Taking a New View for Researching Occupational Safety in Construction: Site Safety Practice

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Abstract

The ‘New View’ of occupational safety is gaining increased attention within both the construction industry and its associated academe. With the potential to overcome the current plateau in accident rates and support the further enhancement of occupational safety on sites, the ‘New View’ offers an alternative approach to more traditional command driven safety management and instead takes a sociotechnical perspective, valorising the workers and acknowledging their contributions to the system in the form of adaptability and resilience. Yet empirical research of ‘New View’ thinking and practice within construction is lacking. Meaningful research in this space demands non-positivistic approaches able to reveal nuanced and local insights able to inform and illuminate ‘New View’ practices and the contexts in which they could potentially be implemented on sites. Here, we make a methodological contribution with the aim to advance empirical research in this space. Social practice theory is employed and evaluated as an approach able to make such a useful contribution. Through the exploration and explication of the block of ‘site safety practice’, we demonstrate the utility of this theoretical approach for ‘New View’ researchers, whilst also making a fundamental contribution to knowledge in the form of insights of the local and situated contexts, in which ‘New View’ thinking could be practically applied.

Keywords: New View, occupational safety, site safety practice, social practice theory

Introduction

Occupational safety within the construction industry remains a serious concern. At least 60,000 construction workers die each year across the world (International Labor Organization 2020), and even in so-called developed countries it remains a high-hazard industry. In the UK, for example, 30 workers died on sites in the period 2021/22 and over 59,000 non-fatal injuries occurred, 26% of which resulted in over a seven-day absence from work. This is statistically significantly higher than the all industry rate in the UK (Health and Safety Executive 2022). Furthermore, in such developed countries, traditional approaches to safety management appear to have reached a plateau in their effectiveness; the construction worker fatality rate in the UK has *‘…*shown signs of flattening out in more recent years*’* and remains *‘…*around four times the all-industry rate*’* (Health and Safety Executive 2022:16).

In seeking to resolve this situation, construction research and practice has starter to take a greater interest in what has been collectively termed the ‘New View’ of occupational safety (see Le Coze 2022 for a comprehensive and detailed review). The New View encompasses a number of different safety-focused theories and initiatives, including Resilience Engineering (RE) (Hollnagel et al. 2006),

Adaptive Safety (Borys et al. 2009) and Safety II (Hollnagel 2014). In general, these approaches bring sociotechnical perspectives to OSH management (Carayon et al. 2015), looking to explore and better understand the interactions between the workers and their work (Kleiner et al. 2015). Essentially, the New View purports that workers are the solution to enhancing occupational safety, rather than the problem (the starting point for much traditional occupational safety management – which for research often leads to proposed solutions such as 'more training' or 'better supervision'), and thus seeks to reframe and reprioritize their contributions to the enhancement of occupational safety in practice. Many New View approaches aim to enhance worker resilience, capacity and adaptivity, but without relying exclusively on workers to resolve failings within the wider system (Rankin et al. 2014). It has been suggested that initiatives and practices developed in line with the New View may be the catalyst needed to overcome the contemporary plateau in occupational safety, to positively disrupt 'safety business-as-usual', and thus support further reductions in fatalities and injuries on sites.

However, the New View of safety also has its critics. Following a comprehensive review, Cooper (2020) recently argued that '…there is no published, peer-reviewed empirical evidence to demonstrate whether or not any aspect of New-View's *ideas* work in practice' [original emphasis]. Instead, he argues, ideology and emotion have triumphed over science and practice; the New View is not able to make its own case based on existing evidence. Such opinions have also been voiced by Patriarca et al. (2018) and Niskanen (2018), who note the lack of empirical evidence for validation of the theoretical concept of Resilience Engineering, and its realization in practice. Within the construction field such comments also find support, as although aspects of the New View have been applied theoretically to the construction industry (Harvey et al. 2019; Peñaloza et al. 2020), and adopted in limited ways in practice, empirical research remains lacking. This could simply be a consequence of timing; the lack of published work exploring New View perspectives a result of its relative novelty for construction safety.

Furthermore, the continued dominance of positivistic methodologies and theories within the field (Sherratt and Leicht 2020) may also have limited the generation of findings able to explore the rather more nebulous New View world of the social and the technical in practice, and thus constrained relevant academic outputs. We are ourselves methodologically curious. We wish to contribute to the development of '…different perspectives that may contribute to the collective task of … increasing knowledge of how [construction] organizations … work safely' (Haavik et al. 2019: 487, [our addition]) and thus support empirical explorations able to meaningfully evaluate and inform New View thinking. To make such a contribution, we here propose an alternative theoretical approach to support fruitful and effective research of the construction site; able to contribute to the

small but growing body of more nuanced understandings of occupational safety in construction, yet also able to find good fit with practice. We employ social practice theory, which offers a framework for analysis able to synthesize the structural focus of systems, such as the legislative frameworks and organizational policy and procedures for construction safety, alongside the technical, processual, cultural, and social (Reed, 1992: 113). We develop this analytical framework after Reckwitz (2002), positioning practice as assemblages of elements that are integrated by practitioners and workers as they go about their daily activities. Social practice theory is able to deal with the messy complexities of safety as linked to practice as emergent within the 'everyday' (Reckwitz 2002: 244), whilst also seeking to change social practice itself – a highly appropriate approach to adopt in a space where changing practices to make workers and work safer is also the ambition.

We therefore here seek to make a predominantly methodological contribution by the empirical demonstration of this specific approach to construction occupational safety research, and also, by doing so, we are able to make visible the practices of safety found on site and unpack how the interactions between the different elements of practice come about, how they manifest and influence. This reveals a new perspective, that of 'site safety practice', which makes a useful contribution to our understandings of construction site safety in a way that finds excellent fit with the everyday, the nuances and the complexities of the lived experiences of workers on sites. It is this 'local knowledge' that is also needed to underpin and 'validate' New View thinking, and thus we also make a contribution to the generation of the situated knowledge needed to support the exploration of the New View in practice.

Context: The New View of Occupational Safety

Some Fundamentals

The emergence of the New View can be traced through a number of key theoretical developments (please see Le Coze 2022 for a comprehensive review of the New View and its emergence. The brief discussion here aims only to provide the necessary context for the methodological work that follows). An early step was the significant shift in thinking that came with the emergence of the systemic view of occupational safety (Dekker et al. 2011). This necessitated the acceptance that management decisions made upstream at the organizational 'blunt end' have significant influence on occupational safety downstream at the 'sharp end' on worksites, where accidents actually occur (Dekker 2006; Hovden et al. 2010). Countering 'blame the worker' narratives – as in the New View 'blame solves nothing' (Conklin 2019) – this repositioning of workers within the wider occupational safety system reframed their unsafe acts as symptoms, not causes, of poor organizational systems, which can encourage or even force human errors and unsafe acts within certain contexts (Perrow

1999; Whittingham 2004; Dekker 2006).

Workers have also become recognized for the contributions they make to occupational safety in practice. A New View 'truism' is that systems rarely work as predicted (Dekker 2011). There is always a contradiction between work as imagined and work as undertaken (Hollnagel 2014), and workers simply act in ways that reconcile such conflicts (Foster et al. 2019) to get the job done. These variations from work as planned are often essential work-arounds to maintain the overall function of the system, and can be related to Reason's (1990) concept of 'routine violation' or Reiman et al.'s (2015) concept of 'organizational drift'. Indeed, it has been suggested that the majority of such work-arounds are usually successful and so are not associated with negative events, but sometimes they do fall short and incidents occur (Hegde et al 2020).

This further links to the theoretical position of Hollnagel's (2014) Safety II (Wang et al. 2020). Safety II thinking redirects occupational safety management away from solely negative perspectives and reactive measures (the Safety-I approach), and instead suggests that much can be gained from understanding situations in which things also go right and no accidents occur (the resilience in the system). Safety-II recognizes that it is the very same human capability for adaption, innovation and creativity that enables work processes to be maintained and go right when challenged, that also results in accidents and incidents when things go wrong (Harvey et al. 2016).

Although the New View comprises a number of different theories, there are fundamental elements such as the valorization of the workers that underpin the movement in practice. There are also fundamentals in terms of research; the focus on the local social and technical makes specific demands of academics exploring occupational safety from New View perspectives, necessitating the generation of qualitative data and mobilization of non-positivistic methodologies that can themselves accept and work with the complexity, inconsistency, and messy nature of reality.

Construction Safety Research and Practice

The construction industry has arguably embraced the New View more rapidly and with more enthusiasm than its associated academe. For example, a 'no blame culture' is now commonplace amongst large construction and civil engineering firms (Thallapureddy et al 2022), reflecting the acceptance that worker error is a symptom not a cause. It also seeks to enable enhanced worker engagement as a lack of blame should logically result in increased incident reporting, and thus organizational learning.

In contrast, there is a relatively small but notable body of academic work that has explored construction site safety in ways able to support New View theorizing as manifested in practice. For example, the concept of the 'work-around' is readily identifiable on construction sites (Oswald et al.

2015; Peñaloza et al. 2020), as is the frequent conflict between work as planned and work as done within the construction site space (Sherratt 2016), the negative influences of upstream decisions on downstream activities (Patel et al. 2012), and conflicts between organizational goals, such as those of safety and production (Oswald et al. 2020). Theoretically, it has been suggested that the New View of safety rules, in which one size does not fit all (Ramasesh and Browning 2014), finds good fit with the realities of the construction site (Sherratt and Ivory 2019). The New View's situationally sensitive flexibility in how work is organized, managed and practiced to maximize safety could therefore be a beneficial way forward for construction. Sherratt and Ivory (2019) specifically theorize that 'situational self-organizing' amongst the workforce and full awareness of the realities of work within specific contexts (Reiman et al. 2015: 82) could help support effective safety management practices, although this notion remains empirically unexplored.

It is worthy of note here that there is also a growing body of ethnographic studies of the field, focused specifically on safety in practice (e.g. Tutt et al. 2013; Oswald et al. 2017). Such work has revealed the local, socially produced nature of construction safety, and contributes to a richer understanding of the lived experiences of construction workers at work. This research, although not explicitly associated with New View thinking, de facto reveals the contexts in which New View practice needs to find fit, and thus can to some extent inform and provide insights meaningful for safety management out on sites.

