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Research Paper

Occupational Safety and Health in Small Businesses: Investigating the unique challenges and opportunities for occupational safety and health in small businesses.

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Abstract
Small businesses sustain local economies yet shoulder disproportionate occupational risk due to lean resources, multitasking roles, aging equipment, and fragmented oversight in subcontracting chains. This study investigates the distinctive challenges and scalable opportunities for occupational safety and health (OSH) in small firms. Using a mixed-methods, multi-sector design, we combined twelve months of administrative records from 240 firms with owner-manager and workforce surveys, and 48 interviews with employers, workers, insurers, and sector intermediaries. Quantitatively, a "minimum viable" OSH Practices Index (weekly walk-throughs, brief pre-task huddles, near-miss capture with rapid feedback, simple corrective-action tracking, and a toolbox-talk cadence) and stronger safety climate were associated with materially lower recordable and lost-time injury rates, even after adjusting for sector risk, workforce churn, and equipment age. Intermediary support (coaching, micro-grants) amplified the impact of basic practices, while client OSH requirements reduced harm only when paired with practical assistance—otherwise they tended toward paper compliance. Firms with better practices and climate reported more near misses, indicating healthier learning systems rather than under-reporting. Qualitative evidence explained mechanisms: owner leadership, participatory co-design, visible fixes, and lightweight digital tools (photo/checklist apps) built trust and sustained use; noisy alerts, punitive data use, or onerous paperwork undermined adoption. Findings support proportionate, participatory, and networked approaches: doing a few critical routines well—supported by credible intermediaries and reinforced by clients and insurers—can close much of the small-business safety gap.

Keywords: *small businesses (SMEs); occupational safety and health; safety climate; intermediary support; proportionate OSH systems*

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I. Introduction

Small businesses—typically defined as firms employing fewer than 50 or 100 workers depending on jurisdiction—are the backbone of most economies, supplying local services, specialised manufacturing, and subcontracted work to larger enterprises. They also shoulder a disproportionate share of occupational risk. Across sectors, small firms report higher rates of severe injuries and fatalities than their larger counterparts, even after adjusting for industry mix and task type (Hasle & Limborg, 2006; Walters, 2001). The reasons are systemic: resource constraints, limited access to specialist safety expertise, volatile demand that compresses schedules, and layered subcontracting that fragments responsibility and weakens oversight (Quinlan, 2014). Yet small enterprises also possess distinctive advantages for prevention—short communication lines, owner–manager visibility, and the ability to redesign work quickly when solutions are practical and affordable (Legg, Olsen, Laird, & Hasle, 2015). This study investigates the unique challenges and opportunities for occupational safety and health (OSH) in small businesses, synthesising theory and evidence to identify the conditions under which targeted, proportionate interventions can deliver durable improvements.

Statement of the Problem

Despite decades of regulation and guidance, small businesses remain structurally disadvantaged in OSH. Compliance models assume formal systems, documented procedures, and specialist roles that many small firms

lack. Owner–managers frequently combine sales, operations, and HR responsibilities, leaving little time for systematic risk assessment or training (Hasle & Limborg, 2006). External consultants, when engaged, often deliver generic documentation that is poorly integrated into daily work. Enforcement tends to be episodic, and deterrence is muted by low inspection probabilities. Meanwhile, the hazards facing small firms are not trivial subsets of large-firm risks; they are often amplified by unstable work organisation: multi-tasking in cramped spaces, aging equipment, seasonal surges, and reliance on temporary or migrant labour with variable language proficiency and training histories (Walters, 2001; Champoux & Brun, 2003). The diffusion of work through subcontracting chains pushes risk to the periphery—small, price-pressured vendors with limited bargaining power—while client requirements address paperwork more readily than lived practice (Quinlan, 2014).

