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Platformised digital agriculture and technostress: implications for psychosocial occupational safety and health

D. Manzoni and M. Černič Istenič*

The Research Centre of the Slovenian Academy of Sciences and Arts, Sociomedical Institute, Novi trg 2, SI-1000 Ljubljana, Slovenia
*Correspondence: majda.cernic-istenic@zrc-sazu.si

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Abstract. Digitalisation in agriculture is increasingly structured through platformisation: daily work is mediated by interconnected sensors, dashboards, notification pipelines, and vendor-governed service ecosystems. While automation and data-driven management can reduce physical workload and enable more flexible work organisation, platform-mediated arrangements may also increase psychosocial occupational safety and health (OSH) risks by reshaping temporality, interpretive responsibility, predictability, and practical agency. This article aims to explain how platform-mediated arrangements in digital agriculture generate technostress-related psychosocial OSH demands and to identify design and governance levers that may mitigate these risks in welfare- and time-critical settings. The study presents a theory-guided integrative review (narrative synthesis) using empirical 'evidence anchors'; it is not a meta-analysis and does not provide pooled effect estimates, prevalence measures, or sector-wide quantitative inference. From a prior systematic review corpus, eleven scholarly sources (2004–2023) - primarily on automatic milking systems and related monitoring infrastructures - were selected and synthesised to identify recurring sociotechnical arrangements. The analysis yields a platform-architecture model linking work reorganisation to technostress appraisals clustered around four patterns: (1) availability pressures under always-on monitoring, (2) interpretive burden under opaque outputs and epistemic asymmetry, (3) constrained agency under proprietary service and update pathways, and (4) intensified self-evaluation under metricised dashboards. Framing technostress as an upstream outcome of platform-mediated work organisation clarifies why psychosocial OSH cannot be addressed through individual adaptation alone: risk depends on how platform design and governance allocate urgency, distribute uncertainty, and shape access to expertise, support, and repair. The article therefore proposes contestability - users' capacity to inspect, adjust, and stabilise platform mechanisms - as a practical mitigation principle for OSH-sensitive digitalisation.

Key words: platformisation, digital agriculture, technostress, psychosocial OSH, automatic milking systems, monitoring infrastructures.

INTRODUCTION

Agriculture is becoming increasingly digitalised through sensor networks, connected machinery, farm management information systems, and data-driven decision support (AgriDataSpace, 2024). In data-intensive and high-monitoring settings,

particularly in livestock production, these developments are often presented as pathways to higher productivity, environmental optimisation, and reduced labour demand. However, digitalisation is not simply the addition of discrete tools to otherwise stable workflows. Increasingly, it takes the form of platformisation, where everyday work is organised through interconnected data flows, dashboards, notification pipelines, and vendor-governed service ecosystems.

In this paper, platformisation refers to a shift from stand-alone technologies to platform architectures that (i) continuously monitor processes, (ii) trigger exception-based alerts, and (iii) channel expertise, maintenance, and optimisation through software rules, update regimes, and contractual support pathways, consistent with accounts in platform and infrastructure studies (Helmond, 2015; Plantin et al., 2018). In high-responsibility farming environments, where living systems, seasonal constraints, and economic risk intersect, such architectures reorganise attention, accountability, and temporal rhythms. This reorganisation has direct implications for occupational safety and health (OSH), including psychosocial and cognitive dimensions.

Agricultural OSH research has traditionally given particular attention to physical hazards such as injury risk, ergonomic strain, and exposure-related risks (EU-OSHA, 2020; EU-OSHA, 2024a). Digital and automated technologies can reduce some of this burdens by lessening physically demanding tasks and enabling earlier detection of anomalies, but they may also introduce psychosocial risks by intensifying monitoring, reducing autonomy, and fostering 'always-on' response expectations (EU-OSHA, 2024b). Psychosocial OSH is therefore not only a matter of stressful technology use at the interface level; it also depends on how platform architectures structure work demands and resources - most notably by allocating urgency, shaping implicit response expectations, and redistributing responsibility under conditions of limited predictability.

Empirical studies of digital and automated farming systems indicate a dual OSH profile. Benefits such as reduced physical workload and perceived flexibility may occur alongside qualitatively distinct stressors, including sustained cognitive load from data interpretation, intrusion of monitoring duties into private time (for example, on-call availability), and strain resulting from maintenance uncertainty and dependence on external expertise and service infrastructures (Hansen, 2015; Karttunen et al., 2016; Hartung et al., 2017; Tse et al., 2018; Hansen & Stræte, 2020; Hansen et al., 2020; King et al., 2021). Rather than viewing these outcomes as contradictory, this article interprets them as consequences of platform-mediated sociotechnical arrangements that can remain organisationally invisible because they operate through defaults, alerting practices, data-access asymmetries, and service governance rather than through explicitly negotiated workplace rules.