Yet research explicitly seeking to explore the New View within construction occupational safety practice through robust empirical studies is lacking (Cooper 2020). The extent to which the construction industry has adopted and implemented New View thinking, and how it has done so, remains unknown from academic perspectives, as are the levels of success and/or failure from any such initiatives. It can also be suggested that the current body of construction occupational safety research able to illuminate the social, the local and the nuanced is itself lacking in a scale and scope able to meaningfully inform New View initiatives. Thus, there remains a clear gap in knowledge; both in knowledge of how construction safety 'works' on sites, but also knowledge of how New View thinking can best influence and implement occupational safety initiatives able to bring about further improvements in practice and overcome the plateau, if indeed it can.

Methodological Considerations

Collectively, the New View makes specific demands of academic research. It is very much concerned with the social and the technical (Carayon et al. 2015), and the interactions between workers and their work (Kleiner et al. 2015). Thus, nuance is important (Le Coze 2019), and it is the lived realities of the workplace that become most relevant (Dekker 2014). In order to address this and to

undertake research able to make meaningful contributions to the New View in practice, academics must mobilize research grounded in methodological paradigms able to provide insights and illuminations of the mundane, the local, the situated and the constructed. As Haavik et al. (2019:483) note, studies that '…provide insightful analyses of situated work and the adaptability and flexibility that characterize it are critical, and such work has not been well incorporated into the classical body of safety science literature'.

Yet research of construction and its management (including occupational safety) has grown from the mulch of the engineering sciences, where concrete, steel and complicated calculations abound. It is therefore unsurprising that it is a highly ontologically realist and epistemologically positivistic space (Sherratt and Leicht 2020). Importantly, this dominant positivistic approach inherently limits understandings of the social and interactional aspects of occupational safety in this field, and thus the ability to inform effective interventions in practice. It has resulted in a fragmented and individualistic view of occupational safety, where 'unsafe conditions' and 'unsafe acts' separate the workplace from the worker, and the structure and technical from the social in analyses (Smith et al. 2017). Yet within such analyses, all too often no difference is made between the worker and the work, and they are both approached just the same: as something that can be objectively measured and controlled. Survey work and the generation of quantitative data to prove, or rather disprove, null hypotheses remain prominent (Sherratt and Leicht 2020), and where richer qualitative data is collected, much of that richness is subsequently lost it as is reduced through positivistically-grounded analyses that continue to dominate (Zhou et al. 2015; Oswald et al. 2018).

It would be churlish to not here acknowledge that this has been no bad thing for the construction industry; we are not here to denigrate the beneficial positivistic work of colleagues in this space. Dekker himself readily admits that despite his dismissive considerations of the 'growing bureaucratic and ordering of safety work' (2014: 348), it has brought benefits to occupational safety in terms of real reductions in accident and incident numbers, the standardization of good practice and increased control and predictability of organizational processes with regards to safety (ibid 2014: 254). This rings true for occupational safety in construction: To return to the example of the UK, such approaches have supported the reduction of the fatal injury rate from 9.3 per 100,000 workers in 1987/88 to 1.63 in 2021/22 (Health and Safety Executive 2022). Although this approach has undeniably seen success thus far, it has now plateaued. It can be suggested therefore that contemporary research should broaden its horizons and look to alternative approaches able to support ongoing improvements on sites.

However, we must also make it clear we are not making a methodological argument about what approach or paradigm is 'best'. Like Braun and Clarke (2006: 80) we do not '…subscribe to a naïve

realist view of qualitative research, where the researcher can simply 'give voice' (see Fine 2002) to their participants'… nor do we think there is one ideal theoretical framework for conducting qualitative research, or indeed one ideal method. What is important is that the theoretical framework and methods match what the researcher wants to know, and that they acknowledge these decisions, and recognize them as decisions. Indeed, there are many different epistemological methodologies, research paradigms and theoretical frameworks able to make a contribution to the more nuanced and local understandings of safety able to fit with the New View, and we certainly do not wish to disparage positivistic work by default. Work grounded in multiple different approaches creates and places different tiles of different shapes to the mosaic of our knowledge and understanding or, in more contemporary terms, enhances the chiaroscuro, depth and nuance of our knowledge in a way that increases the number of pixels, and ultimately brings the image into sharper resolution.

One such approach is social practice theory. Social practice theory enables us to make visible 'work practices that are often invisible to others than those who perform them' (Haavik et al. 2019: 482). We are able to illuminate the relevant institutional and structural dimensions that are often overlooked in social constructionist evaluations of safety (Le Coze 2012), whilst also remaining cognizant of the social, complex, emergent and intangible nature of safety within the workplace. We empirically demonstrate the beneficial insights and understandings this approach can bring to occupational safety research in construction, and particularly the knowledge needed to inform the New View in practice. To that end, we mobilize social practice theory to unpack and explore the elements that combine to create safety on site. By contextualizing these findings within current understandings of construction safety, we are able to demonstrate the value and utility of this alternative theoretical approach to developing more nuanced knowledge of site safety, and how such knowledge can potentially inform improved occupational safety in the construction industry overall, be that as part of the New View or not.

Social Practice Theory

The 'practice approach' (Schatzki et al. 2001) and social practice theory (see for example Schatzki 1996; Reckwitz 2002; Hargreaves 2011; Shove et al. 2012) offer a development in social theory where connections between context, social activity and change are of interest. Much of the practice literature is aligned along broadly similar principles and philosophical foundations all 'tied to an interest in the "everyday" and "life-world"' (Reckwitz 2002: 244). Differences between practice-theorists are primarily nuanced and about positioning and application; taken together they offer a novel vocabulary for understanding the dialectic between social structures and human agency as a dynamic relationship which continually make and transform practice. 'The practice itself, rather

than the individuals who perform them or the social structures that surround them, thus becomes the core unit of analysis' (Hargreaves 2011: 82). Our point of departure in applying social practice theory to the study of site safety is the focus on agents as 'carriers of routinized, over-subjective complexes of bodily movements, of forms of interpreting, knowing how and wanting and of the usage of things' (Reckwitz 2002: 259).

Practice-theorists typically identify various components or elements of practices (e.g. Reckwitz 2002; Shove et al. 2012). Reckwitz (2002: 249) refers to these elements as Forms of bodily activities, Forms of mental activities, 'Things' and their use, Background knowledge in the form of understanding, Know-how, States of emotion, and Motivational knowledge. These are distilled to materials, meanings, and competences in Shove et al. (2012). To us, the detail Reckwitz offers is helpful and we see these elements as the building blocks of practice, as well as 'the block' that is the practice itself, and the outcomes of such practice, albeit we acknowledge this approach has been criticized (see for example Hui et al. 2017). Adopting Reckwitz's empirically helpful understanding of the elements of practice allows us to investigate how a multitude of single and often unique actions reproduce the practice: site safety. As this practice is social, it is a way of behaving and understanding that appears at different locales and at different points of time and is carried out by different people (Reckwitz 2002: 250).

Ultimately, at the center of social practice theory are considerations of the relations between agency and structure – social situations are influenced by individual choices and actions; yet they are shaped by broader structures and meaning (after Giddens 1984; Reckwit, 2002; Shove et al. 2012: 11-12). It is not the pursuit of individual interest nor the outcome of external forces alone that orders everyday life but rather an ongoing play, duality, of agency and structure. Thus, social practice theory offers a holistic yet grounded framework for analysis of how site safety practices emerge, evolve, and disappear on site (after Shove et al. 2012: 12). As Warde (2005: 140) notes, 'the principal implication of a theory of practice is that the sources of change behavior lie in the development of practices themselves'. Thus, for us to help pave way for further improvements in occupational safety in construction, potentially through the adoption of New View thinking, we establish a new focus and examine the practice (that is, site safety practice) rather than continue with the long-standing interests in specific actors (such as the site workers or safety leaders) or structures (such as the site safety rules, risk assessments or other operational procedures) as the force majeure event. Our research approach is built on these principles, in search for 'a routinized type of behavior' (after Reckwitz 2002: 249) within 'integrative practices' (after Schatzki 1996: 98). Whilst this approach may restrict our ability to make universal generalizations, an issue that would be seen as a significant disadvantage in the conventional positivistic paradigm (Hargreaves 2011:

84), it leads to richer and more subtle accounts of action and embeddedness in empirical analysis (Reckwitz 2002: 259) – precisely those required by New View thinking.

Method

This work was carried out in accordance with the [institution name] Ethical Research Policy Framework.

Data Collection

The empirical data for this study is a set of conversational phenomenological interviews (after Given, 2008; Berner-Rodoreda et al. 2018) conducted on construction sites in the East Midlands and South East of the UK. Although discourse and language do not hold a central position within social practice theory, they offer 'an in' into thinking about and understanding the bodily and mental activities, ways of knowing and know-how, and things that are linked to one another and how these are mobilized in the collective, shared space. A phenomenological approach to interviewing lends itself to exploring and understanding the issues research participants grapple with from their worldview and is able to reveal the nuances that surround their lived experiences. Thus, we adopted an empathetic stance (Saunders et al. 2009: 116) in order to enter the world of the research participants and gain an understanding of site safety practice from their point of view (Pink et al. 2010; Saunders et al. 2009). The flow of the conversations during the interviews was dynamic and led primarily by the participants.

