Developing Project Skills for Managing Construction Safety: A Managerial Perspective

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Abstract

Previous studies have identified the types of skills and recommended a project skill development model for project personnel to manage construction safety. This paper aims to validate those findings using the perspectives of experienced industry practitioners to ensure the relevance and applicability of the findings in practice. In addition, this paper also seeks to find ways in which such skills can be developed to improve safety performance. Semi-structured interviews with eight construction practitioners including safety managers, project managers, site managers, and project engineers were conducted. Thematic analysis method was used to analyse the interview transcripts/contents in relation to the relationships among the research variables (i.e., skill components, safety management tasks, and safety climate development); the important skill components including their development and application process; as well as safety learning and knowledge/skill development processes. Types of safety training and how universities, through education and research, may contribute to construction safety improvement are also discussed. The research findings confirm the validity of the project skill development model, thus providing direction for construction organisations and project personnel to improve their skills. Furthermore, strategies towards improving the important skill components have also been suggested. However, there is a need to provide empirical evidence demonstrating the effectiveness of such strategies.

Keywords

Construction safety, learning and knowledge development, project personnel's skills, safety climate, safety management tasks, thematic analysis.

INTRODUCTION

In construction organisations safety should not only be the responsibility of safety personnel and the top management team; every staff member has to be involved in safety implementation and be accountable towards safety. At the project level, the role of project personnel in safety is to lead the implementation of safety management system. According to Dingsdag *et al*. (2006), there are 39 safety management tasks that project personnel should perform to provide this kind of safety leadership. By providing safety leadership through performing safety management tasks, project personnel are able to contribute to the development of safety climate, which will lead to eliminating/minimising unsafe behaviour and conditions (Sunindijo and Zou, 2009).

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It is important for project personnel to develop proper skills so that to perform the above mentioned roles and responsibilities. Zou and Sunindijo (2011, 2012) conducted a quantitative study using the structural equation modelling (SEM) method to identify the most important skills needed to implement safety management tasks and develop positive safety climate. Their final model is shown in Figures 1a and 1b. The model shows that self-awareness, visioning, and apparent sincerity are the foundation skills and are the precursors of the first tier mediator skills consisting of scoping and integration, and self-management. Thereafter, the second tier mediator skills are social awareness, social astuteness, and relationship management. All these skills support the implementation of safety management tasks and the development of positive safety climate.

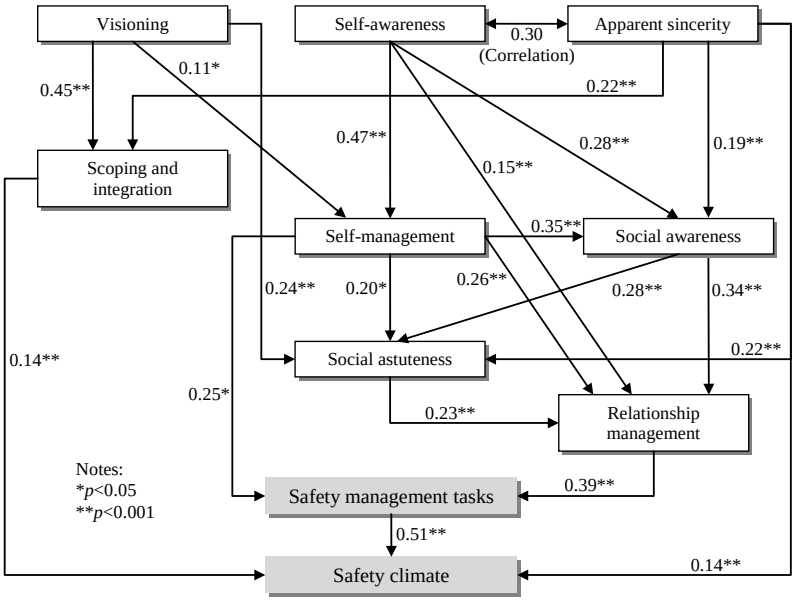

Figure 1a Relationship between safety skills, safety management task implementation, and safety climate development (Zou and Sunindijo, 2011; 2012)