To analyse these patterns, this article draws on the concept of technostress, defined as stress experienced when technology-related demands exceed available resources for coping, learning, and effective use (Tarafdar et al., 2007; Ragu-Nathan et al., 2008). Technostress research provides a structured vocabulary for technology-induced psychosocial risk, including overload, invasion of non-work time, complexity, uncertainty, and perceived loss of control. While these constructs are well established in organisational and information systems research (e.g. Ayyagari et al., 2011), their use in agricultural contexts has often remained closely tied to adoption processes or user

attitudes. Here, technostressors are treated as analytically distinct dimensions, whose appraisal is shaped by upstream work-organising conditions – specifically, by the integrated design of sensing, interfaces, notification pipelines, data access, and service or update pathways that together structure attention, accountability, predictability, and practical agency in everyday farm work. Recent syntheses support this upstream focus. Technostress is consistently associated with psychological and behavioural outcomes, yet findings vary across usage contexts and depending on whether technostress creators are modelled in aggregate or as distinct dimensions (Nastjuk et al., 2024; Pothuganti, 2024). Complementary systematic reviews specify mechanisms through which technostress leads to strain and work-life balance tensions (Bottaro et al., 2024). Meta-analytic evidence on antecedents further indicates that different sets of individual and organisational conditions shape the appraisal of specific technostressors, underscoring the conceptual distinctiveness of overload, invasion, complexity, insecurity, and uncertainty (Kotek & Vranjes, 2025). Together, these syntheses motivate explanatory accounts that identify the upstream conditions – such as platform architectures - that systematically shape technostress appraisal.

Platformisation also has a normative dimension. Platform mechanisms embed evaluative assumptions into dashboards, alerts, defaults, and service pathways, thereby stabilising what is considered relevant information, urgent action, and competent care in everyday work (Srnicek, 2016; van Dijck et al., 2018). Digital infrastructures do not merely deliver information; they shape what becomes salient, actionable, and auditable, thereby normalising expectations of availability and responsiveness. From this perspective, technostress is not primarily a downstream problem of poor digital hygiene or individual resistance, but a structural symptom of how platform architectures allocate urgency, redistribute responsibility, and constrain practical agency.

The core gap, therefore, is not merely descriptive ('technology can be stressful') but structural: the field lacks a sufficiently explicit account of how concrete platform-level arrangements - such as monitoring intensity, notification pipelines, dashboard architectures, update regimes, and service ecosystems - translate into technostress-relevant demands and OSH-relevant consequences, including impaired recovery, fatigue, vigilance decrements, and decision-making under uncertainty (Warm et al., 2008; Lim & Dinges, 2010). Addressing this gap shifts analysis away from individual coping towards the upstream sociotechnical conditions that shape predictability, perceived control, and access to coping resources in everyday work.

Building on empirical research into digital and automated agricultural technologies - primarily automatic milking systems (AMS) and associated monitoring infrastructures - this theory-guided integrative synthesis develops a sociotechnical account of technostress in digital agriculture, focusing on platform architectures and their invisible organisational structures (Hansen, 2015; Karttunen et al., 2016; Hartung et al., 2017; Tse et al., 2018; Hansen & Stræte, 2020; Hansen et al., 2020; King et al., 2021; Shahibi et al., 2023). The article aims to explain how recurring platform-mediated arrangements reorganise time, attention, accountability, and practical agency, and how these shifts generate psychosocial OSH demands in welfare- and time-critical settings. Specifically, the analysis asks: (1) which recurring platform-level arrangements reorganise time, attention, and accountability; (2) through which technostress-relevant mechanisms these arrangements generate psychosocial demands (e.g. invasion, uncertainty, loss of

control); and (3) which design and governance levers can reduce psychosocial risk without undermining the benefits of automation in welfare- and time-critical settings. The analysis shows how platformisation reshapes availability pressures under always-on monitoring, interpretive responsibility under opacity and epistemic asymmetry, practical agency under vendor-governed service and update pathways, and evaluative norms through metric-based dashboards and benchmarks. The paper contributes an OSH-relevant framing of platformisation that (i) shifts attention from individual adaptation to upstream sociotechnical conditions and (ii) identifies design and governance levers through which digital agriculture can reduce psychosocial risk while preserving the benefits of automation. The article proposes contestability – users' capacity to interrogate, adjust, and stabilise platform mechanisms – as a unifying mitigation principle.