We did not look to elicit 'facts' but instead sought to generate discussions around safety. Instead of standard questions, research probes were employed to generate discussion about topic areas related to safety on site as identified from construction safety literature. Topics included general perceptions of the industry and work in construction, but also specifically danger, teamwork, learning, training, communication, regulations and legislation, risk assessment, management, common sense, their experiences on site, and change. A list of searching questions that could be used should the conversation stall served as a backup, for example: 'What are your thoughts on supervision as far as safety is concerned?', 'Do you have safety training at work?', 'Do you assess safety on site? [possibly follow on] And how?' and 'Are there any good safety practices that we have not yet discussed that you could share?' Ultimately, we were interested in opening the interviews with general conversation about safety on site, to put the interviewees at ease, and then developing discussion about issues and themes of importance to them. Hence, the data generated was unstructured and participant-driven, and provided rich insights and understandings around the many aspects and elements that make up the whole 'block' of site safety practice, and inevitably included structure-agency interactions and artefacts. By structure-agency interactions we mean for

example the interplay of organizational policy and management instruction and worker behaviour and attitudes on site (as shown, for example, in the section 'Forms of mental activities'); and artefacts we discuss, for example, in 'Things' and their use, within the Findings and Discussion.

Face-to-face research was employed as participants may mistrust the research process as safety is a sensitive topic (Ellard-Gray et al. 2015) and researching safety on site may be mistaken for "checking up on them". Thus, researcher presence on site helps in gaining trust, which is necessary for uncovering the lived experiences and in-depth discussion about practice on site (Pink et al. 2010). The interview protocol included an explicit statement of research ethics at the start and the participants' consent was voice-recorded as was the full duration of the interviews. The data collection was carried out in two phases. In the first phase n=17 interviews in the East Midlands were conducted, transcribed verbatim and analyzed thematically, before the second phase of interviews (n=12) in the South East. This two-phase approach facilitated an interim period of analysis and reflection, developing deeper insights from the data, before further data was collected and mobilized to verify the research process (Saldana, 2014: 603). Both sets of interviews followed the same process, and the total number of interviewees was a pragmatic decision based on saturation of the data, as considered below.

Sample

Social practice theory work is situated work, as its ontological and epistemological foundations dictate. It looks to explore the nuance of the everyday for those who live and experience it, and thus is itself inevitably subjective. Any sample therefore can only be representative of itself – to very roughly 'translate' into positivistic epistemological terms, this inevitably results in what would be called a 'sample of convenience' - and thus here we make no claim beyond that.

Participants were drawn from a number of construction sites across the regions as stated, and each worked for a small or a micro enterprise, by the UK Government definition for a Small to Medium sized Enterprise (SME): small enterprises register a turnover or balance sheet total less than or equal to €10 million and have less than 50 employees; micro enterprises register a turnover or balance sheet total less than or equal to €2 million and have less than 10 employees (Foreign Commonwealth and Development Office 2022).

The respondent profile was broadly representative of the peripatetic nature of construction workforce and included a range of roles and trades typically present on construction sites (specifically: 11 general builders, 4 groundworkers, 3 bricklayers, 2 carpenters, 2 labourers, 3 steelworkers, 3 site supervisors and managers, and 1 owner of an SME). The respondents' experience in the industry ranged from 1 year to 40 years; most had worked in construction 8-20

years. All but one of the respondents were male. Where quotes are used in this paper, pseudonyms are used to ensure the anonymity of the participants.

Data Analysis

The thematic analysis of the conversation transcripts was inductive at first. A data- driven open coding system was employed to identify themes that represent the essences and essentials of the respondents' lived experiences of site safety practice (Saldana 2014: 596; Braun and Clarke 2006: 83), such as 'Physically demanding and dangerous nature of work', 'Environmental constraints', 'Cautious mindset' and 'Different perceptions'. As an illustration, the theme of 'Physically demanding and dangerous nature of work' emerged from the data as expressed thus:

- *'…when you get to our age things start to wear out. It's very hard this building game. It's very hard on the body. The physical demands, you're lifting, your knees, your back.'*
- *'I think you're lucky if you gonna stop in this industry until you're 65 and retire because it does make you old quick.'*
- *'…you can't be a 100% safe. No matter how much people say. Not on a building site.'*
- *'…always be dangerous. There's always trip hazards and stuff.'*
- *'It comes with risks. You know. You got dust, it's a lot of dust. You might be using a jack hammer it might hit you in the shin you might get wiped, you might get your finger in there.'*

These example illustrations of the 'Physically demanding and dangerous nature of work' are all embodied aspects of work on site, as are the constraints of the physical environment, hence they were categorized together and related to Reckwitz's Forms of bodily activities.

The themes themselves were then categorized (ibid, 598-599). For example, 'Physically demanding and dangerous nature of work' and 'Environmental constraints' relate to the embodied and physical experience of working on a construction site and so they form a category.

After the first level of data-driven coding, a cyclic process was undertaken of reading and re-reading (Nowell et al. 2017: 10) the coded data, the themes, and categories in relation to literature. We then turned to the categories and the elements of social practice theory (after Reckwitz 2002), which were used to establish a sense of order, to give a broader meaning and attach theoretical constructs to our categories (Saldana 2014: 599).

During the second level of coding, what Braun and Clarke (2006: 84) call 'latent level', we then examined the underlying ideas, assumptions, ideologies, and issues that shape or inform the content of the data within each category. Since no new themes or categories were identified during the

second level of coding, we noted that saturation was achieved (Saunders et al. 2018), and altogether we have a data set with transcripts for 29 conversational phenomenological interviews; ~44 hours of data.

Findings and Discussion

A summary of the dominant themes that emerged from the data, and their relationships to the elements of social practice theory, can be seen in Table 1.

<< Table 1. Thematic data analysis and the elements of social practice theory >>

To unpack these findings further, maintaining cognizance of New View thinking, we first offer an insight into the contextual specificity of occupational safety in construction through two social practice elements: *Forms of bodily activities* and *'Things' and their use*. Due to constraints of space, we then develop a more detailed unpacking of just one element of practice that showcases the interrelated nature of site safety practice, and the contribution this approach can make in terms of the additional nuance and details it reveals. For this, we have selected *Forms of mental activities*, as it not only acknowledges the individual prominently in safe practice, it is also able to demonstrate a level of interconnectivity within the data and the elements and sub-themes therein, exploring how the social meets the technical in practice. By 'social' we refer to aspects of practice such as different perceptions and mindsets which influence the way in which individuals' approach and enact safety. By 'technical' we refer to, for example, the bureaucratic aspects of risk assessment. Their interaction then allows us to deepen our understanding of site safety as a practice that both the worker and site own. In the subsequent sections we show how the remaining elements revealed through this social practice approach connect together to form a holistic picture of how the block of safety emerges on site and offer a nuanced and local conceptualization of site safety practice. Where quotes are used, these are representative of the data as a whole and thus mobilized only as exemplars to guide the reader through our wider analyses.

Forms of bodily activities

Social practice theory sees the body as central to practice but not only as an instrument which is used, but rather the site of practice in that 'practices are bodily performances' (Reckwitz 2002: 251). Site safety is intrinsically linked to the conditions of work, that is in construction the dangerous and physically demanding nature of work; and it requires a physical human bodily input in doing work safely, avoiding accidents, and/ or instructing others to do so, and also many skills that are required to carry out work and assess risks within the environment. These bodily activities also include mental and emotional activities, as the site of the social lies within the body in social practice theory.

Our data around *Forms of bodily activities* enables us to confirm understandings of the contextual specificity within the construction site space through the four key themes identified within this element: the physically demanding nature of work, dangerous nature of the work, accidents, and environmental constraints. These combine to highlight the situatedness of construction work and its consequences (Sherratt, 2016), as purported by New View thinking, with additional constraints that extend beyond place to include broader environmental factors such as the weather and available workspace, and also take into account the nature of the tasks/work being undertaken. This begins to reveal the realities of this specific workplace, able to highlight the nuances and specific areas of relevance therein (Le Coze 2019).

Within this construction site space, accidents were seen as the inevitable result of the physically demanding and dangerous nature of work and combination of difficult environmental constraints. Many respondents identified a range of minor injuries that were positioned as relatively commonplace and a consequence of bad luck, rather than agency, blame ascribed more to the context than the individual within it. The recognition that work is hard, workers are at risk and do have accidents due to the nature of the work is simply everyday stuff on site. This revealed 'inevitability' of the impact of technical aspects of work on the workers themselves (i.e. the social) aligns with the sociotechnical underpinnings of the New View, in that worker errors that lead to accidents are themselves inevitable within the current system. When workers interact with their work, accidents are simply the norm. Although validating the New View to a large extent, this finding also reveals the mindset of the workers themselves, and thus suggests efforts directed to reshape the system will also require significant pro-active worker engagement to ensure this 'truth' of construction site life is addressed within any change initiative made in practice. Although, as Power (2016) recognizes: 'riskwork' is a part of normal organizational life, in construction it is much more influential and important than in many other industries.

'Things' and their use

'Things' and their use speaks to the same contextual specificity of construction work and again adds detail to understandings of this particular occupational space. Three key themes that arise as central to this element are: machinery, materials and tools, and personal protective equipment (PPE). Heavy plant and machinery were discussed in terms of their prevalence and risk they bring to site safety practice by respondents from a variety of different roles and trades. Managerial respondents and workers alike noted plant and machinery being of constant and important concern to them, and all wished for things to turn out well with comments such as 'touch wood'. Again, this speaks to the New View of forced worker error – touching wood (a good luck gesture in the UK) should not be the foundation of good occupational safety management in practice, however here it supports New

View thinking that in many cases touching wood likely *does* work, and often the social and technical are able to coexist without incident – things go right more than they go wrong. However, this does not result in neglect of such situations, and shared space and people-plant interactions were said to require careful and proactive management, but the risk is not one that can be easily eliminated. Indeed, the practical need for such equipment and the environmental constraints on site make the dangerous nature of the work as identified within *Forms of bodily activities* itself somewhat inevitable.