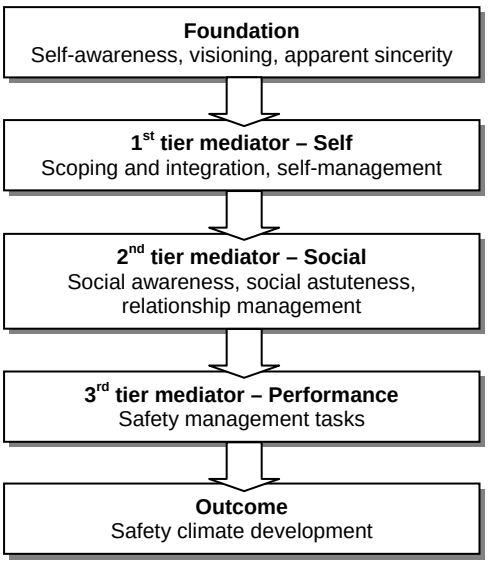

Figure 1b Project skill model for managing construction safety (Zou and Sunindijo, 2011; 2012)

This paper was built upon this previous study by Zou and Sunindijo (2011, 2012). Qualitative research methodology was adopted to obtain insights from industry practitioners concerning the relevance and applicability of the model as shown Figures 1. The important skill components and their roles on construction safety management will also be discussed from the practitioners' perspectives. Finally, the research will explore the issue of safety learning and knowledge development which involves skill development strategies and discussion on how safety research may contribute to improve safety performance in the construction industry.

RESEARCH METHODS

Semi-structured interviews were used to collect qualitative data required by this research. This method is suitable for this research which aims to obtain interpretations and perspectives held by experienced practitioners in the construction industry concerning the skill development model derived from the quantitative analysis performed in the earlier research by Zou and Sunindijo (2011, 2012). Eight construction practitioners have participated and these interview participants, as listed in Table 1, are one national HSE (Health, Safety and Environment) manager, one construction manager, one project manager, one site manager, one safety manager, one commercial manager, one project engineer, and one commissioning engineer. This variety of positions is advantageous for

the research because it enables the proposed relationships to be verified by industry practitioners from different management functions, hence providing a managerial perspective. Furthermore, the interview participants had average of 21.8 years of experience in the construction industry, thus ensuring that they had sufficient experience of safety issues across different contexts.

Table 1. Profiles of the interview participants

Code	Position	Gender	Age	Education	Experience (year)
CAM-01	Commercial administration manager	M	50-54	Bachelor	37
PM-02	Project manager	M	45-49	Bachelor	24
HSEM-03	Branch EHS manager	M	45-49	Diploma	28
PE-04	Project engineer	M	25-29	Bachelor	5.5
CM-05	Construction manager	M	35-39	Bachelor	19
CE-06	Commissioning engineer	M	>55	Diploma	36
SM-07	Site manager	M	40-44	High school	15
HSEM-08	National HSE manager	M	40-44	Diploma	10
		Average years of experience =			**21.8**

Prior to the interviews, relevant information and materials were sent to the interviewees by emails. The interviews were conducted either face to face or by phone, and audio recorded, transcribed, and analysed using the principles of thematic analysis. Thematic analysis is a process for encoding qualitative information (Boyatzis, 1998). It is a method for identifying, analysing, and reporting patterns or themes within data (Braun and Victoria, 2006). A theme is a pattern found in the data that at minimum describes and organises the possible observations and at maximum interprets aspects of the phenomenon. A theme may be identified at the manifest level, which is directly observable in the data, or at the latent level, which underlies the phenomenon (Boyatzis, 1998). Constructivism philosophical assumption was adopted in performing the thematic analysis by using the principle of grounded theory to generate a useful theory of the phenomenon that is grounded in the data. This kind of social constructivism is concerned with knowledge development through the social involvement of agents within a social context (Tuckett, 2005). However, it cannot be claimed as a ‘full-blown’ grounded theory because the analysis did not fully subscribe to the theoretical commitments.

The thematic analysis was performed based on the six stages proposed by Braun and Victoria (2006). The detailed thematic analysis process performed is as follows:

1. The first stage is data familiarisation where all interviews were transcribed and reread for accuracy and data immersion. During the rereading process, notes and ideas were jotted down inductively.
2. In the second stage, initial codes from the data were generated and matched with the data extracts, which resulted in the identification of 51 codes.
3. Stage three involved sorting the codes into potential themes, which resulted in the identification of four themes. Relationships between themes and subthemes were also considered in this stage.
4. In stage four, the themes were reviewed and refined to ensure that data within themes cohere together meaningfully and that there are clear distinctions between themes. During the stage, some themes were discarded, some collapsed into each other, whilst others were broken down into separate themes or subthemes. Two themes and nine subthemes were identified in this stage.
5. Stage five is defining and naming the themes by identifying the essence of each theme and determining what aspect of the data that each theme captures. The story that each theme tells has to fit into the broader overall story about the data in relation to the research objectives, which are to confirm the project skill model, discuss

relationships among the research variables, and find insights regarding strategies to develop the skills. The final overall thematic map of the data is presented in Figure 2. The first theme is the confirmation of the project skill model. The important skill components and their application or development process were also discussed from the perspectives of the interview participants. The second theme is safety learning, safety knowledge development, and safety research, which aims to seek insights on how to develop project personnel's skills to that improve safety performance in the construction industry.

