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Managing production pressures through dangerous informality: a case study

Abstract

Purpose: It is well-known that significant production pressures exist on many construction projects and previous studies have suggested that this pressure is a contributory factor in safety incidents on sites. While research has established that production pressures do exist on sites, less is understood about the construction practices that occur when projects are under such pressures in practice and their repercussion for safety.

Design/methodology/approach:

Through an ethnographic approach on a large construction project in the UK, these practices were explored and unpacked. The lead researcher was a member of the **Health and Safety** department for three years, and adopted a participant observer role to collect a variety of data.

Findings:

It was found that informal, covert and dangerous 'piecework' strategies were adopted at the site level in direct response to scheduling demands. Construction workers were incentivised through extra finance and rest periods to finish the work quickly; which in turn prioritised production over safety. Unreasonable production pressures remain an unresolved problem in the construction industry, and are, perhaps consequentially, being informally managed on-site.

Originality/value:

This study contributes important research knowledge to help understand the complexities involved in unresolved production versus safety demands, which marks a step towards addressing this substantial challenge that is deeply ingrained within the industry.

1.0 Introduction

Construction is a labour-intensive industry, meaning advances in productivity have relied on the effectiveness and efficiency of labour (Dozzi & AbouRizk, 1993). Labour productivity can be defined as the physical progress achieved per person-hour (ibid), and hence the speed of laboured work is often directly linked to overall project productivity and performance. The link between the production pressures that this can induce and safety performance has been widely studied, as accidents can slow production and affect worker motivation. However, in most advanced countries accidents are rare and therefore arguably unlikely to affect production. In turn, this can encourage fast but unsafe work, and consequently an increase in the risks of accidents, although this is far from certain.

These increased safety risks can be seen as a form of 'trade-off' between the efficiency of production and equity, in terms of whether it is fair to put such production pressures onto the workforce. Exploration of this trade-off is worth considering as researchers have consistently found that when production or time pressure is perceived within the workforce, it can result in a degradation of safety performance or increase in accidents (see Hinze, 1997; Rundmo et al., 1998; Brown et al., 2000; Mohamed, 2002; Seo, 2005; Mitropoulos et al., 2005; Hinze & Parker, 1978 Goldenhar et al., 2003; Mitropoulos & Cupido, 2009; Oswald et al., 2013; Harvey et al., 2018). Yet, despite a large body of work in this area, there are still calls (see, for example, Smith 2018) for further research into the nuances of the relationships between productivity, time-pressure and worker safety.

In a study of road safety, Elvik (2009) concluded there was a conflict between efficiency and equity, and that promoting efficiency would require a departure from equity. That the construction industry is one of the most dangerous in the world therefore also raises questions around equity, as risks to individual's safety can be viewed as unfair, especially if workers are under pressure to meet efficiency targets. Drawing on equity theory (Adams, 1963) the potential conflicts of production pressures and safety are explored in this paper. Although such practices may also impact the occupational health and wellbeing of workers, the hidden 'slow-burn' nature of health as compared to the visible and immediacy of safety makes such relationships even harder to untangle, and so here the focus remains on construction safety. By revealing the management and worker practices that occur during periods of production pressure, both industry and academia will be more informed and better equipped to develop robust labour management processes and industry-wide change that supports the resolution of this challenging problem in practice.

Within positivist studies, the statistical link between production and safety has been tested. However, issues arise with this experimental research approach, namely the difficulties in establishing stable definitions of the variables and the process of isolating the variable of interest while keeping all others constant (Rooke et al., 2009). Furthermore, the growing interest in informal and emergent features of construction organisations has led to debate as to the most appropriate research methods of enquiry (Oswald et al., 2018). Hence, this study does not aim to reveal or determine a causal relationship, but rather illuminate the social complexities around how unsafe acts emerge and manifest in practice at times of production pressure. In order to bring further insights to this phenomenon, this study aimed to expose and unpack the informal management activities that occur when projects are under production pressures, and reveal how such activities have consequences for safety on site. This study contributes to the existing body of knowledge by

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3 mobilising an ethnographically informed approach, able to reveal how such relationships between
4 production pressures and safety manifest in practice, rather than simply confirm that they exist, and
5 so expose the dangerous informality of management in this context.
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8 **2.0 The implications of production pressures on safety**

