

INTRODUCING SITE SENSE: COMPARING SITUATED KNOWLEDGE IN CONSTRUCTION TO COALMINING

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The acknowledgment of the use of tacit knowledge as a safety praxis in the mining industry has been in existence for over half a century. This is referred to as pit sense. On the contrary, the use of tacit knowledge for site safety is only gathering steam in the construction industry. Research on common sense in construction suggests that the conflicts with official practices and policies, and resistance from individuals in managerial roles, hold back advancements in employing tacit knowledge. Common sense in construction and pit sense in coalmining substantial similarities including their heavy dependence on self-preservation and the use of a bottom-up approach i.e. both focusing on the discretion of the workers. We introduce the concept of 'site sense' as an approach to site safety which is based on tacit knowledge and reflects situatedness of knowledge. Non-participant observations and semi-structured interviews were used to collect data on the practices of workers of micro construction firms in relation to site safety. The research findings indicate that unlike site sense, pit sense has evolved from first being regarded as a mere informal practice to then being acknowledged by managers as a way of workers taking responsibility and accountability for their own safety. Site sense and pit sense are both recognised as safety practices that are not formally taught but acquired through continuous practice. They are both situational knowledge gained through informal techniques and close interactions among team members. In both schools of thought, it is widely known that experienced workers are proud to possess and demonstrate pit sense and site sense respectively whereas newcomers do not yet possess this tacit and situated knowledge.

Keywords: coalmining, common sense, local knowledge, pit sense, site sense

INTRODUCTION

Both construction and coal mining industries are known to consist of numerous risks and hazards that can lead to fatal incidents (Health and Safety Executive (HSE), 2015). As a result, both industries have resorted to several methods to ensure workplace safety. Both industries fall under the purview of the Health and Safety at Work Act 1974. Explicit and tacit knowledge are implemented as safety management approaches in construction (see Aboagye-Nimo *et al.*, 2015; Bartholomew, 2008) and coal mining (see Morantz, 2013; Kamoche and Maguire, 2011). While explicit safety knowledge is well documented and accepted as a reliable form of knowledge in both areas, tacit safety knowledge is not as prevalent. This may be as a result of the discretionary and interpretivist component attached to tacit knowledge (Polanyi, 1966).

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In the UK mining industry, strides have been made for over half a century to recognise workers' tacit knowledge as a valid form of safety knowledge (Kamoche and Maguire, 2011; British Broadcasting Corporation (BBC), 1961). This is known as '*pit sense*' (ibid). However, the tacit knowledge found in construction safety practice referred to as '*common sense*' (see Dingsdag *et al.*, 2006; Oswald *et al.*, 2015) has failed to receive a similar level of success. We propose that common sense safety in construction is a valuable practice-based approach to safety management which draws on workers' experience and tacit knowledge. In order to locate this common sense approach within the construction site and express the situatedness of such tacit knowledge, we call it '*site sense*'. Thus, the aim of this paper is to introduce '*site sense*' as an approach to site safety drawing on a comparison with pit sense. A critical review of literature on pit sense and site safety is presented next to set the foundation for the study.

Pit sense

The catch phrase "pit sense" has been in the public domain since the 1960s. Emotive ballads were sung about pit sense on ground-breaking BBC radio shows: '*[pit sense] is your only defence... your life may depend on it*' (BBC, 1961). The concept is also echoed in the historical collection of mining stories by Kiveton Park and Wales History Society (2010). Pit sense is a craft-based understanding that pit workers consider important for functioning below ground (Kamoche and Maguire 2011, 726). It is known to be instinctive knowledge that requires all of one's senses and awareness (Sommerville and Abrahamsson, 2003). However due to the tacit nature of pit sense, it may go unidentified and thus undervalued. Sommerville and Abrahamsson (2003, 26) offer the following definition for pit sense:

Well pit sense is, most blokes have it. They might, they take it for granted, especially if they've been in the pits for a long time. But they have got it. A lot of, all the blokes have got pit sense. They know that the roof's bad, they know by hearing it, they know by smell, they know by the sense of just being there and being uncomfortable, the heaviness of the air, that you're in a place where you shouldn't be, lack of oxygen or gas. You'll feel the hairs move up on your legs, y'know, with black damp or something there.