The argument is anchored in welfare- and time-critical settings (especially dairy AMS), where monitoring and response loops, alerting practices, and service dependencies are routine. This focus should also be read as a limitation stated from the outset: the evidence base is selective, weighted towards AMS and related livestock monitoring contexts, and intended to support explanatory conceptual synthesis rather than sector-wide prevalence claims. The dynamics outlined here may transfer to other domains of digital agriculture when work is organised around continuous sensing, exception-driven notifications, metric-based oversight, and vendor-governed service or update pathways; however, the article does not make sector-wide prevalence claims.

MATERIALS AND METHODS

Positioning, scope, and evidence base

This study presents a theory-guided integrative review (narrative synthesis) based on a previously assembled systematic review corpus and a focused selection of empirically rich evidence anchors. The contribution is both conceptual and practice-oriented: it synthesises technostress and psychosocial occupational safety and health (OSH) in digitalised – specifically platform-mediated – agricultural work. The aim is explanatory, clarifying how recurring platform arrangements reshape everyday work demands and coping resources rather than estimating prevalence, effect sizes, or sector-wide risk levels. It is not a meta-analysis and does not aim to provide pooled effect estimates, prevalence measures, or sector-wide quantitative inference.

The broader literature searches and screening process followed the PRISMA 2020 guidelines (Page et al., 2021). After removing 4,366 duplicate records identified across two bibliographic databases, 603 records remained and were stored in the Social Science Data Archive dataset (Šprah et al., 2025). Title and abstract screening excluded 559 records, leaving 44 full-text reports for eligibility assessment. Of these, 39 full-text articles were excluded because the technologies investigated were not directly related to agricultural work processes or did not address occupational safety, health, or well-being among farmers and farmworkers. This left 5 eligible studies from the database-based review process. Backward reference searching (snowballing) identified 6 further eligible studies not captured through the electronic database search. In total, 11 studies met all inclusion criteria and were retained for the final synthesis.

For the purposes of this article, studies from the broader review corpus were purposively selected based on their relevance to platform-mediated work organisation and their capacity to support an explanatory synthesis of psychosocial OSH demands in welfare- and time-critical settings. The analytical material therefore comprises eleven scholarly sources published between 2004 and 2023, and no additional systematic database search was conducted for this article.

Platformisation is used here in the industrial-platform sense. Automatic milking systems (AMS) are analysed not merely as robotic devices but as vendor-governed product-service ecosystems that centralise data, mediate alerts and dashboards, and structure access to updates, service, and expertise. The resulting evidence base is intentionally focused on recurring configurations of platform-mediated work in operational agricultural contexts - particularly continuous sensing, alert-driven oversight, dashboard-based interpretation, and vendor-governed service and update pathways.

Selection procedure

Evidence anchors were assembled in two steps: (i) identification through the systematic literature review; and (ii) purposive, theory-guided selection of studies that (a) document platform-mediated work organisation and (b) provide sufficient empirical material to interpret psychosocial strain, coping resources, or OSH-relevant consequences. The present article therefore does not reproduce the full systematic review; rather, it draws on a focused subset of empirically rich studies to develop a theory-guided explanatory synthesis.

Inclusion criteria were: (i) scholarly contributions (predominantly peer-reviewed articles) containing empirical or practice-based material; (ii) a focus on digital or automated agricultural technologies in operational settings; (iii) substantive reporting on work organisation and human–technology interaction (e.g. monitoring routines, interruptions, dashboard use, troubleshooting, learning demands); and (iv) material enabling interpretation of psychosocial strain, coping resources, or OSH-relevant consequences (e.g. impaired recovery, fatigue, vigilance demands, perceived loss of control).

Exclusion criteria were: studies limited to technical performance metrics without work-process accounts; purely attitudinal adoption surveys lacking interactional or organisational detail; and non-scholarly sources (trade press, vendor, or promotional materials).

For transparency, the eleven evidence anchors are: Alpass et al. (2004); Mathijs (2004); Molfino et al. (2014); Hansen (2015); Karttunen et al. (2016); Hartung et al. (2017); Tse et al. (2018); Hansen and Stræte (2020); Hansen et al. (2020); King et al. (2021); Shahibi et al. (2023).

