Chapter 3
Subcontracting, Repeat Latent Failures and Workplace Disasters

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Abstract Subcontracting, the subletting of work tasks creating a hierarchy of contractual relationships (especially multi-tiered subcontracting), is a centuries-old form of work organisation but has grown substantially since the mid-1970s, including Uber-type arrangements facilitated by digital surveillance and platforms and global supply chains (Nossar in The regulation and management of workplace health and safety: historical and emerging trends, 100–122, 2020). Evidence that subcontracting arrangements can exacerbate health and safety risks (including injury rates, exposures to harmful substances and worker mental wellbeing) is also not new, being extensively documented by government reports and research from the late nineteenth century (see for example Gregson and Quinlan in Labor Hist. 62:534–550, 2020; Quinlan in Int. J. Health Serv. 43:721–744, 2013; Quinlan et al. in Saf. Sci. 57:283–292, 2013)). This paper focuses on the connection between subcontracting and workplace disasters, how to understand their causation and what remedial measures can be taken to minimise such incidents. To do this, it draws on the Pressure, Disorganisation and Regulatory Failure (PDR) model (Bohle et al. in Work Stress 29:114–127, 2015) and the Ten Pathways framework for analysing death and disaster (Quinlan in Ten pathways to death and disaster: learning from fatal incidents in mines and other high hazard workplaces, Federation Press, Sydney, 2014).

Keywords Subcontracting · Outsourcing · Safety · Occupational accidents · Disasters · Latent failures · Organisation

3.1 Subcontracting and Serious Workplace Incidents

Subcontracting refers to the subletting of tasks (or parts thereof) to third parties which may be undertaken within the initial employer's workplace or outside (outsourcing). It can entail a pyramid succession of contracts as those contracted further sublet

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work (multi-tiered subcontracting) and can take on a variety of forms or contractual arrangements ranging from simple exchanges through to more structured types like Uber. It can involve both short-term and long-term agreements between contracted parties (e.g. employment agencies do both). Subcontracting is both a business and work arrangement, and supply chains typically consist of a succession of contracts for the provision of goods and services that in essence amounts to structured subcontracting. Over the past two decades, a growing body of international research has linked subcontracting to adverse occupational health and safety (OHS) effects, including higher injury rates, disease exposure and mental health problems across a wide range of industries, including trucking, aviation, construction, mining, health services and manufacturing (Mayhew and Quinlan 2006; Thebaud-Mony 2011; Underhill and Quinlan 2011). Given the complex array of subcontracting arrangements identified above, it is possible that the extent of risks may vary, for example being higher where subcontracting is multi-tiered and entails more hazardous activities. There is also a question as to whether risks arise from vulnerable workgroups rather than subcontracting itself, but the bulk of research suggests vulnerable groups magnify risks intrinsic to the subcontracting process not vice versa (Bamford 2015).

In order to address the threats posed, it is important to understand how subcontracting arrangements can undermine OHS. While PDR is a general model on how work organisation affects OHS, its development was grounded strongly in evidence drawn from numerous incidents, including those where subcontracting played a pivotal role. Table 3.1 provides a summary of the key risk factors under each category of PDR. Before elaborating, it is important to note that the PDR model applies to OHS outcomes more generally (including physical and mental health), not just to injury/fatal incidents. Nor does it simply constitute a grid approach as might be implied by Table 3.1. The model also uses a validated survey instrument which has successfully been applied (see for example Bohle et al. 2015 and Knox et al. 2017). It has also been used by a number of European studies of the risks associated with agency labour and outsourcing (Pilbeam et al. 2020; Strauss-Raats 2019). There is certainly scope for further research exploring these and other nuances/complexities, such as how boundary-setting operates in relations between large firms and their successive rings of contractors/subcontractors (for a recent Swedish study doing this, see Nygren 2018). Nonetheless, evidence for the overall effect of weakening OHS identified in earlier studies has been overwhelmingly reinforced by subsequent research.

