



**What're You Looking At? Digital Monitoring
Software and Effects on Employee
Contextual Performance**

by

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A thesis draft submitted in fulfillment of the requirements of the Michigan Ross Senior Thesis Seminar (BA 480), April 20, 2023.

Acknowledgements

This culmination of my educational career could not have been made possible in any way, shape, or form without the unconditional love and support of everyone I've learned from thus far in life. From my parents to my sister to my friends to the educators who have encouraged and challenged me, I will forever be grateful for the experiences you've instilled in me and the lessons I've internalized throughout. There will never be enough words to express my gratitude nor actions to repay you all for the gifts you've given me, but I hope this is in some form a way I can start to do so.

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Abstract

The advent of digital technology has been fundamentally transformative to the workplace. From remote work to instantaneous communication and the ever-increasing prevalence of machine learning, these tools force revolutionary updates across the professional world from management strategy to public relations alike. Traditional forms of employee evaluation in particular are experiencing a uniquely stressful situation in terms of adapting to this new environment. The framework for evaluating employees in an industrial environment, as put forth by groundbreaking research Frederick Taylor and is widely adopted today by corporate culture at large, relied on raw output as measures for productivity. Many early magnates including Henry Ford adopted his recommendations for boosting productivity to wild success. However, many criticized Taylorist methods of evaluation as being innately reductive, dehumanizing, and generally invalid in terms of evaluating the employee outside of performance alone. Critics pointed out that performance in a workplace went far beyond mere output, and thus different frameworks of performance began to emerge. One dimension in particular, contextual performance, rose in popularity as it was seen to measure performance outside the workplace's assigned tasks, focusing more on how the employee contributes to the psychological and social wellbeing of the organizational unit. Contextual performance is seen as a more eclectic means of gauging how employees perform, often being considered suited for roles that are more subjective in nature. In the modern context, many managers are attempting to utilize digital monitoring technology (technology that tracks and automatically gauges an employee's performance based on particular measures) to quantify more abstract notions of contextual performance, which are highly situational and circumstantial as the name suggests. With the digital monitoring software industry exploding combined with firms openly admitting to not implementing such software accurately, this thesis will look into how contextual performance within a particular task is affected by digital monitoring technology when its application is not necessarily appropriate for the particular task assigned.

Introduction

The formula for maintaining profit is simple: keep costs low and revenues high. This is the underlying mechanism pushing business operations forward, manifesting in multiple avenues from increasing competitiveness between firms to keep their products and services up to date to decreasing unnecessary expenses. In any firm, the largest variable cost tends to be labor. Therefore, most businesses are keenly interested in evaluating labor to ensure output (measured as productivity) generates more than input (wages to labor.) In pre-industrial societies, production-oriented professions were performed by a relatively small scale workforce in localized scales, making widespread monitoring unthinkable and unnecessary. However, the increasing speed of the economy given the advent of the industrial revolution called for an updated style of workplace management to better reflect the needs of this expedited reality. This was met by Frederick Taylor, an American scientist whose recommendations revolutionized the discipline and standards of productivity for workers, though his efforts were not met without significant criticism as being dehumanizing. With the economy transforming yet again into a primarily digital ecosystem, further criticisms of so-called Taylorist styles of management have flared with newfound recognition and wrath. A system designed for the industrial age and its tasks has been called into significant question as to its relevance in the digital age, whose workforce is significantly more decentralized, fragmented, and performing more subjective tasks. In particular, as understanding of what constitutes acceptable performance evolves, newer categories of performance and productivity are introduced in the business world. One outgrowth, contextual performance (or activities that contribute to the core of the organizations outside assigned tasks) has gained newfound importance in post-industrial economy, and how

management evaluates this type of performance is critical for ensuring the workforce of today does not succumb to the disarray of yesteryear.

Statement of Problem

The thesis' purpose and primary research question is to document how the presence of digital monitoring technology impacts contextual performance in a professional environment. It will attempt to show how employees who perceive digital monitoring tools as being untethered to the task at hand or even evaluating the wrong aspects of performance have increased negative associations with the management strategy of the company, leading to less willingness to engage in tasks as well as participate in activities pertaining to workplace culture, a vital component of contextual performance. To study this, I hypothesize that increased levels of perceived digital monitoring technology in the workspace is correlated to less willingness to engage in activities constituting contextual performance. I anticipate these findings will be consistent with the growing plethora of modern research indicating that the real benefits associated with digital monitoring tools are being depleted due to their widespread implementation without cautious consideration as to how such tools complement the work at hand.

Justification of Problem

The onset of the COVID-19 pandemic caused significant gains for the digital monitoring software industry. Lockdown protocols worldwide forbade in-person office environments, forcing many to work remotely if they continued working at all given the growth in resignations and the resultant labor shortage that persists to this day as of writing this in 2023. As a result, companies worldwide turned to digital monitoring software tools to address the lack of in-person supervision. Even before COVID, digital surveillance tools were gaining popularity because of their perceived impecunious nature. In 2019, 80% of large firms stated they were implementing

some form of digital monitoring technology, yet in the same survey only 32% of these firms stated they believed the implementation was being done wisely (Kalischko, 2021.) This is concerning for obvious reasons, as not only does the blatant mismatch create inefficiencies in operations, but this creates further feelings of isolation and distrust in workers which had already been growing prior to the pandemic. In fact, one 2011 study found that a perceived mismatch between monitoring and relevance to the employee's tasks can actually incentivize further misbehavior (Posey et al, 2011.)

Yet the unprecedented growth of the digital monitoring industry in 2020 and beyond implies that such technologies are here to stay, especially given the persistent labor shortage requiring alternative supervisory techniques to be implemented. Demand for digital monitoring tools was 58% higher between March 2020 and early 2022 compared to 2019, and moving into 2022 the first quarter indicates steady growth at 75%, the largest since the pandemic began (Migliano, 2022.) While this is great news for the digital monitoring industry, the workforce at large might be adversely affected by this growth given the aforementioned trend of haphazard implementation.