6. The last stage of the thematic analysis is reporting to convince readers of the merit and validity of the analysis as given in the next section. This reporting does not only describe the data, but is embedded with analytic narratives and accompanied with arguments related to the research objectives.

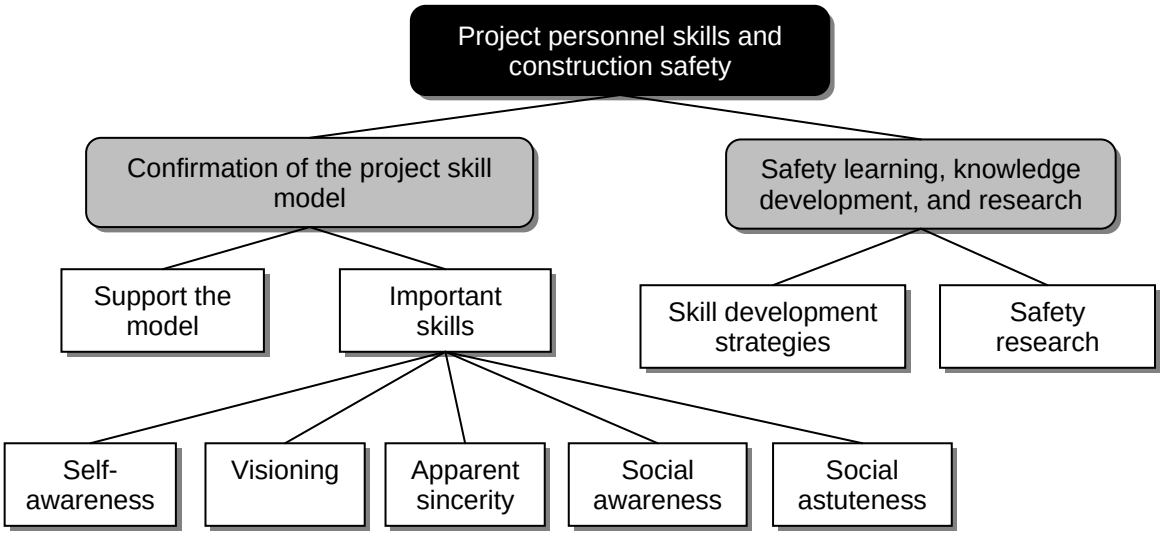

Figure 2. The thematic map derived from thematic analysis, showing two themes and their subthemes

THEME 1: CONFIRMATION OF THE PROJECT SKILL MODEL

OPINIONS OF INTERVIEW PARTICIPANTS CONCERNING THE MODEL

The model by Zou and Sunindijo (2011, 2012) basically has answered the 'what' question by showing the skill components as well as the process to prioritise the skill component(s) development. All interview participants supported the logic shown in the model. It represents a development process and it may not be prudent to skip tiers without being competent in lower tiers (HSEM-08, CM-05). For example, project personnel need to have strong foundation skills to stand on and build the higher-tier skill components. Underdeveloped foundation skills may undermine the effectiveness of other skill components, particularly during pressure and emergency situations. The next question is that, based on the competence level of an employee, which skill components have to be developed first. It is a question of evaluating the skills of every employee, thus the organisation can tailor a specific training and development program which meets the need of the employee.

The question concerning how to develop the skill components is more difficult to answer. Developing technical skill can be considered as straightforward, but developing 'soft' skills, such as self-awareness and relationship management, is challenging. Existing literature has suggested approaches and strategies to develop these 'soft' skills.

