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Between Frustration and Invigoration: Women Talking about Digital Technology at Work

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Abstract

This study addresses the dearth of gender analysis within debates about technological innovation and workplace change. Qualitative analysis of 12 focus groups conducted with women in 'frontline' and 'professional' roles discussing their use and engagement with digital technologies at work reveals contrasting narratives of 'digital frustration' and 'digital invigoration'. To explain these distinct narratives, we synthesise insights from science and technology studies with findings from scholarship on gendered work and labour market inequality to show that these differences are not driven solely by a technology's form or the degree of automation it ostensibly represents. Instead, women's narratives reflect an interplay between technological design, employment context and workers' own voice and agency. These findings challenge assumptions about the totalising and transformative power of work-related technologies, redirecting attention to how social and political contestations over digital technologies inform worker experiences and shape the future of work.

Keywords

future of work, gender, job quality, qualitative methods, technology, working conditions

Introduction

Many discussions about the introduction of new digital technologies at work are characterised by a sense of inevitability, suggesting that robotics and AI are on the verge of replacing human labour in a range of work tasks and occupations (e.g. Brynjolfsson and McAfee, 2014; Frey and Osborne, 2017; Susskind and Susskind, 2015). In these accounts, technology is reduced to its potential to automate work tasks and is often single-handedly blamed – or celebrated – for bringing about 'the end of work'. The analysis in this article does not start from these popular, deterministic ideas about technology and work. Instead, it starts with the aim of understanding how workers themselves describe and make sense of the digital technologies they encounter at work.

Our research question focuses squarely on the experiences of women who, if included at all within the dominant discourse, have typically been reduced to a monolithic group. Recognising the diversity of women's work experiences, particularly across gender-segregated sectors and occupations, we ask: How do 'professional' and 'frontline' working women understand and explain their encounters with and their use of digital technologies at work? In this article, digital technologies refer to the 21st-century communication devices and platforms (i.e. smart phones, email, social media, video platforms, interactive apps) and data-driven software and programming anticipated to replace or limit in-person human interactions (i.e. algorithms, artificial intelligence, machine learning). We define 'frontline' work as interactive, service sector, labour-intensive work. Despite being essential work, it tends to be defined as low skill, attracting low pay with a limited capacity to progress to higher paid work. 'Professional' work is typically accessed by degree-qualified individuals, and is of higher quality in terms of pay, social status, permanency, and career paths.

Our analysis of qualitative data collected from 12 focus groups with 85 women participants working across different areas of the Australian labour market reveals women's enterprising approach to work-related digital technologies. However, important distinctions exist between how women working in professional roles and those employed as frontline workers talk about their experiences and interactions with technology. Professional working women participants were more likely to employ narratives of 'digital invigoration' that highlighted digital technology as a resource in their quest to find meaning, achieve outcomes and pursue upward mobility at work. In contrast, women in frontline roles were more likely to evoke narratives of 'digital frustration' that focused on their dismay at being excluded from decision-making about technology in their workplaces and on the vexing implications of poorly designed or implemented technologies for their everyday work lives.

In what follows, we review insights from the 'social shaping' perspective, from within science and technology studies, that highlight how technology and society are intimately interconnected yet irreducible to each another. We connect this theoretically rich scholarship with the well-established literature on labour market stratification and more recent research on how digital technologies can amplify work inequalities to frame, and ultimately make sense of, our focus group findings. In doing so, this article makes two contributions to the literature on gender, technology and the future of work. First, we provide evidence of the heterogeneity of women's experiences interacting with technology at

work, demonstrating that global, universal theories about technology and the future of work are misplaced. Second, we show how women's technological narratives are driven as much by segregated labour markets and workplace hierarchies as they are by the particularities of the technologies they encounter. Together these findings bring into sharp relief the complex interplay between gender and stratified labour markets and how they combine to structure different technological decision-making processes and outcomes for frontline and professional women.

The 'social shaping' of digital technology and work

Instead of suggesting that technology or society directly determines the other, we argue they are inextricably intertwined. The 'social shaping' perspective we employ in our analysis contends that socio-material realities emerge from negotiated processes between technological designs, the activities of users and existing social and institutional context (Baym, 2010; Suchman, 2007). Designers of technology might create technological features that frame possibilities for how it is to be used, what Ian Hutchby (2001) refers to as 'technological affordances'; yet the design process continues long after a technological artefact's initial development. Within everyday use, people engage creatively with technologies in ways that can challenge or alter their original design and purpose (Davis, 2020). At work, for example, employees might adopt and adapt digital technologies in ways that undermine the initial intent of technological designers or employer adopters (Bain and Taylor, 2000).