The PDR model has specifically been applied to a number of incidents and industries to test its explanatory power and what light it sheds on their causation and remedial measures. An examination of US civil aviation incidents between 1995 and 2010 involving the outsourcing of maintenance and sufficiently serious to warrant a formal National Transportation Safety Board (NTSB) investigation (five were examined although a sixth was later identified) found the three PDR drivers were present in all (see ValuJet 1996 example in Table 3.2). In terms of economic/reward pressures, outsourcing of maintenance was driven by cost pressures as low-cost carriers entered aviation, but this encouraged cost minimisation in repair work including doing maintenance at night under tight time pressures by lower paid and less qualified workers,

Table 3.1 Pressure, disorganisation and regulatory failure model elements

Economic/Reward pressures	*Disorganisation*	*Regulatory failure*
Economic/financial pressures on work effort/cost-cutting	Short tenure, inexperience	Poor knowledge of legal rights, obligations
Contingent, irregular payment and job insecurity	Poor induction, training and supervision	Limited access to OHS, workers comp rights
Long or irregular work hours	Ineffective procedures and communication	Fractured or disputed legal obligations
Multiple jobs/ underemployment	Ineffective OHSMS/ inability to organise	Non-compliance and weak regulatory oversight (stretched resources)

a focus on "break and fix" rather than investigative maintenance [which wasn't paid for], moving work to locations/countries with poorer safety records and unauthorised subletting of work to third parties (Quinlan et al. 2013). In terms of disorganisation, the insertion of a remotely located party into maintenance increased potential for disarticulation and breakdowns in communication/supervision, maintenance repair organisation (MRO) staffing was marked by greater inexperience, staff turnover and poorer induction/training especially given regular staff movement compared to in-house maintenance, safety management systems were compromised, and there was little 'worker voice' to raise safety issues (this spread to in-house facilities where remaining maintenance staff were threatened with further outsourcing). Third, regulatory failure was evident in legislative gaps covering maintenance, regulatory oversight that failed to identify major deficiencies found in other audits, failure to respond effectively to deficiencies that were identified, an overstretched inspectorate and a slow-moving regulator, the US Federal Aviation Administration (see also Quinlan et al. 2014). These findings have been mirrored by research in other countries like Australia where the economics of outsourcing were found to be overstated by the need to rectify 'repairs' when aircraft arrived back from overseas MROs (Gregson et al. 2015).

Research has identified similar scenarios across a range of other industries. When they are paid for the tasks they do rather than the time spent on them, there is an incentive for subcontractors to finish tasks as quickly as possible, which can be conducive to error/corner-cutting and other practices that can undermine health and safety. Multi-tiered subcontracting can exacerbate this as rewards for work tasks are progressively lower at each tier, creating incentives for evasion which—given the complexity—can be difficult to manage, with potentially catastrophic consequences in high-hazard workplaces (Loos and Le Deaut 2002; Mayhew and Quinlan 2006; Quinlan and Wright 2008). Similarly, disorganisation and regulatory failure have been repeatedly identified in subcontracting-related serious incidents including the Petrobras oil rig sinking (2001), Texas City refinery explosion (2005) and Rana Plaza building collapse (2013). We can only provide a few illustrative examples in this chapter, but the key point is that these problems/risks are not industry specific but generic and should inform measures aimed at preventing such incidents.