While studies have already shown that seemingly incongruent uses of monitoring technologies have adverse impacts on individual performance and productivity broadly (such as causing more mistakes in work or leaving potential talent apprehensive to companies implementing such technology), there are still dimensions of performance in the workplace as a concept which have yet to be fully explored (DiFabio, 2023.) One such area is that of contextual performance, defined earlier as being activities which contribute to the core of an organization without being explicitly assigned to workers. Contextual performance in particular, which relies heavily on non-objective standards of evaluation, might be at significant risk of adverse effects

from digital monitoring technologies. Therefore, digital monitoring technology might not adequately address or facilitate this type of performance despite its criticality to the workplace community. The question of how monitoring techniques impact performance is especially critical to consider in the modern age, as the digital monitoring software often attempts to mirror techniques viable during the industrial age. However, the need to update techniques as well as the technology used to carry out such techniques is worth considering, and thus if the underlying theory behind many implementations of monitoring technology is not necessarily suited to the conditions of the environment it is situated in, then alternatives and a reevaluation of what techniques are used must be considered.

This research therefore serves to further examine how digital monitoring is used, what sorts of workforces are most positively impacted by it, and how companies can effectively incorporate it into the digital environment without compromising employee attitude and subsequent performance.

Literature Review

Historical Background: Revolutionary Evaluation Methods for a Revolutionary Economy

The early industrial revolution was marked by general disarray in arranging the workforce. Most workers, displaced from their localized professions and thus forced into industrial life, found their new workplaces constricting and generally unfulfilling. Conditions in the urban environment were deteriorating, with squalor and slums becoming commonplace as cities refused to accommodate the massive influx of people urbanization wrought. Business owners, unable to initially this unprecedented shift in society, searched for a more standard form of evaluation and monitoring whom they found would change the fundamental realities of the workforce forever.

Frederick Taylor, an American mechanical engineer, attempted to synthesize the emergent realms of industrial production and scientism (the school of belief treating the scientific method as entirely foolproof) to maximize productivity in the industrial labor force. Specifically, he believed stretching the individual laborer was nowhere near as efficient as organizing the entire structure of the business operations itself to be more efficient. This was a foundational ideological shift for the American (and eventually global) business community.

Numerous core business practices still practiced and taught today originate from this shift toward scientific empiricism as the sole means of evaluating performance and productivity. A primary focus of Taylor's recommendations was standardization. As products were no longer developed primarily by skilled craftsmen but now compartmentalized into interchangeable tasks, Taylor recommended systematizing industrial workers and ensuring all products were developed with homogeneity to reduce costs and streamline production. One of the most potent manifestations of this was Henry Ford's assembly line, which he directly credited Taylor as an inspiration in developing. Per his eponymous company, the assembly line dropped prices of the famous Model T by nearly 70% from \$825 in 1908 to \$260 in 1924 following the introduction of this system in 1913 (Detroit Historical Society, 2022.) Similarly, the time it took to produce a Model T dropped from 12.5 hours to 93 minutes, an unprecedented achievement which produced tens of thousands of cars daily and introduced the automobile affordably to the masses (Ford, 2010.) Precipitously introduced at the onset of WWI, Taylor's scientific management principles (which he originally called "shop management" but later changed to say "scientific management" after the term had been popularized through a 1911 court case) were considered instrumental in mobilizing the American war industry to heights never before seen (Ahlstrom, 2014.) Though Taylor's recommendations were not necessarily original (such separation and

homogeneity of tasks had been growing staples of the industrial revolution's influence on workplace management and strategy), his popularization and naming of the concepts through his bestselling writings permanently affixed them within the minds of managers and C-suites alike, even as Taylor's influence and reputation waned in the 1930s onward.

Criticisms of Scientific Management

The most pervasive critique of Taylor's principles were their impact on labor's safety and psyche. On an anthropological level, Taylorist modes of production were seen as dehumanizing and invasive, ignoring the needs of human physiology and psychological stability in the name of increasing efficiency and productivity (Trivedi, 2020.) This was a far-cry from Taylor's original intent of actually alleviating the workers' overexertion to increase productivity. Henry Ford infamously believed that the rules of scientific management could also be applied to a worker's personal life, and thus he held strictly regimented rules for his laborers to follow and even hired people to spy on workers in their private lives in order to ensure they were being kept to moral and personal standards Ford saw as most conducive to efficient output (Ballaban, 2014.) Workers were put off by these developments, and even substantial wage increases did not counteract the uneasiness many workers felt with Ford's style of management directly derived from Taylor's recommendations. This, combined with Ford's infamously low pay, meant turnover has reached 370% (or 3.7 men being hired for one job, given a daily absenteeism rate of 10% alone) by the mid-1910s (Meyer, 2004.) Ford's efforts to take the blame off his management (and to prevent the growing labor movement from reaching his doorstep) became notorious. Once Ford was forced to implement his now-famous \$5 a day wage by 1915 (considered one of the first examples of efficiency wages being set as standard practice), yearly turnover rates dropped to 16% (Haden, 2022.)

The scientific validity of scientific management in and of itself has been called into question as well. While such theories and metrics developed by Taylor have been shown to be empirically beneficial for improving industrial productivity, critics note that Taylor's emphasis on the industrial sector translates inefficiently to knowledge-based industries and services. This means that measures normally adduced by Taylorist managerial styles as great indicators of efficiency and productivity actually miscalculate the impact labor has in an industry or firm if the task is not specifically itemized or routine. Therefore, this could create situations where firms are led down the incorrect path if their industry is not suited to Taylorist recommendations and practices, such as in a knowledge-based digital economy. Despite the deindustrialization of American society since the 1970s, Taylorist practices have been continuously implemented into newer sectors of the American economy despite their seemingly incompatible nature with the knowledge/technology economy.

Thus, the concern regarding how newer manifestations of the Taylorist milieu impacts employee productivity and psychology has never been more pressing given the emergence of the Fourth Industrial Revolution. This next stage of the industrial revolution promises to increase automation and machine-to-machine communication in order to purportedly maximize productivity at rates never before experienced. With the introduction of artificial intelligence applications such as ChatGPT already revolutionizing how educational standards are approached and artificial art generators creating a stir within the art community over copyright concerns, proactive scrutiny over how Taylor's set of recommendations laid out for a nascent industrial society could reasonably translate to the nascent digital economy of today given the popularization of digital monitoring tools shows is more critical than ever for evaluating scientific management's validity.