Moreover, laws and policies, patterned practices and shared cultural beliefs underpin how a given technology emerges. On the production side, social and institutional contexts influence who is involved in the design process, the 'problems' they seek to address and how, and the potential users they envision. For example, there are notable affinities between Silicon Valley's emphasis on efficiency and social capital and the technological designs, such as time-management technologies and social networking apps, that emerge from this social enclave (Marwick, 2013; Wajcman, 2019). These contexts are often gendered. Indeed, Allison Pugh (2021) highlights how taken-for-granted beliefs about gender and work underpin recent efforts to automate interactive service labour, leading to innovations that overlook – and ultimately obfuscate and devalue – the important 'connective labour' workers do to nurture identity, dignity and purpose in others.

Social and institutional contexts also shape how people interact with and attribute meaning to technology in everyday life: in other words, the consumption side of technology. An interesting example of the 'situatedness' (Suchman, 2007) of human-technology interactions is the case of texting practices on mobile phones. As Nancy Baym (2010) notes, despite being an available technological feature of mobile phones, texting was an uncommon practice in the US until a change in the pricing structure within phone contracts made the cost of sending and receiving texts less prohibitive. Similar processes play out within paid work. In recent research, Angèle Christin (2020) demonstrates how the meanings and practices associated with audience analytic software vary across news companies in New York City and Paris due to differences in national culture and each organisation's managerial regime, with implications for the extent to which professionals

internalise audience metrics as indicators of their individual performance and worth (see also Brayne and Christin, 2021; Maiers, 2017).

Context is particularly important when thinking about the gendered use of technology at work (Wajcman, 2007). Labour markets are highly segmented. Working conditions – such as pay, security, work time and worker autonomy and voice – are often clustered together, creating 'good' and 'bad' jobs that are increasingly polarised (Goos and Manning, 2007; Kalleberg, 2011). Importantly, labour market segmentation is not a gender-neutral phenomenon. Rather, it intersects with gender-based occupational segregation (Dwyer, 2013; Grimshaw et al., 2017), with women more likely than men to occupy low-wage and precarious jobs than high-wage and secure jobs (Charles and Grusky, 2004; Foley and Cooper, 2021; Padavic and Reskin, 2002). This labour market segmentation not only means that 'emergent digital systems are both differentially deployed and differentially experienced by workers, depending on the sector and employment conditions' (Terry et al., 2021: 3), but also that these experiences may be different for women, compared with men.

In this article, we begin from the standpoint of working women, who have rarely been at the centre of mainstream investigations of technology in contemporary work (Howcroft and Rubery, 2019). We focus on women's technological encounters and experiences in two distinct work contexts: (1) professional work, where workers have access to resources and decision-making power and (2) frontline work, where workers typically operate under the direct supervision of managers with little autonomy. Employing the lens of the social shaping perspective, we examine how women navigate the constraints and opportunities posed by technological designs and work contexts, and how they embrace, challenge and reinvent the technologies they confront in their jobs. Before launching into our research design, however, we first provide a targeted review of research that documents how technological designs can be a conduit for inequality, especially gender inequality.

Digital technology and inequality for working women

Existing social hierarchies and patterns of discrimination often take on new life within technological systems, becoming part of their internal logic in ways that reproduce and amplify social inequalities (e.g. Benjamin, 2019; Eubanks, 2017). In the workplace, where the relationship between workers and employers has generally been considered the dominant axis of power and inequality, the desire to maximise profit influences technological design and implementation (Bailey and Barley, 2020). For example, employers' use of algorithmic systems to align retail workers' hours with periods of high demand reflects their interest in efficiency, which prioritises business interests over workers' need for schedule predictability and economic stability (O'Neil, 2016). Similarly, workplace surveillance technologies incorporate taken-for-granted assumptions about who has the right to privacy, and these assumptions often reinforce power and status differentials between employers and workers (Hodder, 2020; Ticona and Mateescu, 2018; Van Oort, 2019). Furthermore, workers' actual labour can be deliberately hidden behind the implementation of new technologies. For example, new projects attract investors by reducing the appearance of costly labor, which simultaneously serves to portray programmers and IT managers as the sole producers of knowledge-economy innovations

(Irani, 2015). Thus, it is lower status workers who are often made invisible through the implementation of technology: for example, workers performing crowdsourced 'micro' tasks accessed through platforms like Amazon Mechanical Turk (Gray and Suri, 2019) and grocery clerks who manage 'self-service' checkouts (Mateescu and Elish, 2019). Workers are aware of these tensions and are anxious about new digital technologies *changing* the nature of their work, rather than losing their jobs per se (Dodel and Mesch, 2020).