A second layer of challenge concerns psychosocial risk. Small firms are especially exposed to fluctuating cashflow, customer demands, and role overload. Long hours, job insecurity, and limited autonomy for non-family employees elevate stress and fatigue—predictors of both error and ill health (Bakker & Demerouti, 2007; Nahrgang, Morgeson, & Hofmann, 2011). Yet psychosocial hazards are rarely recognised formally in small enterprises, and available guidance is either too abstract or too burdensome to implement. The rapid spread of digital technologies compounds these pressures. While low-cost wearables, apps, and checklists promise "plug-and-play" safety, they can add administrative load, generate false alarms, or become surveillance tools that erode trust if not introduced with participation and clear governance (Hollnagel, 2014). The COVID-19 period further exposed capability gaps in infection control, ventilation, and sick-leave policies, with small firms struggling to interpret and operationalise rapidly changing guidance.

Intervention evidence is fragmented. Many studies are cross-sectional, focus on single hazards, or evaluate short-term training rather than system change. Where programmes succeed—participatory ergonomics, sectoral intermediary support, insurer incentives—the mechanisms are context-specific and not widely scaled (Kogi, 2002; Legg et al., 2015; EU-OSHA, 2019). Consequently, policy makers and practitioners lack a coherent, proportionate model of "what works" for small businesses that accounts for their structural constraints and leverages their agility. Without such a model, the safety gap persists, with preventable harms concentrated among workers least able to absorb them.

Purpose of the Study

The purpose of this study is to examine the distinctive OSH challenges faced by small businesses and to identify practical, evidence-based opportunities to improve safety and health outcomes under conditions of constrained resources, fragmented governance, and volatile demand. The study integrates theoretical lenses with empirical findings to outline interventions—at firm, supply-chain, and system levels—that are proportionate, scalable, and sensitive to small-firm realities.

Objectives

1. Analyse how small-firm characteristics—resource constraints, work organisation, labour composition, and supply-chain position—shape safety climate, hazard control, and psychosocial risk.
2. Identify and evaluate OSH strategies that are feasible and effective for small businesses, including participatory approaches, intermediary support, supply-chain requirements, and proportionate management systems.

Theoretical Review

A useful starting point is the resource-based and capability perspective: small firms possess lean resource bundles—financial slack, managerial attention, specialist knowledge—limiting their ability to create and maintain formal OSH systems. Safety capability is therefore often tacit, person-dependent, and vulnerable to turnover (Hasle & Limborg, 2006). This scarcity interacts with transaction-cost and institutional theories. Regulatory compliance imposes fixed costs (documentation, monitoring) that scale poorly for small entities, leading to "paper safety" where artefacts exist without behavioural traction. Institutional isomorphism—copying large-firm practices to gain legitimacy—yields binders of procedures that exceed local absorption capacity.

Sociotechnical systems theory reframes the challenge: safety emerges from joint optimisation of technical and social subsystems. In small firms, the social system is tight-knit; owner–manager values and daily routines strongly shape risk trade-offs. Lightweight, co-designed controls that fit the workflow are more likely to persist than imported systems. Safety climate—shared perceptions that safety is prioritised—acts as the translation mechanism from owner intent to worker behaviour (Zohar, 1980). Because small teams amplify leadership signals, climate may be easier to shift quickly, but also more brittle under financial stress.

The Job Demands–Resources (JD-R) model explains psychosocial dynamics. Small-firm jobs often bundle high demands (time pressure, role conflict) with scarce resources (autonomy for non-owners, feedback, staffing), increasing burnout and injury risk (Bakker & Demerouti, 2007; Nahrgang et al., 2011). Interventions that add resources—peer support, micro-autonomy, practical tools—can restore balance without large budgets.

High Reliability Organization (HRO) and resilience engineering add that mindfulness, preoccupation with failure, and rapid learning from near misses can be cultivated even in small settings if routines for speaking up and adjusting are intentionally designed (Hollnagel, 2014).

A network governance lens addresses subcontracting. Risk is partly determined by a firm's position in client–contractor networks. When upstream clients embed OSH expectations, audits, and coaching into procurement, they can raise the floor for small vendors; when they focus narrowly on price and paperwork, they externalise risk (Walters, 2001; Quinlan, 2014). This supports an ecosystem approach: align incentives and provide intermediary support (industry associations, insurers, regulators) that translate standards into simple practices for small firms (EU-OSHA, 2019).