Table 3.2 Subcontracting, workplace disasters and ten pathways: examples

Pattern-cause	ValuJet crash (1996)	Petrobras oil rig sinking (2001)	Texas City refinery fire (2005)	Hangzhou subway collapse (2008)	Rana Plaza collapse (2013)
Engineering, design and maintenance flaws	Yes, outsourcing of maintenance (led to later crashes too)	Yes, poor design and location of safety equipment	Yes, second-best technology used amongst other flaws	Yes, route revisions impacted on design integrity	Yes, building illegally extended
Warning signals ignored	Yes, two previous serious incidents	Yes, history of large spills from rig	Yes, prior incidents	Yes, many similar incidents	Yes, signs of cracking and previous incidents
Risk assessment flaws	Yes	Yes	Yes	Yes	Yes
OHS management flaws	Yes, outsourcing maintenance, disorganisation/ miscommunication re-term 'expired'	Yes, downsizing, poor training and use of contractors	Yes, BP system flawed including devolved decision-making and focus on personal safety	Yes, fragmented/complex web of disarticulated contracts	Yes
System auditing failures	Yes	Probably but need more evidence	Yes	Yes	Yes
Economic/production pressures compromise	Yes, low-cost carrier cost-cutting	Yes, focus on cost-cutting and production	Yes	Yes, govt. cost-cutting, subcontractors pressured and labourers working 16 h	Yes, huge pressure on costs in the supply chain
Regulatory failure	Yes, FAA should have acted sooner	Yes, government control/conflict	Yes	Yes, contractor offloaded responsibility and numerous violations	Yes, regulation symbolic and global supply chain picked for this
Supervisor and others concerned	Yes, Sabretech mechanics raised absence of caps	Yes, union concerns prior to accident	Not investigated	Not investigated	Yes
Poor worker management communication/trust	Non-union operator and workers' pay for training	Yes, union undermined by subcontractor use	Yes, communication gap between subcontractors and other workers	Yes, problem reports ignored but no clear mechanisms for raising concerns	Yes, little if any union representation and workers threatened

(continued)

Table 3.2 (continued)

Pattern-cause	ValuJet crash (1996)	Petrobras oil rig sinking (2001)	Texas City refinery fire (2005)	Hangzhou subway collapse (2008)	Rana Plaza collapse (2013)
Emergency and rescue system failures	No	Yes	Yes	Yes, problematic effectiveness examined in report	Yes

Table 3.2 takes the examination a step further, detailing a number of subcontracting-related disasters in terms of the Ten Pathways framework. This framework was developed from an examination of death and disasters in mines and other high-hazard workplaces, identifying ten latent failures that were repeatedly evident in these incidents (Quinlan 2014). There are synergies between PDR and Ten Pathways. Two PDR elements, namely economic pressures and regulatory failure, are arguably pivotal in Ten Pathways. The difference is that Ten Pathways is less generic, focusing on health/safety disasters and their origins, including specific failure mechanisms, and thereby providing a framework for informed interventions, including auditing and training (it is being used this way by the mining industry in Australia). Within Ten Pathways, subcontracting is largely located in the category of management systems, although it will also affect other latent failures, notably economic/production pressures, regulatory failure and poor worker/management communication or trust.

The explanatory value of the Ten Pathways framework is evident in five cases examined in Table 3.2. Subcontracting played a critical role in all five incidents which can be briefly summarised as follows. In 1996, ValuJet Flight 592—a low-cost carrier—crashed into a Florida swamp killing all on-board after time-expired oxygen cylinders placed in the hold contrary to safety guidelines by a maintenance contractor (SabreTech) ignited. In 2001, the Brazilian Petrobras oil rig caught fire, with ten members of the fire-fighting team dying. Safety on the rig, including emergency procedures, had been compromised by the simultaneous boosting of production with downsizing of staffing levels and shift to using subcontractors. In 2005, an explosion at BP's Texas City oil refinery resulted in the death of 15 workers (all contractors), with subsequent investigations revealing substantial flaws in the company's safety system and procedures (for more details on these events, see Quinlan 2014). In 2008, a subway tunnel under contraction in Hangzhou China collapsed, killing 21 workers immediately (Ma et al. 2012). In 2013, the Rana Plaza building in Bangladesh collapsed due to being overloaded and flagrant breaches of building codes killing 1129 workers and injuring over 2,000 others—the majority women producing clothing for retailers based in Europe and elsewhere (Quinlan 2013). These cases are merely illustrative. Subcontracting has contributed to numerous other small and large workplace incidents, as well as contributing to the spread of infectious diseases, and there is evidence of this stretching back well over a century (Gregson and Quinlan 2020).