Technologies also intersect with gendered work structures and cultural beliefs in ways that further stratify access to material rewards, status and dignity at work. On one hand, women are concentrated in a range of frontline occupations – such as retail and administrative services – where technological changes have undermined recognition and pay, intensified work processes and exacerbated job precarity (Peetz and Murray, 2019). On the other hand, women face significant barriers to entry in high-status, technology-oriented occupations, such as engineering (Kaspura, 2017). As a result, they have fewer opportunities to influence technological design and decision-making. When women do shape technological innovations, their contributions are often overlooked (Abbate, 2012; Hicks, 2017) and their technical acumen downplayed (Guerrier et al., 2009; Kelan, 2008). A contemporary example of this phenomenon can be seen among social media influencers, where the technological (and business) skills of this mainly female workforce are rarely fully acknowledged or compensated (Duffy, 2017). This lack of recognition makes it challenging for women to gain and maintain a strong foothold in technological decision-making, resulting in many technologies being inscribed with masculine-centered logics (Wajcman, 2007).

Nevertheless, research demonstrates that working women are savvy and creative technological interlocuters and that even constraining technological designs can sometimes be reconfigured in unintended and empowering ways. For example, information and communication technologies (ICTs) have been shown to tether people to work, forcing them to be 'always on', even during unpaid time (Clawson and Gerstel, 2014; Nagy, 2020). Yet, professional women explain how these technologies also help them to overcome traditionally gendered work-family challenges, and frontline service workers, a majority of whom are women, say they use ICTs to maintain contact with loved ones and manage boredom and stress while on the job (Gregg, 2011; Horst and Taylor, 2014; Ticona, 2015).

While technological designs reflect and refract existing gender inequalities, women encounter these technologies within distinct work contexts and from differing positions of power and disadvantage. In this article, we use professional and frontline working women's narratives to show how and why these differences matter and to theorise about how they might be interconnected.

Methodology

We prioritised women's perspectives and voices in our data collection and analysis, while acknowledging that women's experience interacting with technology varies according to their status within the labour market and workplace. We capture this variation in our sample by including working women from contrasting occupations and pay

levels, broadly located in either professional or frontline work. We adopt what Leslie McCall (2005) calls an 'intercategorical' intersectional approach to compare and contrast how women in higher-status, higher-paid positions and women in lower-status, lower-paid positions talk about and experience digital workplace technologies and think about ongoing technological change within their work (see also Choo and Ferree, 2010). Through these cross-group comparisons, we evaluate how systems of gender and work status, together, shape technology-worker relationships.

This article focuses specifically on women's *narratives* about using digital technology at work. In other words, we sought to analyse the stories women tell about their technological experiences at work and how they themselves define and engage with one another about their everyday use of digital technologies. These narratives are important because they reflect not only women's lived experiences of workplace technologies but also their expectations, anxieties and hopes for and about these technologies.

We conducted 12 focus groups in 2017 and 2018 with a total of 85 women working across different areas of the Australian labour market. In these 90-minute group conversations, we asked women about their experiences with technology at work, including any new digital technologies they were encountering, technological training in which they had participated, and technological changes they observed taking place more broadly within their sector. We also asked them to characterise the way that they felt about their interactions with the digital technologies they encountered and any changes they had observed.

A purposive sample was constructed based on existing understandings of labour market segmentation within the Australian context (Foley and Cooper, 2021; Foley et al., 2020). We strategically selected women working in different occupations located across key labour market divides, with a focus on 'frontline' and 'professional' workers, to better understand how work contexts shape women's experiences with and expectations about technology at work. We prioritised differences across higher-status, higher-paid (AU$70,000+) occupations and lower-status, lower-paid (< AU$70,000) occupations given the prominence of these divides and our interest in varying experiences based on women's different status within workplaces and industries.[1] We also considered occupational prestige in our sampling choices and ensured our sample included variation within these two groups regarding workplace gender composition[2] and women's level of job insecurity, as the former has been shown to uniquely influence women's work experiences and the latter represents an emerging feature of labour market inequality (Kalleberg, 2011). See Table 1 for a detailed summary of participants in each group.