Social Facilitation Theory

One prominent theory undergirding broad justifications for monitoring practices in general is the concept of Social Facilitation. Scientific management practices upheld the basic premise that the presence of others observing (or even the notion that others are observing) an individual performing a task would cause one to perform better on said task. Explanations range from the concept of eustress (or positive cortisol releases which increase concentration and focus) assisting task bearers as a result of the presence of others to cognitive explanations declaring that the presence of others increases one's comfortability with the task at hand, facilitating their work (Bond, 1983.) An important caveat to note is that a century's worth of research on social facilitation finds a fascinating distinction between observers facilitating a task versus hampering one's performance on a task. The latter is known as social inhibition, and primarily occurs when the person performing the task is not familiar with the task or the environment at hand, increasing stress levels and the likelihood of mistakes. Existing research indicates that contextual performance, important for navigating relationships in the current workplace, is negatively affected by working environments that seem hostile to workers, splintering social cohesion and organizational functions as a whole (Le Sante, 2021.)

This is critical to note given economic developments since the peak of scientific management's popularity. Social facilitation theory and its implications emerged alongside Fordist and Taylorist models of production, and it was incorporated to gel nicely with the industrialists' worldview centered on productivity, simplicity, and familiarity of tasks in one's work environment. As such, social facilitation (monitoring) in these conditions worked on a basic level because the tasks and their respective monitoring practices were relatively facile. However, the emergence of the information/knowledge economy complicated the usability of

these tactics because of the complex nature the modern economy demands of workers. In fact, the industrial age understanding of social facilitation theory has been shown to worsen performance overall (Marsh, 2015.) Researchers suggest this is because the increasing complexity of the tasks in the current economy obfuscates to the monitoring techniques what exactly is being measured and how employees should be evaluated. Therefore, the confusion and seemingly incongruent methods of observation and performance evaluation will in an almost self-fulfilling manner worsen performance and productivity. An important distinction to make is that performance is defined as the process by which results (productivity) is achieved. This includes structures set up within the company to streamline results as well as individual markers (psychological, physiological, etc...) regarding how a task is performed.

Brands of Digital Monitoring Technology

There are multiple types and brands of digital monitoring technologies available to employers to use. Digital monitoring in this case refers to any electronic software or tool purporting to monitor employees' performance and behavior electronically. The software available ranges in scope and price. Basic options include remote screen monitoring, time-tracking for tasks, keystroke detection, and filtering web browsers. These are generally considered agreeable restrictions that can be placed upon employees. More advanced options include email and phone tracking, wiretapping, and remote takeover (Migliano, 2022.) These are generally reserved for more advanced bundles, yet are increasingly included in base packages regardless.

Popular brands in this space include SentryPC, which monitors up to 1,000 computers for only \$9,995 yearly plus an additional \$9.99 per license with a tagline of "Monitor. Filter. Control." (Stone, 2023.) Another is ActivTrak, which is targeted toward timesheet tracking while

also being scalable and targeted toward organizations with smaller numbers of people, yet still requiring a minimum of 5 computers to have the software installed with an annual fee starting at \$10 per computer. Some, such as Hourly, even bill themselves as a dual system by both tracking employee activities while also acting as the primary payroll technology. These firms broadly offer similar options for monitoring, with the differentiation manifesting in which types of functions and employees the technologies will be monitoring.

A nascent development in the industry includes technology which can ascribe employee appraisals based on detected behavior patterns as seen fit by the technology. This can impact performance reviews and interpersonal relationships both inside and outside the workplace. In fact, some existing softwares already attempts this, with Veriato giving daily security risk reports to employers about employees given their daily activities (Corbyn, 2022.) While monitoring and feedback tools have almost always been aspects of the modern workplace, the development of digital monitoring tools, their capabilities to seep into every aspect of an employee's life (imbuing a sense that they are always being watched), and the lack of confidence by employers as to their usefulness in their current forms spell serious concerns for their viability in the modern workplace in their current format.

Digital Monitoring's Impacts on Performance in General

While monitoring and feedback will always be part of the working environment, the rush to digitize these practices has provided some beneficial results that many companies point toward as justification. A 2021 study found that 60% of employers require monitoring software for remote workers, a much larger percentage of the workforce since the pandemic's onset, with 81% indicating that higher rates of productivity were associated with its implementation (Digital.com, 2021.) In fact, the same study found that companies using an hourly basis for

compensation (such as construction) were more likely to implement the technology to ensure that all billed hours reflected the actual productivity of the workers themselves, which they proclaimed digital monitoring technologies made much easier to account for.

However, digital monitoring technologies are often primarily leveraged within lower-skilled industries (Machell, 2023.) This reflects their Taylorist origins as being mechanisms to keep waged laborers in line, despite widely reported perceptions of distrust and unsuredness from the employees themselves over their implementation. This indicates that the level of skill in the industry in which these technologies are utilized play a role in their perception, as many employees indicate that not being explained about why these specific tools were being rolled out in their workforces led to greater levels of institutional distrust, an undesirable outcome indeed. Therefore, the working environment in which these technologies are deployed is critical for evaluating their effectiveness.

Research across the board shows mixed results from the implementation of digital monitoring software across workplaces. Some, such as Wendy Carroll's 2008 meta-analysis, reveal positive effects if implemented wisely (Carroll, 2008.) Positive inclusion involves selective incorporation of tools in order to tailor them to the task at hand. Communication from management and supervisors as to the metrics being collected and how that data is evaluated also create positive correlations as to how digital monitoring technology affects worker productivity. Early forms of digital monitoring technology (such as CCTV cameras) were present in 78% of companies in 2001, with most employees taking little notice as to its presence in their daily working conditions for the era (Ribitzky, 2001.) However, the technologies themselves have become far more advanced, no longer including static surveillance but active appraisal of employee attitudes and performance. Published at the onset of these more advanced

developments, Carroll's research presciently predicted the extreme changes that would come to the workforce given the rate of technological progress.