Therefore, it is important to work systematically in providing empirical evidence to prove the effectiveness of the so-called approaches and strategies. Conceptual skill, such as visioning, and scoping and integration, which can be influenced by various factors including experience, analytical ability, personal values, and other external factors, offers even bigger difficulties in its development process. Katz (1974) suggested coaching, job rotation, and giving special assignments involving interdepartmental problems as methods to develop conceptual skill. However, their effectiveness may not have been sufficiently proven due to the limited attention given to conceptual skill, particularly in the construction industry. It appears that these methods may be superficial as they fundamentally only introduce certain tasks and ways to perform the tasks based on existing practices in the organisation, i.e., focus on behaviour. It does not consider, for example, the internal values and characters or personality of the person who undertakes the training.

IMPORTANT SKILLS FOR PROJECT PERSONNEL TO MANAGE AND LEAD SAFETY

The interview participants also offered their insights on the skill components that are considered important to managing construction safety. Self-awareness, visioning, and apparent sincerity were seen as the foundation skills, which provide the necessary structure for the next tiers. Self-awareness is important because when people are aware of their values, strengths, and weaknesses, it will affect the way they manage themselves which will also be reflected on their actions. These actions, subsequently, will impact on the quality of relationships they build with others, which eventually determine their leadership effectiveness (HSEM-03, CM-05). Previous studies also found that self-awareness is the core and starting point of self-management, relationship management, and effective leadership (Goleman, 2001; Mersino, 2007).

Visioning, as the second foundation skill, is essential because it is closely related to goal setting, both personal and organisational goals. In the context of this research, safety should be part of the overall vision in which “zero harm and injury/incident free” is one of the key project objectives (PM-02). Maxwell (1993) considered visioning or foresight as the indispensible quality of leadership. A vision is the energy that pushes through all difficulties. It unites and induces people to sacrifice for accomplishing the goal. A maxim which says ‘what you see is what you get’ cannot be any truer in relation to this concept of visioning (HSEM-03, CM-05, HSEM-08). Another important consideration about visioning is that the goals must be achievable and clearly expressed (CE-06). This is the basis to motivate and inspire people by providing meaning and challenge to their work (Hannagan, 2002). The interviewees (PE-04, HSEM-08) emphasised the importance of clear goals and expectations in managing safety. It is important to realise that safety is a process, which will not happen overnight. Therefore, the goals and expectations should align with the capability of the human resource and the organisation in general. The vision needs to be grounded on where the organisation is and on its strength (Hannagan, 2002). When a goal is beyond the capacity of the organisation, it would simply be nice words on a paper without any realisation in practice (CE-06).

As leaders, project personnel should not keep their vision to themselves, but also influence what is seen by others so that the vision also becomes what they are aspiring to achieve. In order to communicate this vision and make it to be a reality in the workplace, apparent sincerity, the third foundation skill, has an important role to play. When project personnel put safety as one of the priorities and do not want anyone to get hurt, they have to say it and mean it. The vision should be communicated until the sincerity is felt by others (PM-02, HSEM-03, CM-05, CE-06). Apparent sincerity is needed to communicate such vision effectively because project personnel need to cultivate trust first before influencing people to accept the vision (Maxwell, 1993). Eventually, the vision should become a governing principle or value in performing any work and activities, thus making safety as one of the priorities in the project. This is the first step in creating safety culture

that is embraced by everyone throughout the organisation. This result confirms the previous findings which suggested that leaders of complex organisations must have a strongly held vision, which they are able to communicate, and they should be able to convert their vision into reality (Hannagan, 2002).

Three interview participants (CAM-01, PM-02, SM-07) also pointed out the importance of understanding people to lead safety implementation, which is about the social awareness and social astuteness skills in this present research context. The multi-stakeholder characteristic of a construction project coupled with the diverse backgrounds of construction workforce make these skills crucial for project personnel to communicate effectively, build trust, and embed safety values in others. One interview participant (CAM-01) gave a simple but powerful example on how a simple question 'do you understand?' can cause miscommunication, which may lead to a bigger problem. In responding to this question, when people from a certain culture say 'yes', it means 'yes, they understand'. On the other hand, for people from another culture, they may say 'yes' because of politeness, whilst in reality they actually do not understand or only understand partially. In relation to this example, it is essential to remember that completing a project is about getting work done through others. Without the ability to understand people, it is difficult to relate to and get work done through them. Furthermore, the temporary nature of construction projects limits the luxury of gradually building long-term relationships with the team. Therefore, project personnel have to be able to quickly and accurately read and understand others to develop productive relationships and create a safe workplace.

