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Technostress in the Cooperative Use of Technology at a Danish Hospital

Raluca A. Stana
Roskilde University
raluca@ruc.dk

Morten Hertzum
Roskilde University
mhz@ruc.dk

Abstract. Digital technologies such as radiology information systems, scanners, and electronic health records are central to clinical cooperation in hospitals. While these systems enable efficiency, they also give rise to technostress—stressful or frustrating experiences with technology. Prior research has primarily examined technostress at the individual level. In this study, we investigate how technostress both shapes and is shaped by cooperative practices. Drawing on qualitative interviews and a pilot survey conducted in a nuclear medicine department at a Danish university hospital, we identify interruptions, performance monitoring, and uncertainty as strongest dimensions of technostress with cooperative consequences. Our findings show how technical breakdowns, system updates, and misaligned workflows disrupt temporal coordination, force ad hoc renegotiations of responsibilities, and weaken trust in shared digital infrastructure. This frames technostress as connected to a breakdown in cooperative and temporal alignment, and not just a personal and momentarily discomfort.

Introduction

Hospital staff use a range of digital technologies, including electronic health records and department-specific systems such as scanners, radiology information

systems, and picture archiving and communications systems. These technologies enable specialized treatment and efficient information sharing, but they are also giving rise to stressful and frustrating incidents (e.g., Califf, 2022; Stana and Hertzum, 2024; Thunberg et al., 2023). Such technostress has been documented for newly implemented technology (Hertzum and Ellingsen, 2019) as well as for healthcare technology that has been in use for years (Lääveri et al., 2024).

In this study, we investigate *how stressful experiences with digital technology influence day-to-day cooperation among the staff at a hospital department in Denmark*. The study adds to existing studies about the changes and hassles required to sustain cooperation, quality, and wellbeing while adopting and using healthcare technology (e.g., Fitzpatrick and Ellingsen, 2012; Marcu et al., 2021; Pedersen and Bossen, 2021; Poon et al., 2021; Procter et al., 2024).

Technostress, an initially psychologically defined set of constructs associated with stressful or frustrating experiences (e.g., Ragu-Nathan et al., 2008; Tarafdar et al., 2007), has been defined in 1983 (Brod, 1984). While being a well-established research stream within IS, it is only peripherally discussed in CSCW (e.g., Ciolfi and Lockley, 2018; Nauwerck et al., 2018). By discussing it in the context of cooperation (Ciolfi et al., 2023) we hope to open the discussion and draw on cooperative work perspectives and thus contribute to both IS and CSCW research.

We investigate qualitatively and quantitatively the technostress experiences which the hospital staff have with technology post-implementation in a nuclear medicine department at a Danish hospital and the impact it has on cooperation practices.

Method

Following approval by the department's management, this study was conducted at the department of nuclear medicine at a university hospital in Denmark. The department performs a range of imaging tests that involve the use of specialized technology to reveal, for example, cancer. The department has about a hundred employees and sees approximately 30,000 patients a year. A chief physician at the department kindly facilitated the recruitment of employees for interviews and the dissemination of a survey to all employees.

We interviewed 15 employees (5 physicians, 2 physicists, 2 radiographers, 2 medical laboratory technologists, 2 researchers, and 2 medical secretaries) about whether the technology they used in their work gave rise to stressful situations. If it did, they were asked for concrete examples of such situations, including follow-up questions about their consequences and how they were resolved. The interviewees had worked in the department for an average of 8.5 years. They gave their written informed consent to take part in the study and were interviewed between October 2023 and January 2024.

In April 2025, we returned to the department to pilot test a survey about technostress. Respondents were initially asked to describe an example of a stressful incident with technology and to indicate whether it had consequences for their own work, their colleagues' work, and the patients. Then, respondents were asked to indicate how often they experienced technostress in general and how often they experienced each of 12 previously proposed technostress dimensions. Table 1 lists the dimensions and gives the wording of the questions. The five first dimensions (invasion, overload, complexity, insecurity, and uncertainty) were from Tarafdar et al. (2007); the seven other dimensions were proposed by Ayyagari et al. (2011), Day et al. (2012), Fischer and Riedl (2015), Galluch et al. (2015), Gimpel et al. (2024) and Vaziri et al. (2020). A total of 27 employees responded to the survey (11 physicians, 7 medical laboratory technologists, 3 medical secretaries, 1 physicist, 1 radiographer, and 4 others).