Similar understandings were shared about materials and tools. Safety training and subsequent certification (referred to as tickets) was a development that was said to be improving machine and tool operating safety, but the respondents that commented on this sub-theme all viewed tickets with some measure of suspicion. Indeed, certification is not always a guarantee of worker competence (Hardison et al. 2014), and their increasing use on sites has resulted in what has been termed a 'carded' rather than competent workforce (Spanswick 2007). Certification for use often forms a site rule, yet as '*Things' and their use* reveals, it is one regarded with little value by and for the workers on site. This reveals an interesting relationship between those who make the rules at the blunt end, and those who have to work with them at the sharp end. This rule is not uncommon, indeed workforce qualifications are often used as a leading safety indicator (Hinze et al. 2013) as logically the more workers have tickets the safer a site will be, and so from blunt end perspectives is has value on the site. However, our findings suggest otherwise and a ticket does *not* equate to competence in reality, and the ineffectiveness of this rule could potentially devalue the other safety rules of the site. It would of course be interesting to explore what could provide an alternative to tickets on sites. A critique levelled at New View thinking is that for all its desire for flexibility and worker adaptability in practice, it relies on 'Safety I' deliverables for its fundamental operations (Cooper 2020), and so does not yet offer a realistic and practical alternative to tickets.

In the discussions regarding PPE, two connected sub-themes became prominent: 5-point PPE (the wearing of boots, high-viz, helmet, gloves and light eye protection which are mandated at all times) and task appropriateness. In relation to 5-point PPE, many workers noted that site/company rules stipulate what PPE ought to be worn and when, in a top-down approach to safety (Hale and Borys 2013). Some respondents firmly believed in the idea of 5-point PPE and showcased an acute awareness of the necessity and benefits of its use, happy to integrate their social with this technical. However, many workers critically noted that they do not see the relevance of all of it. This leads us to consider the task/place appropriateness of PPE in the 'ordering of safety work' (Dekker 2014) and again highlights the dissonance between those who make the rules and those who have to enact them in practice.

PPE is a contentious issue, not least because its use is relatively easy to manage and enforce due to its inherent visibility and ease of identification for the collection of metrics (Sherratt 2016), and thus welcomed by more bureaucratic approaches to safety management. It is also however also one that commonly finds challenge because it can actually hinder safe practice through constraining or restricting workers (for example see Löwstedt 2014). Reflecting this, both managerial and operative level respondents called for the empowerment of workers to make an informed choice about PPE, very much in keeping with New View thinking that would argue precisely for worker self-management and adaptability with regards to their own PPE given the requirements of specific work tasks. Indeed, many voiced actual frustration. Overly strict and not thought-through PPE requirements can damage people-relations on site and easily lead to deviant behavior, blame and discord (as also found by Oswald et al. 2018), again supporting New View thinking and suggesting that a level of self-organising in this element of construction safety practice may be of benefit.

In summary, *Forms of bodily activities* and *'Things' and their use* provide clear insights into the contextual specificity of safety work in construction and go some way to revealing the nuances of the space in which safety needs to 'work': site safety practice happens in a place of danger, there is a struggle between rules and reality that must be acknowledged and addressed by management in their delivery of mitigations to support their ultimate acceptance in practice. This finds fit with New View thinking, yet still requires grounding in the practicalities of a hazardous site space – further, more focused research is required. Although these are perhaps not 'new' issues, the empirical confirmation and contextual specificity is important to deepening our understanding of the nuance and practical implications relevant to developing the sociotechnical system to support enhanced occupational safety going forwards.

The interactions between these elements of practice also provide helpful illumination. For example, the intention of PPE responses to the high-hazard site environment is to reduce risk, however our analysis shows they can also combine to create unsafety in practice. This has further repercussions for risk perception, behavior and risk normalization which is potentially very problematic. However, there is the potential for alternative approaches to be developed that are much more situationally flexible, and the New View could potentially support changes to practice that better empowers workers in their own situated safety management yet is still balanced with legal obligations for risk management.

We will now turn to the narrative and detailed analysis of one of the elements of interest: *Forms of mental activities.*

Forms of mental activities

Mental activities imply certain ways of understanding a workplace, where occupational safety is located, understanding the social space, and knowing how to do work (safely) therein. Our analysis shows that the 'workforce' is not a homogenous mass, but a collation of different perceptions and mindsets which influence the way in which individuals' approach and enact safety. This supports arguments for local considerations in occupational safety research and management, as also argued for by champions of the New View. As while occupational safety is a bodily performance, it is also necessarily connected with know-how and interpretation of other workers understanding and behavior on site, and all relevant agents' emotional levels. This way, occupational safety as a social practice 'crosses the distinction between the allegedly inside and outside of mind and body' (Reckwitz 2002: 252). Within the *Forms of mental activities*, three key themes arose as central to this element: cautious mindset, risk assessment, and different perceptions.

Cautious mindset

Cautious mindset was discussed extensively; a variety of respondents voiced things related to their personal understandings and prioritization of safety, and three sub- themes: collegiality, pro-self, and deviation, emerged. Commonly the talk was related to the avoidance of danger and keeping both themselves, and their peers, safe on site.

Such collegiality amongst the workforce was found to underpin some workers' approaches to safety:

> *'Danger… Try to avoid it, just let them all know. Verbally. Yeah, it can always be dangerous. There's always trip hazards and stuff. Yeah it's got risks in it … If there is a danger then make sure everyone's aware of it. Let everyone know.' (Mark)*

Sharing knowledge of hazards was here linked to the contextual specificity of the site workplace, where danger is felt to be inevitable, and reveals how situated work is sought to be made safer by the workers themselves, as they embody the New View's solution for occupational safety practice. This collegiate and empowered perspective of safety management amongst workers was prominent in the data, suggesting that workers can also be the solution to everyone's safety, not just their own:

> *'Not just for my sake but for everyone else around you.' (Joe)*

A cautious mindset was not only associated with the workers' personal perceptions of safety or danger on site, as other stakeholders, including clients and main contractors, were said to also operate in a similar way. This resulted in both positive and negative outcomes. For some the mindset was seen as beneficial:

> *'I actually think that a lot of clients have taken on health and safety themselves, and the vast*

majority are helpful and try and encourage… see that people are moving in the right direction… work with people… I'd include HSE in this… they will try and improve things.' (Anthony)

For others, the humanistic element of the approach was lost, and a cautious mindset instead resulted in structural manifestations of organizational policy and rules, for example in the strict requirements for PPE use (as considered above in relation to *'Things' and their use*):

'Why do we need to wear hard hats? People were actually living in these houses that we were tarmacking the footpaths of and we were like, "Do you make them wear safety helmets?" "No, we just need you to do it. It's policy." Now straight away if a manager says that, he's completely contradicting health and safety because he's basically saying, "I don't care about your health and safety or welfare, I'm only telling you to do it because I've been told to do it." Straight away all faith is lost in not just the manager but the actual company, because it's basically saying, "I don't care about you. This bit of paper tells me to do it, you'll do it," and it's like well, yes, great, cheers.' (Philip)

Although here PPE is the initial focus of Philip's concern, the consequences for him are far more reaching, and he quickly finds frustration with the bureaucracy (Dekker 2014) that underpins policy and thus practice on this site. Violation of such non-situated safety rules should come as no surprise, adding credence to New View thinking.

Two respondents were more pro-self than collegiate, which is perhaps unsurprising given the very personal consequences of unsafety and expressed a need to secure for themselves '*peace of mind*' (Tom). The role of the individual in safety was explained:

'I like going home at the end of every day in one piece… I have the confidence in my own decision-making… I refuse crazy, dangerous work… I am comfortable with that and I'll sleep at night…' (James)

Deviation from a cautious mindset was strongly challenged. Where respondents felt that their cautious mindset had been compromised, they had refused to carry out tasks according to their superiors' instructions:

'…excavation and wanted me to go down 3m deep without proper support so I refused to go down. If it's gonna put me at risk, I wouldn't do it. It's not worth it is it. For a day's pay end up… either you're dead or somebody else is; not worth it. Normally, I'd get fired for that. Refused to do something, get rid of him.' (Eric)

Both pro-self and collegiate aspects of the cautious mindset were present in the data, grounded

within the specific realities of construction work where unsafety readily arises. In many cases, as in these examples, this was closely aligned to the New View contradictions between work as planned and work as done (Hollnagel 2014), and thus reveals specific illustrations of the emergent complexity of safety itself (Sherratt and Ivory, 2019). Here, the workers had been asked to perform 'work-arounds' to maintain production in spite of, in the specific cases within our data, the lack of the correct equipment to undertake the work safely. The workers drew on their cautious mindset to refuse to undertake the task and thus act in a way that reconciled the situation (Foster et al. 2019) with positive consequences (at least for them personally). However, it must be noted that again conflict arises here, as people in some cases do 'get fired for that'. This presents a lost opportunity for supervisors and managers to listen and incorporate concerns raised into development processes that seek to improve site procedures and design. Where there isn't a psychologically safe environment for speaking up and taking suggestions forward, overly localized management of issues prevent systemic advances.

The conflict between safety and production (Foster et al 2019) is well documented throughout safety research, although in our data only one respondent prioritized production in their discussions of safety. In this instance, a rather flippant approach could be found:

> *'…everybody is health and safety mad. Crazy sometimes on sites you go on. But you just, I know it's for a good reason obviously if them statistics say so then its working, but productivity slows down with health and safety.' (Jason)*

This perspective is not uncommon within the construction industry, where production pressures are considerable (Sherratt 2016), yet also speaks to the fundamental tension that always exists for all occupational safety. That it was not prominently represented in the data perhaps reflects the understanding of the workers in the high-hazard construction site environment that safety is indeed paramount, as danger is never too far away, and so for them, the consequences are simply not worth the risk.