After obtaining Human Research Ethics Committee approval for the study through our university, we commissioned social research company, IPSOS, and specialist qualitative recruitment company, Qualitative Recruitment Australia (QRA), to recruit women, aged 18–40, into the study.[3] Participants used only their first name in the focus group and transcripts of conversations were anonymised. The research team was not directly involved with recruitment thus preserving anonymity and confidentiality of any substantive personal information about participants. In line with the ethical standard in qualitative data collection, and as approved by our Ethics Committee, participants were reimbursed for their time via a prepaid gift card.

Table 1. Summary of participants, by categorisation and by focus group.

Category	Focus Group Size	Occupation Group	Typical Roles	Gender Composition of Work Context	Employment Status	Age (in years)
Professional workers: Higher-paid, Higher-status Focus Groups	8	Mixed	Lecturer, nutritionist, recruiter, design consultant	Not specified	Casual/self-employed mix	24-40, $\bar{x}$=33
	9	Mixed	Financial controller, lawyer, pharmacist, accountant	Not specified	Full-time	29-40, $\bar{x}$=32
	7	Professionals (Engineering)	Project engineer, civil engineer	Men-dominated	Full-time	22-28, $\bar{x}$=26
	7	Managers (Information Technology)	Systems analyst, software developer, project manager	Men-dominated	Majority full-time, minority part-time	23-40, $\bar{x}$=32
	8	Professionals (Healthcare)	Physiotherapist, dietician, diagnostic imaging specialist	Women-dominated	Full-time	24-36, $\bar{x}$=28
	8	Managers (Digital Media)	Social media professional, podcast producer, digital marketer	Women-dominated	Full-time	23-39, $\bar{x}$=31
Total Participants in Category	**47**					
Frontline workers: Lower-paid, Lower-status Focus Groups	8	Mixed	Bartender, receptionist, customer service	Not specified	Casual/part-time mix	20-39, $\bar{x}$=24
	8	Mixed	Teacher's aide, human services officer, healthcare assistant	Not specified	Full-time/part-time mix	22-3, $\bar{x}$=30
	5	Labourer	Warehouse worker, traffic controller, landscaper	Men-dominated	Full-time/part-time/ casual mix	21-25, $\bar{x}$=23
	6	Community & Personal Service (Security)	Security officer, control room administrator	Men-dominated	Full-time/part-time/ casual mix	19-35, $\bar{x}$=29
	7	Sales (Retail)	Sales clerk checkout operator	Women-dominated	Full-time/part-time/ casual mix	18-40, $\bar{x}$=32
	4	Community & Personal Service (Care)	Aged care worker, disability support worker	Women-dominated	Full-time/part-time/ casual mix	26-40, $\bar{x}$=35
Total Participants in Category	**38**					
Total Participants	**85**					

Focus group discussions were transcribed and analysed using a type of thematic analysis characterised as 'flexible coding' (Deterding and Waters, 2021), a method well suited for collaborative analysis of large qualitative datasets. Applying this approach, we began by 'indexing' each focus group transcript, coding large chunks of the data into the substantive topic areas outlined in the protocol. As we coded the transcripts, we wrote memos for each, highlighting key themes and areas of difference and similarity across groups. These memos produced initial 'hunches' about what the data's story might be and informed our creation of more narrow codes about the technology-focused data, such as 'satisfying technological experiences' and 'frustrating or disappointing technological experiences'. We also created codes that focused on different dimensions of job quality, such as 'security', 'autonomy and voice', 'schedule control' and 'resources and training' and codes that focused on specific gender dynamics, such as 'gender composition', 'perceptions of gender inequality' and 'rude or inappropriate interactions/behaviours'. We then developed analytic memos that explored overlapping codes within each focus group and compared themes across groups. From this, we were able to compare and contrast women workers' attitudes based on their job type, status, security and industry; as well as identify how they interacted and shared stories with one another about their agency and the context for the use of technology at work.