Elaborate supply chains have extended subcontracting risks globally, leading to a shift of production to countries marked by vulnerable workers, low wages and labour standards, minimal levels of OHS management and weak and under-enforced regulatory regimes. In addition to the Rana Plaza building collapse (Table 3.2), these risks have manifested in a repetitive cycle of fatal factory fires in Bangladesh, Thailand, China, Vietnam, Pakistan and other poor countries—the products destined for rich countries. A number of private quasi-regulatory schemes have been introduced to improve OHS outcomes in subcontracting and supply chains including contract-compliance provisions, labelling and codes of conduct that form part of the broader rubric of corporate social responsibility (CSR) by top-of-chain organisations. There

is evidence that some initiatives can have positive effects in specific areas and regions but only where several critical contingent conditions prevail or circumstances apply, including the extent that the primary supply chain driver is cost-cutting as well as the degree of community pressure and potential/actual reputational damage (Short et al. 2020; Walters and James 2011). Common limitations with these CSR-type programmes include their restricted coverage/voluntary basis, deficiencies in monitoring/oversight/auditing and unauthorised subletting of work (Brown 2017). The negotiation of international framework agreements (IFA) with unions constitutes one means of extending the coverage of OSH and other labour standards and providing more effective means of overseeing compliance. However, progress developing IFAs has been slow (Papadakis 2008). A study of the conduct of 30 companies involved in international framework agreements (IFA) benchmarked against 38 multinational corporations in comparable industries found IFA codes addressing OSH were more likely amongst firms in the European Union (the leading region in terms of ratifying ILO conventions). Van Tulder et al. (2009) concluded that there appeared to be a relationship 'between home country regulation and international supply chain strategy'. The Rana Plaza incident enabled international unions to negotiate an accord on safety conditions in Bangladesh factories with a number of major garment purchasers in North America, Europe and Australia, which included review of the implementation process (Quinlan 2013). Overall, while CSR and framework agreements can have value, they are not a substitute for mandatory regulation—indeed the latter helps drive more effective measures as already indicated.

OHS management systems have repeatedly proved vulnerable to changes that the system did not accommodate, including changes in work organisation such as the introduction/expansion of subcontracting, downsizing or relocation of key staff as at Esso Longford in 1998 (Quinlan 2014). One factor here is that systems have been too geared to routine hazards rather than low frequency–high impact events which require an entirely different set of KPIs and controls. While more organisations have recognised this, moving beyond KPIs like lost time injury rates that essentially measure routine risks has proved remarkably difficult (especially given influential notions of behaviour-based safety). There is an argument that it thus warrants recognition as a distinct pathway rather than being incorporated under management systems and change as it is in Ten Pathways.

3.2 Remedies/Preventative Measures

To minimise the risks associated with subcontracting, organisations—especially those with high-hazard facilities—need to make careful strategic assessments of whether particular activities can be subcontracted, thoroughly considering all the associated risks (including long-term workforce and community risks) and factoring in the full costs of control measures ensuring safety and health are not compromised (including rigorous monitoring and auditing and union/worker safety representative involvement). This assessment will sometimes preclude subcontracting of particular

activities and will entail assessment of the cumulative effects of the additional disorganisation/regulatory failure risks of multi-tiered subcontracting. Key principles in effective subcontractor management regimes include careful site-specific induction/training (every site differs in ways that can compromise safety to those unfamiliar with them), ensuring full hazard knowledge and ready communication amongst both organisation employees and contractors (and their employees), having a single OHS management system for the site (to which all including contractors must abide), rigorous monitoring, treating employees and ongoing contractors as core parts of the workforce, encouraging worker feedback (with representative/union involvement to facilitate this) and developing a preferred contractor engagement model (based on the contractor's known commitment to OHS, not just statistics, as these are subject to biases and manipulation) and episodic rigorous independent auditing. The equal treatment of employees and contractors (including agency workers) not only means their full integration into all safety systems and procedures, but taking specific additional measures to ensure their security/readiness to report problems. The importance of the latter was demonstrated by an inquiry into a May 2020 coalmine explosion (Queensland Coal Mining Board of Inquiry 2021) and a number of jurisdictions including France and Germany (see for example Erol and Schulten 2021) have introduced laws to try to ensure this.