Although this definition firmly establishes that pit sense exists, it falls short of clearly identifying what it is. This comes as no surprise as scholars in the field of tacit knowledge (e.g. Nonaka and von Krogh, 2009; Tsoukas 2005) all stress how difficult it is to define tacit knowledge. In one of the definitions of tacit knowledge, a miner has been quoted as follows: '*just something that you picked up*'; '*you get it as you're working down the mine... a lot comes with experience*' (Kamoche and Maguire 2011, 732). Pit sense is used by workers as a '*flexible buffer*' for dealing with the uncertainties inherent in coalmining (Kamoche and Maguire 2011; 726). In essence, these uncertainties are risks (ibid). Thus, pit sense is or includes workers' ability to readily adapt to situations in the face of risks and dangers. In high-risk work environments (like coal mines and construction sites), the word dangerous is open to interpretation (Turner and Tennant, 2009); there are varying levels of perceived risks (Gray, 2002). Workers in such environments thus evaluate levels of risks and uncertainties, hence distinguishing between what they assume can be controlled and what is uncontrollable (Baarts, 2009). Without experience in the pits, it will be almost impossible for outsiders to acquire the tacit safety knowledge known as pit sense (Sommerville and Abrahamsson, 2003). In addition to work experience, greater cohesiveness is generated amongst mining teams that work together for long periods of time (Trist and Bamforth, 1951). In the 'Longwall Study', Trist and Bamforth

(1951) identified the importance of leadership and supervision in internal groups and responsible autonomy. By working close together for long periods of time, miners are able to learn from one another and gradually form their own safety culture and generate very unambiguous norm of safety (Kamoche and Maguire, 2011).

Although pit sense is being presented as a quasi-formalised safety approach in the mining industry, many miners hold a different view. Workers believe that pit sense (or what is left of it) may be a watered-down version following the bureaucratisation of their safety practices (Kamoche and Maguire, 2011). They describe the period where management would not challenge pit sense as the 'golden age' (ibid). Although the legitimacy of pit sense was challenged following the introduction of extensive bureaucracy in the mining industry, there is evidence of an emergent blend of formalised procedures and a tacit knowledge (i.e. pit sense) in ensuring workplace safety (ibid, 726). The current practice of coalminers' pit sense is essentially a combination of formalised practices (and explicit knowledge) and tacit knowledge. Next we introduce site sense.

Site safety, Common sense and site sense

Construction sites are among the most injury-prone workplaces worldwide. Safety issues on site include serious injuries, lost work time, hospitalisation and mortality (Kines *et al.*, 2010, 399). Construction projects differ from one another and many sites present a unique and ever changing working environment. Workers must continually assess and manage risk and safety on site. Together with formal policy and processes, reactive measures are therefore always incorporated in managing unforeseen risks.

Recent research has identified common sense safety on construction sites as 'the practical knowledge and judgement developed by workers after gaining years of experience on site' (see Aboagye-Nimo *et al.*, 2013; Oswald *et al.*, 2015). Practical knowledge and judgement on site requires complex interaction of both explicit and tacit knowledge gained through training, experience, guidance by leaders, experiential learning in new situations, and from experts and experienced workers who have preceded the workers (Gherardi and Nicolini 2002, 192). Without this type of knowledge, people (especially those without experience in the construction industry) may stand right next to extremely dangerous hazards and not notice them (Baart 2009, 953). While there are clear documentation and records of explicit knowledge in the construction industry (e.g. HSE rules and regulations, and company policies), tacit knowledge is rarely represented.

Common sense safety gained some recognition when a special report highlighted its importance and relevance to site safety (see Lord Young of Graffham, 2010) in response to the increasing burden of excessive bureaucracy and red tape measures (Cook, 2015). Arguably, bureaucracy and red tape prevent experienced and knowledgeable workers from using their tacit and situated knowledge they have gained from years of site practice (Vassie *et al.*, 2000). However, it is extremely important that health and safety matters are detached from bureaucratic matters to ensure focusing effort on measures that are implemented primarily for the improvement of workplace safety (HSE, 2003, 13). Therefore, measures that help prevent injuries and harm to individuals on site must not be restricted by bureaucratic measures. Unfortunately, using measures that fall outside the scope of official work policy (even if they help improve safety) can lead to workers losing their jobs and subsequently being placed on a 'blacklist' (Taylor, 2013).

We propose that 'site sense' offers a balanced approach to managing safety on construction sites; an approach that acknowledges the need for strategy, policy and processes and more importantly one that allows for workers to employ tacit knowledge to continually assess and negotiate the changing work environment. Using site sense in opposition to excessive bureaucratic safety measures helps improve overall safety and also frees '*businesses from unnecessary burdens and the fear of having to pay out unjustified damages claims and legal fees.*' (Lord Young of Graffham, 2010: 9). Matters concerning 'health and safety' are gradually losing their importance in society as a result of red tape requirements as they have overridden common sense and personal responsibility (Löfstedt, 2011).