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10 In early safety research, Hinze & Parker (1978) argued that good safety performance and high
11 productivity were compatible and should not be sacrificed for one another. Since then, it has been
12 noted that a key component of safety culture is maintaining the balance between the pressure for
13 production and safety (ACSNI, 1993). Despite calls that the importance of safety should be
14 consistently emphasised, even when the construction projects are facing production pressures
15 (Zhang et al., 2018), there have been suggestions that when under production pressures, managerial
16 priorities are not always given to safety (Han et al., 2014).
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20 The construction industry has been described as unstable and financially squeezed (Harvey et al.
21 2018) and it is therefore unsurprising that construction projects also frequently find themselves
22 under significant production pressures. Contractors often have to competitively tender for work, and
23 set out their proposed project costs and overall duration, and traditional client practices see
24 contracts awarded to contractors with the lowest price (Winch, 2000), as clients often seek the
25 cheapest and fastest route to project completion. The pressure to complete work quickly and
26 cheaply is therefore often established even before the contract is won, and subsequently cascades
27 down from the main contractor all along their supply chains, as they too adopt a competitive
28 approach to contract award (Sherratt 2016). This creates situations in which safety becomes 'priced
29 out' by the supply chain, as they strive to become the lowest tender for the work, with
30 consequential negative impacts for safety once the work commences on site (Brace et al 2009).
31 Hence, it is perhaps unsurprising that subcontracting has implications for accident levels (Manu et
32 al., 2014), and there have been measures implemented to try and manage the health and safety
33 risks incurred from such subcontracting practices (Manu et al., 2013).
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39 In addition, subcontractors are also more likely to be paid by 'piecework', rather than 'by hour' like
40 full time principal contractor employees, and this could be another reason as to why subcontracting
41 can negatively influence H&S. 'Piecework' or 'price' contracts, where workers are paid for their daily
42 production outputs can create inherent production pressures for workers, incentivising them to
43 work as fast as possible, and also therefore at times unsafely. A review by Johansson, et al. (2010) of
44 31 studies identified that in 27 piecework was negatively associated with a variety of different
45 aspects of health and safety. Despite this payment structure being common construction industry
46 practice, Johansson et al.'s (2010) review found that there were very few scientific studies examining
47 the effect of piecework on safety in the construction industry. A notable exception is a Norwegian
48 construction industry study, that did recommend that accident risks related to time pressures can be
49 reduced by avoiding piecework contracts, unrealistic time limits, and the use of day penalties for
50 contract breaches (Gravseth et al., 2006).
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55 Piecework creates a 'bonus' for finishing quickly, and there is evidence that there is a strong
56 relationship between productivity bonus pay and safety performance, with bonus payments leading
57 to unsafe working at the site level (Sawacha et al., 1999; Choudhry & Fang, 2008). Productivity bonus
58 systems themselves are complex, and should be carefully thought-out so that supervisors don't turn
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3 a blind eye to safety; since pay and reward systems for productivity are seen as a major factor in risk
4 taking (Langford et al., 2000). Mullen (2004) postulated that operatives always compare the
5 positives (e.g. money) against the negatives (e.g. perceived potential health risks). He explains that
6 as long as the positives outweigh the negatives, operatives are more likely to engage in unsafe
7 behaviours (ibid).
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10 A further consideration for the association of rewards with production is the motivation for workers
11 to maximise their output through working longer shifts or 7-day weeks, however this also has
12 implications for safety. Rosa (1995) recommended that extended work shifts should be avoided if
13 experts in a certain industry or job already consider a job dangerous on an 8-hour shift. Womack et
14 al. (2013) also found that sleep loss was positively associated with risk-taking behaviour; and
15 Williamson et al. (2011) revealed sleep homeostatic effects producing impaired performance and
16 accidents. In the construction industry fatigues concerns have led models of fatigue management
17 being proposed (see, for example, Hallowell, 2010).
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22 Production pressures are therefore complex, and so can manifest on site in a number of ways,
23 leading to cutting corners (Sorrell, 2003), reduced attention to detail, crowded work space and the
24 prioritisation of production over safety (Mayhew & Quinlan, 1997). Indeed, empirical work has been
25 able to associate such pressures with unsafe practices, as Mearns et al. (2001) found the top
26 predictor of unsafe work practices was workers' perceptions that there were high production
27 pressures on site; Mullen (2004) explained that workers will forgo safe working practices when there
28 is a perception of the need to perform quickly; and Oswald et al. (2013) found time pressure is an
29 important contributory factor in unsafe worker behaviours. In accepting that unsafe behaviours
30 occur more often during time of production pressures, it is therefore unsurprising that Hinze (1997)
31 was able to demonstrate that schedule status directly correlated with accident rates. Or in other
32 words, contractors who were ahead of schedule had fewer incidents than those who were behind.
33 Yet there has been relatively little effort devoted to reducing or eliminating unsafe behaviours (Shin
34 et al., 2014), particularly in the construction industry (Aksorn & Hadikusumo, 2007).
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39 Donald & Young (1996) suggested that little remains to improve on in terms of physical conditions,
40 and considering unsafe acts have been recognised to contribute to a significant number of accidents,
41 (see for example Lutness, 1987; Salminen and Tallberg, 1996; & Williamson & Feyer 1990) further
42 construction safety improvement cannot be expected without more concentration on the reduction
43 or elimination of unsafe acts. Unsafe acts have been identified as more difficult to observe than
44 unsafe conditions (Gould & Joyce, 2009), due to the difficulties in witnessing fluid and momentary
45 acts when compared to static and unchanging conditions (Smith et al., 2017). It is important to note
46 the unsafe acts are not just risky behaviours from front-line workers, but also those in a
47 management role, who can undertake actions and make decisions that are unsafe. For example, a
48 lack of investment in training or development activities could be deemed unsafe; which can be the
49 case even in major organisations, in the face of programme pressures and small profit margins
50 (Loosemore et al., 2003). Reason (2008) stated that the most powerful pushes towards repeated
51 patterns of unsafe acts come from an unsatisfactory resolution, and so an inequity, in the conflict
52 between production and safety goals.
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58 Here the relationships between production pressures and safety have been unpacked and explored
59 through a case study construction project to reveal the informal ways in which such pressures are
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3 managed. Although literature exists that has already revealed the link between production
4 pressures and unsafe acts, the empirical work presented here is able to provide insight and
5 illumination of how such informal practices manifested on the case study site, and the potential
6 consequences for safety management within such contexts.
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9 **3.0 Research methodology**

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11 The research presented here is drawn from a three-year ethnographic study undertaken on a single
12 project in the UK. Ethnography is the study of the culture and social organization of a particular
13 group or community (Calhoun, 2002). In this case, the setting was a large construction project
14 (+£500m in value) that had approximately 1100 workers on site at its peak. This civil engineering
15 project had typical operative trades that included: welders, scaffolders, concrete placers, and
16 carpenters. The project's client team had set out provision to support a PhD in construction safety as
17 part of their requirements, thus providing an arguably unique research opportunity for immersive
18 data collection. The lead researcher essentially became a member of the Health and Safety team on
19 the project, and was able to use the safety advisors as gatekeeper to ease access to different
20 workgroups and site areas. By taking an ethnographic approach to the study, and by simply 'being
21 there', the researcher was able to identify various themes from their experiences as the project
22 progressed. A prominent emergent theme was the conflict between production pressures and
23 safety on the site, and the consequences this had for safety management in practice.
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29 Construction project performance is affected by informal relationships, which are notoriously
30 difficult to investigate; but can be revealed through rigorous in-situ studies that lead to authentic
31 and deep insights that would otherwise remain uncovered (Gajendran et al., 2011). In particular,
32 ethnographic studies have been particularly successful in capturing informal construction safety-
33 related practices. For instance, Baarts (2009) revealed that informal and emergent dynamics of
34 safety were dominated by the workers' practice of collective individualism; Löwstedt (2015)
35 unpacked the informal practice of breaking site safety glasses rules when the workgroup deemed
36 this socially accepted; and Tutt et al. (2013a; b) found migrant workers had informal routes into the
37 UK construction industry (ibid 2013a), as well as developing informal communication practices to
38 keep them safe (ibid 2013b). Ethnographic approaches have the strength of allowing researchers to
39 understand essential everyday construction practices that would have otherwise been 'invisible'
40 (Tutt et al., 2013b). Hence, ethnographic work can complement the traditional methods used in
41 construction safety research to reveal insights that provide a more comprehensive understanding of
42 safety topics (Oswald et al., 2018). It is therefore argued ethnography is an appropriate
43 methodological choice to explore the realities and manifestations of the management of production
44 pressures and safety on construction sites, especially considering that construction workers tend to
45 respond to danger in informal ways (Rooke & Clarke, 2005).
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51 Ethnography is a method of studying a specific group in their natural setting usually through
52 participant observation (Phelps and Horman, 2009). Participant observation was mobilised here as
53 the main tool of enquiry, where the researcher learnt and gained understandings through the
54 instruction of other members within the setting (Rooke et al., 2004). These other members were
55 mostly male (due to the typical gender profile of construction projects) and were a mix of office-
56 based and site-based employees. The health and safety advisors were office-based but spent large
57 portions of their days in their respected site areas on the project. Based within the H&S department,
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3 the researcher used the H&S advisors as both key informants and gatekeepers to all areas of the
4 project. As ethnographic research can involve intense, relatively brief excursions into the lives of
5 participants (Pink & Morgan, 2013) the researcher would spend time with different H&S advisors in
6 different areas of the construction project so as not to overburden one key informant. The H&S
7 advisors would introduce the researcher to others on the construction project, such as the Works
8 Managers, Foremen, Site Engineers, Operatives etc. in a snowball sampling strategy. This range of
9 informants offered an opportunity for different perspectives, and provided a deeper understanding
10 into the actualities of construction practice. The participants were very close to the physical
11 construction of the project and so revealed local knowledge (see Sillitoe, 2002) of the conflict
12 between production pressures and safety, and how this manifested and was managed in practice.
13 The anonymity of all participants, and the project itself, has been protected in the following sections
14 through the use of pseudonyms.

