Workplace Monitoring through the Lens of Future Information Workers

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Abstract

Emerging technologies are transforming all areas of life, and the information workplace is at the forefront of innovation. Passive sensing technologies, with significant potential to monitor human behavior and offer insights, are particularly effective for information workers, as their computer-centric tasks enable seamless integration. These technologies can potentially provide valuable insights to support workers by tracking well-being and performance. Prior research has examined various stakeholders' views, such as managers and employees, on workplace monitoring and its contesting notions of worker well-being and performance. However, with the fast-paced advancements in information technology and increasing anxiety among university students, attitudes regarding workplace culture and practices can impact the desirability and choice to pursue career options in Computer Science (CS). In this study, we recruited 20 university CS students to understand their perspectives on these technologies as future workers. Our findings surface how students perceived such technologies, whether and how their views differ from current workers, and how their views on organizational culture changed based on its adoption. From our findings, we propose initial implications for the design and adoption of future workplace monitoring technologies.

CCS Concepts

• **Human-centered computing → Empirical studies in HCI**.

Keywords

workplace surveillance, workplace monitoring, information work, technology, computer science, students, stakeholder

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1 Introduction

Despite increasing enrollment numbers in STEM fields, the US Department of Defense recently warned of a shortage of graduates to meet the future needs of the domestic Science, Technology, Engineering, and Mathematics (STEM) workforce [1]. Further, the U.S. Department of Labor estimated that between 2008 and 2018, a quarter million computing jobs opened in the U.S [20]. Additionally, the U.S. Bureau of Labor Statistics determined that employment in computer and information technology occupations is projected to grow much faster than the average for all occupations from 2023 to 2033. More than 350,000 openings are projected each year, on average, exceeding what the U.S. Department of Labor estimated for an entire decade previously [2]. With the fast-paced advancements in information technology and increasing stress and anxiety among university students [19], attitudes regarding workplace culture and practices can impact desirability and choice to pursue career options. However, the perceptions of Computer Science (CS) students, who are future information workers, on the information workplace and its practices are largely underexplored.

There have been numerous efforts within the HCI community to design effective technologies to track health and behavioral markers among various populations continuously. Such efforts can range from mobile sensing to wearable tracking [10, 15, 16]. Passive sensing can measure data at the most granular level, including how productive, stressed, or physically active someone is [13, 14, 17, 21, 22]. With the increase in development and adoption of passive sensing technologies, the information workplace is increasingly looking for similar integration to measure both employee performance and well-being. One class of such techniques is Automated Emotion Recognition (AER) through Computer-based sensing, which can potentially classify someone's emotional response to stimuli. But recently there has been more scrutiny on the reliability and accuracy of these technologies [5, 6, 11]. Further, the dual-edged nature of sensing and the contesting notions of well-being and productivity has lighted conversations about employees' perceptions and the socio-technical aspects of integrating monitoring technologies in the workplace [9]. In our study, the central research question is: *What are future information workers' attitudes regarding workplace*

monitoring and how can this inform future design of workplace monitoring technologies? To answer our research question, we conducted semi-structured interviews with 20 university CS students to understand their attitudes and notions regarding workplace monitoring technologies, particularly AER.