While investigating the evolution of workplace safety, Cooper (2003) highlights two areas that traditionally have been considered for improvement. These are as follows (ibid, 3):

Are employees provided with the maximum protection possible?

Are employees trained to recognise potentially hazardous situations and take the most appropriate actions?

The first point is out of the control of the employees themselves and may require explicit measures such as rules and regulations, statutory means and safety equipment. The second point requires workers to take some responsibility with regard to their actions and reactions. Thus, an individual possesses the relevant knowledge and skills to help avoid accidents (Cooper 2003, 3).

In order for individuals to possess the relevant knowledge and skills to help avoid accidents on site, they must have experience (Aboagye-Nimo *et al.*, 2015). This type of knowledge cannot be learnt offsite or in a classroom setting and it is best learnt through actual work practice (Sillito, 2002). It is important that this knowledge is given a terminology that reflects the situation and environment where it is implemented i.e. construction sites. The name common sense does not reflect the situatedness of the knowledge and also creates contradiction with the everyday use of the phrase. In light of the above, we introduce the term '*site sense*' as a best fit for the site knowledge often referred to as common sense. Site sense reflects the tacitness and situatedness of construction workers' safety knowledge accurately. The definition we thus offer for site sense is as follows:

Site sense is the tacit and situated knowledge workers exercise on construction sites. It is often taken for granted due to its ineffable nature as a result of knowledge internalisation based on many years of practice and experience.

RESEARCH METHODS

Rich qualitative data was collected from experienced workers in the construction industry. This was achieved using non-participant observations and semi-structured interviews. Geographically the participants were located in the East Midlands and the South East regions of the UK (the 'South East' in this study excludes the Greater London area). This approach to data collection allows researchers to gain an in-depth understanding of workers' practices and perceptions and facilitates comparison with the findings from studies on pit sense (e.g. Kamoche and Maguire, 2011; Leger and Mothibeli, 1988; Trist *et al.*, 1963). The views and perceptions of construction workers were collected from visits to five construction firms in the East Midlands and two firms in the South East. All respondents worked in small teams on site (micro construction firms). Similarly, miners have been observed to work in small teams of

up to seven in some cases (Trist and Bamforth, 1951) bearing resemblance to subcontractors on typical construction projects, and so the data from construction sites provides feasible comparisons with the studies of mining workers.

The micro firms studied included different trades, ranging from general builders, steelworkers and ground workers. This variation offered important insights into how site sense manifests for different professions on site. All respondents included in this study had several years of work experience on construction sites. Table 1 presents the research participant profile.

Table 1: Profile of the research participants

Region of operation	Type of work	Participants	Years of experience
East Midlands	Refurbishments	John	17
East Midlands	Bricklayers	Steve	28
East Midlands	New builds	Derek	21
East Midlands	Steelworks and groundworks	Tony	11
East Midlands	New builds	Tom, Andy	14, 38
South East	Temporary structures	Phil	20
South East	General builders	Bruce	21

To preserve the anonymity of the participants, pseudonyms have been adopted in place of their actual names. All the semi-structured interviews were digitally recorded and transcribed verbatim. Extensive field notes were recorded during the non-participant observation events. QSR Nvivo 10 was used to facilitate data management and thematic analysis.

COMMON SENSE ON SITE VS PIT SENSE = SITE SENSE

Several themes emerged in the data analysis. The key themes included the definition of common sense, teaching and learning on site, workers' personal responsibility with regard to safety, and how site sense may be accepted as a valid safety approach.

Defining common sense

While discussing how site safety is created and maintained, participants made several references to the importance of common sense. This led to the question: '*what is common sense?*'

Common sense is safety, isn't it?

This was Andy's definition of common sense. Although he was confident of his understanding i.e. the importance of common sense, he was not able to give a clear definition due to the tacit nature of the knowledge. He literally equates common sense to site safety. As shown in the literature review, both pit sense and common sense are difficult to define. On a conceptual level we can see that they refer to the knowledge they gain at work i.e. in the pits or on sites respectively.

