

# THE USE OF EXPERIENCE AND SITUATED KNOWLEDGE IN ENSURING SAFETY AMONG WORKERS OF SMALL CONSTRUCTION FIRMS

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Techniques used by small construction firms with regards to site safety have been found to differ considerably from those of large construction firms. Workers of small construction firms adopt a 'common sense' approach and eliminate procedures that the workers deem bureaucratic rather than practical. This paper is based on a PhD research project which aims to critically investigate 'good' health and safety practices undertaken by workers of small construction firms and in particular explores the informal ways of managing health and safety. The East Midlands region of the UK was chosen for the study of good practice due to a steady decline in accidents and injuries over the past decade. The research is being conducted with a qualitative approach to gain rich data on site practices and workers perceptions. The findings of a pilot study suggest that workers of the small firms use situated knowledge and experience when dealing with health and safety matters. Experienced workers tend to quickly and informally assess potential risks and subsequently manage their work environment so as to prevent injuries or accidents from happening in collaboration with their co-workers. Specific good practices emerging from the research include verbal and non-verbal communication such as gestures with eyes and hands, vital on-the-job training for new workers and insightful guidance by the leaders in order to attain safe work environments. The aim of this project is to create a foundation for further research into the good practices of small construction firms as the area is currently understudied. Much of the literature in the field focuses on problems and issues with health and safety rather than good practice.

Keywords: accident prevention, tacit knowledge, common sense, small firms.

## INTRODUCTION

Construction sites are some of the most dangerous workplaces (Conchie and Burns, 2009). Large and small construction firms implement different approaches to accident prevention and building good safety environment on site (Gillen *et al.* 2004: 235).

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Dissimilarities between organisations stem from differences in management style, training, risk management, site arrangements and use of safety equipment (ibid). In the UK, 92% of the construction workforce is employed by small firms (Edwards, 2011). As they represent such a large proportion of the industry, their safety practices are constantly under scrutiny by policy makers and researchers (Loosemore and Andonakis, 2007). It has been found that the owners of small firms (who usually work as site operatives as well) have a considerable amount of influence on the overall culture of the firm: if the owner is very conscious about good health and safety practices, other workers in the firm tend to work likewise (Hinze, 2004). Trust and supportive environment amongst workers have also been found helpful in developing safety culture as workers believe they can rely on their colleagues during risky situations and this demonstrates that workers have genuine concern for each other's safety (Conchie and Burns, 2009; Mohamed, 2002).

This paper is based on a PhD project which focuses on the 'good' practices of small construction firms in the East Midlands region of the UK (see Aboagye-Nimo *et al.* 2011). This geographical area was chosen as a focal point of research because of a reduction in accidents and injuries over the last decade. Indeed, this unexpected decline in reported accidents and injuries sparked the interest in the project late 2009.

The Health and Safety Executives' (HSE) records (excerpts of records in Table 1) show the steady decline in accidents from 2001 to 2010. Most importantly, the figures reveal that smaller injuries that kept workers out of work for more than three days (+3 day injuries) have reduced from 10904 to 8049 over the nine year period. This is - 2855 point difference, despite a temporary surge 2002/3-2003/4. However, figures for major injuries and fatal injuries have gone down too (-97 and -14 points respectively).

*Table 1: HSE records on workplace accidents in the East Midlands (HSE, 2011)*

	2001/2	2002/3	2003/4	2005/6	2006/7	2007/8	2009/10
Fatal injuries	23	17	17	11	12	8	9
Major injuries	2175	2153	2488	2293	2295	2238	2078
+3 day injuries	10904	11110	11047	10092	9683	9194	8049

While some may attribute this reduction in injuries to the fall in economic activity, a close look at construction output in the region suggests that this is not the case (see Table 2 below).

*Table 2: Construction output trends in the East Midlands (Construction Skills, 2010)*

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
%change	10	17	26	12.2	24.3	-7.1	-10.9	-27.1	-9.3	15.5

Construction industry in the East Midlands experienced its' lowest level of output during the peak of the global financial crisis in 2008 (-27.1% percentage point change). 2009-2010 indicate recovery to almost as high a figure as shown for 2002 when the economy was known to be more stable. For the same period (2008/9-2009/10), Table 1 shows a notable decline in both smaller injuries that kept workers out of work for more than three days (+3 day injuries) and major injuries - only small increase in fatal injuries is noted.