Findings

The survey respondents regularly had stressful experiences with technology; their median response to the overall question about technostress was at the midpoint between 'Never' and 'Always' (Table I). The 12 technostress dimensions were equally or somewhat less common. Notably, the three dimensions that most strongly explained overall technostress were interruptions, performance monitoring, and uncertainty. The frequency of overall technostress tended to increase and decrease in tandem with these three dimensions. In contrast, variation in dimensions such as overload and insecurity was almost unrelated to variation in overall technostress. Additionally, eight of the examples provided in the survey were rated by the respondents as having direct consequences for colleagues' work, showing how technostress not only affects individuals but also disrupts cooperation routines and task coordination.

Our data suggests that technostress, which is primarily induced by digital technology, can arise from and impact cooperative practices. For instance, staff described stress arising from poorly timed communication flows (e.g., emails outside working hours), misaligned workflows (e.g., patient check-in failures), and system issues like file deletions or data being saved incorrectly. These issues often forced staff to compensate manually, rely on others for workarounds, or renegotiate responsibilities—all of which strained workflows and coordination.
Below, we interpret some of the technostress dimensions that seem to be most predominantly experienced by the department staff.

Interruptions seem to manifest in the department in the form of IT related breakdowns in workflows that prompt the staff to shift their attention to perform other tasks, such as requesting help from their colleagues, find workarounds or troubleshoot the technology. For example, the patient check-in portal laks in usability and triggers many cooperation issues. In the quote below, a bioanalyst

Table I. Technostress and its dimensions, as experienced by the 27 survey respondents

Dimension	Question	Median[a]	Correlation[b]
Overall concept	Technostress are the stressful or frustrating experiences you have with digital technology. To what extent do you experience technostress in your daily work?	4	-
Invasion	Digital technology creates situations where I can potentially be reached anytime or feel a need to be constantly connected, which blurs the boundary between work and personal contexts	3	-0.103
Overload	Digital technology makes me work faster and longer than I otherwise would	4	0.059
Complexity	Digital technology is so complex that I feel inadequate as far as my skills are concerned and need to spend extra time and effort to learn and understand it	3	0.333
Insecurity	Digital technology makes me nervous about losing my job because it may replace me or because other people have a better understanding of it	2	0.064
Uncertainty	Continuous changes and upgrades in digital technology unsettles me and makes me uncertain	3	0.521*
Unreliability	Digital technology is often unstable, including system crashes and technical problems	4	0.351
Role ambiguity	Digital technology creates uncertainty as to whether I should expend my resources to perform my work or to acquire new skills in mastering the technology	3	0.374
Privacy invasion	I am concerned that my privacy could be invaded by digital technology	2	0.231
Interruptions	Digital technology causes interruptions that shift my attention away from my current tasks	4	0.756***
Performance monitoring	I feel that digital technology is used to monitor and assess my performance	2	0.577*
Nonavailability	Digital technology that could ease my work is often unavailable due to technological or organizational restrictions, safety, or monetary reasons	4	-0.201
Lacking sense of achievement	Due to digital technology, it is difficult for me to say what progress I have made in my work	2	0.468

[a] Rated on a scale from 1 ('Never') to 7 ('Always'). [b] Spearman correlation with overall technostress (i.e., with the question in the first row). * $p < 0.05$. *** $p < 0.001$.

describes such a situation, which led to disrupting not only the individual work, but also other interdependent workflows and cooperative routines:

> *The patient must self-check in at the kiosk by the entrance to the department. Many do not realize they have gone to the wrong place – despite the kiosk actually informing them that they are in the wrong waiting room. They sit down and wait – in good faith. In my system, the patient is not registered (since they weren't in the right place), so I think they have either missed their appointment or are delayed. If I have time, I walk around to the other waiting rooms to see if they are sitting there. […] Their scheduled time has passed, and I'm already with a new patient. Of course, I can't turn the patient away—they acted in good faith. But I get delayed, I have to interrupt a colleague preparing a new radiotracer, another colleague might need to be disturbed to perform the examination, and everything shifts so I can still have a lunch break. The patient gets delayed, and so do the following ones.* (Bioanalyst, Survey).