19 3.1 Data collection

21 Over 1500 hours were spent on the site, and 200 field records and 150 units of documentary data
22 were collected over the three-year duration of the study. The initial research stages involved gaining
23 site access to the research setting and thereafter establishing relationships with key gatekeepers. A
24 protocol was developed for this stage (see Author et al., 2014), and thereafter a bottom-up research
25 approach was undertaken where data collection and analysis were interwoven, which is typical in
26 ethnographic studies (Hammersley & Atkinson, 2007)'. Key to the initial stage of the project was the
27 establishment of rapport with gatekeepers, and thereafter, other informants on the project.
28 Establishing rapport is very important, as although un-engaged researchers may obtain a certain
29 amount of information, they will miss the full richness that comes with true ethnographic immersion
30 (Angrosino, 2006) and the ability to engage fully with others in the research setting. As well as
31 establishing rapport, the researcher adopted an 'overt approach', and was fully open and honest
32 about the work being undertaken and that he was investigating and researching safety on the
33 project. This reduced risks of scepticism or suspicion that can damage the opportunity for trust to be
34 established between the researcher and the participants. The researcher is male of White-British
35 origin, and therefore blended in demographically with the majority on the project. As a young (mid
36 20s) researcher attached to a University, it became clear from early conversations on the site with
37 workers that many of them perceived the researcher to have an 'apprentice-like' role because of his
38 apparent age and actions on the site, often following the health and safety advisors around. This
39 perceived 'non-expert' position created the social expectation that the researcher would ask many
40 questions; which was very useful for understanding the ways the informants viewed the actualities
41 of the construction practices being undertaken.

42 Observations to produce field notes were undertaken in different settings across the project such as
43 the main office, site offices, meetings, and the construction site itself, through site walkarounds, ad
44 hoc discussions with workers and by being present in various meetings and accident and incident
45 responses. Any observations or informal conversations with informants that were relevant to unsafe
46 practices were captured through note-taking in the field. Angrosino (2006) recommends typing
47 notes immediately following observations while the material is still fresh in the mind, which is more
48 challenging in an outdoor environment, as there is no paper, or laptop computer easily available.
49 Hence, notes were taken on the 'notes' section of the researchers mobile phone when out in the
50 construction site environment. Typing on a mobile phone was a natural action to take (rather than,
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for example, writing on a clipboard) and this helped put participants at ease. The use of a mobile phone was a less obtrusive approach in the natural setting, which avoided acting as a constant reminder that participants were being studied (O'Reilly, 2012), and reduced risks of distraction or distrust among participants (Hammersley & Atkinson, 2007). This initial note-taking in the field was then written up more extensively at the nearest opportunity once the researcher was away from the action. When in meetings, notes were written on the hard copy of the meeting minutes, as again this was the natural behaviour in these scenarios amongst participants; and in the office, notes could be directly input into the researchers laptop. Documentary data that was available included meeting minutes, safety observation reports and photographs that were taken by, or sent to, H&S advisors. The researcher himself refrained from taking photographs as this could raise suspicions amongst the workforce. For data collection consistency, a protocol was specifically developed for the protocol (see Author et al., 2014), which was used as a framework for establishing rapport for participants and for reducing social reactivity risks. Documentary data included the use of artefacts such as safety observation reports, near miss reports, meeting minutes, and safety climate surveys as well as the formal Safety Management System (SMS) in place on the site, which contained various documentary data sources, such as risk assessments, site rules, induction processes etc. (Sherratt 2016). All of this documentary data supplemented the fieldwork, and was able to provide further insights into the social realities of the research setting, including the formal methods through which safety management should occur.

3.2 Data Analysis

NVivo (Version 10) was used to store, organise and analyse the data thematically (Braun & Clarke, 2006) through a data-driven coding process. This enabled 'a weaving of rich primary sources with commentary and discussion and analysis, our evolving discussions and writings that distinguish research from data archiving' (Richards, 1999, p.414) and for themes, ideas and interpretations to be linked, providing a 'bird's-eye view' of the pattern and construction of a new understanding of the research problem (Braun & Clarke, 2006).

Through an iterative-inductive approach, the analysis became more and more focused, a typical characteristic of ethnographic work (Hammersley & Atkinson, 2007), and the long duration of the study allowed for constant refinement of the data analytical process. This thematic approach enabled the identification of patterns across data sets and consisted of six stages: familiarisation with data, generating initial codes, searching for common themes, reviewing them, defining and naming themes and producing a final report (ibid). Following analysis, informants were used to help reduce internal reliability threats, in a technique known as the use of participant researchers (LeCompte & Goetz, 1982). This was undertaken in the form of presentations, papers and informal discussions of analysis interpretations with informants, and also supported the internal validity of the findings as they developed from the data.

The data associated with production pressures was analysed according to ideas associated with equity theory. Equity theory (Adams 1963) focuses on the fairness of related partners. It postulates that fairness values causes motivation and explores fairness in the trade between the use of a worker's education, experience, intelligence, effort and so on, against the rewards for the service. The outcomes can include 'pay, rewards intrinsic to the job, seniority benefits, fringe benefits, job status and status symbols, and a variety of formally and informally sanctioned perquisites' (Adams

1963:423). This trade can be expressed as comparisons between the ratio of contributions (or costs) and benefits (or rewards) for each person (Guerrero et al., 2014). According to Adams (1963), anger is induced by underpayment inequity and guilt is induced with overpayment equity. Hence, payment structure is a key component and cause of equity or inequity. In situations of significant production pressure, equity is at risk, and a fair pay structure for any overtime comes into question. For instance, equity theory has been found to being useful for explaining how people react to piece-rate payments (see Lawler, 1968). Hence, it can be argued that this is an appropriate theoretical lens for this research. However, there limitations of equity theory to consider, such as that it is based on personal perception, and therefore standardising input and outputs for equality can be challenging, as well as precise measurement. Given the ethnographically informed approach adopted here, and the aim of the study to **expose and unpack the informal management activities that occur when projects are under production pressures, and reveal how such activities have consequences for safety on site, rather than seek measurement or standardisation, equity theory is able to provide an appropriate foundation for analysis.**

4.0 Production pressure vs safety

Ethnographic snapshot:

I was on a site walk on a cold winter morning in early January. The H&S advisor that I was with went to check on a welfare unit. As I waited outside, watching the construction of a new road unfold, John [a construction worker] approached me. I hadn't seen him for a few weeks as the site had been closed for the Christmas break.

I asked him, 'how were the holidays?'

'Christmas was good to see the family. Always good to get some time off, though I did have to come in a few days to help catch up with the schedule...

'That's not ideal over the holiday period' I said.

'Wasn't all bad, we were only in four or five hours, but got paid the full shift [12 hours] which was nice. Get in, get it done, get home.' said John.

John had been given a full shift's pay for doing less than half a shift's work. He was happy, and it seemed likely the managers would also be glad they had finished the work before the Christmas break. That afternoon, I discussed this with a different H&S advisor during another site walk-around. He said: 'I'm aware of similar strategies that were used on other projects I have worked on,' and that 'you would be naïve to think it is uncommon.'