This paper discusses the use of situated knowledge in achieving good health and safety practices in order to prevent accidents on sites. It begins with a literature review on knowledge management in small construction firms, with a specific focus on tacit

knowledge and common sense approach to safety. This is followed by a section on research methods and an in-depth discussion on the research findings and conclusion.

## **KNOWLEDGE MANAGEMENT**

Knowledge is a known source of organisational advantage in projects and this has led to a great deal of interest in how organisations create, transfer and apply knowledge (Sole and Edmondson 2002: S17). The characteristics of organisational knowledge can be summarized as follows: (i) it is situated in the system of ongoing practices, (ii) it is relational and mediated by artefacts, (iii) it is always rooted in a context of interaction and it is acquired through some form of participation in a community of practice, and (iv) it is continually reproduced and negotiated, and hence it is always dynamic and provisional (Gherardi and Nicolini 2000: 330). This indicates that knowledge is contextual and hence the importance of the situation and actors involved in its management cannot be overlooked. Organizational knowledge can be viewed as a form of distributed social expertise in the sense that the knowledge-in-practice is situated in the historical, socio-material and cultural context in which it occurs (Tsoukas, 2003; Sole and Edmondson, 2002).

There are two types of knowledge: explicit and tacit knowledge (Polanyi 2009: 23). Explicit knowledge can be articulated and recorded. Tacit knowledge cannot be operationalized in this manner - it is displayed or manifested in what people do (Tsoukas 2003: 1). Workers of small firms use many forms of tacit (and explicit) local knowledge. Technical know-how, working practices and the values of workers contribute to site safety. Less experienced workers have to acquire such knowledge via training, work experience and leadership. Teaching of safety techniques (explicit knowledge) can be done on the job through demonstration and practice and in the classroom (Ngowi 1997: 289). The former has been found to be more effective (Laukkanen 1999: 60), as learning events can incorporate both explicit and tacit knowledge. When workers observe relevant instances and commit them to memory and subsequently compare them to other situations, they draw their own conclusions and this influences future performances hence creating a more effective learning experience (Gherardi and Nicolini 2002: 193). This lends support to encouraging multiple modes of knowledge conversion (as noted above after Little *et al.* 2002).

With regard to knowledge transfer (from person to person), the essential instrument of mediation is communication (Ciborra and Lanzara, 1990). On construction sites, communication takes different forms including verbal, paraverbal, non-verbal and/or actions (Bust *et al.* 2008: 586). That is, what is said; how it is said; non-verbal body language and the way things are done.

### **‘Common sense’ in construction safety**

Common sense approach to safety on site has been employed by workers of small construction firms for quite some time (Vassie *et al.* 2000: 36). However, recently, common sense and safety have been connected in higher level (political) discussions about health and safety too, as impractical bureaucratic requirements have been found to be taking over the safety measures which actually prevent accidents (Lord Young of Graffham 2010; Davis, 2009). Since the commissioning of Lord Young’s ‘Common Sense Common Safety’ report in 2010, researchers, policy makers and industry practitioners have been compelled to rethink their views on the state of safety issues in the UK. The Lofstedt report 2011 recommends that many HSE regulations need reconsideration - health and safety systems will be ineffective if businesses

continue to over-comply with health and safety regulation due to fear of civil litigation (Department for Work and Pensions, 2011).

But conceptually common sense in safety lacks clear definition. Common sense in everyday language is defined as “the basic level of practical knowledge and judgement that we all need to help us live in a reasonable and safe way” (Cambridge Advanced Learner’s Dictionary, 2008: 278). Application of this definition to health and safety on a construction site is problematic. Practical knowledge and judgement on site requires complex interaction of 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 us (Gherardi and Nicolini 2002: 192). People without extensive situated knowledge may stand right next to danger and not notice it (Baart 2009: 953). Situated knowledge is knowledge specific to a particular situation (Sole and Edmondson, 2002). What is ‘reasonable’ must be shared knowledge (whether explicit or tacit) among the workers on site so that they can create and maintain earlier-mentioned trust and supportive work environment.

In summary, we have discussed tacit knowledge and common sense as two emergent themes in contemporary literature on construction safety but little is known about the good practices that use tacit knowledge to ensure workers' safety. As part of improving safety practices in the construction industry, this research seeks to identify and encourage good practices of small construction firms that incorporate the use of tacit knowledge. The research methods adopted for the empirical investigation follows.