Teaching and learning common sense

After participants had established the importance of common sense in site safety, they were asked how common sense was taught or learnt. Phil stated:

I don't think you can teach common sense

Although Phil mentions that common sense cannot be taught to individuals, he further states: "*You just have to keep pointing it out to people*". Phil thus unconsciously

implies that common sense can be taught. The practice of having to keep pointing things out to people until they '*get it*' is in essence a teaching and learning process. '*Getting it*' is part of the internalisation of tacit knowledge (Nonaka and von Krogh, 2009), thus a teaching and learning process. As a good teaching approach, experienced workers must thus be encouraged to '*keep pointing out*' mistakes and keep highlighting safety practices to new workers until they internalise the knowledge being taught. Although informal in nature, this is known to be a very effective method.

According to the participants, workers on construction sites learn a lot from mistakes. The workers attributed the subsequent awareness of the mistake or hazard to common sense. As shown below, workers are aware of how experience has taught them (as they have also learnt) about risks and hazards.

When you've seen someone else misbehave or how you've worked based on how far out you've worked it's just experience... you've got to be on site and you've got to be doing the job and pit up; the right ways as well as the wrong ways. (Derek)

Phil adds that "*Common sense [improves] with time... If it hurt once, you won't do it again*". This shows that subconsciously, he knows that common sense is learnt but he may not be recognising or assigning the learnt outcome to the actual learning process (considering his previous quote), in this case learning from mistakes through experiential learning. Other examples of mistakes that people learn from when on construction sites included people temporarily losing their hearing from using 'wackers' without ear defenders. From the uncomfortable experience and fear of losing one's hearing, workers do not repeat such erroneous practices.

In the case of pit sense, experiential learning and learning from mistakes is also common place. In Kamoche and Maguire (2011, 737), a pit deputy is quoted as follows: "*you get an 18-month-old youngster that will walk up to the fire and touch the fire and [they] won't do it again*". Thus in the pits, new workers learn about risks and hazards in a similar manner to construction sites. This shows that workers believe that when people carry out such mistakes or observe them, they end up committing the details of the given incident into memory and hence learn from it (Gherardi and Nicolini, 2002).

Site sense and its use

The experienced workers that participated in this study had all expressed their use of common sense to create and improve site safety. None of the participants implied the everyday use of the term common sense but a much specific knowledge. They referred to it as the knowledge they had learnt through years of practice on site. Our earlier proposal of the definition of site sense thus better captures the uniqueness of the tacit knowledge often referred to as common sense.

Due to the nature of the small sized groups, there was a great deal of closeness amongst workers. All workers mentioned that it allows them to know what others know (in terms of competence) and allowing them to trust one another better. This is reflected in how new members are trained or taught. Experienced workers mentor the newcomers by allowing them to work closely with them for long periods of time. Gerardi and Nicolini (2002) explain that tacit knowledge is best taught and learnt when experienced workers demonstrate the act and subsequently allow the newcomers to practice the given technique. Likewise, pit sense is not acquired through formal training but is disseminated in situ, experientially, informally, through close social

interaction and use of language, and based on the very unambiguous norm of safety (Kamoche and Maguire 2011, 726-727).

Prerequisites for site safety: Legality and practicality

By law, all workers in construction have to possess Construction Skills Certification Scheme (CSCS) cards before being allowed to work on site. The CSCS card is an indication that the bearer has received training and skill including safety training and hence is competent enough to work on site. All workers (including the newer ones) on the visited sites possessed CSCS cards. However, experienced workers believed this scheme was not a helpful approach. They believed the newcomers had the CSCS cards but lacked site sense. John, Tom and Tony all disagreed with the scheme because they were of the opinion that the workers came on site with preconceived notions of what safety was meant to be and this basically interfered with their learning of good safety practices. Furthermore they believed that a classroom based test such the CSCS, National Vocational Qualifications (NVQs) and Scottish Vocational Qualifications (SVQs) were not representational of real site experiences. Such tests are however good for assessing explicit knowledge but research indicates that construction sites require more of tacit knowledge (Abdel-Wahab *et al.*, 2008; Aboagye-Nimo *et al.*, 2015). The efficiency of the NVQs and SQVs are also questioned in other industries.