2 Related Work

Large companies are deploying monitoring tools in the workplace, which may increasingly include AER [8]. Given their limitations, there has been growing concern among workers about deploying AER in the workplace. In a recent study, Roemmich *et al.* [18] conducted semi-structured interviews with US adult workers with and without being subject to AER in the workplace and found that workers view the use of such technology by management as a privacy violation and that they may be exposed to a wide range of harms as a result of their deployment. In a study by Boyd *et al.* [3], researchers analyzed 86 patent applications that developed emotion recognition technologies to be potentially used in the workplace and found that such technologies scoped data collection broadly, claiming to reveal not only targets' emotional expressions but also their internal states and also prompted a wide range of actions, many of which impact workers' employment and livelihoods. Similarly, in another study by Kawakami *et al.*, interviews with 33 participants across stakeholder groups revealed how workers envisioned these technologies leading to cascading impacts on their broader organizational culture, interpersonal relationships with colleagues, and individual day-to-day lives [12]. A recent study by Chowdhary *et al.* revealed how workers are vulnerable to "meaningless" consent as they may be subject to power dynamics, minimizing their ability to withhold consent. [7]. While these works have produced interesting insights and raised concerns of workers, some perspectives are missing. CS students are future information workers, and thus, it is important to explore how CS university students might respond to workplace monitoring technologies employed to support their emotional well-being by their future employers for a full picture of the impact such technology might have in the industry.

3 Method

3.1 Data Collection

Participants were recruited using university list-servs and word-of-mouth. The inclusion criteria was for a participant to be (i) 18 years or older and (ii) a university student in CS. Prospective participants were invited to complete a preliminary intake survey. Once the research team received their response, the participants were sent a Calendly [1] link to provide their availability for scheduling an interview. Interviews were conducted both on Zoom and in person. Researchers and participants had their videos turned on during the interview, but only audio files were used for analysis. Participants who were uncomfortable turning on their video partook in an audio-only interview. We used Zoom's live transcription feature to automatically transcribe interviews, revised transcripts using Otter.ai [2], and manually verified them to improve accuracy.

[1] https://calendly.com/
[2] https://otter.ai/

3.2 Interview Protocol

The interview questions were included in a broader need-finding study to understand CS students' mental health [6]. This work features a subset of the collected data that focuses on their perceptions of workplace monitoring tools, specifically AER. The participants were asked about their perspectives and experience with AER technologies in general, specifically when used for workplace monitoring. This study reports on questions that address specific elements relevant to the central research question of this manuscript. Interviews were conducted from 27 December to 15 March 2023. The interview protocol consisted of four phases. In phase 4, we asked our participants their views regarding and experience being subject to workplace monitoring (if any). Interviews lasted approximately 60 minutes (M=48) and were primarily conducted remotely over Zoom. Participants received $10 (USD) compensation for their time at the conclusion of the interview via an Amazon Gift Card or University Payroll. More details on interview protocol can be found in [6].

3.3 Analysis

We used Braun and Clarke's thematic analysis framework to analyze interview data using a mix of inductive and deductive codes [4]. After conducting interviews with all 20 participants, the researcher independently coded the transcripts using open coding and identified emergent themes. A total of 20 transcripts were coded by two researchers. We used Dedoose [3] to code the interviews and achieved a Cohen's kappa value of 0.77 after two rounds of iteration (0.56 to 0.77). Throughout the analysis process, the team engaged in iterative and collaborative discussions to resolve disagreements and identify themes. Our final codebook contained a set of 20 codes arranged into multiple high-level themes [6]. One of the themes was on student attitudes regarding workplace monitoring as future information workforce.

4 Preliminary Results

We asked about university CS students' perspectives regarding workplace monitoring technologies. Most (18/20) participants were aware of such a technology being used in industry and showed interest in learning more about it. However, there was a mix of opinions regarding such a technology among participants.

4.1 Harmful Implications of Workplace Monitoring

Most (14/20) viewed such technologies as a violation of privacy. For example, P1 and P5 have been subject to workplace monitoring themselves during their industry experience. P5 was initially concerned about the software tracking his data but eventually learnt to deal with it emotionally. Some technology companies' monitoring policies are intense, whereas some are not, reflecting on whether there was any industry standard for such monitoring. For some employers, it is blocking websites that belong to the entertainment industry; for others, it is keeping track of how efficiently an employee works (P13, P17). Participants believed that data collected by such tools should not be leveraged for profit nor employed to coerce employees into greater effort. In P16's words:

[3] https://www.dedoose.com/

> *"I think the question is to what extent are they monitoring? Are they recording screens? Are they looking into personal data? If it is just tracking how many hours I worked or moderating specific applications like Visual Studio, that would make sense in my opinion, because, all right, you can see how much code I'm getting done especially without monitoring my screen during certain hours of the day..."* (P16)

Other reasons why participants thought workplace monitoring technologies are harmful is because their efficiency might be non-linear with respect to time and these trackers may not be able to account for that. For example, P1 mentions using such a technology at a large technology company during their summer internship where an automatic bot would monitor if the employee sent emails outside regular working hours. Even though the application actually received positive response in the broader organization, P1's experience was different.

> *"I did an internship at [a large information technology company], and, they researched, productivity tracking,... I think at this point, what I've mainly learned is that it's not exactly the hours that you're working, like, if you're always productive, rather than if you spend select time that you're feeling creative on what's super important."* (P1)

4.2 Reasons for Acceptance of Workplace Monitoring

Some participants mentioned that workplace monitoring helps identify if employees are extremely negligent. P5, was subject to such technology for 2 years before starting their graduate program. Initially, they were very stressed about its use but eventually understood that it should not be a problem for someone who works sincerely on job-related tasks and does not misuse their time. However, it might make sense for businesses to track efficiency of their employees, especially workers who may be negligent of their work. In P2's words:

> *"There may be possibilities that employees are just passing time and that can be a great loss for the entire company, so in that case it's very necessary to track the employee, and, secondly, if he or she is doing some malpractices in their work, it can be helpful [to track] in that case."* (P2)

But, in these circumstances, workers may find things to deceive such software when they are being used for extorting their efforts. In P0's words, *"even to get around that, if they're tracking mouse activity, there are little mouse jugglers on Amazon. So you're always online, even if you're just sitting on your couch. So it is not extremely effective."*

Additional reasons that participants were accepting of such technologies included being accountable for the pay received (P5, P15, P16) or for managing their own well-being (P1). P1 found the technology to be helpful to manage his well-being, especially in scenarios such as the software alerting him when he is on his work email at night. In P1's own words:

> *"I think it depends on whether the tool is only telling you if you're too stressed out versus sending that data to your supervisor; those are two very different things. It would be better to do it anonymously if you're going to send it [to alert] the supervisor, but might also be good if it's not shared at all."* (P1)

Overall, participants expressed that their comfort with such technologies would be improved with increased transparency (5/20) and reduced reliance on such technology as means to mistreating employees leading to a toxic workplace (3/20). Employers should trust their employees (P12), however, participants agree that the expectation is for employees to be giving their time to the company. In P12's words:

> *"The bond between an employer and employee should be such that you should be able to tell them that you are stressed, and if you are, take help from them. Not something where they have to track."* (P12)

5 Discussion & Conclusion

By examining the attitudes of future information workers toward workplace monitoring technologies, our preliminary findings contribute to bridging the gap between emerging workforce expectations and current organizational practices. Consistent with prior studies on U.S. adult workers [18], our participants viewed AER in surveillance contexts as a violation of privacy and a potential source of harm. Additionally, our findings highlight that future workers are cognizant of workplace power dynamics, as reflected in statements such as being "accountable for the pay received." In contrast, current employees express concerns that the adoption of such technologies could negatively affect interpersonal relationships with colleagues [7]. Notably, future workers appear to approach the workplace with an expectation that they should be able to openly communicate stress with their managers. Therefore, the design and adoption of workplace monitoring tools should consider diverse stakeholder perspectives, as these tools can potentially impact students' desirability to choose those career trajectories in the future. Building on this foundation, we plan to: (i) continue probing this topic to explore multiple stakeholder views around technology governance and (ii) interview and survey current students and employees who chose alternative careers to information work. We will also solicit feedback about their work habits and willingness to adopt workplace monitoring tools. As a result, the expected contributions of this work include design guidelines for workplace monitoring technologies in the information workplace.

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