## **RESEARCH METHODS**

This research sought to acquire rich data in order to explore the use of situated knowledge in accident prevention in-depth. Our interests were not in measuring the overall health and safety performance of the sites visited, but rather, to gather qualitative insights into the views and behaviours of the workers and specific practices they employ in order to manage health and safety. Collection of rich data requires direct contact with operatives on site (Pink *et al.* 2010). Hence, within an overall interpretivist ideology, semi-structured interviews and non-participant observations were used to collect qualitative data. These methods allowed for the study of the research participants in their natural work situations (Saunders *et al.* 2007: 600) and gave a voice to the workers of small construction firms with respect to their good practices.

The PhD research is based on a case study of five construction sites. This paper presents the findings of a pilot study; case study 1 conducted on a University campus in the East Midlands over summer 2011. The interviewees included the site manager and three of his site operatives. Areas covered in the interview included accident prevention, knowledge management, risk management, individual perceptions and supportive environments. Collection of the interview data was done with the aid of a digital audio recorder with interviewees’ consent. The researcher transcribed the interviews verbatim. The non-participant observation was carried out on site with great care and aim for minimal researcher influence, with the site manager’s consent on behalf of the site operatives. This method sought to reveal hidden or unconscious practices (e.g. different forms of communication) that may not have been discovered during the interviews. Field notes were compiled after site visits via thorough recollection of the day’s accounts.

A thematic analysis was used to give the researcher a bird's eye view on emerging patterns in the data (see Aronson, 1994). In addition, a thorough thematic coding of the information (transcribed interview data and field notes from observations) was carried out with the assistance of QSR NVivo 9. This qualitative data analysis software eased the storage and organisation of data (i.e. interview transcripts, observation notes, personal comments, relevant literature and personal reflections), helped facilitate the coding process and helped the researcher draw out patterns and refine the research ideas, and hence assisted in efficient data retrieving and handling.

We develop critical discussion of the research findings in relation to the literature on tacit knowledge and common sense below.

## **THE PILOT STUDY - FINDINGS AND DISCUSSION**

### **The project, the workers and work environment on site**

As alluded to above, the site for the pilot study was located within a University in the East Midlands. The project included the renovation of a foyer, student union offices, a bar area and an entertainment hall together with the construction of a new beer garden. There were 15 craftsmen on site, including carpenters, bricklayers, electricians, plumbers and labourers. Four workers were interviewed on the site: the site manager, John; skilled labourer, Rick; and two general labourers, Mark and Ben. The interviewees had been working in the construction industry for 14, 30, 20 and 1 years respectively and had different levels of work experience. Age-range of the workers spanned from early 20s to late 50s. The workers wore casual clothing (e.g. jeans/trousers and t-shirts) and similar high-visibility vests. A sense of 'comradeship' was recognisable in their conversations and interactions with each other as they were observed waiting for a concrete truck to offload materials.

The interviewees mentioned that they currently work or had previously worked with many different workers on sites as a result of project requirements. John who was in charge of bringing in subcontractors explained that he hired firms or workers on the basis of their pricing and/or expertise in a specific area (pointing out some electricians on site who he hired on the basis of price). John explained that his team had a site orientation programme that has been designed to work for everybody and this arrangement was also supported by an open discussion about what could be done to help any newcomers. He clarifies that:

"You need to be able to do your own job as well as working with other people with your health and safety in place".

This echoes the importance of supportive working environment discussed in the literature (after Conchie and Burns, 2009; Mohamed, 2002) but also 'fitting in' safe working practices with the demands of the operational schedule. As the 'need to be able to do your job' is prioritised in the quote, it is indicative of functional/ pragmatic line, which could also reflect notions of common sense. There is an implied emphasis on workable solutions for 'health and safety in place' that allow for 'the job' and 'working with other people' to flourish in the foreground.

Rick, the skilled labourer, with 30 years of experience in the construction industry and having moved around numerous different sites, explained that through his years of working he had learnt the valuable lesson that once you arrived on a new site, it is advisable to familiarize yourself with the workers on site in order to receive support and prevent accidents. Ben supported Rick's statement by adding that he and his co-workers do their best to help other workers that come to work with them. It could be

sensed that the interviewees make genuine efforts to help workmates on site. An observation confirmed this when one of the electricians (new on the site) received help from one of the workers in moving scaffold to a desired location with ‘a simple head nod’. These instances in the data support Mohamed’s (2002) concept that workers showing genuine concern for each other’s well-being improves the ties between workmates and this leads to a better safety culture. There is also an indication of ‘communication by action’ (after Bust *et al.* 2008: 586) in how the nod of the head results in useful and preventative action by the workers. This form of communication relies on the workers’ awareness of what is going-on on site and ability to read cues in their fellow workers behaviour to produce collaborative action. It is based on tacit knowledge, which out of situation would be worth little, yet here is very valuable indeed.