Women's technological encounters at work

Our analysis located two overarching narratives of women's uses of technology at work: a 'digital invigoration' narrative where women felt empowered by the technologies they encountered to create positive change in their working lives; and a 'digital frustration' narrative where women identified how technologies were increasingly being imposed on them by their workplaces, often in the name of managerial control or efficiency. These narratives are analytical abstractions, or 'ideal types', that demonstrate how workplace privilege and disadvantage produce distinct technological experiences; however, we also noted that some participants perceptively understood *both* the enabling systems in the implementation of technologies *and* how they were being used or misused by management within workplaces.

Professional working women and 'digital invigoration' narratives

Professional workers who participated in focus groups were employed in a range of industries: engineering, healthcare, media and information technology. The majority of these participants were employed in secure positions with decent working conditions, although some were on fixed-term contracts. Some, such as those employed in the information technology (IT) sector, encountered technology primarily as designers, writing code for computer programs and mobile applications and conducting user acceptance tests. Other participants described technological encounters primarily from a user perspective. For example, some engineers talked about using drones to survey project sites and augmented reality devices to present design proposals, while professionals employed in healthcare settings talked about using electronic health records in patient case management, mobile apps to assist patients with rehabilitation exercises, and emerging technologies to help

align and fit prosthetic limbs. Professional working women participants all described using digital communication platforms to collaborate with colleagues and to engage with clients.

Professional working women's narratives portrayed a strong sense of engagement and enthusiasm about their encounters with work technologies. A digital media professional said that new technologies offered creative ways to meaningfully engage with audiences. She explained, 'it's about being intellectually stimulated and engaged with my work'. Similarly, a healthcare professional spoke enthusiastically about a new automated program for interpreting mammograms, which she felt would have a 'huge impact' on health outcomes for patients. In the IT group, one participant described the 'fun' of being involved with the design of cutting-edge technologies, saying, 'it's a lot of fun to deliver innovation!'. Women in engineering and IT, in particular, were keenly aware of being in occupations that were historically and culturally coded as masculine, and they took pride in their ability to 'break through' in those environments. For example, participants noted that they were frequently 'the only female' in meetings. They described the need to gain recognition and legitimacy in the 'boys' club' and spoke about how they brought unique value to their organisations because they 'think differently'.

Participants in the professional workers' focus groups struggled to identify problems and challenges associated with the digital technologies they engaged through their work. When asked if there were any downsides to new digital technologies within her workplace, one IT professional responded, 'I have been exposed to only successful outcomes'. She recalled reading about how technology made some jobs redundant, but reiterated that, 'from my perspective, it has only been positive'. This view was shaped by her unique social location. In her professional role, she had input into technological design processes and an ability to, at least partially, shape outcomes. Technologies she encountered at work reflected her interests, and she was invested in those initiatives in ways that may have made it difficult for her to see their (potential) drawbacks.

Several professional women were leading technological design or implementation projects. An IT consultant spoke about a project she was leading at the time of the focus group, noting that it threatened other workers' jobs, but she was more interested in the benefits and opportunities created:

> We've put in place a new system. . . the benefit of this system and those roles changing is that the customer satisfaction is going to be much better for that business, and I can really see that happening. I know a lot of people have been made redundant. . .a lot of [people] were against what we were doing because they knew it was going to put their jobs in danger, but having said that, it has created new roles as well. So, yeah there will be challenges coming up, but I think it's exciting.

Other participants expressed similar ideas, explaining that 'in terms of applying [technological] development into real life, there is a lot of testing. . .as well as the understanding of how things work and is applicable'. This participant emphasised that automation decisions were complex, involved negotiating between business and technological logics and often produced outcomes that differed from those expected at the outset. Participants also pointed out that few technologies were fully autonomous, highlighting examples

where human labour was needed to deal with 'everything you have to fix in the background', to address issues when 'it screws up' and to assist with 'translation' between business and IT because 'they are completely speaking different languages'. One participant even explained how in the legal profession, she was often required to manually replicate the work of technology due to other workers being slow technological adopters within a profession that valued tradition. She described how more junior lawyers often had to assist senior lawyers by providing them hard copies of e-files and helping them navigate communication platforms. Given gendered hierarchies within the legal profession, with men more likely to be in senior roles than women, it was often women who were doing this additional labour.