More recent studies attempt to account for the workplace environments of today more thoroughly. A study recently conducted in an attempt to simulate how modern digital monitoring tools operate in a real-world environment was undertaken by Christin Hoffman and Kirsten Thommes in 2020 using truck drivers in a field experiment. Here, artificial intelligence monitored their performance on the road and attempted to offer real time feedback on how best to reach the intended destination and improve driving performance. Statistically speaking, significant improvements in performance were observed, but the individual positive impacts on drivers did not necessarily translate into benefits for the rest of the company and their profits (Hoffman and Thommes, 2020.) The study's implications on solutions to the principal-agent problem were considered, though further consideration was needed as to how digital monitoring tools can effectively offer genuine feedback, and for which tasks or roles it is most appropriate for.

Other meta-analyses in the intervening years tell a more macabre tale emerging in American workforces. While selective uses were seen as beneficial toward worker productivity, more recent analyses indicate that the broader implementation of these technologies at the expense of selectivity have created negative effects. For example, 2022 research indicated that digital monitoring technology in its more current forms had little to no effect on productivity, but were positively associated with stress and strain in the working environment, negatively affecting the organization by proxy (Ravid et al, 2022.) Similarly, job satisfaction and general feelings of belonging in the workforce were negatively correlated to increased presence and intensity of digital monitoring technologies (Siegel et al, 2022.)

Previous research into these technologies have primarily been via attitudinal surveys instead of replicating how these tools impact peoples' behavior. Research by Carl Botan found that by 1996 around 40 million Americans had reported some form of electronic monitoring being implemented in their workforce. Given the technological limitations, the tools being referred to in this study were CCTV cameras and other such passive surveillance technologies. He found upon surveying employees that most were distrustful of the concept starting out, but with explanations as to their necessity (such as telling employees that cameras were being used to collect data on completion rates and why this was the most effective tool available to them at the time), workers became more amenable to its presence.

However, Botan found that those with the least control over their tasks (i.e. non-supervisory positions) were the least likely to accept digital monitoring tools from being implemented (Botan, 1996.) This is interesting to note because early studying on monitoring and surveillance techniques found them to be most effective on easier, assembly-line-like tasks (such as ones where workers do not have much control over how to complete them.) These findings were backed up by Effy Oz in 1999, where her survey of hundreds of workers found resistance in response in those whose roles had the least autonomy, for they feared backlash (Oz, 1999.) This supports the social facilitation theory's implication that unfamiliarity with those observing a task can cause negative consequences, or social inhibition. This is especially so in lower-skilled workers, who as mentioned earlier were the most likely to be on the receiving end of such technology.

In the context of social facilitation theory, these recent trends support the inhibition effect, or the notion that seemingly incoherent uses of monitoring spur negative feelings in workers. Given the aforementioned statistics that the majority of American companies have

implemented these tools while barely a third have any confidence that they're being implemented correctly, this overreliance may spell a disastrous trend for American businesses, paradoxically reversing their goals for increased productivity.

Looking forward, the implementation of digital monitoring tools need to be critically evaluated. Given that contextual performance is circumstantial and important in creating a positive culture at work, cultivating welcoming work environments is as critical as ever. Although there are plenty of surveys showcasing employees' thoughts on the implementation of these tools, their relatively new insurgence in the workplace given the abruptness of COVID-19 and the advent of hybrid or remote working opportunities gives many pause given the lack of widespread behavioral studies given to the topic. As such, this research centers primarily on behavioral experimentation studying how digital monitoring tools impact employee contextual performance (and thus productivity by extension) in a modern working environment consistent with the social facilitation/inhibition theory.

Hypotheses

From the literature review, digital monitoring technology is perceived most negatively when applied to a seemingly incongruent task. This sense of incompatibility causes many workers to react negatively to this technology in their workforce. From this, two hypotheses on how monitoring technology relates to both contextual and task performance were formulated:

H1: Those exposed to forms of digital monitoring technology seemingly unrelated to evaluating the task at hand will be less likely to engage in activities constituting contextual performance.

H2: Those experiencing digital monitoring technology seemingly unrelated to evaluating the task at hand will have more errors in their responses compared to peers not interacting with such technology.

Similarly, the interaction between demographic variables (such as level of education) may provide insight into willingness to engage in contextual performance given the presence of unrelated monitoring technologies, though no concrete hypothesis as to which forms will most impact willingness will be made at this stage. This is to keep the focus primarily on how the monitoring condition impacts willingness to engage in activities constituting contextual performance.

Methodology

Previous research on digital monitoring technology has primarily focused on attitudinal beliefs in employees, though behavioral studies exist. However, many of these do not attempt to focus specifically on how contextual performance is impacted, preferring to focus mainly on performance and productivity on assigned tasks rather than broader implications for the workforce as a whole. As such, this research will attempt to hone in and draw conclusions as to how contextual performance is affected by digital monitoring technologies being implemented into professional tasks. Here I will describe the setup of the survey, the reasons behind its strategic choices, and how it will attempt to measure contextual performance's relationship to increased salience of digital monitoring technologies in professional environments.

Setup

Given that the study is attempting to evaluate participants through the social facilitation theory, this means it will follow a deductive approach and experimental design. To create an experimental design to test the theory's designated impacts so that it would interact with

contextual performance in a measurable manner, a Qualtrics survey was created. This survey ostensibly told participants that they were participating in research about instructional methods under the guise that it was being performed on behalf of a real company. This would help to increase trust in the initial experimentation by not having it seem like pure academic research, which would harm the perceived realism of the survey. From here, a suitable task to elevate the perceived sense of awareness of monitoring needed to be found. This sense of being perceived as being monitored is one of the key findings of seminal 1965 research on social facilitation theory that found even merely thinking monitoring is occurring is enough to alter behavior (Zajonc, 1965).

Given that the study was meant to understand the impact of monitoring on contextual performance, an environment simulating a professional workforce was prioritized. This included finding a task type that was more similar to the conditions most professional workers being inundated with such digital monitoring software would be working on. Monitoring is seen as less congruent with the work encountered by many young professionals, meaning that task should reflect the relative complexity of what modern offices require. Laila Bidaki's 2004 research on electronic (the precursor term for digital) monitoring technology suggested easier tasks (or what many would consider "unskilled labor") benefit from observation greater than complex ones (Bidaki, 2004.) Her work attempted to simulate Zajonc's early studies which included anagrams as one of a hallmark of a complex task, though she even admitted further tasks of cognitive complexity would be needed for the impacts of short-term exposure to digital monitoring technology become salient. This is critical to note because, as aforementioned, a major pitfall of studies covering this technology is the fact that briefer amounts of exposure usually create fewer prominent impacts as compared to exposure over a long period of time, which Bidaki noted.