Contrary to the shared view of his workmates, Mark, a general labourer who boasted of years of work with a multi-national construction firm, said he would rather work to the standards of other workers he was working with if it meant getting the job done. This supports the above-mentioned prioritising of the ‘job completion’ as the primary goal, but alarmingly, is also indicative of flexing health and safety standards where the situation may allow this. Beyond this reference to getting the job done, the interview with Mark as a whole suggested that he was not fully committed to his current team on site, as he constantly talked about the time he used to work with a large firm on large construction sites. Notions of trust and supportive work environment did not register with Mark in the way that Conchie and Burns (2009) and others argue that small construction firm workers believe in team work and feel they can rely on each other in risky situations instead of working alone.

### **Tacit and explicit knowledge**

As much as respondents said they saw some importance in training in a classroom based setting, they all insisted that the process could not be compared to training received from the job and what could be learnt through experience. Some of the key statements made by the respondents with respect to on-the-job training included:

*“Experience told you they’re not safe. Somebody new on site might not see them... It’s like driving a car. You can’t sit in a classroom until you get into a car.”* (Rick)

*“I don’t think you can replicate anything in the classroom that happens on site. I think you can only be made aware of risks in the classroom.”* (John)

*“Yeah, [Construction Training] is hands on.”* (Mark)

*“...onsite training because when you get into it, you know what you’ve done wrong... you don’t get the experience [in the classroom] they just give you answers.”* (Ben)

All the above statements suggest that only the basics can be explained or taught in the conventional way. Clearly, it is tacit knowledge that helps develop competent and safety aware workers.

In contrast to this emphasis on tacit knowledge, John, the site manager, described one recent industry initiative in terms of the Construction Skills Certification Scheme (CSCS): each operative on a construction site is required to hold a CSCS card, which is obtained through a classroom based test. John was concerned that this type of practice was rather creating situations of risk as new workers on site potentially only hold the [explicit] knowledge delivered through the formal training and assessment system. He mentioned that obtaining the certificate was very easy. He had passed his

test in around four minutes and noted that this was not because he was smart but because the questions were “*ridiculously easy*”. It may be that the test was easy for him given his valuable site experience during which he would have acquired both explicit and tacit knowledge through practice.

Ben also reflected on this issue and noted that even though he had his CSCS card before getting on site one year ago, his knowledge had grown considerably through experience at work. He is now more aware of his surroundings and what could go wrong as well as how to prevent situations from going wrong. Clearly, he has acquired tacit knowledge since joining the experienced workers on site. He also added that he has now learnt the personal protective equipment (PPE) required for specific activities. The latter specifically depicts his improvement in situated knowledge as he is now able to assess situations and determine how to protect himself against potential dangers.

A setting for explicit knowledge versus tacit knowledge is evident. John points out that explicit knowledge can be used to pass the CSCS test and thus gain access to working on site but that this will not be sufficient in practice in order to prevent accidents. Rick, Mark and Ben seem supportive of John’s stance highlighting the importance tacit knowledge in learning safe work practices.

#### **Knowledge transfer: verbal and action-based communication**

Verbal communication is regarded by the interviewees as the most effective means of getting one’s point across while on site. John, the site manager, stated:

“I think verbal [communication] is the most important thing through the job”.

However, Mark, one of the general labourers, expressed a preference for more posters on site, to serve as reminders. Here again, as with regards to the supportive work environment above, he referred to his time with the multi-national organisation, noting that they used to have many more posters than the small site where he was interviewed. This lends support for our earlier deduction that he is not fully integrated into the life of a small construction site.

Rick, the skilled labourer, explained that if people are to see something going wrong, the best thing is to do whatever it takes to warn the other person including shouting from the top of a scaffold. He reflected on the this type of support in terms of ‘looking out for one another’; he needs to warn his colleagues as he could be faced with a similar situation one day and would expect a colleague to help him out. Also, Rick stated that on a small site workers got to know each other well, unlike on large sites where workers may operate in different parts of the site day to day and hence not know each other personally. The ability to communicate amongst the team on the basis of their established relationship was valued greatly. Mohamed’s (2002) idea of workers relying on each other to prevent unwanted incidents is again confirmed.