Risk assessment

Risk assessment is an important aspect of managing site safety for many respondents at all levels (from labourers to managers and company owners), and its undertaking is required by UK law. In the data, risk assessment emerges as the key mechanism for both formally and informally operationalising awareness of danger and risk as one of the respondents states: *'I don't think you can eliminate risk; you can obviously reduce it which is the point of a risk assessment.*' (Anthony)

Broadly aligning to the themes found within cautious mindset, again here three sub-themes emerged around risk assessment: practical and personal responsibility, joint responsibility, and

impractical and formalized bureaucracy. In terms of taking practical and personal responsibility for risk assessment, the trade-based workers particularly note the ongoing nature of risk assessment as an activity and process that carries on throughout a project, and simply forms part of the daily routine: *'…you assess every situation and what you do.'* (Dave). This suggests the presence of some level of the New View championed situational self-organizing (Reiman et al. 2015; Sherratt and Ivory 2019) amongst our sample, as found in adaptive safety research of other industries. The site and work task context are also important, with workers mindful of the specific hazards and risks associated:

> *'I'm going to be working from heights quite a bit. What else? There are other contractors there, so I need to be aware of them. It's just writing a plan before we start as to what's going to be done. What are the risks? What are we doing to minimise them or get rid of them entirely if possible?' (James)*

This approach not only considers the individual, but also others working on the site and again realizing the practice of safe working as a joint responsibility, as demonstrated by James' use of the term 'we' in the risk assessment process. Such collegiality was also evident from those who manage sites, who stretched the formal risk assessment task-focused requirement to include an informal risk assessment of all those working on the site on that day:

> *'We never start the day without we all have a cup of tea together. You might call it a briefing, I don't know. That would be being posh, I call it having a cup of tea… Because that's when you can assess how people are. If somebody's sat there going, "Oh, I've got a headache today," or something, you're thinking, "Ah, don't let them work at heights today, then." So, you use your time to communicate.' (Amanda)*

However, there was also evidence in the data of impractical and formalized bureaucracy which highlight the distance between paperwork and practice, and again work as planned vs work as done. The risk assessment paperwork was seen as an obstacle in executing and managing safety and risk assessment processes jointly with those directly involved with the situations of potential concern:

> *'…I think it's losing its focus. I'll give you an example: You go onto a job, and they say, "Sign the risk assessments." You look at it and it's an A4 lever arch file full of paper, you sign it. You haven't got the time to read it. But the whole point of this is to be safe and to work in an environment and at the end of the day to go home. Why, as management, are people making it so, so hard for operatives to follow that? …it needs to be relayed down to an operative's level in a more sensible approach. I think that has a knock-on effect to it at an operative level because people look at health and safety as going crazy, whereas it's not but*

it's got that image of it…' (Philip)

Philip is here articulating Dekker's (2014) concerns around the bureaucracy of safety, and the consequence of a traditional approach to its management, which positions safety as a goal that can be achieved through management control. Although the workers are critical in ensuring risk assessments are followed, the systems and processes in place to support this are not able to actually deliver their promise, due to their impractical manifestation. Our data finds such a procedural approach to safety utterly lacking in terms of practical implementation, and indeed may even generate negative consequences with regards to worker engagement with safety and riskwork overall.

However, as noted above, our analysis also reveals a more positive approach to risk assessment that the workers take as part of their practical and personal responsibility, which is able to counter the negative consequences of this impractical and formalised bureaucracy around risk assessment:

> *'I go to the office first. Induct yourself then they'll tell us what's what. Then basically… just come out on the site and you look around you.' (David)*

Our analysis reveals that workers risk assess beyond the formal paperwork, capturing a more emergent aspect (Silbey 2009; Power 2016) able to better reflect the realities of work in this space and thus suggesting a potentially meaningful and practical way of developing worker engagement and inclusion in site safety practice, and specifically risk assessment, overall. This is in complete alignment with New View arguments for worker-led situational self-organizing, in which the workers are able to adapt to the work actually before them, rather than what was planned in an office and thus all too often bears little resemblance to reality.

Different perceptions

In our analyses of the data several sub-themes emerged that were relevant to different perceptions within the workforce. These are: contract type (fixed-term vs full-time), office-based staff vs site workers, personal characteristics, size and culture of an organization, different trades, and common sense. The overall theme however was summarized well by one of the ground workers, Joe:

> *'…some people have different opinions and options from other people so you might not care whether it's safe or not or he might say it's safe only because he wants to go home. So, I'll check it for myself anyway.' (Joe)*

Joe clearly identifies that peoples' views, motives, and priorities vary, and that there is a need to establish a clear idea of one's own position on site. He works to the cautious mindset and notes that he prefers to secure his position by 'check it for myself anyway' thus leaving no danger of

interpretation by people with differing perceptions.

Our analyses within this theme highlights something often neglected within occupational safety research: that 'the workforce' is not a homogenous mass. It is made up of different individuals, with a variety of different situations and characteristics, as seen in the sub-themes found within our data. Key to the operationalization of the New View is the understanding of what workers do, and also why they do it, and the different perceptions revealed through the social practice approach are able to provide such illumination.

For example, the Managing Director of a SME, Anthony, noted that contract type, i.e. whether a worker is employed on a short-term contract or on a permanent full- time basis, makes a significant difference in how they perceive site safety. The majority of the work for his company is undertaken outdoors, and so the seasonal nature of the business requires and attracts workers on short, fixed-term contracts. In his business, the more senior crew who have made a career doing it all the time have bought into the company values, standards, and practices. Those on short-term contracts require organizational resources to continually train, monitor and support compliance and good practice. For Anthony, this necessitates mobilization of a top-down structural approach as well as approaches more aligned to New View thinking. This makes safety management for Anthony complex and reveals the need for a multiplicity of approaches that both impose rules on workers but also seeks to empower them. Yet this in turn may have consequences for workers who have to respond to both forms and may therefore become disaffected by the implementation of an approach that does not find fit with their own safe practice. This suggests the need for situationally sensitive flexibility in management and work practices and supports the New View rejection of the idea that there can ever be one set of safety rules that fits all; there is no one ruleset for site safety practice.

Another facet to the use of differently employed workers was noted by Amanda:

> *'…if you're doing something that's quite, I don't want to say unskilled, say, like, laying flooring. So it's not high-risk, then that's a time that you might use agency [staff]. If you're doing something that involves working closely with other people, or something that's risky, then I personally don't opt for that by choice.' (Amanda).*

Here, she explains her understandings of the potential consequences of the use of different types of contract workers with regards to specific work tasks, and how this affects her management practices on sites. Informal risk assessment is undertaken, but here the worker is part of that process and how the consequences of their employment may impact site safety overall. This links to the concept of unsafe acts (Smith et al. 2017), and interestingly focuses on the worker and their potential to

perform errors from a behavioral-based safety perspective (Reason 1990) or violations (Kletz 2001), whilst also connecting this directly to their mode of employment, which is itself a structural and systemic problem within the wider construction delivery system.

A further difference was noted in the perceptions of office-based staff vs site workers, with experience and an understanding of the lived reality of the workplace seen as important for practice:

> *'…they've been taught something in the classroom that technically is right, but when you get on site sometimes it's not practical. You can learn lots of things in the classroom, but when you go on site… they might say to you, "…you're meant to do this and that" and you say "Well, you can't do it like that, because you can't physically do it".' (Dave)*

Much work takes place in real space, and our analysis shows how important this truth is – as again the lack of appreciation by those who do not occupy it every day manifests and the contradiction between work as planned and work as done is once again realized. There is also a link to the approach to risk assessment, which can contribute to the impractical and formalized bureaucracy that surrounds it: *'They [health and safety officers] are thinking of the paperw*ork.' (Lee).

The interconnectivity between these two themes (risk assessment and different perceptions) serves to highlight the way in which social practice theory can contribute to a more detailed understanding of the complexities at play within the occupational safety space. Here, it reveals how those tasked with its management should reflect on the rigid top-down structural approaches in place and instead consider how to more effectively engage workers, who have been shown to already and actively be engaged in risk assessment, albeit in more informal modes. It is such informality that the New View argues actually makes much work happen as efficiently and safely as it does. With regards to the connections between the different elements of social practice theory, this is one of the most explicit illustrations of how the *Forms of bodily activities* and *Forms of mental activities* integrate, and together inform a more holistic understanding of site safety as a social practice.

In addition to the broader categorizations noted above (different contract types and office vs site-base), personal characteristics, such as nationality and age, are also seen as influential in how perceptions of safety differ, how fellow workers' perceptions of one another's views and priorities may differ, and thus when combined, how this can impact their own behavior. This is a much more detailed consideration of this aspect of occupational safety, and one in which positivistic research and generated metrics can paint a 'broad-brush' picture but in which more subtle details are arguably lost. For example, the knowledge that migrant workers are at a higher risk of accidents has long been accepted (Orrenius and Zavodny 2009). However, the consequences of this in terms of management and co-worker understanding and responsive behaviors cannot necessarily be

captured through positivistic approaches, yet are, arguably, of equal importance for any holistic understanding of site safety practice. In our data, workers of other nationalities necessitated the same managerial approach as those on short-term contracts, in that they all require additional organizational resources to continually train, monitor and support compliance and good practice, albeit that this investment is made for a limited period of return. Workers from places where safety legislation and management are not on a par with the UK require additional support:

> *'People come from abroad from South Africa or Australia. They join us for a period of say seven months, and that requires far greater attention to detail to bring them up to speed. Australia is pretty good with health and safety… Brazil doesn't really have any at all. It's therefore hard, you have to do a degree of retraining and refocusing of people, particularly in the first month.' (Anthony)*

This again speaks to the need for variety in management approaches to compensate for differences in worker behavior due to their home-country experiences, and also the potential for systemic issues borne of this worker-employment strategy in construction to influence safety on the site (Oswald et al. 2017).

Age was also raised as a personal characteristic that had consequences for safety:

> *'You're judging people. If I got assigned to a team with- say I was a labourer for three bricklayers and they're all in their 50s, straight away I'm thinking they're experienced. Straight away I'm judging them on how they keep their work area and if it's tidy, I'm like yes, they're experienced, they're professional, they know what they're doing…But if they're younger and they're messing about and stuff then I'm going to have my wits about me a lot more because of that judgement…' (Philip).*

Although Philip went on to caveat this comment with the understanding that older workers are not necessarily any safer, it is through his observations not only of age but also how they work that then has consequences for his own safety supervision of those workers. This connects to the informal risk assessments undertaken by Amanda, and the presence of a site practice that is not able to be formally documented, grounded as it is in experience and understandings borne simply from time spent out on site.

Some workers also voiced differences in their perceptions as to how the size of an organization and organizational culture influences workers safety practice. Larger construction organizations and building sites managed by corporate main contractors were seen to be more organized and proactive about managing occupational safety, but only as long as pressures to complete jobs weren't urgent. Near deadlines teams working for large and small organizations were said to be

prone to 'cutting corners' (Jack and Tom), not uncommon within the construction industry where production pressures can be significant as project completion nears (Sherratt 2016).