As such, the survey attempted to build upon Bidaki's recommendations by centering intellectually stimulating tasks that require more exercising of cognitive function than by-rote tasks. This was accomplished by including not only anagrams for participants to solve as a measure of performance during the survey, but also by including an additional series of short tasks that involved checking for grammatical or spelling errors in short passages. These passages held several or, in one case, no mistakes for participants to notice and correct in their responses. This prolonged exercising of linguistic ability combined with the seemingly incongruent nature of the monitoring at hand (for those in an experimental group) was meant to highlight the awareness of the monitoring. This is meant to increase the salience of the social facilitation's possible negative consequences in the context of a situation where digital monitoring technology seems inappropriate or ambiguous, imbuing feelings of incompatibility which has been found to impact performance (Hovorka-Mead, 2002.)

Therefore, upon entering the survey following the initial screen, participants were categorized into two groups: control and experimental. The control group were simply given instructions as to how to complete the task without further explanation. This made the tasks seem neutral to complete. Conversely, the experimental group was shown an instruction screen with bolded sentences warning them that they were being monitored throughout the experiment and that it would be tied to evaluation. This was meant to jar participants into (theoretically) implicitly noticing the incongruence of the nature of the monitoring because no further explanation was given as to how the monitoring was relevant to the task or why. To up the ante even further and account for the lack of prolonged exposure which has been shown to be more statistically significant, a pop-up was constantly present throughout the entire monitoring group's progress through the tasks reminding them of their status as being monitored. This was meant to

align with Zajonc's assertion that even the mere thought that monitoring is occurring in any capacity is enough to influence behavior.

Both participant groups were given the same series of 7 anagrams and 4 passage correction tests. The specific numbers of each category were selected to keep the estimated completion time below 10 minutes in total. The anagrams were relatively simple, with none exceeding 7 letters and containing a diverse amount of letters within them to prevent confusion. The 4 passage correction portions had a total of 7 mistakes to be corrected, making both sections have up to 7 possible correct answers participants can mark. Intermittent quality control questions were thrown in to make sure that participants were engaging with the survey seriously.

Following the main task of solving the problems themselves, all participants were shown perhaps the most critical screen of the survey. The screen congratulated both groups for completing their tasks, and asked if another task meant to benefit the company would be carried out voluntarily. It said if participants selected no, they would be transported to the end of the survey. All participants were shown the same text, and this question was designed to be a measurable example of contextual performance. The work asked of participants went outside their necessary tasks, was voluntary, and was stated to be beneficial to the company. Should the participant say yes to completing the task, they were then transported to a series of 3 additional anagrams for unscrambling (these ones containing a sardonic prison theme to them if participants noticed.) If not, these questions were skipped and participants were brought to the post-survey questionnaire.

Post-Task Survey

This questionnaire included relevant demographic, professional, and educational background questions. The purpose of collecting this data was to compare if there were any

noticeable correlations in choosing to work on the task meant to measure contextual performance outside of the independent variable of the condition given to participants. Finally, an additional feedback section was given to participants allowing them to express their thoughts and rank their experiences during the survey using the Likert scale. This draws upon previously established scales and metric of self-evaluation such as the Likert scale, which is a relatively binary numerical scale assigning points to emotions, which helps make often inexpressible implicit observations more salient (Jebb, 2021.) This increased salience can help measure psychological impacts such as locus of control (something many employees working in heavily monitored environments feel they lack), and the questions are stylized similar to J.B. Rotter's locus of control study could be used to deduce how in-control employees felt at particular tasks given the level of monitoring software's salience (Rotter, 1966.) At this stage in the experiment, participants have finished and they are allowed to collect compensation.

The specific participants for this study were recruited using Prolific, a website where surveys can be distributed for compensation. A beneficial aspect about Prolific is that it allows segmentation of participants to more closely resemble the desired demographic. In this case, young (20s and 30s preferred) professionals could be more adequately identified and asked to participate in the study. This participant profile simulates the average employee landscape of professional companies implementing digital monitoring technology (Deloitte, 2014.) Compensation on Prolific depends upon a variety of factors, but generally speaking they are paid on an hourly rate basis, with compensation reflecting the amount of time taken to complete a particular survey. This may conflict with digital monitoring technology's influence on salaried workers in this design, but generally speaking engagement through compensation is the most

surefire way to create (initially) committed to taking the survey seriously and answering it thoroughly.

Results & Data Analysis

The survey was live on Prolific for approximately 2 days, in which time it collected 76 responses. On average, participants completed the survey in 645 seconds, or in around 10 minutes and 45 seconds. This was within the anticipated range for completion, with the condition assigned not holding much statistically significant evidence that it played a role in duration length, with an r-squared value of 6.3% and a p-value of 0.0281, with the latter representing good evidence against the null hypothesis (in this case being that monitoring condition would not affect duration) but not enough to be considered significantly strong.