Two site observations were made with regards to non-verbal communication: one occurred when two workers, Bob and Derek, were carrying a movable scaffold and approaching a cable which presented a potential trip hazard. Bob was in clear view of the cable and he looked down to the cable and then looked back up at Derek. Derek then automatically followed Bob’s line of sight and noticed the cable and hence was able to avoid it. The other site event related to workers pouring concrete from wheelbarrows. They knew exactly when to pour the concrete the moment the workers casting the concrete in place lifted their head up to them. This collaboration was observed for about an hour and no miscommunication or safety compromise occurred.

These observations show that even though workers continuously talked about verbal communication, body language and actions also play an important role in communicating effectively in difficult situations whereby verbal communication may be restrained for example because of noisy environments (Bust *et al.* 2008). They present good examples of ‘tacit knowledge in practice’ the workers put to use on site; good practices they may not be consciously aware of and hence would not think to discuss in interviews without a probe. Clearly this type of action-based collaboration is very important in accident prevention but easily remains hidden due to ‘common sense’-ness of the practice.

### **Common sense**

As discussed in the literature section, common sense as a concept is somewhat problematic in the context of accident prevention on construction sites. Firstly, it lacks definition, and, as it is based on tacit knowledge people are likely to interpret it differently. This was evident in the interviews and site observations in that some workers referred to it in terms of ‘you should know it’ -type of information and basic site rules and practices as common sense, where others believed that it was more concerned with intuitive and personal input.

For John, the site manager, common sense refers to a worker’s ability to employ PPE and other forms of protection when working as situations change and new potential hazards emerge. The following example helps illuminate this:

As part of the formal site risk assessment, steel toe cap boots were found inadequate for the current site because the project required nails and hence a worker could step on a nail and get injured. Although it is beyond the HSE’s PPE requirements, and an added expense to the workers, the labourers and craftsmen on site agreed to wear steel mid sole boots as opposed to the steel cap toe boots as a preventative technique. The ease in which the agreement was reached was facilitated by the workers’ common sense about the work environment on a construction site; namely the falling of spare nails during work.

Rick, the skilled labourer, used the term common sense with reference to learnt knowledge about safety practices, referring to a situation where scaffold may be missing railings. All workers operating on a scaffold are given explicit knowledge about the nature and structure that particular scaffold should look like. But rather than connecting with learnt experience, or inspection of explicit knowledge, Rick stated that “[a worker] automatically knows something is not safe.” However, consider a situation with a scaffold structure where only few but crucial safety railings are missing together with a newcomer on site. The missing safety railing may prove undetectable for the newcomer or be associated with the design of the scaffold, especially if the equipment comes from a supplier with signed documentation which states all safety checks had been carried out. To Rick such an error in judgement would be incomprehensible, but he was unable to explain why or how the ‘automatically’ works. As external and independent researchers, we are in the position to deduce that his 30 years of experience on site had led him build this valuable ‘common sense’.

Interestingly, Ben, the worker with the least experience amongst the interviewees (only 1 year) did not refer to common sense during the interview. He did talk about continuous learning with regards to safe practices and acquiring new knowledge. This can be attributed to the fact that he had not yet internalised the safety culture on site, or moved to transfer of explicit to tacit knowledge as suggested by Little *et al.* (2002).

To him, many practices were still conscious processes rather than ‘obvious’ or ‘automatic’ as described by the workers with extensive experience above.

## **CONCLUSION**

We have discussed tacit knowledge and common sense in accident prevention on a small construction site in the East Midlands. The key findings support literature in that interpersonal relationships play a significant role in creating safety aware culture on small sites, aiding workers’ understanding of each other and building supportive work environment. Curiously, one worker with extensive previous experience from larger sites operated by a multi-national construction firm, expressed much less commitment towards such personable and collaborative approach. This strengthens our curiosity about the differences in the ways in which small and large sites operate; hence the later stages of the research project will investigate this in more detail.

The findings also suggest that workers of the small firms use situated knowledge and experience when dealing with health and safety matters. The respondents viewed initiatives based on explicit data, such as the CSCS card, critically. Experienced workers tend to quickly and informally assess potential risks and subsequently manage their work environment so as to prevent injuries or accidents from happening, in collaboration with their co-workers. Specific good practices emerging from the research include verbal and non-verbal communication such as gestures with eyes and hands, on-the-job training and insightful guidance by the leaders in order to attain safe work environments. Much of this relies on to tacit knowledge.

The qualitative research methods employed for the pilot proved useful in uncovering this tacit knowledge. The observations in particular revealed much useful information which the respondents did not think to report, as they considered it ‘common sense’. Four other case studies are currently being developed on this model toward final presentation of the PhD thesis.

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