Philip also noted that the culture of an organization has a significant impact on shaping workers' perceptions and safety practice:

> *'…if you're working with people who are cutting corners and looking at things in a sense of time, how to speed things up, then you sort of think, 'Well, that's how you do it.' It's like a child, isn't it, when they grow up? If their parents do something and you don't know anything else, then you'll definitely think that is the way to do it. But then if you go onto a different site for a different firm and they're more professional, again it comes down to exposure. If you're working for a local builder who hangs off scaffold to carry out his work, although you may think that it's not the done thing, there's nothing to compare it to.' (Philip).*

Philip considers safety in relation to individual's differing perceptions but also in connection to organizational culture in the form of what he sees as professionalism. The differences in site experience that can be found within the workforce depending on the backgrounds and the sites they have worked on before are instrumental in developing one's own perceptions. This reveals a further layer of complexity that should be acknowledged when considering experience and age with relation to safety as noted earlier; time on site is not inevitably well spent, more specifically it is the type of site, and the organizational culture found there, that actually matters.

This links closely to the final sub-theme of 'common sense' which, perhaps unsurprisingly, is itself complex as it reveals further connections with the other themes within this element. For some, the frustrations arose when a cautious mindset led to inflexible rules on site or the impractical and formalised bureaucracy found within risk assessment result in a dismissive approach to any formal or structural form of safety management:

> *'Well my basic opinion is that health and safety is a load of rubbish, but people should just follow common sense.' (John)*

John disregards the concept of difference perceptions within the workforce and feels the presence of a fundamental 'common sense' on site for workers to follow, and which itself negates the need for any health and safety. Whilst there is perhaps merit in the notion of common sense as an underpinning concept behind occupational safety (and indeed it is perhaps more assumed within the New View than it is ever fully articulated), the realities of the different perceptions explored above is not something that can be defined or universally categorized. In addition to the discussions regarding experience and exposure to sites, further complexity was revealed within the data linking common sense to, for example, the different trade roles found there:

'Someone once told me it may be sense but it may not be common to everyone…I think that's a big problem on site when you've got so many different trades. I'm not an electrician, right…[but] I'm putting something in someone's way, the sparky will be like, "Use your common sense," but I'm like, "Well, I'm not a sparky. Your common sense is different to mine."' (Philip)

Philip clearly understands that everyone on site may be seeing the same situation from different perspectives and with different perceptions, and what is common sense to one may be new knowledge to another. This insight is enhanced by the realisation that the experience of individuals and those working alongside each other means much safe practice is perhaps not common sense, as James, a self-employed labour subcontractor notes:

'I don't agree that it [OHS] is common sense… a lot of it's not common sense. A lot of it's specific. It wouldn't be common unless you've done it a few times…' (James)

Here, experience is considered valuable, but perhaps more importantly this understanding recognizes the contextual specificity of all site work; although the task itself may be one done many times before, the space in which it is being undertaken is always unique, if only geographically.

From theoretical perspectives, the range of insights and nuances revealed by the social practice approach adds much to our current understandings of occupational safety in this space. They speak more to the why of people's mental activities, rather than the what, and are able to draw on numerous aspects of established theory to further enhance them and demonstrate the contribution this approach is able to make to the wider field. Such whys cannot be revealed through questionnaire surveys, but remain incredibly valuable, as they are able to reveal the informal and emergent, and their associated benefits, failings, and complexities, through the illumination of the shared understandings that exist around site safety practice.

Having offered an insight into the contextual specificity of site safety in construction via two specific elements (*Forms of bodily activities* and '*Things' and their use*) and following the detailed unpacking of the *Forms of mental activities* we now briefly summarize how the remaining elements revealed through a social practice approach connect together to form a holistic picture of how the block of safety emerges on site.

Background knowledge in the form of understanding

Under the element *Background knowledge in the form of understanding* four key themes emerged: learning, training, experience, rules. Learning to work safely takes many different forms in the respondents' accounts. Role modelling, informal learning events, integrating task specific and safety

learning, observation, and classroom-based learning were all noted by our research respondents. Discussion about integrating task specific and safety learning and how occupational safety and safe working form part of good professional/trade-based practice, and are not in fact separate activities, highlighted how individuals (the agents as carriers of social practices) form connections between bundles of practices; for example for Philip: occupational safety and bricklaying.

Analysis of the material related to training revealed three distinct but interrelated sub-themes: on-the-job/on-site training vs classroom-based training, joined-up approach, and CSCS (Construction Skills Certification Scheme) cards. On-the-job/on- site training was preferred by all the respondents who contributed to this sub-theme, highlighting close proximity to professional or trade-based practice and their ability to visualize and 'do it' as some of their key reasons for this. A 'joined-up approach', utilizing both on-the-job/ on-site training and classroom-based training was put forward as the best-rounded solution. As an example of classroom-based training, James and Philip note the necessity of holding a CSCS card and agreed that they have played a part in improving awareness of and standards on safety. However, others were more critical and noted that certification does not always mean competence, as has also been suggested in the literature (Hardison et al. 2014) and in the analysis of *'Things' and their use* with regards to 'tickets'.

Experience was identified as a more important determining factor for working safely, a necessary addition to training, and the respondents discussed gaining knowledge cumulatively over time and beyond that related to an individual worker's time-bound experience on site. Collective industry wide improvements on safety were highlighted to give workers a broader, ever-developing knowledge base.

Rules stood out as an interesting theme within this element. Three sub-themes focused on general safety rules, policing/ regulating safety, and the ever-changing nature of rules. The general safety rules were said to form a vital foundation to understanding specific activity and conditions of sites, and a pathway to the development of in-depth knowledge and skillful working practices thereafter. However, the nature and implementation of such rules remains contentious, as explored through *Things and their use*. CSCS cards were a focal point in the discourse around general safety rules as a gateway and a key to accessing work on construction sites, despite the criticisms that requirements for gaining the card were very low.

The policing/regulating of safety rules was important for the respondents in managerial positions, with the need for everyone to observe the rules said to focus workers' behavior on making appropriate choices. The consequences of not abiding by the rules presented a management issue, a something to deal with; deviance from practice, something inevitable from New View perspectives.

For some workers the implications of not working to the rules presented a possibility that *'you're going to end up hurting yourself and others' (Philip)*, yet for others, rules and policing safety were unnecessary and linked to an overly defensive approach to managing occupational safety, closely related to the bureaucratising of safety towards rule making and record keeping, as opposed to practice-based and practical task or being. This returns us to considering the differences in perception discussed under the *Forms of mental activities* and shows how *Background knowledge in the form of understanding* knits together to that element.

Know-How

The data on *Know-how* centered on three inter-related themes: competence, leadership, and compliance. Proof of competence was identified as a useful current focus, taking attention away from training provision and rather making sure workers were able to showcase evidence of a certain level of know-how. This was acknowledged to be a difficult area however, for example when it comes to assessing and developing new workers, given the abovementioned challenges with industry wide initiatives, such as the CSCS card. As worst, occupational safety was compromised on site because of neglect and/or incompetence.

Organizational and on-site supervision and leadership techniques, such as toolbox talks or leading by example, draw on the hierarchical division of responsibilities for managing occupational safety, and most commonly manifest in a top-down approach whereby communications between managers in the office and workers on site try to put in practice general principles and homogenous rules around safety. This is linked to a compliance perspective, a managerial imperative, whereby qualified workers are not always trusted but overcautious policy/practice leads to the inevitable cutting of corners and challenges to authority as previous identified. *Know-how* thus connects to *Forms of Bodily activities*, *Forms of mental activities* and *Background knowledge in the form of understanding* and an integrative picture of site safety practice emerges.

States of emotion

Within the element *States of emotion* four main themes arose as relevant to the discussion. These are resistance, challenges and barriers, change, and looking to the future. The respondents identified differences in organizational cultures and priorities as one factor that initiated resistance on site, especially in circumstances where different contractors were found to be working to different levels of safety requirements, for example in their use of PPE. This led to discussions about worker comfort and questions about the usefulness of PPE, linking back to *'Things' and their use*.

The challenges and barriers that our respondents identified in terms of practicing good safety work included considerations of project pricing and what additional costs working safely may involve,

funding for safety work in terms of taking part in forums and consultation/ development groups, [tight] project timescales and how safe working fast or long hours is vs careful and considerate professional practice, emotional responses, and language issues specifically when employing workers whose first language isn't English. Such issues are often found within the construction safety literature (see for example Sherratt 2016); however, this provides reassurance that this analytical approach is not only able to resonate with previous research undertaken from different theoretical positions but is able to add additional insights around the consequences of such industry practices not only for this element but also those others with which it interconnects.

Change over time was an ever-present theme during the interviews, reflecting on increased awareness and closer management of site safety practice. Client involvement was one of the positive changes that was noted; Anthony highlighted that appropriately safety was becoming a concern for a wider range of stakeholders, not only those doing the work on site. Others discussed however how safety was losing focus, for example by becoming a paper-based management activity (as noted above). Looking to the future and buy-in to progressive company ethos and policy were some of the positive developments, linked to younger generation of workers.

In this way, *States of emotion* are most closely connected to the *'Things' and their use* (PPE), *Forms of mental activities* (differences in perception) and *Know-how* (leadership) although this element also underpins the data on *Forms of bodily activities* and *Background knowledge in the form of understanding*.

Motivational knowledge

The final element, *Motivational knowledge*, focused on material relevant to teamwork, interpersonal relationships, and co-creating safety. Discussions about teamwork were framed around the benefits of knowing one another, keeping teams together, cohesive crews, and team members knowing what is happening and what trades are on site at any given time. Interpersonal relationships were identified as central to the team-based work on site, and the respondents talked about looking out for one another, trust, and avoiding conflict. Such findings suggest that the energy needed for a resilient, adaptive, and pro-active workforce empowered to manage their own safety may be realizable on sites, and thus support New View models in practice.