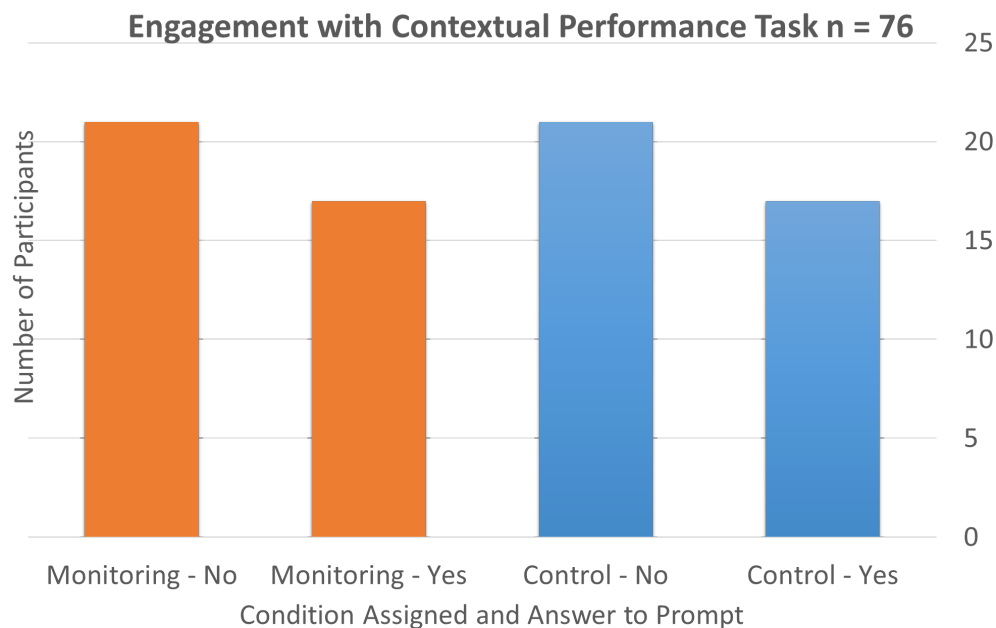
Respondents' age averaged in their mid-20s, with 52 men answering versus 24 women. 5 held associate degrees, 30 bachelors, 29 held high school diplomas or G.E.Ds, 11 held master degrees, and 1 had a J.D. Income distribution was across the board, with most earning between \$51,000-75,000 yearly, and the majority of respondents were in the workforce and not students. For those who were students, they tended to be undergraduates. For the work environment question, most respondents indicated that they were in professional office jobs, with academic and service jobs being the next most popular options. The majority of respondents were also currently employed, with those not in employment typically being students or actively searching for new opportunities. The majority of respondents were from the United States. The sample collected reflected the demographics of young professionals in America, whose average starter salaries correlated with income levels and educational attainment (National Center for Educational Statistics, 2022.)

Both groups were equally split into either condition, 38 in each. Those in the monitoring condition statistically finished the survey in less time than those in the control group, at 552.6053 seconds on average versus 738.9211 seconds, respectively. When solving anagrams, the monitoring group tended to actually do better than the control group, averaging correct response rate of 4.737 anagrams right out of 7 compared to 4.526, respectively. One critical development to note in this case however, is that one of the anagrams had multiple possible answers. The word “selnit” could be unscrambled into “listen”, “tinsel” “enlist”, and “silent”, but only a single correct response was encodeable as the correct answer. However, upon correcting for this and allowing all 4 to be considered correct, the average correct response rate grows in both groups. The correct response rate out of 7 anagrams for the control group rises to 5.000 when accounting for such answers in that particular anagram, compared to the monitoring group rising to 5.421. Overall, little statistical significance was found in how the monitoring condition impacted correct response rates in anagrams.

For the paragraph corrections, the average amount of corrections (7 total corrections were possible across the 4 passages) for the control group was 4.921 while the monitoring group averaged 5.395 corrections accurately caught. These results go against hypothesis 2, which states that those in the monitoring condition would likely have more errors given the statistical likelihood of monitoring technology causing more tension (and therefore mistakes) within intellectually stimulating tasks. These results support the notion that digital monitoring technology is beneficial in the work environment in spite of personal uncomfortability individuals may have with the technology’s introduction.

However, the main point was to see how digital monitoring technology affects employee contextual performance, materialized in the optional block question. Here, hypothesis 1 theorized

that those exposed to the monitoring condition would be less likely to engage with a task of contextual performance compared to someone in the control group given plain instructions without any indication of monitoring. An initial pilot version of the survey sent out to a smaller sample size did indicate some relevance, with 60% of those in the monitoring condition opting to not contribute to the optional task compared to 80% in the control group who opted into the task. However, as the sample size increased the statistical significance of the condition assigned relatively vanished. In the end, the same response rates from either condition were recorded, with both control and monitoring having 21 participants say no to the optional task while 17 agreed. This meant the r-squared significance was around 0%, meaning it held essentially no significance whatsoever. This does by itself support the social facilitation theory that monitoring, or the perceived presence of monitoring, will inevitably change behavior by itself. A graphical representation of this data is below.



Recode	Q66...ion.	Count	Percent	Cumu...tive
1	Yes	34	44.7%	44.7%
2	No	42	55.3%	100.0%
Total		76	100.0%	

For those who did say yes and complete the optional task, much more interesting results emerge depending on the condition assigned. Those in the control averaged (out of 3) 2.125 correct responses while those in the monitoring condition averaged only 1.588. This is an inverse of the trends seen in the main tasks, where the monitoring group was more likely on average to answer correctly than the control. This may be a result of numerous considerations, such as those who said yes in the monitoring group feeling more obligated to continue the task while being more fatigued and likely to respond incorrectly. Upon reviewing the data for those who opted into participating, the average correct response rate for the control group was 6.11 out of 7 on the anagrams and 5.470 out of 7 on average for passage corrections. For those in the monitoring group who opted in to the optional task, the average score on the main anagram task was 5.235 and 5.187 on the passage corrections.

This data seems to indicate that those who performed worse on the main tasks in the monitoring group were more likely to attempt the optional tasks. This could be due to several factors, such as a perceived need to “perform better” with the optional task given the perceived presence of monitoring. In that case, it could be that the digital monitoring technology does increase contextual performance to some degree, but could actually be incentivizing worse performance, which is likely to cause tension in the workforce regardless of ability to engage in contextual performance activities. In fact, such a perceived obligation to “improve” by taking on more optional tasks that could be construed as contextual performance may create worse outcomes for the company in the long-run because employees who have contextual performance

as part of their appraisal may be given tasks that are mismatched with their skillsets, creating inefficiencies despite perceived positive benefits of digital monitoring technologies. This data does imply that some type of social inhibition per the inverse of the social facilitation theory did occur, but rather it incentivized low-performers to do extra tasks in the presence of monitoring, rather than simply dissuade them altogether.