The more sanguine orientation toward digital technology among women working in professional occupations also reflected their own privileged and autonomous position within decision-making roles. Women in these roles often aligned themselves with their employers' interests, prioritising objectives such as customer satisfaction, profit maximisation and business growth over workforce protection. For example, a digital media manager professed, 'you have to [pursue automation] to succeed because everything is so expensive. It's kind of the most sustainable way to keep the growth going'. The lack of reflexivity regarding how such pursuits of automation might negatively affect workers was facilitated, in part, by participants' perception of themselves as distant from those implications. This perception became particularly evident in one focus group when, in response to a question about how participants envisioned the 'future of work', one woman replied, 'if today, you were managing projects or managing people, you might be managing machines in the future'. In other words, she saw herself as being largely above the fray when it came to the displacement effects of automation.

Professional women generally saw themselves as safe from automation displacement or felt they had a skillset that would allow them to navigate technology-driven changes in the labour market. For example, when we asked a group of healthcare professional workers whether they felt their jobs were threatened by technological change, the unanimous reply was 'no'. These participants explained that they were in a growing sector of the labour market and that digital technology 'supports but does not replace' work. Similarly, digital media and engineering professionals suggested that their analytic and problem-solving skills could not be fully automated and that women with those skills were 'in-demand'. As one participant said, 'there's still a massive shortage for engineers, as well as developers, *especially* females'. Those participants with high-level technological skills felt that they were likely to find new opportunities, even if their current roles changed. Speaking to this perceived agility, one participant said, 'because I work *in* technology, I kind of have that edge. . .if I sense that I was going to be made redundant because a machine could do my job, then maybe I've already got something else in the works', while another stated, 'yes, my role will change, but you can evolve with it'.

Notably, high-level technology skills were often fostered within resource-rich environments that invested heavily in learning and development. Participants described robust in-house training sessions, being afforded time and money for conferences and external seminars and having supportive colleagues who would share knowledge and resources. At the same time, these benefits came at a cost. Professional women felt constant pressure to 'keep up'. One participant said: 'I don't want to fall behind . . .like, oh

crap, everyone is over here, and I am over here!' Along with the pressure to continuously upskill, participants described how digital technology increased their workload, work pace and their overall working hours. One digital media professional observed how, with new work technologies 'there's no real barrier to getting things done', and another commented that with 'cloud-based stuff, there's no such thing as 9-to-5'. When asked whether digital technology *increased* workloads given claims that technology *reduced and streamlined* tasks, one participant explained:

> At the same time that it makes things easier, you're able to produce more, and you force yourself because you know that you're able to get more things done. . .you're like 'I'm going to produce more and more.' So, it kind of creates a pressure.

Professional worker participants felt the pressure to manage a constantly evolving, 24/7, global economy, and they struggled with how work demands encroached on their personal lives. Interestingly, while they viewed digital technologies as contributing to the problem, they also saw them as part of the solution, with some using digital calendars to purposefully block out time that could not be scheduled with work activities to protect their personal time.

Frontline working women and 'digital frustration' narratives

Frontline worker participants were employed in interactive service and labour-intensive roles across a range of industries, including retail, healthcare, security, manufacturing and hospitality. The frontline sample included workers employed on full-time, permanent contracts, part-time, permanent contracts and casual contracts, yet, across contract type, they were paid significantly less per annum than the professional worker cohort.

Like the professional groups, frontline workers saw value in digital technologies, and they were keen to integrate them into their work practices. They described using digital technologies to make administrative tasks easier and to reduce some of the more mundane aspects of their work. Aged-care assistants explained how they used scheduling and communication technologies to manage patient appointments and to communicate efficiently with their supervisors between visits to patients' homes. Security workers talked about how digital technologies allowed them to livestream surveillance footage directly to their phones, providing them with greater mobility and facilitating quicker responses to threats. Retail workers shared how they used digital technologies to manage inventory and to serve clients, as one participant detailed:

> We have iPads at work, which is really good. So, when a customer goes in and goes, '[I'm looking for a top and] the top was pink', I'll automatically go [motions as if scrolling through a screen], 'this one?' 'No.' 'This one?' 'This one.' 'Ok, we're going to get it on the website.'. . . the website. . .nowadays will have the code. . .which is great because that's the code I need to then check if we have it.. . .it's convenient for me and also really good for them.