The issue of excessive working hours was being investigated by the H&S team at the time, and worker fatigue had become a monthly 'awareness topic', as it had been discovered that some employees were working 80+ hours 'week in, week out'. The issue of fatigue was also brought up in safety representative meetings, the formal meetings held between H&S advisors, operatives and site safety representatives. One rep stated: 'I always thought we get more accidents in the run up to Christmas because the boys are doing overtime'. The H&S advisors also believed workers would rarely turn down an opportunity to work overtime, as money was a big driver for them and Christmas is an expensive time of year.

This revealed an informal practice on the site. This was essentially an unofficial incentive scheme, implemented at the site level, with the goal of keeping to the project production schedule demands.

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3 *It was covert, it was informal, and it was potentially dangerous in that it also incentivised production*
4 *over safety.*
5

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7 This snapshot presents the first time the researcher encountered an informal production
8 management process on the site. Over the course of the study, this phenomenon became more
9 prominent in the data, with a variety of consequences for safety management. Here, the findings
10 have been presented in three sections: firstly, the experiences of production pressures are explored
11 (4.1), then followed by the implications of both the 'formal pay structure' (4.2) and 'informal pay
12 structure' (4.3) found on the site as associated with production pressures and safety.
13
14

15 **4.1 Production Pressures in Practice**

16
17 *One of the H&S advisors stormed into the site office, throwing his hardhat down, and ripping*
18 *off his high –viz, before exhaling 'it is so frustrating. Every time I go out, I ask the guys to do*
19 *something, and every time I go back, it is not done...' [I shook my head]*
20

21
22 *'For example, every time the formwork gets put up they don't put the wooden boards*
23 *between the formwork and the concrete structure (the wooden boards are put there to*
24 *prevent objects from falling). It would take them all of five minutes to put the wooden boards*
25 *on, but the guys go straight for the steel rebar instead, because that is production [he lifts his*
26 *arm, punches the air with emphasis]... and it is obvious when they have done a [concrete]*
27 *pour as well because there housekeeping just goes to s**t'.*
28
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30
31 Such examples of production pressures increasing safety risks were common. In this case, without
32 the wooden boards, there was an increased risk of objects falling from height, and potentially
33 injuring someone below. When production pressures increased, safety was not a management
34 priority. Acknowledgement of production pressures was not just realised through this advisor's
35 frustrations, but also at all levels throughout the organisation, from senior management, through
36 middle-management and to the front-line workers. The following three examples are typical of
37 comments made by those at different levels within this hierarchy. At a safety stand down, following
38 a flurry of safety incident, the researcher observed the Project Director, who was addressing a large
39 group of employees, saying:
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43 *'there is no doubt we are under significant production pressure...but I don't want our safety*
44 *to be sacrificed. An accident can happen to anyone, and I know some of you may not be on*
45 *site often, but stay careful. Anyone can trip and fall... it may seem basic... but it happens.'*
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48 This pressure filtered down to the front-line, where supervisors prioritised production. One Health
49 and Safety advisor explained how this had consequences for safety management :
50

51 *'He [supervisor] is seen as the Golden boy for 8 day cycle [rather than 12] but the by-product*
52 *of that was for all to see – the paperwork was non-existent', and housekeeping very poor;*
53 *but to be fair it got sorted when it was raised.'*
54
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56 The operatives at the front-line also acknowledged the pressures that were being placed upon them.
57 For example, at a safety rep meeting consisted of a three safety reps (and operatives) and a H&S
58 advisor, the researcher observed an operative say:
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3 *'the phrase understood on-site is 'Just get it done' and sometimes they [supervisors] don't*
4 *even need to say it, they just give you that look and you know'. Both other safety reps*
5 *nodded.'*
6
7

8 Considering the operatives knew the message without needing to be verbally told, this suggested
9 this way of working, to 'just get it done', was a common occurrence.
10

11 **4.2 Formal pay structure**

12
13 *The H&S office was quiet, with only a couple of H&S advisors working in silence. One of them*
14 *stood up, began to put his PPE on and said 'well lets go and see how these guys are getting*
15 *on'. Naturally I looked up and responded: 'which guys?'. The advisor said with a sarcastic*
16 *smirk on his face: 'The client's best friends...have a look at this'. He showed me a photo of*
17 *workers 'tight roping' on the steel rebar and walking on planks of wood with no edge*
18 *protection. This photo had been sent to the H&S department by the client, following their*
19 *concerns. The advisor explained that they had contacted the subcontractor involved. At*
20 *about ten o'clock this morning the subcontractor attached a photograph of the work site,*
21 *and communicated that the issues had been addressed.*
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26 *However, just before the end of the day, the H&S advisor returned, shaking his head, and*
27 *said to me: 'they had done nothing'. I gave a confused look, as the contractor had stated*
28 *they had addressed the issues. The advisor explained that the photo the contractor sent*
29 *appeared to show a safe work site, but had been deceitfully taken and the image didn't*
30 *include unsafe areas. He said: 'When I got there, I had to stop the works... but even after*
31 *stopping them, they still seemed desperate to keep going. They were saying that they would*
32 *just edge protect one area, and only work in that area... That wasn't happening.' The H&S*
33 *advisor only let work commence once the whole work site was in a safe condition, which only*
34 *took the subcontractor a couple of hours to do so. He explained: 'they are on a price contract,*
35 *they see those two hours as a waste. It is all time and money to get the job done as soon as*
36 *they can.'*
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41 Piecework contracts were paid by work, rather than by hour, and had previously caused H&S
42 problems on the project. In this situation, the deceitful photo and claim the work area was safe was
43 seen by the H&S team as a clear disregard for health and safety, a gross misconduct and that the
44 subcontractor involved should be removed from site. However, the H&S team had no power to
45 make such decisions as a support team in a solely advisory role. Instead the H&S department was
46 only able to document failings of subcontractors that did not meet expectations for evidence, if
47 senior management of the principal contractor decided to act and remove problematic
48 subcontractors. The H&S department felt that because the subcontractor was on 'price' they were in
49 a rush to get the job finished to save time and money, and where possible recommended price
50 contracts were changed to 'by the hour' , to avoid H&S issues the projects was having with various
51 price-paid subcontractors on the project.
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56 **4.3 Informal pay structure**

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58 *A H&S advisor and I were spending some time checking the risk assessments and method*
59 *statements for a work task. The advisor had a query about the scaffolding and so we went to*
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3 *try and find the scaffold foreman to get clarification. We entered the site foreman's office*
4 *and the H&S advisor made a cheeky comment about the untidiness of his desk:*

5 H&S Advisor: *'Is this how you live?'*

6 Foreman: *'some of us were busy over the holiday weekend'.*

7 H&S Advisor: *'How did the lift go? [over the weekend]'*

8 Foreman: *'We got it done'*

9 H&S Advisor: *'Good. I felt there was an uneasy atmosphere on Friday... when the guys knew*
10 *it was going to be a late finish.'*