In the post-survey questionnaire, little to no correlation was quantified between the condition assigned to participants and their responses to the Likert scale regarding their thoughts on the emotional sensations the survey made them feel as well as their thoughts on the instructional/management style they were assigned to. Additionally, the demographic questions found educational attainment and income to be the best (though still relatively insignificant) factors of deciding to engage with the contextual performance task. This could reveal how one's background influences their interactions with digital monitoring technologies to some degree, though not enough to make definite conclusions about.

However, in the written response section, differences were noted depending on the condition they were assigned to. Many in the control group simply found the tasks interesting but odd to study, questioning what relevance the instructional style could have held. Those in the monitoring group, conversely, were more likely to write responses openly questioning why monitoring was even necessary at all for the purposes of the tasks. A direct quote from one participant reads "I don't know why you needed to observe my screen. I wouldn't want to work for a company that does that, but it wasn't part of the instructions." Another, in reference to the condition assigned once again, reads "Well it wasn't much to go off of, I'd need to know a bit more honestly."

These quotes illustrate the underlying sentiments many employees have toward seemingly incongruent styles of digital monitoring technology being integrated into their workforce: that it seems opaquely difficult to understand and seeds deep feelings of distrust in workers. This represents a critical reason for why qualitative responses often illustrate what empirical calculations cannot: it allows people to articulate their feelings without having to rely upon statistical inferences in isolation. Overall, though the statistical observations were overall insignificant, interesting observations on the behaviors that digital monitoring technology can compel in the absence of seemingly rational implementation can still be inferred from those who chose to engage in the contextual performance task as well as the responses written out by participants.

Limitations

It is vital to acknowledge the limitations of this research. First, personal information of the participants is anonymized on Prolific, meaning there is no way to independently check if the demographics programmed in the site to have the survey directed toward them (young adult working professionals) is an accurate description of the people behind the accounts taking these surveys. Additionally, although the relatively niche demographic this research is attempting to target is the one most likely to be impacted by the increasing advent of digital monitoring technology, placing such restrictions on participant profiles does limit the generalizability of the data to other demographics, such as elderly service workers or middle-aged professionals.

One of the major limitations of the experimental design is that it is a one-time exposure instead of the continuous exposure in the workplace which increases protracted stress and error rates in employees. This means this survey is only able to capture a temporal snapshot of the often much longer process that employee data collection, appraisal writing, and subsequent

evaluation is, which is what digital monitoring software is attempting to automate. This may mean the perceived social inhibition caused by the presence of incongruent monitoring techniques likely do not fully manifest in this design, as it takes repeated exposure for the psychological impacts to fully weigh on the participant despite certain written responses in the survey itself indicating participants did notice the monitoring as intended.

Another limitation of this design is that the tasks themselves are not fully representative of the professional work environment, limiting its realism. While the linguistic tasks were chosen to replicate cognitively demanding tasks, most peoples' work obviously does not involve unscrambling words or passage corrections (outside of teachers, perhaps.) This means the design did not fully simulate a realistic professional working environment and thus limits the generalizability of the data to contextual performance actions in real-world settings. Another similarly related limitation is that the compensation mechanism was not impacted by participants' responses, as they were paid on an hourly basis. Professional workers are often compensated after appraisals, which are increasingly incorporating digital monitoring technology, making the equalized pay rates unrepresentative of how these tools tie into professional compensation.

Discussion/Future Research

The results of this data seem to open an interesting avenue for future research in reviewing how low-performers are impacted by digital monitoring technologies, as the data from this survey indicates that low-performers may feel the presence more acutely to some degree and thus may be more persuaded to engage in tasks constituting contextual performance as a means to make-up for lackluster productivity. This would offer interesting insights as to how social facilitation in the presence of perceived presence of digital monitoring technologies work.

Other avenues to explore regarding digital monitoring technology can be how it impacts contextual performance in different work environments, as this survey was attempting to primarily simulate professional, cognitively complex work situations which are not representative of the whole of the workforce.

The presence of educational background and income levels having some impact on willingness to engage in contextual performance activities also offers room for exploration. With the rise of artificial intelligence and digital monitoring of students given increased remote educational opportunities, studying contextual performance in an academic setting (such as extracurricular involvement) is also recommendable, as it provides critical insight as to how the next generation being inundated with these tools might interact with their working environment as well as providing critical insights as to how such technologies impact educational learning.

While this research focuses primarily upon employee performance and productivity, future discussions on digital monitoring tools could focus on their impact on employee recruitment, as many companies developing this type of software (such as HireVue) tailor their software specifically to hiring departments in organizations by proclaiming their tools will streamline the process efficiently. This of course has massive implications for hiring strategy and the recruitment of talent in firms, particularly around whether such technology is capable of attracting and screening for qualified or even compatible talent. Given that digital monitoring technologies are holdovers from the era of scientific management (where social facilitation theory was used to justify traditional monitoring techniques), its validity in attempting to use an industrial-era measure of empiricism in current economic conditions (knowledge/digital economy) can be called into further question. Since many of the criticisms regarding scientific management's dehumanizing metrics hold critical weight in hiring proper labor to the firm, this

is especially important to consider given digital monitoring technology's meteoric rise in the aftermath of COVID-19, with accusations of "panopticon" becoming more prevalent daily. This understanding of human psychology and the workforce is critical to creating an open and amicable work environment, which are key predictors of successful operations.

Conclusion

Although the study failed to find statistically significant data regarding how digital monitoring technologies impact contextual performance, the data around those who do decide to engage in contextual performance in the present of digital monitoring technology offers an interesting route to explore in future research. By assessing what it is about digital monitoring technology that compels a person to perform certain behaviors, we can gain a fuller understanding of how to create a more approachable workplace. This is especially important in the current moment, as these technologies are being rolled out en masse despite an apparent lack of understanding as to how these technologies work and what environments they are beneficial to be utilized in.

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Appendices

Appendix 1: Survey introduction screen



Greetings! And thank you for your participation in this task. We are conducting this research on behalf of a firm studying different instructional techniques. We'd like to ask you to take approximately 10 to 15 minutes to assist us by filling out this survey. You will be asked to do a series of standardized tasks and you will receive compensation for this work.

Your responses will be kept entirely confidential and secure at all times after the survey's conclusion, and you are free to withdraw at any time. Your responses will benefit our research's mission, and associated risks have been minimized. Please fill them out to the best of your abilities.