In contrast to professional participants, women in these groups were not employed in roles or industries that offered opportunities to shape or lead technological design. In

addition, they described how they were often actively excluded from decision-making regarding the implementation of technology within their workplaces. For example, participants employed in retail explained how company executives frequently offered online shopping promotions to customers without informing them or adjusting staff in-store sales targets. As a result, they felt powerless. One woman working in a frontline healthcare role recalled how her supervisor rebuffed her suggestion to transition the organisation's patient management systems to a different software provider, which would reduce the manual labour required by staff. Another participant recounted her boss's reply to her request to update the company's invoicing software: 'he just said "no" . . .there's no conversation, didn't explain it. Yeah, just said "no"'. Frontline participants articulated a reactive stance to digital workplace technologies, as opposed to the more empowered stance of their professional counterparts.

Frontline worker focus group participants also described having limited access to training and support to help them navigate evolving workplace systems. When training was offered, the format was typically self-directed and web based. One participant commented, 'I'd much rather get a qualification than work at it myself and have to struggle and learn everything from scratch'. Self-directed training was seen as burdensome, and because it did not provide workers with formal credentials, it was not portable and useful for navigating the labour market to better jobs.

Exclusion from decision-making and insufficient training led frontline workers to feel more exposed and vulnerable than professional workers to technology-driven displacement. More than job loss, however, frontline workers were concerned with how digital technologies increased the intensity of their work. Retail workers described how a focus on online sales meant fewer staff were scheduled for in-store shifts, exacerbating existing work pressure. As one participant described it, 'there's just not enough staff to do what is required. . .wages are still unbelievably low, and the workload is unbelievably high'. In addition, frontline workers discussed how outdated software and poorly maintained digital technologies resulted in frequent 'system crashes'. They explained how failures 'put everything into chaos', creating more work and customer backlash. While professional and managerial participants also discussed work intensification, the anxiety and frustration among frontline participants was exacerbated by their limited voice in technology-related decision-making and the lack of acknowledgement (and compensation) they received for their extra tech-related efforts.

Notably, the two groups had contrasting views in relation to the use of surveillance technologies at work. Professional workers described surveillance technologies as passive and protective, contributing to the safety they felt at work. By contrast, frontline workers reported feeling actively monitored by digital technologies such as video cameras and finger scans. Rather than being protected, they felt targeted and they described how their employers used surveillance technologies to look for in-house theft and to monitor their work time and activities. Indeed, one participant described a situation in which surveillance technology obviously failed to keep her safe:

> I will tell you a very bad story. . .my controller touched my backside in a lift. . .An old man. Sixty. Touched my butt. I froze. They saw it on camera. Like, usually I walk out of the lift first. He walked out, and you could see me. I was frozen walking back to the room. I told my

> supervisor who was one of those 'boys' club' boys and you know what he said to me? 'You have to be very mindful that he is from the era of the 60's and 70's of free loving, and he's probably a bit different.'

In this case of sexual harassment, video documentation was not enough to spark managerial action. As a woman, this participant was more likely to be exposed to sexual harassment, and as a worker within a frontline context, surveillance technologies were more likely to be used *against* her than *for* her.

Frontline workers described how technology-mediated interactions sometimes amplified customer mistreatment of staff, an experience not discussed at all by professional participants. Retail workers explained that customers became frustrated when items or promotions from the website were not available in store, recalling times when customers would 'shove their phone into my face' to make their point. In a different context, a woman working in security services recounted how people would sometimes snap at her over the phone while she worked with them to troubleshoot issues: 'they're trying to do something online, and they're struggling with it, and they let it out on you because they're just frustrated that they can't get it'. She recalled how the conversations could become abusive, at times making her cry. As outrage filled the room, one participant posited, 'I think they're doing that because [they think] they're talking to a machine'. Customer-driven abuse of low-status, interactive service workers has been well documented (Korczynski and Evans, 2013), and participants' experiences suggest that digital technology can have a distancing and dehumanising effect that worsens the issue.

Like women in professional roles, women in frontline jobs saw value and opportunity in the implementation of new digital technologies. However, their lack of workplace power and poor access to employer-sponsored resources and training meant that opportunities for using digital technology to their own benefit were rare. In contrast to the 'invigorating' experience of technological innovation that professional women reported, these women were much more likely to experience work intensification, chaos, frustration, disrespect and even violence in their technological encounters at work.