The issue begins with the patient registering in another waiting room, a usability issue, which at first might go unnoticed by the bioanalyst, but it cascades into breakdowns in coordonative practices.

The example shows how interruptions in socio-technical systems extend beyond the immediate user. In a tightly coupled clinical setting, a workflow interruption can ripple through the department, straining coordination. These incidents introduce ad hoc renegotiations of responsibility, delays and added stress from re-synchronizing efforts, as the medical staff cannot '*turn the patient away – they acted in good faith*'. Our interview data is also rich of such examples of interruptions in cooperative practices which lead to delayed tasks.

Performance monitoring correlates highly with technostress, but the median level is quite low in our data and that matches with that we do not have any concrete examples from neither the interviews nor the survey.

Uncertainty, another dimension to explain technostress highly in our survey data, seems to be triggered in the medical staff due to upgrades scheduled during working hours or sudden updates that erase the cooperative customization work done by the medical staff, as seen in the representative example below:

> *There are some built-in shortcut keys—to avoid too many clicks and mouse movements and such. But you can also make your own. […] So, we made some templates that could serve as a starting point. But then there was just some update. And then everything we had saved disappeared. The things we had gotten used to. And I have to say, after that, I kind of started to give up on it. Because it's satisfying to spend time preparing something—setting it up—if you know you'll be able to use it for a while and it makes sense. But when it can just disappear suddenly and no longer make sense, then it feels like a waste of time to sit and work on it. And I'd also say that the way it affected us was in terms of mental energy. We didn't have any during those periods—especially in the beginning when everything was being changed. And it wasn't just because it was new. It was also because it wasn't good.'* (Physician, Interview)

The quote illustrates how continuous updates and unstable customization processes leads to uncertainty and discouragement amongst hospital staff, whose customization work (such as templates and custom shortcuts created together) is

erased by sudden updates. This leads not only to a loss of effort but also undermines stability and continuity in shared tools. The uncertainty about whether their modifications would persist discouraged further investments. These breakdowns in the customized infrastructure reflect how uncertainty not only unsettles individuals, but also leads to weakened alignment between tools, people, and organizational routines, while the staff experience that the system no longer supports, but rather destabilize the collective.

Concluding Discussion

Our data – derived from both survey and interviews, indicates that hospital staff experience technostress at some frequency, with some interviewees describing daily occurrences. Among the twelve surveyed dimensions, interruptions, performance monitoring and uncertainty seem to correlate high with overall technostress. While we find various examples of interruptions and uncertainty in our interview data, our respondents do not discuss performance monitoring.

The consequences of interruptions in healthcare work are well studied (e.g., Hall et al., 2010, Westbrook et al., 2025). These disruptions may be linked to the staff making more errors and challenged in task resumption due to high switching costs. Similarly, uncertainty, as an unintended consequence of health IT implementation (e.g., Eikey et al., 2025), might affect not only the mental workload of staff, but also the quality and timeliness of patient care. It is important to note that hese technostressors have consequences for both patients and healthcare providers.

Our research contributes to technostress literature by emphasizing the cooperation aspects that both lead to and are impacted by technostress. In that sense, technostress moves from being understood as individual or related to isolated incidents, triggered by technology directly or indirectly, to bring forth the relational and systemic breakdown, particularly in coordination and task interdependence.

Adding to previous research which emphasizes that group-specific user interfaces cause teamwork problems in EHR (e.g., Sand et al., 2025), in our mixed method investigation, we look at the broader technological landscape and cross-group cooperation (from secretaries, to bioanalysts, radiographers, physicians and researchers), contributing with a broader scope to existing literature that either focuses on a specific system or staff group.

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