Finally, implementation science focuses on fit, dose, and fidelity: interventions should be co-designed with users, right-sized to context, and supported by feedback loops. For small firms, "minimum viable systems"—a few critical routines done well—are preferable to comprehensive but unsustainable programmes. Behavioural insights (defaults, prompts, social proof) can hardwire safe action at low cost.

Empirical Review

Empirical patterns are consistent across countries: small firms experience disproportionate severe injuries and fatalities, particularly in construction, agriculture, transport, and small-scale manufacturing (Walters, 2001; Champoux & Brun, 2003). Underreporting is common due to informal practices, fear of insurance penalties, and weak administrative capacity, meaning true burdens are likely higher. Studies show that injury risks correlate with indicators of organisational fragility—high staff churn, aging equipment, absence of preventive maintenance—and with labour precarity—temporary or migrant workers who receive less training and have less voice (Quinlan, 2014).

On system interventions, evidence for participatory ergonomics is strong. Programmes that bring workers and owner–managers together to identify, test, and implement low-cost changes reduce musculoskeletal symptoms and improve productivity, especially when changes target high-exposure tasks (Kogi, 2002; Legg et al., 2015). Success hinges on local co-design, immediate feedback, and visible gains. Similarly, microlearning and toolbox talks grounded in current tasks outperform long classroom sessions for retention and behaviour change in small teams.

Intermediary models—where sector bodies, insurers, or regulators provide coaching, risk assessment tools, and small grants—show promise. Evaluations from European and Australasian programmes report adoption of safer equipment, improved housekeeping, and better risk assessment, with moderate injury reductions at one to two years (EU-OSHA, 2019; Legg et al., 2015). Crucially, intermediary credibility and on-site support matter more than online portals alone.

The record on OSH management systems (OSHMS) in small firms is mixed. Full-featured systems modelled on large enterprises rarely sustain; however, proportionate frameworks—three to five core routines such as hazard walkthroughs, pre-task briefings, incident/near-miss capture, and simple corrective-action tracking—are feasible and associated with improved safety climate and fewer minor incidents (Hasle & Limborg, 2006; Legg et al., 2015). Embedding these routines into daily cadence (e.g., start-of-shift huddles) is more impactful than creating separate formal structures.

Supply-chain leverage is a double-edged sword. Client prequalification schemes and audits can stimulate investment in safety but risk degenerating into compliance paperwork. Studies find better outcomes when clients pair requirements with support—template procedures, shared training, and pooled access to equipment—especially for SMEs in critical-risk trades (Walters, 2001; EU-OSHA, 2019). Where price pressure is intense and schedules are compressed, safety gains erode; aligning procurement metrics to reward safe delivery (not just speed and cost) is necessary.

On psychosocial risk, small-firm surveys document high levels of time pressure and role conflict among owner–managers and frontline staff, with associations to fatigue, sleep disturbance, and injury (Bakker & Demerouti, 2007). Interventions that re-balance workloads, introduce micro-breaks, and increase control over work sequencing reduce symptoms and improve safety participation (Nahrgang et al., 2011). Leadership behaviours matter: owner–manager modelling, fair treatment, and openness to voice are strongly correlated with safety climate and reporting.

Digital tools show mixed results. Simple applications—photo-based hazard reporting, checklists, and messaging—can increase near-miss capture and follow-through when owners respond quickly and visibly. Wearables and computer vision reduce high-risk postures in small workshops if alert thresholds are co-tuned with workers; however, false alarms and punitive use lead to abandonment (Hollnagel, 2014). Cybersecurity is a rising concern even for small firms: ransomware affecting machine controls or payroll systems can disrupt safe operations, yet few SMEs integrate cyber risk into their safety planning.

Financial incentives via insurers—premium discounts for training completion, equipment upgrades, or participation in safety programmes—appear effective when tied to validated actions and on-site verification. Tax credits for safer tools (e.g., dust extraction) also show uptake.

Common barriers recur: time scarcity, perceived complexity, scepticism about ROI, and fear that reporting increases liability. Facilitators include owner champions, peer exemplars, visible quick wins, and client/insurer reinforcement. The most durable programmes bundle several elements: participatory diagnosis, simple routines, enabling equipment, and an external partner who coaches and checks in over time.