Discussion and conclusion

This article set out to bring a gender lens to the study of technological innovation and workplace change, investigating how working women understand and explain their encounters with and use of new and existing digital work technologies. Our analysis of data from focus groups with women working in professional and frontline jobs reveals similarity and difference in women's narratives about technology at work. We find that both professional and frontline women approach digital workplace technologies with enthusiasm, and they see technology as a potential resource for improving work processes and outcomes. However, women in professional roles are more likely to view themselves as being able to leverage the potential of digital technologies, while those in frontline roles articulate a more reactive stance toward workplace technologies, noting how digital technologies contribute to more harried and chaotic work shifts, greater surveillance, and increased exposure to interpersonal abuse.

We build on core insights from science and technology studies scholarship (e.g. Baym, 2010; Suchman, 2007) to explain these findings, arguing that ongoing negotiations between technological designs, workplace contexts and individual perceptions and strategies for action produce distinct technological experiences. For example, our participants' disparate narratives about workplace surveillance technologies are not driven by technological designs alone, although professional and frontline women workers may certainly encounter variations in the forms of technological surveillance they confront at work. Instead, the ability to trust colleagues and supervisors, the potential for autonomy, voice, and influence at work, distinct workplace norms and cultures, and how surveillance technologies are implemented and used within a given workplace also play an important role. Our findings provide empirical evidence that technological designs do not translate directly or uniformly into predetermined workplace experiences, challenging assumptions about the totalising and transformative power of technologies.

We integrate research on technology with scholarship on the gendered nature of work and labour market segmentation. We show that women employees have complicated and stratified relationships with digital technologies at work. The character of this relationship reflects the nature of their work, their occupational status and the gendered dynamics and interactions of their workplaces. We therefore see the research as contributing to scholarship that describes workplaces as environments that reproduce existing and generate new inequalities along gender and class lines (Acker, 1990); and importantly that 'gender matters' across a range of workplace phenomena, relationships and outcomes, including remuneration, regulatory form and workplace voice (Charlesworth and Heron, 2012; Cooper et al., 2021; Whitehouse and Smith, 2020). Our research also demonstrates that difference and inequality exist not just across gender categories but also within them, and that we cannot treat women as a homogenous group. Frontline working women's 'digital frustration' reflects their lack of control over the design and deployment of technologies and their lack of voice in the workplace. Despite facing notable gender inequality in their workplaces, professional working women enjoy higher levels of autonomy and influence and have better access to training and development resources. These relative advantages are critical to enabling their experiences of 'digital invigoration'.

Identifying this, albeit relative, privilege allows us to point out some of the taken-for-granted structures and practices that create and sustain unequal experiences of technology at work. One illustration of this can be seen in how some professional women in this study overlook the potentially negative impact the technologies they design and work with might have on other workers. Their narratives emphasise the benefits of technological innovation over any costs. In contrast, some frontline women describe how uninformed technological decision-making can contribute to conditions that undermine their autonomy, security and dignity and create overwhelming demands on their time and bodies. By comparing and contrasting the narratives of professional and frontline women, we can see how the assumption that negative outcomes for some are simply the cost of innovation helps to enable, maintain and even justify workplace inequalities. This assumption is bolstered by professional women's access to training and development resources, an advantage not typically extended to frontline workers, but which helps professional women feel protected against the worst potential outcomes of technological decision-making. The intent here is not to critique professional women for failing to

appreciate the full impact of technological innovations, but to highlight how normative ways of thinking about technology are structured into many professional environments.

There are limitations to this research. Between our ideal type narratives of digital invigoration and digital frustration are more nuanced and varied accounts that need to be better understood. Our study did not analyse how gender and workplace status intersect with other axes of inequality, such as race, ethnicity and age, to shape workers' experience of digital technologies at work. We also did not make one-to-one comparisons between occupations and industries, raising questions for future research about how industry and occupation-specific dynamics may contribute to the patterns we observe between professional and frontline working women. We encourage future research to further develop the contextual and intersectional drivers of different experiences of digital workplace technologies and to expand and refine the findings presented here.

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Notes

1. Australian women's 2016 average annual earnings for full-time work (~AU$72,000) was used to distinguish between these two groups (Australian Bureau of Statistics, 2016).
2. An occupation was considered to be gender-dominated if one group made up 60% or more of the workforce, as indicated by the Workplace Gender Equality Agency, Australia's statutory body responsible for addressing gender equality at work.
3. Both companies are accredited in Australia to ISO 20252, the International Standard for Market Research.

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