Co-creating safety was related to different project partners raising each other's standards, office-based and site-based staff working together and taking shared responsibility for safety, site awareness, informal-formal interplay, and being mindful of the many positive consequences and implications of collaborative arrangements. In this way, the respondents said the different elements of site safety practice could be brought together usefully. *Motivational knowledge* is the foundation

for constructive engagement with occupational safety, something that could potentially support the implementation of the New View on sites, and integral to both the individual and collective enacting of policy, processes, and practice.

Interconnected elements, themes, and sub-themes

What is most striking in Table 1 is that by showing such a summary of the elements, related themes and sub-themes in the data, a balanced insight into site safety practice emerges. The doing of site safety is made visible and the 'work practices [that] are often invisible to others than those who perform them' are highlighted, as called for by Haavik et al. (2019: 482). The elements, themes and sub-themes draw us into the being on site and how the practice that is site safety is performed, continually negotiated and renegotiated, value-based, and relevant both as a process and a part of 'good work', as well as an outcome, the result of safe good work. We are therefore now better able to appreciate the intricacies of site safety practice, although such a finding is perhaps not as simple as industry would like it to be – it is a messy and complicated space.

Our data commonly brings together and links a number of different elements, demonstrating their interconnectedness, and thus the related themes and sub-themes. Taken collectively, they allow us to explore the situatedness of the data and demonstrate a useful way to respond to calls for developments and change in occupational safety research and practice, able to inform next steps with the aim of overcoming the plateau in accident rates on sites. We therefore make a contribution to knowledge in this area, revealing useful and uniquely rich insights as to how safety works in this construction site space, and thus also validating an alternative methodological approach able to contribute to research going forwards.

Conclusions

Our ambitions for this paper were twofold. Predominantly, we wanted to explore an alternative methodological perspective of site safety and illuminate the contribution it can make to research. Our narrative in the analysis and discussion of the data has progressed from the concrete, physical environment and concerns regarding the dangerous and demanding nature of work, to the abstract and uncertain aspects of site safety as a social practice, including common sense and co-creating safety. It has enabled us to illuminate how different forms of body/ knowledge/ things as routinised patterns of behavior inform and (re)produce on sites. Social practice theory has helped us reveal a highly nuanced understanding of the block of site safety practice as a situated construct, that helps explain how construction workers practice and integrate safety within the bundles of practices that make up their work.

This research is inevitably situated – but intentionally so – although given the peripatetic nature of

this workforce and the regulatory frameworks that cover all UK construction sites, the case can be made for some measure of generalizability. In mobilizing social practice theory, we have been able to respond to calls precisely seeking the nuanced and local, and the more hidden understandings of safety, and thus demonstrated the value in this approach. This suggests it can be used effectively by other construction safety researchers, and those researching other industries to better understand their fields of study. We have also contributed to the enhancement of methodological pluralism within the body of research that surrounds construction and would encourage others to also undertake such 'methodological adventures' and continue to expand the pallet for construction management research.

Secondly, this work also has value in the evaluation and exploration of the New View within the construction industry specifically. It has revealed the different perspectives employment terms bring to safety and how; the way age and experience can help or hinder; how risk assessment works differently on paper and out in the field; and the myriad problems around PPE, all of which show the potential utility of our findings. Such nuanced insights can inform both interventions and systemic developments able to find a good fit with the actual block of safety as it 'works' within this context and the potential for New View thinking to underpin change in the future. A specific example with potential can be found within the insights revealed through *Forms of mental activities*, which suggest a more situated and local risk assessment process would be welcomed by the workforce. This is a particularly interesting proposition as in the UK this brings together individual, organizational, and regulatory duties, meaning any change in operational practice would need careful consideration. Yet such processes are not uncommon in other industries, and therefore this is something construction could look to do differently in order to disrupt the current plateau, grounding the change in a clearer and more holistic understanding of the space in which it would need to find fit.

Academia arguably needs to 'keep up' with New View developments in practice, and thus needs a range of methodological tools and approaches able to reveal the messiness of lived realities, enhance understandings and illuminate the nuance able to inform, shape and meaningfully evaluate changes in safety practice. Here, social practice theory has enabled us to do just that, making visible that which more usually remains hidden, and thus makes a continuing contribution to the body of knowledge that surrounds this high hazard industry, with the overarching goal of improving occupational safety for all those that work within it.

Reflections, limitations and recommendations

Employing social practice theory within this study necessitated a shift from data-driven to theory-

driven analysis. This is in contrast to much construction safety research which, being in the majority positivistic, seeks facts and generalizations firmly grounded in 'the data'. Undertaking more nuanced and situated work, where the analysis necessitates much more detailed explication and discussion, has led to a paper of a length and form of presentation that may be unexpected by some. There is deliberately no tabulation of 'the results', no quantification of themes, and no generation of generalizable recommendations. These are positivistic measures and not applicable to this work. Instead, we have sought to show the beauty and insight in the detail, the quotidian, the mundane – the very aspects of daily work life of most relevance to New View practices.

Our inductive-to-deductive approach, whereby the first level of analysis was data-driven to identify themes that represent the essences and essentials of the respondents' lived experiences and the second level used social practice theory to order your data, emerged from a cyclical reflexive practice. First zooming in into the 'things themselves' (the data) and then zooming out onto the 'interpretation of things' revealed a more robust and holistic view of site safety practice. As an analytical framework social practice theory allowed us to stand back from the specifics of individual participants' realities and see the different elements of practice and the connections between them. Thus, the theory helped us in dealing with the messy complexities of the 'everyday' and encouraged us to focus on the practice, rather than the individuals who perform the practice or the social structures that surround them, throughout.

The way different practice-theorists identify the various components or elements of practices may hinder or help an analysis of a data set in providing boundaries that are loose or confining for the analysis. To us, the detail Reckwitz (2002) offers was helpful, especially given the interconnectedness of the practice with other work and social practices as well as the work environment, which all add to the messiness and complexity in the data and analysis of it. Reckwitz's framing of social practice theory may not find good fit with other researchers' worldview, however. It would be useful to see safety research develop with other practice-based methodologies too, and it may be interesting to examine to what extent does social practice theory overlap or align with cultural-historical activity theory (CHAT) among other approaches.

As stated earlier in this paper, we are not seeking to valorize on methodological approach over all others. Instead, we hope we have provided useful guidance and demonstration of how social practice theory can contribute to the body of research able to align to contemporary developments in practice. This is not to denigrate quantitative work, and indeed a full range of methodological approaches will be needed to continue to develop holistic and comprehensive understandings of safety in the future. For example, phenomena revealed by fine grain approaches such as social practice theory could be further explored by other means, theory-driven steps underpinning data-

driven approaches; any methodology directed (as it always should be) by the research questions being asked. By mobilizing multi-methodological (not multi-method) approaches limitations can be minimized, including those inherent within social practice theory.

It should never be forgotten that the goal of all occupational safety research is to enhance and improve safety for workers. This includes asking questions of new operational practices and activities, such as those ideologically grounded in the New View, to explore their fit and effectiveness in the field. This demonstration of site safety practice has revealed one such approach able to take a different route to useful and valid insights, to add rigor and breadth to the body of construction safety research as a whole.

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The authors report there are no competing interests to declare.

References

Borys, D., Else, D. and Leggett, S. (2009) The fifth age of safety: the adaptive age? *Journal of Health and Safety Research and Practice*, 1(1) 19–27.

Berner-Rodoreda, A., Bärnighausen, T., Kennedy, C., Brinkmann, S, Sarker, M., Wikler, D, Eyal, N. and McMahon, S.A. (2018). 'From Doxastic to Epistemic: A Typology and Critique of Qualitative Interview Styles', *Qualitative Inquiry*. DOI: 10.1177/1077800418810724.

Braun, V. and Clarke, V. (2006) Using thematic analysis in psychology, *Qualitative Research in Psychology*, 3: 77/101.

Carayon, P., Hancock, P., Leveson, N., Noy, I., Sznelwar, L. and van Hootegem, G. (2015). Advancing a sociotechnical systems approach to workplace safety - developing the conceptual framework. *Ergonomics*, 58(4), 548-564.

Conklin, T. (2019) *The 5 Principles of Human Performance: A contemporary update of the building blocks of Human Performance for the new view of safety*, PreAccident Media, New Mexico, USA.

Cooper, D. (2020) The emperor has no clothes: A critique of Safety II, *Safety Science*, https://doi.org/10.1016/j.ssci.2020.105047

Dekker, S. (2006) *The Field Guide to Understanding Human Error*, Farnham: Ashgate Publishing.

Dekker, S., Cilliers, P. and Hofmeyr, J-H. (2011) The complexity of failure: Implications of complexity theory for safety investigations, *Safety Science*, 49(6) 939-945.

Dekker, S. (2014) The bureaucratisation of safety, *Safety Science*, 70: 348-357.

Ellard-Gray, A., Jeffrey, N.K., Choubak, M. and Crann, S.E. (2015) Finding the Hidden Participant: Solutions for Recruiting Hidden, Hard-to-Reach, and Vulnerable Populations, *International Journal of Qualitative Methods*, 1–10, DOI: 10.1177/1609406915621420.

Fine, M. (2002) *Disruptive voices: the possibilities for feminist research*, Ann Arbor, MI: University of Michigan Press.

Foreign Commonwealth and Development Office (2022) *What is an SME?* https://www.gov.uk/government/publications/fcdo-small-to-medium-sized-enterprise-sme-action-plan/small-to-medium-sized-enterprise-sme-action-plan#what-is-an-sme [accessed 21 November 2022]

Foster, C.J., Plant, K.L. and Stanton, N.A. (2019) Adaption as a source of safety in complex socio-technical systems: A literature review and model development, *Safety Science*, 118: 617-631.

Giddens, A. (1984) *The Constitution of Society: Outline of the Theory of Structuration*, Cambridge: The Polity Press.

Given, L.M. (2008) Conversational Interviewing, The SAGE *Encyclopedia of Qualitative Research Methods*, Thousand Oaks, CA: SAGE Publications, DOI: 10.4135/9781412963909.