The evidence base is weighted towards livestock systems, particularly AMS and associated monitoring infrastructures, where monitoring and response loops, alerting practices, and service dependencies are prominent. When the paper extends beyond AMS, it does so to illustrate general platform-mediated features, such as learning demands, update uncertainty, and advisory infrastructures, rather than to claim comprehensive sector-wide coverage.

Analytical approach: platform architectures and 'invisible organisational structures'

The synthesis employs an abductive, theory-informed approach that moves between (a) empirical regularities identified in the evidence anchors and (b) concepts from technostress research and sociotechnical OSH. The analytic aim is to make visible the platform architectures and associated 'invisible organisational structures' through which digitalisation reorganises time, knowledge, responsibility, and practical agency in everyday work. Accordingly, the Results section prioritises claims grounded in the agricultural evidence anchors, whereas the Discussion explicitly mobilises technostress, platform, and digital justice scholarship as interpretive lenses for situating those empirical patterns.

'Invisible organisational structures' refers to organisational consequences that are not always explicitly negotiated as workplace rules but are embedded in platform defaults and infrastructures – for example, notification pipelines that allocate urgency and implicitly define response windows, dashboard architectures that shape what is legible and actionable, and service or update arrangements that govern access to repair and expertise.

Analytical steps: For each source, the authors extracted passages describing (i) monitoring routines, interruptions, and response expectations (including after-hours arrangements); (ii) dashboard use, interpretive work, and uncertainty handling; (iii) troubleshooting, learning demands, and support relations; and (iv) evaluation practices tied to indicators, benchmarks, and accountability. Extracted material was then mapped to four recurring dimensions of platform-mediated work that structure the Results and Discussion: (i) platform temporality and availability; (ii) epistemic architecture (what is made legible, how thresholds and baselines are configured, how uncertainty is communicated, and how interpretive labour is distributed); (iii) service and update governance (maintenance and troubleshooting pathways, remote diagnostics, dependence on external technicians, update timing and change management, and constraints on repair); and (iv) metricisation and evaluation regimes (dashboards, indicators, benchmarks, comparison practices, and implications for accountability and perceived competence).

Technostress constructs are used as sensitising concepts to interpret how platform features reallocate demands and resources, including overload, invasion of non-work time, complexity, uncertainty, insecurity, and perceived loss of control. This provides an interpretive framework for organising the evidence rather than a fixed measurement model. This interpretive use is kept analytically distinct from the evidentiary base: the agricultural studies provide the empirical anchors of the synthesis, while technostress and related scholarship provide the conceptual vocabulary for explaining how those observed patterns matter for psychosocial OSH.

OSH relevance is addressed by linking these shifts in demands and resources to recovery, fatigue, vigilance requirements, and decision-making under uncertainty in welfare- and time-critical work settings. Where relevant, moderators such as training, advisory capacity, and peer support are treated as system components that can buffer or amplify psychosocial risk by altering the balance between demands and coping resources.

Given the predominance of AMS and livestock studies, the argument is presented with explicit scope conditions. The article prioritises conceptual clarity regarding upstream design and governance levers that shape psychosocial risk; transfer to other domains of digital agriculture is plausible when similar platform arrangements organise work, but further empirical testing is required.

RESULTS

The Results section presents analytically structured patterns identified across the evidence anchors, rather than new empirical estimates. The cited empirical studies provide the evidentiary basis for the synthesis, while broader technostress and platform scholarship is used as an interpretive lens where explicitly indicated. The following sections develop the argument through four recurring dimensions.

Table 1. Summary of the main findings across the four analytic dimensions

Dimension	Main platform arrangement and technostress mechanism	Psychosocial / OSH implication	Representative evidence anchors
Platform temporality / availability	Always-on monitoring, alert-driven oversight, and techno-invasion / techno-overload	Recovery disruption, vigilance strain, and fatigue risk	Hansen, 2015; Karttunen et al., 2016; Tse et al., 2018; Hansen et al., 2020
Epistemic architecture / interpretive burden	Opaque dashboards, threshold uncertainty, and techno-complexity / techno-uncertainty	Cognitive load, decision strain, and uncertainty under time pressure	Hansen, 2015; Hansen et al., 2020; Hansen & Stræte, 2020
Service / update governance / constrained agency	Vendor dependence, remote diagnostics, limited repairability, and loss-of-control appraisals	Stress from restricted action capacity and unpredictable restoration	Alpass et al., 2004; Hartung et al., 2017; Karttunen et al., 2016
Metricisation / responsibilisation	Dashboard visibility, benchmarking, and techno-uncertainty under evaluative pressure	Chronic self-monitoring, moral pressure, and responsibilisation	Hansen, 2015; Hansen et al., 2020; King et al., 2021

Note: Table 1 presents an analytical overview of recurring patterns identified across the eleven evidence anchors, rather than a quantitative aggregation of findings. The studies listed in the final column are representative examples for each dimension, and some anchors inform more than one row because the same empirical cases address multiple sociotechnical mechanisms.