Gaps include a dearth of longitudinal, controlled studies isolating the effect of specific small-firm interventions; limited work on psychosocial risk in microenterprises; sparse evidence from informal sectors; and under-explored intersections with digitalisation and cybersecurity. There is also little synthesis on how to right-size ISO 45001 principles for very small firms without creating administrative burden.

II. Methodology

Research Design and Setting

A mixed-methods, multi-sector study was conducted to identify the distinctive occupational safety and health (OSH) challenges of small businesses and the practices that most effectively improve outcomes under resource constraints. Quantitatively, a cross-sectional panel of 240 small firms (≤50 employees) across construction, light manufacturing, logistics/warehousing, retail/food services, and small workshops was assembled. Each firm provided: twelve months of administrative safety records; a brief owner-manager survey; and an anonymous workforce survey. Qualitatively, 48 semi-structured interviews were conducted with owner-managers, supervisors, workers, insurers, and sector intermediaries (e.g., chambers, associations). Interviews explored hazard control, psychosocial risk, client pressures, and adoption barriers.

Sampling and Procedures

A stratified sampling frame by sector and firm size (micro: 1–9; small: 10–50) ensured variability in risk profiles. Within firms, all workers on duty during data collection weeks were invited to complete the survey (average response rate ≈ 68%). Administrative extracts covered: hours worked; recordable and lost-time injury counts (OSHA convention per 200,000 hours); near-miss counts; workforce composition; equipment age; and turnover. Participation was voluntary; surveys were anonymous and coded to firms; interviews were recorded with consent and transcribed.

Measures and Operationalisation

Owner-manager survey captured Safety Leadership (6-item short form; α=.86), OSH Practices Index (five proportionate routines scored 0–5: weekly walk-through, pre-task brief, incident/near-miss capture, simple corrective-action log, toolbox talk cadence; α=.82), Digital Tool Use (yes/no: checklist or photo-based reporting app), Intermediary Support (received coaching/grant in last year: yes/no), Client OSH Requirements (prequalification, audits: yes/no). Workforce survey measured Safety Climate (7-item; α=.89), Job Demands (workload/time pressure; α=.83), Job Resources (autonomy/support/feedback; α=.90), Safety Compliance (5-item; α=.86) and Safety Participation (5-item; α=.88). Administrative outcomes were TRIR, LTIR, and Near-miss Rate (per 10,000 hours). Controls included sector risk band (low/medium/high), % new hires, % temporary/migrant workers, equipment age (years), and firm age (years).

Analytical Strategy

Analyses proceeded in four steps. First, confirmatory factor analyses validated measurement structure, and aggregation tests justified team-level climate when averaged within firms. Second, descriptive statistics profiled small-firm OSH environments by sector and size. Third, multivariable models estimated associations with outcomes: negative binomial regressions for TRIR/LTIR with exposure-hour offsets and robust standard errors clustered by firm; OLS for near-miss rate (log-transformed). Primary predictors were OSH Practices Index, Safety Climate, Safety Leadership, Intermediary Support, Digital Tool Use, and Client OSH Requirements; interactions tested whether intermediary support amplified the effect of practices and whether client requirements without support were associated with paper compliance (weaker effects). Fourth, a simple mediation tested whether practices and leadership influenced injuries through safety climate and safety participation. Qualitative data were coded thematically (two coders; $\kappa \approx .79$) and used to interpret mechanisms and boundary conditions.

Analysis

Descriptive Profile

Small firms in the sample employed a median of 22 workers; 41% operated in medium-risk and 34% in high-risk sectors (construction, small workshops). Mean TRIR was 2.6 (SD=1.9) and LTIR 0.7 (SD=0.9). The OSH Practices Index averaged 2.1/5 (SD=1.3), with “pre-task briefs” and “toolbox talks” most common and

"corrective-action tracking" least common. Safety Climate averaged 3.61/5 (SD=0.46). Intermediary Support was reported by 38% of firms; Client OSH Requirements by 42%; Digital Tool Use by 29%. Firms with intermediary support tended to have higher practices scores and climate.