Appendix 2: Control Condition Introduction Screen



Welcome! Thank you for your participation once again. We are conducting research on the subjectivity of the English language. We ask that you please unscramble a series of 7 anagrams, or words whose letters have been shuffled around to make them unintelligible. There is no time limit associated, and you are allowed to skip anagrams you cannot solve (please type "N/A" in such a scenario.)

Afterward, you will be asked to read 4 short passages which contain a grammatical or spelling error (or sometimes both!) Please read each paragraph carefully, there may be more than one correction to make in a paragraph! Again, if you cannot solve or if there are no mistakes to be found, please type "N/A" into the text box. Such answers will not affect your compensation. If you have multiple answers, PLEASE separate them using commas. Thank you, and feel free to begin by clicking to the next page. Best of luck!

Appendix 3: Monitoring Condition Instruction Screen



Welcome! Thank you for your participation once again. Your responses WILL be monitored electronically for the purposes of these tasks. We are conducting research on the subjectivity of the English language. We ask that you please unscramble a series of 7 anagrams, or words whose letters have been shuffled around to make them unintelligible. There is no time limit associated, and you are allowed to skip anagrams you cannot solve (please type "N/A" in such a scenario.)

Afterward, you will be asked to read 4 short reading excerpts which may or may not contain a grammatical or spelling error (or sometimes both!) Please read each paragraph carefully, there may be more than one correction to make in a paragraph! Again, if you cannot solve or if there does not appear to be any mistakes, please type "N/A" into the text box. Please separate multiple answers by commas. Remember: your responses will be monitored and evaluated as you fill out these tasks.

Appendix 4: Monitoring Condition Pop-up Example



Appendix 5: Anagrams

Anagram tasks for both conditions (anagram on left, correct answer(s) on right)

Dunrot - Rotund

Bermun - Number

Selnit - Listen/Tinsel/Enlist/Silent (all right)

Essaon - Season

Lomo - Loom

Horst - Short

Evolved - Devolve

Appendix 6: Passage Correction Instructions



Congratulations! You have completed the anagram task. Next, you will be asked to correct mistakes in a paragraph. Please read the sentence and type the correct word in the box provided. For example, if given:

"She never heard he" as the initial sentence, the correct answer in the box should simply read "him", as that is the grammatically correct version of "he" in this case.

If the sentence has multiple errors, such as "She skreemed at he" an accepted answer would be written as "screamed, him"

Appendix 7: Passages for Correction (Correct Answers in Italics in Parantheses next to Error)

"At dusk, the sun were (*was*) turning scarlet. The sky was painted with an ominous streak, and a foreboding message illuminated itself. There was no turning back now."

"In the quiet ambience of the evening few words were thought. Even fewer were spoken. The group ambled about aimlessly, their intentions uncertain. The group called out and listen (*listened*) to see if anyone was nearby. There were (*was*) no reply."

"I hadn't heard from her in yeers (*years*). What few correspondences I had with her previously were disjointed and confusing. Her letters were vague and rambling, never offering genuine answers"

“The sea was shining brilliantly. Seagulls flown (*flew*) past us and disappeared into the horizon. We danced for a while. Catch (*Caught*) our breath afterward. Soon we continued on our way. There been (*was*) one other person on the beach with us, but they paid us no mind.”

Appendix 8: Contextual Performance Measure Question



Thank you very much for your participation in today's tasks! Before you go, we'd like to ask if you'd be willing to take part in solving some final 3 anagrams for our firm. This is completely optional and is not related to your previous tasks or your compensation. If you decide not to, click no and you be taken to the final section.

- Yes
- No

Appendix 9: Optional Anagrams

Prison - ionrps

Control - nolcort

Surveil - ireluvs

Appendix 10: Post-Survey Questionnaire Prompt



Thank you once again for your time and effort on this survey! Before we end, we'd like to ask you a few final questions regarding your thoughts on how the scenario went.

Appendix 11: Post-Survey Questionnaire

Please Select Your Gender

- Man
- Woman
- Non-binary / third gender
- Prefer not to say

Please Select Your Age Range

- Under 18
- 18 - 21
- 22-29
- 30-39
- 40-49
- 50-59
- 60+
- Prefer not to say

Please Select Your Highest Educational Degree Received

- Did Not Finish High School
- High School Diploma or Equivalent (G.E.D.)
- Associate's
- Bachelor's
- Master's
- Ph.D.
- JD
- Other (Vocational Program, Certificate, Etc...)
- Prefer not to say

What is your annual household income?

- Under \$25,000
- \$25,000-\$50,000
- \$51,000-\$75,000
- \$76,000-\$100,000
- More Than \$100,000
- Prefer Not to Say

Are You Currently a Student?

- Yes, Undergraduate
- Yes, Graduate
- Yes, Ph. D. Candidate
- Yes, Other
- No
- Prefer not to say

Are you currently employed?

- Yes
- No
- Prefer not to say

Appendix 12: Post-Survey Attitudes

M | MICHIGAN ROSS

Please use the slider to select the numbers, with 1 being the lowest and 7 being the highest.

During the tasks, how often did you feel...

Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree		
1	2	3	4	5	6	7

Stressed



Anxious



Reluctant



Relaxed



Productive



M | MICHIGAN ROSS

If you were to describe this company's instructions in one word, it would be...



Would you work for a company that instructs employees in this manner?

- Yes
- Maybe
- No

What factors influenced your choice to the previous question?

M | MICHIGAN ROSS

To what extent would you agree that a company that instructs in the style you were given is... (1 being the lowest, 7 being the highest)

Strongly disagree	Somewhat disagree		Neither agree nor disagree	Somewhat agree		Strongly agree
1	2	3	4	5	6	7

Reasonable



Efficient



Rational



Coherent



Communicative



M | MICHIGAN ROSS

Did you complete the optional task?

- Yes
- No

What influenced your decision to the previously stated action?



How likely are you to work for a company that uses this style of instruction?

- Extremely likely
 - Somewhat likely
 - Neither likely nor unlikely
 - Somewhat unlikely
 - Extremely unlikely
-

What influenced your answer to the previous question?



Are there any other comments you'd like to make as you finish today?