Platform temporality: when ‘always-on’ monitoring becomes an availability regime

This dimension concerns how continuous sensing and notification pipelines transform time: monitoring becomes a constant orientation rather than a bounded task. Across empirical accounts of AMS work organisation, continuous monitoring can reduce physical workload and increase perceived flexibility, while simultaneously producing a persistent sense of accountability that extends beyond ‘shift-like’ work episodes (Hansen, 2015; Karttunen et al., 2016; Tse et al., 2018; Hansen et al., 2020; King et al., 2021). This co-occurrence is not adequately captured by a simple benefits-versus-harms framing. Analytically, it is better understood as a structural

transformation in which information availability becomes a standing obligation–generated through alert regimes, welfare- and economically loaded norms, and limited role redundancy, particularly outside standard hours (Hansen & Stræte, 2020). Field accounts also describe substantial reconfiguration of labour routines and lifestyle boundaries during AMS implementation (Molfino et al., 2014). The evidence anchors thus suggest that availability pressures arise from concrete monitoring and alerting arrangements documented in AMS practice, while technostress concepts help interpret these empirically observed arrangements as forms of techno-invasion and techno-overload.

A key psychosocial mechanism in this temporal architecture is hyper-responsiveness: always-on sensing and exception-driven alerts foster a latent 'on-call' stance, even during nominal non-work time. The pressure is often experienced less as an explicit managerial demand and more as an internalised norm of competent care under high-stakes conditions. The practical consequence is a continual renegotiation of everyday life: recovery becomes fragile as anticipatory checking, micro-interruptions, and the perceived cost of missing a signal repeatedly intrude into private time. In technostress terms, this pattern aligns most closely with techno-invasion and techno-overload, where monitoring obligations extend beyond work boundaries and recurrent micro-demands fragment attention and recovery (Tarafdar et al., 2007; Ragu-Nathan et al., 2008).

OSH relevance is clearest in relation to recovery and vigilance. Diffuse response expectations and sleep-time interruptions are associated with fatigue and sleep disruption, conditions that undermine sustained attention and decision quality in time-sensitive environments (Lim & Dinges, 2010; Warm et al., 2008). A useful design parallel comes from clinical monitoring research on alarm fatigue, where frequent or low-specificity alerts increase cognitive strain and can compromise effective responsiveness (Cvach, 2012; Sendelbach & Funk, 2013). Although agricultural monitoring differs in context and accountability relations, the comparison highlights a shared sociotechnical problem: how alert volume, specificity, and escalation logic shape attention and responsiveness over time. The issue, therefore, is not connectivity itself but the configuration of notification ecologies – how alerts are generated, prioritised, and socially embedded – through which platforms govern urgency and availability. This points to alert governance (severity tiering, escalation pathways, batching, and recovery-protective 'quiet hours') as a practical prevention lever.

Opacity and interpretative responsibility: stress under epistemic and attention asymmetries

This dimension examines how dashboards and alerts redistribute the management of uncertainty. In empirical studies of AMS decision-making, operators report ongoing sense-making demands: interpreting trends, reconciling metrics with local knowledge, and deciding whether deviations require intervention under time pressure (Hansen, 2015; Tse et al., 2018; Hansen et al., 2020; Hansen & Stræte, 2020). The strain is not simply due to 'too much data'; it reflects a structural shift in which dashboards and alerts transfer uncertainty management to the operator, while inference logic, thresholds, baselines, and conditions of confidence remain only partially transparent (Burrell, 2016; Hansen et al.,

2020). Here again, the evidence anchors identify the practical burden of sense-making in agricultural settings; technostress research is used interpretively to clarify why these demands are experienced as complexity and uncertainty rather than simply as increased information volume.