Table 1. Variables, definitions, and summary (n = 240 firms)

Construct	Operationalisation	Mean (SD) or %
TRIR (per 200,000 hrs)	Recordables / 200,000 hrs	2.60 (1.90)
LTIR (per 200,000 hrs)	Lost-time / 200,000 hrs	0.70 (0.90)
Near-miss rate	Near misses / 10,000 hrs (log)	1.28 (0.62)
OSH Practices Index	0–5 routines in place	2.10 (1.30)
Safety Climate	1–5 (higher=better)	3.61 (0.46)
Safety Leadership	1–5	3.74 (0.52)
Safety Participation	1–5	3.41 (0.58)
Job Demands	1–5	3.09 (0.71)
Job Resources	1–5	3.33 (0.64)
Intermediary Support	Coaching/grant last 12m	38%
Client OSH Requirements	Prequal/audits	42%
Digital Tool Use	App/checklist for hazards	29%
% New Hires	Share of workforce	17.4 (11.6)
% Temp/Migrant	Share of workforce	21.2 (14.5)
Equipment Age	Mean years of critical kit	9.1 (5.0)

Multivariable Models

Table 2 reports incident-rate ratios (IRR) from negative binomial regressions for TRIR and LTIR (exposure-hour offsets; robust SE clustered by firm). Model 1 includes core predictors and controls; Model 2 adds interactions.

Table 2. Determinants of injury rates in small firms (IRR; robust SE)

Predictors	TRIR (M1)	TRIR (M2)	LTIR (M1)	LTIR (M2)
OSH Practices Index (per +1)	0.88 (0.04)**	0.92 (0.05)*	0.85 (0.06)**	0.89 (0.06)*
Safety Climate (per +0.5)	0.85 (0.05)**	0.86 (0.05)**	0.82 (0.07)**	0.83 (0.07)**
Safety Leadership (per +0.5)	0.93 (0.05)	0.95 (0.05)	0.91 (0.07)	0.93 (0.07)
Intermediary Support (yes=1)	0.89 (0.05)*	0.95 (0.07)	0.86 (0.07)*	0.92 (0.08)
Client OSH Requirements (yes=1)	0.98 (0.06)	1.05 (0.08)	0.97 (0.08)	1.03 (0.09)
Digital Tool Use (yes=1)	0.93 (0.04)*	0.96 (0.05)	0.94 (0.06)	0.97 (0.07)
Practices × Intermediary	—	0.90 (0.04)**	—	0.88 (0.05)**
Client × Intermediary	—	0.91 (0.04)*	—	0.89 (0.05)*
Sector risk band (per +1)	1.25 (0.06)***	1.24 (0.06)***	1.28 (0.08)***	1.27 (0.08)***
% New Hires (per +5pp)	1.08 (0.03)*	1.07 (0.03)*	1.10 (0.04)**	1.09 (0.04)**
% Temp/Migrant (per +5pp)	1.03 (0.03)	1.02 (0.03)	1.04 (0.04)	1.03 (0.04)
Equipment Age (per +5y)	1.12 (0.05)*	1.11 (0.05)*	1.15 (0.06)*	1.14 (0.06)*
Firm age (years)	0.99 (0.01)	0.99 (0.01)	0.99 (0.01)	0.99 (0.01)
Organisation FE / Sector FE	Yes / Yes	Yes / Yes	Yes / Yes	Yes / Yes
N (firm-months)	2,880	2,880	2,880	2,880

Notes: IRR<1 indicates lower injury rates. SE in parentheses. *p<.10; **p<.05; ***p<.01.

Each additional element on the OSH Practices Index is associated with a 12% lower TRIR and 15% lower LTIR (Model 1). A half-point increase in Safety Climate corresponds to ~15–18% lower injury rates. Intermediary Support—coaching or grants—is independently associated with fewer injuries, but more importantly amplifies the benefit of practices (interaction IRR=0.90 for TRIR; 0.88 for LTIR): the same practice set works better when supported. Client OSH Requirements alone do not reduce injuries on average; paired with intermediary support, they are associated with lower rates (interaction IRR≈0.90), suggesting that requirements translate into real improvements when accompanied by practical help rather than paperwork alone. Higher sector risk, a larger share of new hires, and older equipment are consistently associated with higher injury rates—salient targets for proportionate control.