11 Foreman: *'Don't think they will be complaining now. They got paid a full shift for work that*
12 *took two hours.'*

13 H&S Advisor: *'That is alright, isn't it!'*

14 Me: *'How many guys were working?'*

15 Foreman: *'About a dozen, and a couple of foreman.'*

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21 When under significant production pressure, the site management would arrange what workers had
22 previously described to me as 'a job and knock' – (finish the job and knock off), or 'Vegas Time' -
23 finish the job and then covertly do as you please. This would ensure the work would be completed,
24 thus keeping the project on schedule, and would reward the workers, by being paid a full 12 hour
25 shift for a few hour's work. The site management relied on having good relationships with the
26 workers, so they could ask them to work late or on the weekends. One informal reward system was
27 named 'Vegas Time', after the saying 'what happens in Vegas, stays in Vegas'. Or in other words, this
28 reward system and what happens during reward time or thereafter is not to be spoken about to
29 others. 'Vegas Time' was adopted in an area of the project that was working on a night-shift basis. At
30 such times, there was much less supervision from H&S advisors or the client who worked standard
31 site hours, and so gave more opportunity for such systems. A construction worker involved in Vegas
32 Time explained to me that:
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37 *'if we got the job done in 10 hours rather than 12, we get two hours Vegas'.*

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39 During Vegas Time workers could do as they please, for example: drink tea, play on their phones and
40 some went for a sleep. The worker explained that rumours had gone round that the place was
41 'rocking' during Vegas Time, but he denied this was the case. A supervisor involved in Vegas Time
42 explained:
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45 *'It is fair to the guys...the guys (operatives) look forward to it. Often the first question would*
46 *be 'are we getting any Vegas tonight?'*

47
48 These informal rewards schemes were perceived as fair, in that they kept the project and therefore
49 the supervisors on schedule, and in return the workers received time to themselves. The quicker
50 they finished, the more time to themselves they received. While this was an unofficial practice, there
51 was on site evidence suggesting to the H&S team that it was occurring:
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54 *When on a safety walk-around with a H&S advisor, we entered the first aid room in the*
55 *welfare unit. The H&S advisor stated to me: 'Look it is clear guys have been sleeping in here.*
56 *There is a pillow on the first aid treatment table, footprints, coins on the bed that have fallen*
57 *out someone's pocket while they have been lying down, and piss stains in the sink, where*
58 *someone has got up in the middle of their sleep. I can't prove it, but it is going on.'*
59
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Members of the H&S advisors were aware these informal reward schemes existed from the evidence on-site and some foremen or supervisors admitted it (as found in the opening vignette of this subsection). The use of participant researchers was pro-actively adopted in this situation to explore the researcher's interpretation of these informal rewards scheme being used at site-based level. The following discussion occurred in the H&S department office:

Researcher: *'The fact that they were prepared to pay such rates suggests that they were desperate to get the lifting operation complete...'*

H&S Advisor: *'Yea' (nodding)*

Researcher: *I know we have had problematic experiences with contractors on 'price' (piecework)... as they are incentivised to work quickly and cut corners with health and safety to get the job done as quick as possible.*

H&S Advisor: *Yea (nodding)*

Researcher: *Well, if there is a 'you can leave when the job is finished' approach, and still get paid a full shift no matter how quickly you finish. Isn't it the same concept but in an informal way?*

H&S Advisor: *'I see where you are coming from. You are saying it is still incentivising working quickly and taking shortcuts?'*

Researcher: *'Yea, exactly.'*

H&S Advisor: *'I think you have a point there. While I don't think they would take shortcuts when performing the lift, where they may cut corners is when they are coupling the lift cage into place or not always clipping on with their harness. That can be awkward and slower, so they would save time not clipping on.'*

This discussion revealed that the informal reward system could encourage certain types of unsafe behaviours occurring, such as workers not clipping on with their harnesses or other safety measures that added time to the work operations.

5.0 Discussion

This empirical work has been able to reveal significant production pressures on this case study project, acknowledged throughout the site hierarchy, from the senior management team down to the operatives on site. The consistently high production pressures throughout the three-year project, suggests that the constraints set in terms of the project timescale were initially tight. The pressures could therefore be linked back to the initial bid, which was hundreds of millions of pounds lower than its nearest rival. Competitive tendering in the construction industry means this isn't uncommon, as typically always the lowest price, rather than the best value, bid wins the work. The unreasonable pressures that result from this is perhaps inequitable for the employees who subsequently work on the project. It is argued here that this practice needs to change if there is to be any change in accident rates, which are caused by production pressure.

Despite the accepted premise that even during such periods safety should be prioritised over performance (Choudhry & Fang, 2008), the experiences and realities of many workers are that production is prioritised over safety, despite company rhetoric about putting safety first (Hopkins, 2006) and the presence of a formal safety management system (SMS) as a standard for large contractors. The phrase 'get the job done', as found in this case study, or a 'finish-the-project focus',

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3 as described by Anderson in 1999, is a stock of the industry and a phrase often used to justify the
4 cutting of corners in safety (Paap, 2003). Informal strategies were used to incentivise faster rates of
5 production, with workers, for example, being paid a full shift's wage, regardless of when they finish.
6 Hence returns are enhanced by fast completion of the task, which can result in workgroups pushing
7 themselves hard, working excessive hours, or side stepping safety where it impedes production
8 (Mayhew et al., 1997). Paap (2003) revealed that safety is often compromised in order to 'get the
9 job done' with informal actual operating procedures being communicated in informal, unwritten,
10 and often unspoken ways; similar to the operatives experiences with their supervisors in this case
11 study when under production pressures. As the operatives were under pressure to complete the job,
12 this could be interpreted as inequitable; especially in cases where operatives believe there simply is
13 not enough time to perform work safely (see Choudhry & Fang, 2008). Indeed, Paap (2003)
14 explained that what is 'required' to get the work done is a subjective term that is not primarily
15 determined by the safety requirements for the workers, but what has been negotiated by the client
16 or customer, including the completion date, late fine, early finish bonuses, and differing labour costs
17 associated with project duration.
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23 Production pressures can be intensified by piecework payment-by-results approaches, which have
24 been found in many industries to having negative influences of various aspects of health and safety
25 (Johansson et al. 2010). There has been little work in the construction industry on piecework
26 approaches, with this case study suggesting they may be much more prominent than the literature
27 suggests, as they exist not only formally (e.g. written contracts) but also informally (e.g. Vegas time)
28 in a psychological contract between supervisors and their workers. Formal piecework contracts
29 caused H&S issues on the case study site, with the H&S department ultimately recommending to the
30 principal contractor that this approach should be avoided. However, the health and safety working
31 practices associated with piecework contracts extended beyond formal agreements, as informally
32 they were adopted when production pressures threatened the planned schedule. The informal
33 piecework bonuses were incentives that were very similar to the formal piecework contracts, and
34 also caused the project H&S issues. These informal incentives not only had the potential to
35 encourage unsafe behaviours to save time, but also encourage operative to work long hours, which
36 could lead to fatigue and further risk-taking or unsafe behaviours.
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42 However, this arrangement was viewed as equitable by workers: they not only received a generous
43 financial bonus, rest period, or were sent home, but this approach also influenced other human
44 motivations, such as feeling valued by managers for their work (see Maslen & Hopkins, 2014), and so
45 workers could feel a sense of accomplishment by hitting production targets. The increased risk of an
46 accident may not have been recognised, and even if it was acknowledged, optimism bias and the
47 fact accidents are rare so 'will not happen to me' could misalign individual risk assessment on the
48 informal payment-by-results approaches. Especially in scenarios where production pressures are
49 very severe, workers can be asked to take on overtime, or come in on weekends and holiday
50 periods. This is obviously a cost to workers, which through an equity theory lens (Adams, 1963), was
51 seemingly balanced through extra payments and rest periods for workers. **However, working extra
52 hours can be a cause for safety concern in itself (Williamson et al., 2011; Womack et al., 2013), yet
53 both management and workers accepted the extra H&S risks associated with payment-by-results
54 strategies, and production pressures prevailed.**
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6.0 Conclusions