THEME 2: SAFETY LEARNING, SAFETY KNOWLEDGE DEVELOPMENT AND SAFETY RESEARCH

The interview participants explained how their organisations provide safety training in implementing safety measures to maintain and improve safety performance. Initially, they train everyone to a minimum standard, for example, by using the Safety White Card Course, which has been mandated in Australia, requiring any person to complete the course before they start work on any construction activity. Passing this course, therefore, can be considered as a common denominator and an indication of basic safety competence in the Australian construction industry. Achieving this minimum requirement clearly is far from sufficient for construction organisations who aspire to uphold safety as one of their priorities. Consequently, they 'upgrade' their personnel safety knowledge by authorising safety induction, which typically explains various hazards that may be encountered at work. They also have a tool box talk at the start of the day to make people aware of particular activities that would happen in the project, along with the potential hazards, during that day. In addition, these organisations also have a supervision system to monitor and remind people to following safety procedures.

All these training and learning strategies are, of course, useful for safety knowledge development. However, it is important to remember that safety learning and knowledge development is a process which does not happen instantaneously. There is a danger that construction organisations may try to accelerate the rate of safety learning without realising it. Putting people in a room for five days to learn about safety and expect them to be experts, who would implement everything that they have learnt, is irrational. Therefore, it is important to determine the appropriate rate of learning to ensure its effectiveness by paying attention on different learning capacities of individuals (CM-05, CE-06, HSEM-08).

Learning is clearly necessary for construction practitioners, especially workers, to perform their work safely. This learning is fundamental for maintaining and improving safety performance in the construction industry. However, although organisational learning and knowledge management have been widely implemented, current practices seem to have

overlooked the problems and complexities of knowledge making and learning process (Styhre, 2006). In many cases, learning was seen as an acquisition of knowledge which can be accomplished through classroom instruction and training. This view of learning considers that knowledge can be easily transferred from one medium to the minds of learners (Gherardi and Nicolini, 2000; 2002).

However, the reality in a workplace is much more complex than this. Learning occurs via social interactions with peers and fellow professional groups. Individuals acquire new skills and knowledge by seeing, saying, showing, telling, and learning-by-using/doing instead of learning from the confinement of a classroom instruction (Styhre, 2006). Knowledge is integrated and distributed in everyday's activities, thus learning cannot take place if participation in those activities is not possible (Gherardi and Nicolini, 2002). Due to this reality, Wadick (2006) implied that construction practitioners, especially workers, do not consider safety regulations, training, and research as something beneficial for them. They believe that many safety rules do not address their real safety concerns, but an attempt by powerful bureaucrats to subdue their subjects. As a result, they resist the whole thing by doing as little as they can only to comply, a far cry from the 'best practice' that those regulations, training, and research try to achieve (Wadick, 2006).

LEARNING STRATEGIES

Most interview participants (CAM-01, PE-04, CM-05, SM-07, HSEM-08) voiced the need to have a kind of on-the-job training and informal training/learning for safety. On-the-job training, in either formal or informal setting, is flexible and relevant to what people do in the organisation. It should be planned and follow a logical progression of stages, which includes preparing the trainees by putting them at ease, finding out what they know, and inciting their interests; presenting the information by telling, showing, and questioning one point at a time to ensure that the trainees understand; providing the trainees with practice by having them perform the tasks, observing and correcting, and evaluating; and lastly following up regularly before reducing supervision gradually as performance improves. In the case of on-the-job training, the supervisor or manager who conducts the training must be able to teach and show the trainees what to do. However, this dependence on the supervisor or manager can become a major issue. When the trainers are inexperienced in training, have no time nor desire to do it, on-the-job training will not be effective. Incorrect information or bad habits from the trainers can also be transferred to the trainees, as pointed out by Mathis and Jackson (2011).

Informal training and learning, on the other hand, occurs through interactions and feedback among employees as a result of a learning need in the context of working. Much of what people know about their jobs they learn informally from asking questions and getting advice from peer employees and their supervisors, rather than from classroom-structured training programs. Informal training may involve group problem solving, job shadowing, coaching, or mentoring (Mathis and Jackson, 2011). As mentioned earlier, a great deal of learning occurs informally, through interactions with people and artefacts at work (Gherardi and Nicolini, 2002; Styhre, 2006), thus construction organisations should be able to harvest the advantages of informal learning by developing work environment that promotes such learning. Having argued the importance of informal training and learning, construction organisations should also make sure that the correct contents are being used and exchanged during the informal learning process. Bad habits, shortcuts, and ways to bypass regulations, for examples, are not learning experience that organisations want to nurture. Therefore, the correct learning culture has to be developed first and become the basis of such informal training.