Two related mechanisms help define this psychosocial load. Epistemic asymmetry refers to unequal access to the grounds of interpretation – how baselines are configured, which variables are prioritised, and how outputs are generated and prioritised. Attention asymmetry describes what occurs when informational complexity increases while time and cognitive capacity remain limited: an abundance of signals leads to attention scarcity, repeated task switching, and switching costs (Simon, 1971). This explains why 'more data' does not necessarily result in 'better decisions': without interpretability and attention management, monitoring infrastructures can deplete cognitive resources and increase uncertainty. In technostress terms, this pattern aligns most closely with techno-complexity and techno-uncertainty, often co-occurring with overload as interpretive work accumulates in a stream of micro-decisions under time pressure (Tarafdar et al., 2007; Ragu-Nathan et al., 2008; Hartung et al., 2017).

OSH relevance arises from the combination of sustained cognitive load, limited response windows, and high-stakes consequences. During peak periods and on thinly staffed farms, interpretive work competes for already scarce attention, while errors have welfare and economic implications (Hansen & Stræte, 2020). Strain arises not only from informational volume but also from how epistemic labour is distributed: platform arrangements may externalise uncertainty management to users while keeping key interpretive premises - thresholds, model assumptions, prioritisation rules - difficult to inspect or contest. When interpretive burden coincides with restricted access to diagnostics, support, or repair, epistemic asymmetry becomes closely linked to constraints on agency, anticipating the role of service and update governance.

Service ecosystems and constrained agency: when maintenance governance becomes a psychosocial risk

This dimension concerns how maintenance and repair pathways influence psychosocial risk when responsibility remains high but practical agency is externally controlled. Reports of troubleshooting, vendor dependence, and limited repairability indicate that malfunctions are stressful not only because they disrupt production, but also because they expose restricted agency: limited local troubleshooting capacity, restricted access to diagnostic information or tools, and reliance on external technicians and vendor timelines (Alpass et al., 2004; Hansen, 2015; Karttunen et al., 2016; Hartung et al., 2017). In these cases, uncertainty is not merely subjective; it is structurally produced by service arrangements that determine what can be repaired, by whom, and when.

From a psychosocial OSH perspective, constrained agency reshapes appraisal and coping resources by narrowing the operator's capacity to act while accountability remains high. When restoration depends on opaque or externally governed processes – such as remote diagnostics, proprietary components, or update dependencies – perceived control decreases and resolution becomes less predictable. In technostress terms, this corresponds most directly to techno-uncertainty and loss-of-control appraisals, and may also involve techno-complexity when troubleshooting requires learning and coordination

across multiple system layers and actors (Tarafdar et al., 2007; Ragu-Nathan et al., 2008). Constrained agency can also intensify temporal pressures: monitoring may become more intensive, working hours may extend, and vigilance may increase while awaiting support, parts, or access to vendor-controlled diagnostics (Hansen, 2015; Hartung et al., 2017). Maintenance and update architectures therefore form part of the psychosocial work environment, not merely an external technical layer.

Constrained agency also interacts with epistemic issues. When diagnostic grounds, error histories, or system rationales are not locally accessible, interpretive responsibility increases while actionable options remain limited. This coupling widens the gap between accountability and practical agency, making uncertainty persistent rather than occasional. Up to this point, the argument rests on the agricultural evidence anchors, which document stress linked to troubleshooting, vendor dependence, and limited repairability. The following paragraph shifts from empirical synthesis to a more explicitly interpretive use of platform and data-governance scholarship.

To clarify why constrained agency can become chronic, this article draws on critical accounts of platformisation and data governance. These claims are interpretative extensions rather than direct empirical findings from the eleven evidence anchors and require targeted empirical testing in agricultural platform ecosystems. In this context, digital dispossession refers to a separation between data generation and data control: operational data produced through everyday work may be captured by proprietary infrastructures, rendered non-portable or difficult to interrogate, and thus limit users' ability to audit, repurpose, or switch providers without significant loss (Bronson & Knezevic, 2016; van Dijck et al., 2018; Couldry & Mejias, 2019). Where interoperability is limited and data are held in proprietary silos, switching can entail loss of historical records, high reintegration costs, or incompatibilities that serve as effective lock-in. A related mechanism is digital rent, used here as a conceptual label for recurring revenue generated by controlling access to essential platform functionalities and to the analytics or historical records required for confident operation (Srnicek, 2016). For psychosocial OSH, the central mechanism remains predictability and control: accountability may remain high while access to diagnostics, histories, and decision-relevant context is restricted, further widening the gap between responsibility and practical agency.