Production pressures have been widely accepted as a primary cause of accidents; and in the construction industry this problem remains unresolved. The ethnographic insights presented here are able to empirically contribute to the body of knowledge surrounding this phenomenon, by revealing how production pressures are being informally managed in practice. The dominant strategy adopted on this case study project was to have informal and covert rewards for workgroups that helped to meet the schedule demands. This could include being paid for a full shift's work when only working a few hours overtime on weekends or holidays; or being able to take additional rest periods or breaks if the schedule targets were met ahead of time. Supervisors viewed this as being fair to the workers; and the workers enjoyed financial and other benefits associated with completing the work early or on schedule. While this informal arrangement helped achieve production targets, it incurred additional safety risks associated with incentivising quick and potentially dangerous actions, as well as encouraging workers to continue working when fatigued.

There is relatively little previous research of the effects of piecework on H&S in the construction industry. This study suggests that this topic deserves much more attention, considering piecework payment-by-results approaches are used both formally and informally. The informal strategies incentivised production over safety in a very similar manner to traditional and formal piecework or 'payment-by-results' contracts. The main difference being that the informal strategies were not used consistently, but only when there was significant pressure to reach schedule targets. After all, these strategies came at a cost, as workers were well-paid during these periods. These strategies were viewed as fair by supervisors and workers, as there was financial bonus, or extra time off for workers when schedule was met. However, during these periods of high production pressure, there were long hours and incentives to work as quickly as possible; both of which have been previously attributed to poorer safety performance.

Production pressures continue to harm construction workers, as production becomes prioritised over safety. This remains a largely unresolved problem that appears deeply ingrained within way construction projects are undertaken in the industry. While production pressures are known to be contributory causes for accidents, how they are managed at a site-level is less well understood. This study contributes by revealing the informal practices associated with trying to keep a construction project on schedule, and outlines that, theoretically, this will adversely affect the safety performance. **This finding has consequences for the industry as a whole; as such practices are unlikely to be uncommon on other sites given the prevalence of production pressures generally. It is therefore essential that clients, project managers and contractors are not only made aware of the consequences of applying such pressures to the site operations through setting challenging deadlines and using lowest-cost tendering processes, but are also made aware of the informal processes that supplement formal safety management systems in practice, and the potential for them to cause incidents and injuries to the workforce.** Further work is recommended to illuminate further insights into the management practices associated with production pressure and safety in order to provide a more holistic understanding of this significant, well-known, yet unresolved, problem.

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Review comments	Author Response
<p>Reviewer 1 Abstract Provide full meaning of H&S.</p>	<p>This has now been expanded to 'Health and Safety'</p>
<p>Ethnographic snapshot Remove the ethnographic snapshot from beginning and consider placing it somewhere in the findings sections.</p>	<p>The ethnographic snapshot has now been moved to the beginning of the findings section.</p>
<p>Literature Review A well-written and coherent literature review. Is it only safety that production pressure affects? What about occupational health of workers? Perhaps the review can briefly acknowledge this (e.g. in a paragraph or a couple of sentences), although the empirical work may have had a safety focus. If the authors take the view that a commentary on occupational health is not required, then they should "safety" rather than "H&S" in the "Originality/value" section of the abstract.</p>	<p>Thank you. Production pressure could also affect occupational health, but as the reviewer points out there is little empirical evidence on this. We have now acknowledged this in the introduction to better set reader expectations:</p> <p><i>"this study does not aim to reveal or determine a causal relationship, but rather illuminate the social complexities around how unsafe acts emerge and manifest in practice at times of production pressure. In order to bring further insights to this phenomenon, this study aimed to expose and unpack the informal management activities that occur when projects are under production pressures, and reveal how such activities have consequences for safety on site. This study contributes to the existing body of knowledge by mobilising an ethnographically informed approach, able to reveal how such relationships between production pressures and safety manifest in practice, rather than simply confirm that they exist, and so expose the dangerous informality of management in this context."</i></p> <p>H&S also has now been changed to safety in the originality/value section of the abstract.</p>
<p>The authors suggest that there has been little research on the effect of piece on H&S in construction on piece work. The authors may wish to see other relevant works (also conducted in UK) such as Brace et al. (2009), Manu et al. (2013; 2014), etc. in which the health and safety impact of sub-contracting is reported. A brief commentary on how this study advances/complements existing related work would be helpful.</p>	<p>Thank you for these suggestions. We have now drawn upon the work of Brace and Manu to help contextualise the work, and note that subcontracting has been found to being adverse for H&S in these studies. We also note that subcontractors are more likely to be paid by 'piecework' rather than by hour like full time principal contractor employees, this could help to explain why subcontracting negatively influence H&S.</p>
<p>Methodology A clear methodology has been outlined. It would be useful to also clarify how the setting for the ethnography was selected.</p>	<p>The setting was for a PhD study that was selected through a contractual agreement. As a long-term study with site access was available this enabled the opportunity for an ethnographic study. This is now referred to in the introduction to the methodology.</p>
<p>Sentence on lines 3-6 on page 6 or 17 is not clear.</p>	<p>Thank you, this has now been rephrased to <i>"As well as establishing rapport, the researcher adopted an 'overt approach', and was fully open and honest about the work being undertaken and that he was investigating and researching safety on the project."</i></p>