It has to be considered that the focus of learning and development is the person (i.e. trainee or learner). Its aim is to enable an individual to develop his/her abilities and

strengths to the fullest extent and to find individual achievement. The active participation, encouragement, and guidance from the superior and organisation are certainly needed for development efforts to be fully productive. However, it is important to remember that no one can motivate a person towards self-development if the person has no desire to develop. Motivation must come from within, i.e. intrinsic. Drucker (2008) said that development is always self-development. For an organisation to assume responsibility for the development of a person/employee is idle boast. The responsibility rests with the individual, his abilities, and his efforts. From this motivation of self-development, a person will realise the need to develop others. It is in and through the efforts to develop others that people raise their demands on themselves. The best performers in any profession always look upon the people they have trained and developed as the proudest monument they can leave behind (Drucker, 2008). Similarly in this present research, project personnel must find motivation from within to develop themselves, otherwise no matter what strategies, approaches, and training that the organisation uses will not be effective.

SKILL DEVELOPMENT STRATEGIES

Many previous studies, though from different other fields, have suggested strategies to develop the important skills identified in this research, i.e., as self-awareness, visioning, apparent sincerity, social awareness, and social astuteness. For example, it is suggested that keeping an 'emotion journal' to look for emotion patterns by recording events that trigger strong emotions along with the physical sensations that accompany the emotions is helpful to see oneself more objectively and improve self-awareness (Bradberry and Greaves, 2009; Mersino, 2007). Action training is seen as a method to improve charismatic communication and apparent sincerity (Frese et al., 2003). Social awareness can be improved by paying attention and actively looking for emotional clues from facial expression; the pitch, rhythm, and tone of voices; and the feelings conveyed by the posture of someone's body (Caruso and Salovey, 2004). These methods and strategies should be applicable in the construction safety context.

However, it should be pointed out that not much empirical evidence has shown the effectiveness of the above mentioned strategies in practice. There is a need, therefore, to focus on contextualising these strategies, i.e. how, when, and where these strategies should be employed, and determining their effectiveness. The longitudinal impacts of such training strategies on various performance indicators, such as safety, employees' motivation, job satisfaction, and achievement of project or organisational objectives, could also be investigated. Furthermore, it is necessary to monitor how the newly developed skills are implemented in practice (if they are implemented in the first place). If there are more than one skill development strategies, then future research could compare the effectiveness of these strategies and find out how they may complement, or conflict to, one another, particularly those that are currently being used by project personnel in construction organisations.

It should be noted that "conventional research methods", i.e. questionnaire survey and interview, may not be adequate to collect the necessary data and validate the above mentioned future research. Observation and ethnography may be the more suitable methods to gain rich data which reflect what actually happens in practice. This aligns with the argument proposed indicating that learning occurs in practice through interactions with people and artefacts at work. An interview participant (EHSM-03) addressed the importance of observing and finding out real issues on construction sites. Future safety research should be implemented in the form of longitudinal action-research to track a live project so that to develop grounded theories and provide recommendations at the completion of the research. Therefore, instead of explaining the cognitive process and conceptual structure involved in safety implementation, research should investigate what

kind of social engagements provide a proper context for learning and improving safety (see for example Gherardi and Nicolini, 2002).

CONCLUSION

In this research, the thematic analysis technique drawing on the principles of grounded theory was used to analyse qualitative data collected through a semi-structure interview method. First, the project skill model developed by Zou and Sunindijo (2011, 2012) showing the skill development and application process was confirmed by all interview participants. Second, the question of how to develop the important skill components (including self-awareness, visioning, apparent sincerity, and understanding of people and their roles) was expounded by integrating interview findings and literature review. Third, the question of safety learning and knowledge development was discussed. It was argued that construction organisations, instead of viewing learning as simply a transfer of knowledge through classroom-setting training, should recognise the reality that safety learning occurs through interactions with people and the environment in formal or informal settings. Although no one can fully challenge the necessity of existing practice of classroom-setting training and learning process, construction organisations need to devise a new skill training and development method if they want to develop their human resource capacity into an extent where safety performance can be further improved. Strategies and approaches to develop important skill components have been identified in existing literature, however, empirical evidence showing the effectiveness of such strategies and approaches are lacking. Researchers in construction safety should consider, in their future research, which type of social engagements and interaction, in formal or informal settings, on-the-job site or off-site, may provide a proper context for learning and acquiring relevant knowledge and skills so that to improve safety performance in construction projects.

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