Regulatory oversight also plays a critical role, with a growing preference for mandatory regimes given failures of voluntary 'light touch' regulation. Some key principles in this regard are developing legislation that regulates work (not employment) and covers all parties that influence work arrangements while targeting the party with the most power to affect outcomes (typically at the top, except for Uber-type arrangements). The Road Safety Remuneration Tribunal (RSRT) legislation in Australia was one example of this targeting that also placed proactive requirements on all parties. This model was adopted for some truck drivers in South Korea, and while the RSRT was subsequently abolished, a recent Senate Inquiry has recommended an essentially identical solution (Australian Senate 2021). Note the potential for digital tracking mechanisms and app-enabled enforcement where the onus lies on top-of-chain firms to identify/report on all lower contracts. There will be growing pressure for global agreements mandating labour standards in supply chains as prerequisite for commercial arrangements. In the meantime, it should be noted that governance provisions in existing contracts can be used to extend global reach and regulatory controls to top-of-chain firms (Nossar 2020). While targeting the top of supply/subcontracting chains remains critical in most circumstances, the rise of Uber-type app-enabled subcontracting regimes in food delivery and a range of other services in the gig-economy warrants some tweaking because these organisations are key drivers but not at the pinnacle of some supply chains (Rawling and Riley 2021).

Finally, the Ten Pathways framework—the latent failures that have repeatedly led to death and disaster at work—provides a useful template for organisations, unions and government to assess the robustness of existing safety systems and contract-related decisions, to investigate incidents (including high-potential incidents where fatalities were narrowly avoided) and to design more effective interventions. There

is also a need to recognise that the COVID-19 pandemic has highlighted the vulnerability of highly articulated systems dependent on long supply chains and contingent work arrangements (van Barneveld et al. 2020).

References

Australian Senate Rural and Regional Affairs and Transport References Committee, Without Trucks Australia Stops: The Development of a Viable, Safe, Sustainable and Efficient Road Transport Industry. Commonwealth of Australia, Canberra (2021)

A. Bamford, *The Influence of Work Arrangements on Occupational Health and Safety: A Study of Australian and United Kingdom Horticulture*. PhD thesis, University of New South Wales, Sydney, 2015

P. Bohle, M. Quinlan, M. McNamara, C. Pitts, H. Willaby, Health and wellbeing of older workers: comparing their associations with effort-reward imbalance and pressure, disorganization and regulatory failure. Work Stress **29**(2), 114–127 (2015)

G. Brown, Hansae Vietnam's garment factory: latest example of how corporate social responsibility has failed to protect workers. J. Occup. Environ. Hyg. **14**(8), D130–D135 (2017)

Y. de Ma, M. Jong, J. Koppenjan, B. Xi, R. Mu, Explaining the organizational and contractual context of subway construction disasters in China: the case of Hangzhou. Policy Soc **31**(1), 87–103 (2012)

S. Erol, T. Schulten, Renewing labour relations in the german meat industry: an end to 'organised irresponsibility'? *WSI Institute of Economic and Social Research Report* No. 61e, 1–21 (2021)

S. Gregson, I. Hampson, A. Junor, A. Fraser, M. Quinlan, A. Williamson, Supply chains, maintenance and safety in the Australian airline industry. J. Ind. Relat. **57**(4), 604–623 (2015)

S. Gregson, M. Quinlan, Subcontracting and low pay kill: lessons from the health and safety consequences of sweated labour in the garment industry, 1880–1920. Labor Hist. **62**(5–6), 534–550 (2020). https://doi.org/10.1080/0023656X.2020.1818712

F. Loos, J. Le Deaut, Rapport fait au nom de la commission d'enquete sur la surete des installations industrielles et des centres de recherche et sur la protection de personnes et de l'environnment en cas d'accident industriel majeur. *Assemblee Nationale*, No 3559, Paris (2002)