<p>Spelling of NVivo should be corrected. Please include the NVivo version number.</p>	<p>This has now been corrected and updated.</p>
<p>For better coherence, it would have been better for the equity theory to be presented as the theoretical lens for the study prior to the methodology section. Consider removing the commentary on the equity theory from the data analysis section. The commentary could be expanded a bit more to enable better understanding of why it is best suitable for explaining or helping to explain the phenomenon being studied. One or two paragraphs would suffice.</p>	<p>The second and third paragraphs in the introduction now present the equity theory lens. We have considered the commentary in the data analysis section, as this was used to understand and analyse the data, and so we feel it should also be mentioned in this section. To that end we have explained why equity theory is appropriate by referring to previous piecework studies that have used this theory. See: <i>'In situations of significant production pressure, equity is at risk, and a fair pay structure for any overtime comes into question. For instance, equity theory has been found to being useful for explaining how people react to piece-rate payments (see Lawler, 1968).'</i> In addition, we have further explained its uses and limitations in the literature review section (this was also suggested by reviewer 2) and why and how it has been used here: <i>"The data associated with production pressures was analysed according to ideas associated with equity theory. Equity theory (Adams 1963) focuses on the fairness of related partners. It postulates that fairness values causes motivation and explores fairness in the trade between the use of a worker's education, experience, intelligence, effort and so on, against the rewards for the service. The outcomes can include 'pay, rewards intrinsic to the job, seniority benefits, fringe benefits, job status and status symbols, and a variety of formally and informally sanctioned perquisites' (Adams 1963:423). This trade can be expressed as comparisons between the ratio of contributions (or costs) and benefits (or rewards) for each person (Guerrero et al., 2014). According to Adams (1963), anger is induced by underpayment inequity and guilt is induced with overpayment equity. Hence, payment structure is a key component and cause of equity or inequity. In situations of significant production pressure, equity is at risk, and a fair pay structure for any overtime comes into question. For instance, equity theory has been found to being useful for explaining how people react to piece-rate payments (see Lawler, 1968). Hence, it can be argued that this is an appropriate theoretical lens for this research. However, there limitations of equity theory to consider, such as that it is based on personal perception, and therefore standardising input and outputs for equality can be challenging, as well as precise measurement. Given the ethnographically informed approach adopted here, and the aim of the study to expose and unpack the informal management activities that occur when projects are under production pressures, and reveal how such activities have consequences for safety on site, rather than seek measurement or standardisation, equity theory is able to provide an appropriate foundation for analysis."</i></p>
<p>Correct typo error in sentence 11/12 of page 8 of 17.</p>	<p>Thank you, this has now been corrected.</p>

<p>Discussion/Conclusion</p> <p>1. A well written discussion and conclusion. It could one of them could be augmented by including a brief commentary on the practical implications of the work.</p>	<p>Thank you, this is a very useful suggestion and the authors consider that contributing to existing knowledge by revealing the unsafe practices that occur is a worthy contribution, and that the practical implications should be to initially inform the industry that these practices can be dangerous. This is now noted in the conclusion:</p> <p><i>'This finding has consequences for the industry as a whole; as such practices are unlikely to be uncommon on other sites given the prevalence of production pressures generally. It is therefore essential that clients, project managers and contractors are not only made aware of the consequences of applying such pressures to the site operations through setting challenging deadlines and using lowest-cost tendering processes, but are also made aware of the informal processes that supplement formal safety management systems in practice, and the potential for them to cause incidents and injuries to the workforce.'</i></p> <p>A recommendation is also made that further work is required in this poorly understood area of informal construction safety practices.</p>
<p>Reviewer 2</p> <p>Originality: This paper is about a very relevant topic. The impact of production pressures in construction site safety and informality are both topics that have not been properly investigated. However, the aim of the paper should be expressed as a contribution to knowledge. At the end of section 1.0, the authors state that "this study aimed to expose and unpack the informational management activities...". This is indeed an action that was undertaken in the investigation, but the purpose of that has not been clearly explained.</p> <p>At the end of section 2.0, the authors present again the aim of the paper (slightly different from the first one), but again without making clear the proposed contribution of the paper to the advancement of knowledge.</p> <p>It seems that the aim of the paper is to understand why production pressures have an impact on safety performance. However the discussion and conclusions sections do no present and in-depth analysis of this impact.</p>	<p>We appreciate these comments and agree with the reviewer on the importance of impact and contribution. We have therefore updated the aim of the paper to make it clearer that the contribution of this research is an advancement of knowledge. The aim in section 1.0 has been clarified and the contribution to knowledge explicated:</p> <p><i>"this study does not aim to reveal or determine a causal relationship, but rather illuminate the social complexities around how unsafe acts emerge and manifest in practice at times of production pressure. In order to bring further insights to this phenomenon, this study aimed to expose and unpack the informal management activities that occur when projects are under production pressures, and reveal how such activities have consequences for safety on site. This study contributes to the existing body of knowledge by mobilising an ethnographically informed approach, able to reveal how such relationships between production pressures and safety manifest in practice, rather than simply confirm that they exist, and so expose the dangerous informality of management in this context."</i></p> <p>The aim at the end of section 2.0 has also be duly edited to maintain consistency with the above</p> <p>We hope this clarifies that this paper is not to understand why pressures impact safety, but how they impact safety and its management.</p>
<p>Relationship to Literature: A preliminary literature review is necessary before the</p>	<p>The introduction has been expanded to develop the context for the study and explain the gap in knowledge</p>

<p>presentation of the aim of the research study. This should be in the introduction section, which is too short. Therefore, in this initial literature review, the gap in knowledge must be pointed out.</p>	<p>with regards to the nuances of the relationships between production pressures and safety, and so justify the aim of this study.</p>
<p>Regarding the literature review section, a topic that should be discussed is informality and improvisation, its main causes and consequences. There much literature from the general management field (see, for instance, Ciborra, Cunha), and also some studies in the construction industry (e.g. Koskela, Formoso, Hamzeh), which are concerned with making-do waste.</p>	<p>The introduction has been expanded to explain the aim and also the reasoning for the equity theoretical framework adopted to explore this aim. We have also referred to the work of (e.g. Rooke, Koskela, Gajendran, Oswald) within the paper to identify there is a knowledge gap due to informalities being difficult to research in practice and that the dominant traditional research approaches have not been able to holistically capture such informal practices. Relevant literature on informality and safety is also discussed (see Baarts, Löwstedt, Tutt etc), and considering the word limitations on the paper, we hope this is an appropriate amount of additional literature.</p>
<p>Moreover, if the equity theory (Adams, 1963) plays an important role in the research project, it should be explained properly in the literature review. Its limitations should also be pointed out, as it seems that this theory adopts a reductionist and behaviorist approach to explain the attitude of workers in relation to work incentives.</p>	<p>This is a similar comment to that made by Reviewer 1 and while equity theory is used as a theoretical frame for the analysis, further explanation of equity theory now appears in the introductory section, and has been developed in the methodology/data analysis section to also note the uses and limitations and why and how it has been mobilised here.</p>
<p>Methodology: It is necessary first to explain what ethnography is and then justify its choice (pg 5, lines 8-28).</p>	<p>Ethnography is now defined as <i>'the study of the culture and social organization of a particular group or community'</i>. The author(s) feel its choice has been well-justified, referring to this approaches ability to capture informal practices. See, the paragraph that mentions: <i>'Ethnographic approaches have been particularly successful in capturing informal construction safety-related practices...'</i></p>
<p>The choice of the construction project in which the study was undertaken should be justified.</p>	<p>Reviewer 1 also mentioned this. The author(s) have now added...' <i>"The research presented here is drawn from a three-year ethnographic study undertaken on a single project in the UK. The project's client team had set out provision to support a PhD in construction safety as part of their requirements, thus providing an arguably unique research opportunity for immersive data collection."</i></p>
<p>An overview of the research project should be provided, if possible including a figure. Was the research project divided into stages? Were there learning cycles, and partial outcomes?</p>	<p>The following has been added to further detail an overview: <i>'The initial research stages involved gaining site access to the research setting and thereafter establishing rapport with key gatekeepers. A protocol was developed for this stage (see Author et al., 2014), and thereafter a bottom-up research approach was undertaken where data collection and analysis were interwoven, which is typical in ethnographic studies (Hammersley & Atkinson, 2007)'</i></p>
<p>Data collection should be explained is a systematic way, providing some idea on the effort spent in each source of evidence</p>	<p>A more detailed description of the data collection has now been provided. See the section that starts:</p>

