they are as convenient as sitting in a meeting room?

Despite the trend toward sedentary lifestyles, many recent advances in technology have actually increased our ability to be mobile. Entertainment on the go is possible through a tablet or smartphone, versus the tethering nature of a television in a single room of your house. Similarly, advances in speech recognition and text interpretation mean we can develop an intelligent artificial meeting assistant to record notes during a mobile walking meeting. Technology can enable us to accomplish tasks on the move with the same level of support and productivity that once required a desk and a notepad.

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Example: Face-to-face conversations. Advances in communication technology mean that we are more connected than ever before to people across the globe. In spite of this connectedness, the simplicity in communicating digitally has noticeably reduced how often we experience face-to-face social interactions. Interacting in person has been shown to improve mood and even boost work performance [4]. However, conversations have been intentionally designed out of the workplace through workflow systems, email, and messaging to increase apparent productivity and increase accountability.

There is an opportunity to investigate ways to reincorporate personal social interactions at work through technology. Small gestures through technology can have a profound effect in encouraging new behaviors. For example, we could implement a location-aware tool that prompts you to

With digital technologies such as head-mounted displays, meetings can be conducted while on the move in a park.

Traditionally we can see and understand the results of our work. Sewing on a button gives instant gratification and a physical reminder of your accomplishment over time. Comparatively, digital work provides little tangible evidence of progress.

go chat with a colleague in the next office over when you try to send them an email, or arranges corresponding coffee breaks to discuss an issue in person rather than sending digital messages down the hall.

Example: Increasing tangibility in a digital workplace. Modern knowledge work is predominantly and increasingly digital. It can often be very difficult to conceptualize the amount of work that has been accomplished in a given day, because there are no physical indications of progress.

A carpenter may start the week with a stack of fresh wood from the lumberyard, and by the end of the week she may be able to sit in the new chair that she has crafted. The physical products that are produced in many traditional professions lend themselves to feelings of accomplishment and satisfaction. In digital work, however, the tangibility of progress has been removed. Even the stacks of paper in inboxes and outboxes have been removed, leaving office workers with only abstract concepts of their accomplishments. How can we create visible and understandable work results for digital work?

We can create tangible representations of data known as physicalizations (physical + visualization) to convey information in three-dimensional physical space [5]. Physical representations of abstract concepts can heighten our experience and understanding by engaging multiple senses at once. A physicalization of data can be touched, seen, or even smelled, rather than just displayed as charts on a screen. If we create tangible physicalizations of how much a worker has accomplished in a day, will this increase their job satisfaction?

LOOKING TO THE FUTURE

The future workplace should be one that is intentionally designed to support the physical and mental health of people. Technology designers have an opportunity to shift the trajectory to create spaces and tools that are developed to cater to the human needs of people in the workplace, without compromising their ability to create value.

In a world continuously undergoing digital transformation, we need to make intentional decisions about the roles we define for humans. Developing intuitive interaction methods to decrease the cognitive load involved in using technology frees up mental bandwidth for more useful tasks. We should continue striving to offload repetitive tasks and heavy calculations to computers, and use increasingly sophisticated artificial intelligence technologies to solve problems with large datasets. Using technology to solve the problems it is well suited to solve can allow humans to solve the creative and divergent problems that computers are not yet able to tackle. A truly efficient workplace is one where computers and humans are each working on the types of problems to which they are best suited, and where only the computers—not the humans—are treated like machines.

ENDNOTES

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