Metricisation and responsibilisation: platforms as normative architectures

This dimension addresses how platforms stabilise evaluative regimes that shape self-monitoring, accountability, and identity-relevant appraisal. Empirical studies of AMS dashboards and indicator-driven oversight show that continuous performance visibility and benchmarking can intensify responsibilisation, particularly when evaluative criteria and signal quality are difficult to contest (Hansen, 2015; Hansen et al., 2020; Hansen & Stræte, 2020; King et al., 2021). Platform mechanisms embed evaluative assumptions into dashboards, alerts, defaults, and service pathways, thereby stabilising what is considered relevant information, urgent action, and competent care in everyday work (Srnicek, 2016; van Dijck et al., 2018). Digital infrastructures do not merely report performance; they shape what becomes salient, actionable, and auditable, and thus influence how responsibility is experienced and enacted. The evidence anchors therefore support the claim that evaluative strain is already present in dashboard-

mediated agricultural work; platform studies are drawn on here as an interpretive lens to clarify how these evaluative effects become stabilised and normalised within broader sociotechnical arrangements.

In metricised environments, accountability can shift from situated judgement to indicator-driven performance regimes. Farmers may feel pressured to align their actions with what the platform makes visible and comparable, while experiential knowledge becomes harder to legitimate if it is not captured, ranked, or recognised by the system (Hansen & Stræte, 2020). A chronic sense of 'never doing enough' is more likely when indicators fluctuate for reasons beyond the operator's control, such as animal variability, weather, or sensor error, and when updates recalibrate thresholds and reclassify variation as deviation (Hansen et al., 2020). In technostress terms, this aligns most clearly with techno-uncertainty and loss-of-control appraisals; it can also become morally charged in welfare-critical settings, as platform outputs implicitly define what a responsible actor should notice and address.

Another source of strain concerns asymmetries of authority embedded in platform outputs. When a system flags deviations with high salience, farmers may feel compelled to respond even when signals conflict with local knowledge and embodied competence; yet not responding may be experienced as negligence in welfare-critical environments (Hansen, 2015; Hansen et al., 2020). These dynamics intensify when contestability is low - when users cannot readily interrogate why an indicator changed, assess uncertainty, adjust thresholds, stabilise alert settings, or access meaningful explanations - and when service ecosystems constrain calibration and repair. In such conditions, the platform can function as an 'invisible manager': it sets priorities and performance horizons without explicit organisational negotiation.

The intensity of metricisation-related strain is likely moderated by work organisation and support capacity: staffing levels, division of monitoring responsibilities (individual versus shared), advisory infrastructure, peer support, and the degree of user control over configuration (thresholds, alert tiers, benchmarking modes). Where interpretability and contestability are high and monitoring is collectively organised, dashboards may be experienced as supportive; where control is low and accountability remains high, they are more likely to function as chronic psychosocial stressors. To specify why evaluation regimes may stabilise, it is useful to refer to the analyses of the platform economy accounts of value capture through subscription- and service-based arrangements, where access to interpretation, diagnostics, or historical records is structured as an ongoing paid service (Srnicek, 2016). These claims require targeted empirical testing in agricultural platform ecosystems, but they help clarify why evaluation layers may become entrenched and consequential for everyday work.

Taken together, the evidence anchors indicate that technostress in digital agriculture cannot be reduced to interface difficulty or individual adaptation. Across the reviewed studies, recurring platform arrangements reorganise work through four linked pathways: availability pressures from always-on monitoring, interpretive burden from opaque outputs, constrained agency due to vendor-governed maintenance and updates, and intensified self-evaluation from metricised dashboards. These patterns suggest that psychosocial OSH risks originate upstream in the design and governance of platform-mediated work. The following discussion considers the practical and conceptual implications of these findings.

DISCUSSION

The identified patterns clarify why psychosocial OSH in digital agriculture cannot be addressed solely through individual adaptation at the interface level. OSH-sensitive digitalisation requires treating notification ecologies, interpretability, service and update governance, and the evaluative effects of dashboard design as work-organising conditions rather than peripheral technical details. This is consistent with EU-OSHA work on digitalisation and psychosocial risks, which emphasises organisational prevention - participatory risk assessment, clear role expectations, and design and governance controls - rather than relying primarily on downstream, individual-level coping interventions (EU-OSHA, 2020; EU-OSHA, 2024b). In dispersed and small-scale work settings such as farming, prevention also depends on accessible advisory capacity and feasible support pathways (EU-OSHA, 2024a). These patterns can be interpreted through technostress research as evidence that psychosocial risk is shaped not only by interface demands but by how sociotechnical systems allocate demands, control, and coping resources. Drawing on platform studies as an interpretive lens, the discussion now considers how these empirically observed arrangements are embedded in broader architectures of governance and dependency. This emphasis on governance through interfaces, data flows, and service dependencies is consistent with platform and infrastructure scholarship, which shows how digital architectures organise participation, visibility, and dependence beyond the level of the single tool (Helmond, 2015; Plantin et al., 2018; van Dijck et al., 2018).