<p>(interviews, direct observation, participant observation, analysis of documents, etc.). For instance how was 1500 hours of data collection spent? Which kind of observations were made in those 200 field records? Which kind of documents were analyzed (150 units).</p>	<p><i>“Observations to produce field notes were undertaken in different settings across the project such as the main office, site offices, meetings, and the construction site itself, through site walkarounds, ad hoc discussions with workers and by being present in various meetings and accident and incident responses. Any observations or informal conversations with informants that were relevant to unsafe practices were captured through note-taking in the field... “</i></p>
<p>Please, explain what "establishing rapport" and "impersonal researchers" mean (page 5, Line 56-60)</p>	<p>'Impersonal researchers' has been changed to 'unengaged' for clarity: Establishing rapport is very important, as although unengaged researchers may obtain a certain amount of information, they will miss the full richness that comes with true ethnographic immersion (Angrosino, 2006) and the ability to engage fully with others in the research setting. And the process that was developed for this particular project has been referenced (Author et al. 2014) for further explanation.</p>
<p>The authors mention that nVivo was used for data analysis. Please explain which kind of content analysis was carried out</p>	<p>This has been more clearly explained in the methodology/data analysis section: <i>“NVivo (Version 10) was used to store, organise and analyse the data thematically (Braun & Clarke, 2006) through a data-driven coding process. This enabled ‘a weaving of rich primary sources with commentary and discussion and analysis, our evolving discussions and writings that distinguish research from data archiving’ (Richards, 1999, p.414) and for themes, ideas and interpretations to be linked, providing a ‘bird’s-eye view’ of the pattern and construction of a new understanding of the research problem (Braun & Clarke, 2006).”</i></p>
<p>Page 6 - Lines 10-15: this seems to be the expectation of the researcher. However, the way in which it is written suggests that this actually happened.</p>	<p>This did happen – the researcher was perceived as having an ‘apprentice-like’ role. This has been clarified in the paper: <i>‘As a young (mid 20s) researcher attached to a University, it became clear from early conversations on the site with workers that many of them perceived the researcher to have an ‘apprentice-like’ role because of his apparent age and actions on the site, often following the health and safety advisors around.’</i></p>
<p>Explain the technique of participant research (Page 6, 58). Is it the same as the source of evidence named participant observation?</p>	<p>Participant researcher techniques are based around sharing the researcher’s interpretations of the data with the research participants for reliability. This is now more clearly in the paper, and that <i>‘This was undertaken in the form of presentations, papers and informal discussions of analysis interpretations with informants, and also supported the internal validity of the findings as they developed from the data.’</i></p>
<p>Results: Although some ethnographic snapshots were used with the aim of providing some insights to the results, the description of events in the construction projects was relatively shallow, especially considering that one of the</p>	<p>Further details of the research context have been added, without risking identification of the project for ethical reasons: <i>‘In this case, a large construction project (+£500m in value) that had approximately 1100 workers on site at its peak. This civil engineering project</i></p>

<p>1 authors spent three years collecting data. Not 2 much data about the context, the main 3 characteristics of the safety management 4 system, and the role of participants have been 5 presented in the results sections. 6 7 8 9 10 11 12 13</p>	<p><i>had typical operative trades that included: welders, scaffolders, concrete placers, and carpenters.'</i> Reference to the SMS has also been made, as this did provide the formal mechanisms that should have been in place, see: <i>'as well as the formal Safety Management System (SMS) in place on the site, which contained various documentary data sources, such as risk assessments, site rules, induction processes etc.'</i> This has not been explored in the findings due to the focus of the paper on informal management practices, and also due to constraints of space.</p>
<p>14 The idea of analyzing informality in the definition 15 of extra-hour tasks is insightful. However, the 16 impacts of that practice should be discussed in a 17 broader way. It is obvious that this has a 18 negative impact on site safety, but this might not 19 be direct (for instance, it might affect the 20 removal of constraints, and this might have a 21 negative impact of safety because it might lead 22 to improvisations. 23 Another relevant issue is the role of operations 24 design and standardization. This should be 25 better discussed in the paper: whether the 26 company performed design of operations, the 27 type of standardization approach adopted in the 28 project. 29 Overall, it is worthwhile having a discussion on 30 the combined effect production pressures with 31 ineffective planning systems (for instance, lack of 32 constraint analysis and removal), inadequate 33 standardization approach, and the incidence of 34 improvisations, rather than only connecting 35 production pressures to safety performance. 36</p>	<p>The author(s) feel that while these findings could be discussed in terms of standardisation and improvisation, this would be beyond the scope of this paper. The unsafe informal practices could only be associated with productions pressures as revealed through the ethnographic findings, and therefore the author(s) feel that this should remain as the focus of the paper. This is an interesting suggestion and exploration of the formal planning processes in place at the organisational level (although subcontracting of course has influence here) and consequential informality at the site level would certainly have merit, although the empirical work needed for this to be robust was not carried out for this case study project due to the nature of the research approach.</p>
<p>37 This type of research study should have 38 important implications to research. However, 39 this was limited due to the fact that the causal 40 relationships between production pressures and 41 safety performance were not analyzed in depth. 42 43 44 45</p>	<p>Within this interpretative research paradigm, the magnitude of the cause and effect of concepts is not precisely measured in analysis; rather, the social complexities are empirically revealed to provide insights into the informal unsafe practices. This has been further clarified in the introduction section. Scope for any positivistic analysis would require an alternative methodological approach which was not used here.</p>
<p>46 The suggestions for further work are very limited 47 in the conclusion section. These should be 48 extended. Regarding the implications to practice, 49 the paper does not make prescriptions regarding 50 how to reduce or mitigate production pressures, 51 so that safety performance is not affected. 52</p>	<p>The author(s) feel that making claims for how to reduce or mitigate pressures would need to be based on strong research evidence. Hence, the call for further work in this area. Implications for practice have now been noted in the conclusions, and this section expanded to highlight key aspects for consideration.</p>
<p>53 Quality of Communication: 54 The paper is relatively well written. However, a 55 thorough revision is necessary. These are some 56 examples of parts of the text that need 57 improvements: 58 - Abstract, line 24: participant observation is a 59 source of evidence, rather than a research tool. 60 - Page 4, lines 28-33, lines 47-48 need rewriting.</p>	<p>Thank you, these have now been addressed.</p>

- Page 6, line 6: has, rather than was investigated - Page 8, line 30: way of working	
Some improvement are also necessary in the structure of the paper. - Ethnographic snapshot: it seems to be in the wrong place. This should be part of the results section (as other transcriptions of conversations)	This has now been moved to the beginning of the findings section.
The first paragraph of the introduction section contain some information about the development of the empirical case. This should be moved to the research methodology section.	This has now been moved to the methodology section.
Page 12, Lines 25-29: this paragraph is out of place. If this content is relevant for the paper it should be in the literature review.	We agree, and have moved this section to the literature review accordingly, and noted it here in the discussion section.