Personal responsibility and autonomy

Participants believe that workers should have some form of responsibility for their own actions. They believed that newer workers were not capable of taking up such responsibilities and hence needed to be guided. On this issue of workers taking responsibility of their own safety, participants stated: "*Young people are one of the biggest issues for me*" (John). He explained that young people (specifically newcomers to the construction sites) did not have a complete understanding of the implications of their actions and inactions. Therefore they do not approach or handle risks and hazards with the same seriousness that experienced workers would. This attitude can lead to incidents and accidents to themselves or workmates. Andy also expressed concern about the lack of safety awareness that some newer workers exhibited. '*Horseplay*' and '*use of mobile phones*' while working were serious matters that created distress for experienced workers with regard to safety. They share John's views. The experienced workers also added that there is a need to shelter and protect new workers who have not yet gained site sense from potentially risky situations. Therefore these experienced workers believe it is their responsibility to ensure the safety of the newer workers.

Kamoche and Maguire (2011) explain that the idea of responsibility has evolved to be shared between workers and managers in the pits. Similarly on construction sites responsibility has evolved to be shared between all workers on site i.e. site operatives, foremen, site managers and other site officers. Also, once managers in pits are comfortable with workers' practices, they allow them to use their own discretion even if it means turning a blind eye to some of their practices (ibid). While mining companies may be owned by large companies, micro construction firms are different. In micro firms (including specialist subcontractors), the managers/owners tend to be part of the working teams on site and key to decision-making (Huang and Hinze, 2006); this was also observed on all sites visited in this study. Noticeably, none of the newer workers on site (with less than five years of site experience) mentioned or implied using common sense/site sense. Although experienced workers rely on site

sense to take care of themselves and other workers, their concept of working outside official policies may not be accepted in the workplace. According to the participants, it is difficult to use site sense as justification in an argument in court because of the lack of records or documentation on such practices. Tom and Phil expressed concerns about the consequences of using site sense and other informal practices that are not documented because they believed that: “*common sense doesn't hold in court*”.

Accepting site sense safety as a valid approach

Unlike the mining industry, construction sites are geographically spread across the UK and the industry employs more than 6% of the entire British workforce (Rhodes 2013, 3). In addition, stakeholders in construction are very different from those of mining, such as employees, passers-by, policymakers and private clients. The Health and Safety at Work etc. Act 1974 makes it the duty of employers to ensure the safety of employees and the general public, but the mining industry may not have to encounter the general public as much as the construction industry. For example, the Construction Design and Management Regulations (2015) place a great deal of responsibility on all stakeholders including clients who may not have any expertise in construction processes and site safety for that matter. The HSE acknowledges that many clients do not have safety knowledge or site sense and offer guidance to clients lacking knowledge in site safety. Unlike the construction industry, mining has always been regarded as a specialised job that requires expert skillset (Harris, 1976; Czaja, 2014). However, due to the many facets of construction projects and the introduction of 'do-it-yourself' (DIY) projects, many non-experts consider themselves as having construction knowledge (Ball, 2014) although they may not possess any site sense. This in addition to health and safety being ridiculed in the media (Löfstedt, 2011) has potentially eroded the level of expertise associated with construction works.

Although construction workers use common sense to mean a more sophisticated level of knowledge that is tacit, situational and unique to years of practice on site, the name makes it difficult for a newcomer or non-construction professionals to accept it in this manner i.e. it is easily confused with the everyday definition of the term.

Interpretation of the term (by non-construction experts) ends up reducing its significance and uniqueness to the industry. Site sense is representative of the situatedness and tacit nature of safety knowledge on site. The term pit sense is unique to pit mines and as such cannot be confused with any phrases found in everyday language. As a result, the introduction of site sense can radically transform public perception of the knowledge learnt on site, thereby giving it the recognition it deserves i.e. a unique safety knowledge acquired from years of site practice.

CONCLUSIONS

This study has introduced site sense and discussed it in relation to pit sense as practices based primarily on tacit and situated knowledge acquired through years of work experience. Primary data was collected from micro construction firms within two regions of the UK. The data confirmed that a significant amount of tacit knowledge is used in managing risks and safety on site. Similarly, pit sense in the mining industry is based on tacit knowledge but over time has been blended with more formal practices. We propose that 'site sense' offers a representative conceptual label for a blended approach to safety knowledge on construction sites. Furthermore, the new terminology open up possibilities for transforming public perception of safety knowledge gained on site because it will be perceived as a specialist knowledge that is gained from a specific industry. Moreover, 'site sense' offers policymakers a less

ambiguous interpretation of the place of tacit knowledge in site safety. The aspects of site sense that are not currently covered by existing rules and regulations can be recognised and incorporated into working practices and so organisations stand to attain the best of both worlds: explicit and tacit knowledge being implemented together. Thus site sense can be included in both onsite and offsite safety training for newer and even experienced workers thereby capturing explicit and tacit approaches in site safety.

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