Hale, A. and Borys, D. (2013) Working to rule, or working safely? Part 1: A state of the art review, *Safety Science*, 55, 207-221.

Hardison, D., Behm, M., Hallowell, M. and Fonooni, H. (2014) Identifying construction supervisor competencies for effective site safety, *Safety Science*, 65, 45-53.

Harvey, E., Waterson, P. and Dainty, A.R.J. (2019) Applying HRO and resilience engineering to construction: barriers and opportunities, *Safety Science*, 117: 523-533.

Haavik, T.K., Antosen, S., Rosness, R. and Hale, A. (2019) HRO and RE: A pragmatic perspective, *Safety Science*, 117: 479-489.

Hargreaves, T. (2011) Practice-ing behaviour change: Applying social practice theory to pro-environmental behaviour change, *Journal of Consumer Culture,* 11(1): 79- 99.

Health and Safety Executive (2022) Construction statistics in Great Britain 2022, *Health and Safety Statistics: Key figures for Great Britain (2019/20)*, online, available: https://www.hse.gov.uk/statistics/industry/construction.pdf [accessed 2 December 2022]

Hegde, S., Hettinger, A.Z., Fairbanks, R.J., Wreathall, J., Krevat, S.A., Jackson, D.C., Bisantz, A.M. (2020) Qualitative findings from a pilot stage implementation of a novel organizational learning tool toward operationalizing the Safety-II paradigm in health care, *Applied Ergonomics*, 82.

Hinze, J., Thurman, S. and Wehle, A. (2013) Leading indicators of construction safety performance, *Safety Science,* 51(1), 23-28.

Hollnagel, E., Woods, D.D. and Levenson, N. (2006) *Resilience Engineering: Concepts and Precepts*, Aldershot: Ashgate Publishing.

Hollnagel, E. (2014) *Safety I and Safety II: the past and future of safety management*, Aldershot: Ashgate Publishing.

Hovden, J., Albrechtsen, E. and Herrera, I.A. (2010) Is there a need for new theories, models and approaches to occupational accident prevention? *Safety Science*, 48(8) 950-956.

Hui, S., Shove, E. and Schatzki, T. (2017) *The Nexus of Practices: Connections, Constellations, and Practitioners*, London: Routledge.

International Labour Organisation (2020) *Health and Safety for All, an ILO Flagship Programme, Facts and Figures 2016-2020*, online, available: https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/--- lab_admin/documents/publication/wcms_764208.pdf [accessed 12 January 2021].

Kleiner, B.M., Hettinger, L.J., DeJoy, D.M., Hyang, Y-H. and Love, P.E.D. (2015) Sociotechnical attributes of safe and unsafe work systems, *Ergonomics*, 58(4), 635-649.

Kletz, T. (2001) *Learning from Accidents*, Oxford: Butterworth-Heinemann.

Le Coze, J.C. (2019) Vive la diversité! High Reliability Organisation (HRO) and Resilience Engineering (RE), *Safety Science*, 117: 469-478.

Le Coze, J.C. (2012) Towards a constructivist program in safety, *Safety Science,* 50(9): 1873-1887.

Le Coze, J.C. (2022) The 'new view' of human error. Origins, ambiguities, successes and critiques, *Safety Science*, 154, 105853, https://doi.org/10.1016/j.ssci.2022.105853

Löwstedt, M. (2014) "Taking off my glasses in order to see": Exploring practice on a building site using self-reflexive ethnography" In: Raiden, A and Aboagye-Nimo, E (Eds.), *Proceedings 30th Annual ARCOM Conference*, 1-3 September, Portsmouth, UK, Association of Researchers in Construction Management, 247–56.

Niskanen, T. (2018) A Resilience Engineering-related approach applying a taxonomy analysis to a survey examining the prevention of risks, *Safety Science*, 101: 108-120.

Nowell, L.S., Norris, J.M., White, D.E. and Moules, N.J. (2017) Thematic Analysis: Striving to Meet the Trustworthiness Criteria, *International Journal of Qualitative Methods*, 16: 1–13, DOI: 10.1177/1609406917733847.

Orrenius P.M. and Zavodny M. (2009) Do immigrants work in riskier jobs? *Demography*, 46(3), 535-551.

Oswald, D., Aboagye-Nimo, E., Smith, S. Raiden, A. and Sherratt, F. (2015) You couldn't finish the job without breaking the rules, In Raiden, A. and Aboagye-Nimo, E. (Eds.) *Proceedings 31st Annual ARCOM Conference*, 7-9 September 2015, Lincoln, UK, Association of Researchers in Construction Management.

Oswald, D., Sherratt, F., Smith, S.D. and Hallowell, M. (2017) Exploring Safety Management Challenges for Multi-National Construction Workforces: A UK Case Study, *Construction Management and Economics*, 36(5): 291-301.

Oswald, D., Sherratt, F. and Smith, S. (2018) Problems with safety observation reporting: a construction industry case study, *Safety Science*, 107: 35-45.

Oswald, D., Ahiaga-Dagbui, D., Sherratt, F. and Smith, S. (2020). An industry structured for unsafety? An exploration of the cost-safety conundrum in construction project delivery, *Safety Science*, https://doi.org/10.1016/j.ssci.2019.104535.

Patel, M., Sherratt, F. and Farrell, P. (2012) Exploring Human Error through the Safety Talk of Utilities Distribution Operatives. In Smith, S.D (Ed) *Proceedings 28th Annual ARCOM Conference*, 3-5 September 2012, Edinburgh, UK, Association of Researchers in Construction Management, 403-412.

Patriarca, R., Bergström, J., Di Gravio, G. and Costantino, F. (2018) Resilience engineering: Current status of the research and future challenges, *Safety Science*, 102, 79-100.

Peñaloza, G.A., Saurin, T.A., Formoso, C.T. (2020) Monitoring complexity and resilience in construction projects: The contribution of safety performance measurement systems, *Applied Ergonomics*, 82.

Perrow, C. (1999) *Normal Accidents – Living with High Risk Technologies*, Chichester: Princeton University Press.

Pink, S., Tutt, D., Dainty, A. and Gibb, A. (2010) Ethnographic methodologies for construction research: knowing, practice and interventions, *Building Research & Information*, 38(6): 647-659.

Power, M. (2016) *Riskwork*, Oxford: Oxford University Press.

Ramasesh, R.V. and Browning, T.R. (2014) A conceptual framework for tackling knowable unknown unknowns in project management, *Journal of Operations Management*, 32 (4): 190-204.

Rankin, A., Lundberg, J., Woltjer, R., Rollenhagen, C., & Hollnagel, E. (2014). Resilience in everyday operations: A framework for analyzing adaptations in high-risk work, *Journal of Cognitive Engineering and Decision Making*, 8(1), 78-97.

Reason, J. (1990), *Human Error*, Cambridge: Cambridge University Press.

Reckwitz, A. (2002) Toward a theory of social practices: A development of culturalist theorizing, *European Journal of Social Theory,* 5: 243-263.

Reed, M.I. (1992) *The sociology of organizations*, Hemel Hempstead: Harvester Wheatsheaf.

Reiman, T., Rollenhagen, C., Pietikäinen, E. and Heikkilä, J. (2015), Principles of adaptive management in complex safety-critical organisations, *Safety Science*, 71: 80-92.

Saldana, J. (2014) Coding and analysis strategies, In Leavy (Ed) *The Oxford Handbook of Qualitative Research*, Oxford: Oxford University Press, 581-605

Saunders, M., Lewis, P. and Thornhill, A. (2009) *Research Methods for Business Students*, New York: Pearson.

Schatzki, T.R. (1996) *Social Practices: A Wittgensteinian Approach to Human Activity and the Social*, Cambridge: Cambridge University Press.

Schatzki, T.R., Knorr Cetina, K. and Von Savigny, E. (2001) *The Practice Turn in Contemporary Theory*, London: Routledge.

Sherratt, F. and Leicht, R. (2020) Unpacking Ontological Perspectives in CEM Research: Everything is Biased, *Journal of Construction Engineering and Management*, 146(2), https://doi.org/10.1061/(ASCE)CO.1943-7862.0001734

Sherratt, F. and Ivory, C. (2019) Managing 'A Little Bit Unsafe': Complexity, Construction Safety and Situational Self-Organising, *Engineering, Construction and Architectural Management*, 26(11), 2519-2534

Sherratt, F. (2016) *Unpacking construction site safety*, Chichester: John Wiley & Sons.

Shove, E., Pantzar, M. and Watson, M. (2012) *The Dynamics of Social Practice,* London: SAGE.

Silbey, S.S. (2009) Taming Prometheus: talk about safety and culture, *Annual Review of Sociology*, 35: 341-369.

Smith, S., Sherratt, F. and Oswald, D. (2017) The antecedents and development of unsafety. *Proceedings of the ICE: Management, Procurement and Law*, 170 (2): 59-67.

Spanswick, J. (2007) As near as dammit. *Building Magazine*. Issue 13.

Thallapureddy, S., Bhandari, S., Hallowell, M. R., Sherratt, F., Stoddard, E., & Hansen, H. (2022) Incident Investigations and Learning: Methods, Barriers, and Opportunities. *Proceedings of the Construction Research Congress*, pp. 274-283.

Tutt, D., Pink, S., Dainty, A.R.J. and Gibb, A. (2013) 'In the air' and below the horizon: migrant workers in UK construction and the practice-based nature of learning and communicating OHS; *Construction Management and Economics*, 31 (6), 515-527, DOI: 10.1080/01446193.2012.756145.

Wang, F., Tian, J., Lin, Z. (2020) Empirical study of gap and correlation between philosophies Safety-I and Safety-II: A case of Bejing taxi service system, *Applied Ergonomics*, 82.

Warde, A. (2005) Consumption and theories of practice, *Journal of Consumer Culture,* 5: 131-153.

Whittingham, R.B. (2004) *The Blame Machine – Why Human Error Causes Accidents*, Oxford: Elsevier Butterworth-Heinemann.

Zhou, Z., Goh, Y.M. and Li, Q. (2015) Overview and analysis of safety management studies in the construction industry, *Safety Science,* 72: 337-350.