C. Mayhew, M. Quinlan, Economic pressure, multi-tiered subcontracting and occupational health and safety in the Australian long haul trucking industry. Empl. Relat. **28**(3): 212–229 (2006)

I. Nossar, Protecting 'gig economy' workers through regulatory innovation: controlling contract networks within digital networks, in *The Regulation and Management of Workplace Health and Safety: Historical and Emerging Trends*, ed. by P. Sheldon, S. Gregson, R. Lansbury, K. Sanders (Routledge, New York, 2020), pp. 100–122

M. Nygren, *Safety Management on Multi-Employer Worksites: Responsibilities and Power Relations in the Mining Industry*. PhD thesis, Luleå University of Technology, Luleå, 2018

K. Papadakis (ed.), *Cross-Border Social Dialogue and Agreements: An Emerging Global Industrial Relations Framework?* (ILO, Geneva, 2008)

C. Pilbeam, D. Denyer, N. Doherty, Safety risk factors in two different types of routine outsourced work: a systematic literature review. Policy Pract. Health Saf. **18**(11), 1–15 (2020). https://doi.org/10.1080/14773996.2020.1787701

Queensland Coal Mining Board of Inquiry, *Report: Part 2, Queensland Government, Brisbane* (2021). https://coalminesinquiry.qld.gov.au/wp-content/uploads/2021/06/Queensland-Coal-Mining-Board-of-Inquiry-Part-II-Report.pdf

M. Quinlan, L. Wright, *Remuneration and Safety in the Australian Heavy Vehicle Industry: A Review Undertaken For the National Transport Commission*, Melbourne (2008)

M. Quinlan, Precarious employment, ill-health and lessons from history: the case of casual (temporary) dock workers 1880–1945. Int. J. Health Serv. **43**(4), 721–744 (2013)

M. Quinlan, I. Hampson, S. Gregson, Outsourcing and offshoring aircraft maintenance in the US: Implications for safety. Saf. Sci. **57**, 283–292 (2013)
M. Quinlan, *Ten Pathways to Death and Disaster: Learning From Fatal Incidents in Mines and Other High Hazard Workplaces* (Federation Press, Sydney, 2014)
M. Quinlan, I. Hampson, S. Gregson, K. Russell, Slow to learn: regulatory oversight of aircraft maintenance safety in the USA. Policy Pract. Health Saf. **12**(1), 71–90 (2014)
M. Rawling, J. Riley, Proposal for legal protections of on-demand gig workers in the road transport industry, in *Report Prepared for the Transport Education Audit Compliance Health Organisation (TEACHO)*, Sydney (2021)
J. Short, M. Toffel, A. Hugill, Improving working conditions in global supply chains: the role of institutional environment and monitoring program design. Ind. Labor Relat. Rev. **73**(4), 873–912 (2020). https://doi.org/10.1177/0019793920916181
P. Strauss-Raats, Temporary safety. Regulating working conditions in temporary agency work. Saf. Sci. **112**, 213–222 (2019)
A. Thebaud-Mony, *Nuclear Servitude: Subcontracting and Health in the French Civil Nuclear Industry* (Routledge, New York, 2011)
E. Underhill, M. Quinlan, How precarious employment affects health and safety at work: the case of temporary agency workers. Relat. Ind. **66**(3), 397–421 (2011)
K. van Barneveld, M. Quinlan, P. Kriesler, A. Junor, F. Baum, A. Chowdhury, P.N. Junankar, S. Clibborn, F. Flanagan, C.F. Wright, S. Friel, J. Halevi, A. Rainnie, The COVID-19 pandemic: lessons on building more equal and sustainable societies. Econ. Labour Relat. Rev. **31**(2), 133–157 (2020)
R. van Tulder, J. van Wijk, A. Kolk, From chain liability to chain responsibility. J. Bus. Ethics **85**(2), 399–412 (2009)
D. Walters, P. James, What motivates employers to establish preventive management arrangements within supply chains? Saf. Sci. **49**(7), 988–994 (2011)