Across the four dimensions, a unifying mitigation principle is contestability: the extent to which users can interrogate, adjust, and stabilise platform mechanisms that allocate urgency, distribute uncertainty, and shape accountability and practical agency. For clarity, contestability can be specified across four layers:

1. Informational contestability (legibility): users can see what has changed, why an alert was triggered, and which assumptions or baselines are in use, including indicators of uncertainty.
2. Configurational contestability (control): users can adjust thresholds, escalation tiers, quiet hours, and dashboard views to reflect operational realities and staffing capacities.
3. Procedural contestability (change governance): users can access versioned change logs, retain stable configurations, and obtain timely rollback, calibration, or support when updates reclassify variation as deviation.
4. Infrastructural contestability (dependence reduction): users have meaningful options for interoperability, data portability, repair, and alternative service provision.

Contestability is not limited to interface settings; it also concerns service and update governance - whether users can maintain stable configurations, understand the consequences of updates, and obtain timely calibration or rollback. Such mechanisms directly reduce techno-uncertainty and help prevent the transfer of diagnostic and accountability burdens to users without corresponding control. Increasing contestability strengthens practical agency and predictability, which are key psychosocial OSH resources in welfare- and time-critical settings.

This makes contestability both a design and governance issue: it depends not only on interface-level configurability and transparency, but also on the institutional arrangements that structure access to data, diagnostics, expertise, updates, and repairs. From this perspective, contestability also depends on how standards, interfaces, and service arrangements structure users' practical room for manoeuvre within wider platform ecosystems (Srnicek, 2016; Plantin et al., 2018).

Beyond local design improvements, mitigation can also be pursued through digital justice principles, defined as fairness in how datafying systems make people and practices visible, govern participation, and distribute the benefits and burdens of data-driven coordination (Taylor, 2017). For psychosocial OSH, the practical implication is that OSH-relevant resources - diagnostics, interpretability, expertise, updates, and repair - should not be structurally withheld by default. In addition to evidence anchors, digital justice scholarship clarifies why access to diagnostics, interoperability, and repair should be treated as questions of fairness and infrastructural power, not merely as technical design issues. This concern also resonates with broader accounts of asymmetrical data control in digital systems, where dependence is intensified when access to data and interpretive infrastructures is unevenly distributed (Couldry & Mejias, 2019).

This lens highlights infrastructural power: mitigation is more feasible where coordinated investment supports public or cooperative digital infrastructures that enhance ownership and control of data repositories and core technical capabilities. In the European context, investment in open, standards-based agricultural data infrastructures could increase contestability and reduce dependency on closed ecosystems by improving interoperability, data portability, and the availability of alternative support arrangements. Governance options include strengthening the right to repair, supporting interoperability and data portability, enabling cooperative models for data stewardship and service provision, and experimenting with open-source toolchains where appropriate. These political–economic claims should be read as interpretative extensions grounded in platformisation and data justice scholarship, rather than as direct empirical findings from the eleven evidence anchors. They specify plausible governance levers through which platform architectures may shape psychosocial OSH conditions and therefore require targeted empirical testing in concrete agricultural platform ecosystems.

CONCLUSIONS

Digitalisation is transforming agricultural work not only by introducing new tools, but also by reorganising time, uncertainty, accountability, and decision-making through platform-mediated monitoring, dashboards, and service ecosystems. Across the eleven evidence anchors analysed here - primarily from AMS and related monitoring infrastructures - four recurring patterns were identified: availability pressures under always-on monitoring; interpretive burden under opaque outputs and epistemic asymmetry; constrained agency under vendor-governed service and update pathways; and intensified responsibilisation under metricised dashboards. Collectively, these findings indicate that technostress in digital agriculture is best understood as an upstream consequence of platform-mediated work organisation, rather than a downstream problem of individual coping.

The main practical implication is that psychosocial OSH-sensitive digitalisation relies on contestability: users and responsible intermediaries require meaningful capacity to understand, question, adjust, and stabilise the mechanisms by which platforms allocate urgency, structure interpretation, and govern support, updates, and repair. As the synthesis is explanatory and weighted towards AMS and livestock contexts, the article does not make sector-wide prevalence claims; instead, it provides a focused conceptual framework to guide future empirical testing and more prevention-oriented design and governance in digital agriculture.

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