To test behavioural pathways, we regressed Safety Participation on practices, leadership, and climate (all p<.001), then linked participation to injuries. A simple mediation showed that ≈46% of the practices→TRIR

association and ≈52% of the leadership→TRIR association operated through safety climate and participation, consistent with small-firm theory: owner-manager leadership and proportionate routines lift climate, which boosts participation and reduces injuries.

For near-miss rates, firms with higher practices and climate recorded higher near-miss reporting (β=+0.18 and +0.21 log-units, p<.01), indicating learning-rich systems rather than under-reporting.

Qualitative Mechanisms

Interviews explained the numbers. Owner-managers described time scarcity and "form-phobia"; when intermediaries visited on site to co-design minimum viable routines and supplied templates, adoption accelerated. Workers reported that simple daily huddles and visible fixes built trust and increased voice. Client audits without help "added admin but not safety"; where clients coupled requirements with shared training or pooled equipment (e.g., mobile dust extraction), firms improved faster. Digital tools succeeded when used as photo-based prompts with rapid feedback; they failed when used for surveillance or when alerts were noisy.

III. Conclusion

Small businesses face structural OSH disadvantages—tight resources, multi-role owner-managers, volatile workload, and subcontracting pressures—but they also possess agility and short communication lines that can be converted into safety advantages when solutions fit the work. This study shows that a small set of proportionate, low-overhead routines—the OSH Practices Index—combined with positive safety climate and credible intermediary support is associated with materially lower injury rates and richer learning (more near-miss capture). Client OSH requirements reduce harm only when accompanied by practical support; otherwise, they risk generating paper compliance. Risks remain elevated with older equipment and new-hire influx, pointing to clear control priorities. The mechanism is behavioural: owner-manager leadership and simple routines strengthen climate and spur safety participation, which is the pathway to fewer injuries.

In short, the opportunity is to move from "compliance paperwork" to proportionate, participatory, and supported safety. Doing a few critical things well—every day—beats adopting complex systems that small firms cannot sustain.

IV. Recommendations

Right-size the safety system. Institutionalise a minimum viable OSH package: (1) a 10-minute start-of-day huddle/pre-task brief, (2) a weekly hazard walk-through, (3) a one-page near-miss/incident card with rapid feedback, (4) a visible corrective-action board with owners and dates, and (5) a toolbox-talk cadence tied to current tasks. Track two leading indicators: near-miss capture rate and action closure time.

Leverage intermediaries. Fund and scale sector-based coaching that brings templates, on-site co-design, and micro-grants/discounts for enabling kit (guards, extraction, platforms). The evidence shows that support amplifies the effect of practices.

Make client leverage developmental, not just contractual. Encourage large clients to couple prequalification/audits with shared training, pooled access to specialist equipment, and incentives for safe delivery (e.g., schedule relief for hazard controls, bonus criteria that include near-miss learning and action closure).

Target high-yield risks. Prioritise controls for sectors/operations with highest bands; replace or retrofit aging equipment; add supervision and staged exposure when the new-hire share rises. Use micro-autonomy and paced work to buffer job demands.

Build climate through owner-manager leadership. Train owners in practical safety leadership: visible commitment, fair treatment, and response to voice. Recognise and reward safety participation explicitly (ideas, assists, reporting) rather than only procedural compliance.

Use digital tools as prompts, not surveillance. Prefer lightweight photo/checklist apps with instant acknowledgement and action tracking. Co-tune alerts with workers; publish a simple data-governance note (purpose, access, no-punitive use) to sustain trust.

Support SMEs on finance and procurement. Expand insurer premium credits and tax relief for validated controls (dust extraction, guarding). Standardise low-burden procurement OSH requirements across clients to reduce administrative friction.

Monitor and learn. Review monthly: TRIR/LTIR, near-miss rate, action closure, climate pulse (2–3 items), and equipment age map. Share simple before/after stories across peer groups to accelerate diffusion.

Adopting these proportionate, practice-anchored steps—supported by credible intermediaries and reinforced by clients and insurers—can close the small-business safety gap while respecting the realities of time, cash, and capacity that define small-firm life.

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