



Aligning the Sharp End and the Blunt End in Construction Projects: Planning and Execution for Safety as Case

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Purpose: The construction industry is one of the most hazardous work sectors in Norway, according to Statistics Norway. The purpose of this study was to study planning at various levels of construction projects, including the planning of lifting operations, to assess how safety can be optimised.

Methodology: This qualitative interview study was based on a thorough review of safety literature. Fifteen interviews were conducted with workers in the sharp and blunt end, i.e., close to or removed from hazard sources on construction projects. The participants in this study were skilled workers, construction supervisors, and managers.

Findings: The current study found that proactive planning is critical for safety. The current study also investigated the important crucial role of project management as an important factor for safety. It was also identified that project management is key in setting and maintaining safety in construction projects. However, this is dependent on communication and cooperation and alignment of the sharp end and the blunt end in projects.

Originality: The current study goes deep into construction projects and demonstrates the importance of a close link between planning and execution, and identifies prerequisites for good social interaction and thereby taking care of safety.

Introduction

In 2019, 246,000 workers were employed in the Norwegian construction industry, making it the second largest industry after oil and gas (Statistics of Norway, 2022). The industry is characterised by more deaths per year because of occupational injuries in relation to deaths in most other industries in Norway (Mostue et al., 2015). In 2020, there were 41 fatal accidents on worksites in Norway, eight of them in the construction industry, and it was, therefore, the second-deadliest occupation (Statistics of Norway, 2021). Further, 4.9 occupational accidents per 1000 workers were reported (Statistics of Norway, 2021). This means that the industry must comply with comprehensive regulations for safety, which include requirements for the coordination of HSE systems and cooperation in the workplace. The purpose of this qualitative study was to study planning at different levels in construction projects and in advance of lifting operations to assess how safety can best be taken care of in these projects and operations. The goal was to contribute knowledge about what is required to achieve good planning in the construction industry. Based on the findings in the current study, we give recommendations for how planning in the industry can be improved. The study was conducted by conducting interviews with people at the sharp and blunt end of the danger. Skilled workers, salaried

employees, and managers were included as interview persons in the current study. Construction is considered a dynamic industry with a complex structure in which many different tasks must be performed at the same time and in the same physical space. For this reason, various professionals with specialised expertise are needed for the projects. The question for this study is: How do planning and project management affect the safety of a construction project?

Theory Section

Snook (2000) has addressed the importance of aligning organisations in such ways that the execution of tasks is as they are planned or intended to be and to avoid "practical drift". Practical drift can be seen as the slow uncoupling of practice from the written procedure. Grote (2009) stated that dealing with uncertainty is at the core of every planning activity. Uncertainty and variation often interfere with formal planning approaches (Hamzeh, 2020). According to Bråten et al. (2012), lack of safety measures, short deadlines, and performing work under pressure can lead to poor planning in the construction industry and further have consequences for safety. This is supported by the research of Gravseth et al. (2006), who specifically pointed out time pressure as one of several risk factors that can affect the safety of building and construction projects. In the last decade, extensive health, environment, and safety work has been done to improve the situation in the industry (Bråten et al., 2012). Another challenge is identifying the risks and finding means to handle them (Pandit, Albert, Patil & Al-Bavati (2019). A study from the United Kingdom revealed that up to 33.5% of safety hazards may remain unrecognised in construction workplaces (Carter & Smith, 2006). If construction hazards are not recognised, the adoption of effective safety management might be hampered (Albert, Hallowell & Kleiner, 2014; Carter & Smith, 2006). This implies that risk in planning is important. In cases where the planning was not good enough, the reason was often that the professional groups involved had to wait for each other or ran out of time. There are characteristics of the construction industry that make safety work here more challenging than in many other industries (Nykamp et al., 2011). It has been argued that the construction industry should learn from the petroleum industry with respect to standardisation, barrier thinking, and knowledge-sharing (Edwin, Nilsen & Albrechtsen, 2021). Safety Management Systems are developed to help manage risk. However, they can also increase written artefacts (plans, risk assessments etc.) to enable work to happen by encouraging a belief that the risks have been managed - they might not when they have not (Hutchinson, Dekker & Rae, 2022). Bory (2012) stresses the importance of social interaction in applying safety methods. A better understanding of the differences in perceptions of safety climate across construction personnel may make appropriate safety interventions that align construction managers, supervisors, and workers (Marin, Lipscomb, Cifuentes & Punnett, 2019).

Building and construction are characterised by complex and dynamic activities. Furthermore, the construction industry is among the riskiest industries in Norway. In 2021 10 out of the total 39 killed in work-related accidents were from the construction industry (Statistics Norway, 2022). This is shown, among other things, in a report on occupational injury deaths from the Norwegian Labour Inspection Authority (Røv et al., 2010), describing construction as being among the four industries in which there are the most deaths because of occupational injuries in Norway. In the nine-year period from 2000 to 2008, the industry ranked fourth in number of deaths, with a total of 62 fatalities in connection with occupational accidents. During the same period, only three industries were exposed to higher death rates: agriculture and forestry (91 fatalities), industry (66 fatalities) and transport and communications (64 fatalities). Another report from the Norwegian Labour Inspection Authority confirmed these numbers and found that construction was the industry with the most occupational injury deaths in Norway in the period from 2009 to 2014 (Mostue et al., 2015). The industry is characterised by tough

requirements for progress and finances, and in addition, hired labour and subcontractors are often used to a large extent (Arbeidstilsynet, 2014). Bråten et al. (2012). According to Arbeidstilsynet [Health, Safety and Environment Authority of Norway] (2014), risk factors within the industry include several occupational groups and enterprises present at the same time, frequent changes in the workplace and partnerships, as well as different safety cultures between different enterprises, occupations, and nationalities. In different phases of a building or construction project, different actors spend time on site to carry out their work tasks before changing jobs.

The client's plan for safety, health, and working environment (SHA plan) in The Client Regulations (2009) § 7 stipulates that the client must draw up a plan for safety, health, and working environment (SHA plan). The plan must be easily accessible on the project. The regulations specify four requirements for the content of the plan. The requirements include an organisational map with the division of roles, a progress plan that describes when and where work operations are to be performed, measures related to work that may involve danger to life and health, and routines for non-conformance treatment (Byggherreforskriften, 2009: § 8). In a guide to the client regulations developed by the Norwegian Association of Contractors - Building and Construction (EBA), the plan is described as a key tool for deciding how the risk factors in a construction project are to be handled (Dukan et al., 2013). The plan is developed by the client and the designers in the project's development and engineering phase. The SHA plan must also be followed by employers and one-man companies in the project's implementation phase (Dukan et al., 2013). Before the tender round, the client must describe the risk factors in the planning phase so that the potential contractors can calculate what the project will cost. Following the tender round, the client prepares a completed SHA plan for the relevant construction project, which includes completed risk assessments and assessments for life and health. To remove and uncover as many risk factors as possible that can lead to accidents, work on the SHA plan should start well in advance of the construction process and only contain what the client regulations require (Dukan et al., 2013). The Entrepreneurs' Association is experiencing the challenge of having SHA plans that are too large. In them, conditions other than those required by the client regulations are included, and the SHA plan no longer works as well.

In a literature study that focused on safety culture in the construction industry, it was found that many companies in the industry have shown an increased interest in this concept in recent years (Choudhry et al., 2007). In the study, it was further found that safety culture determines and reflects how effective the safety management system is on the construction site. In an interview study in the construction industry, it was found that management was a key factor in achieving a positive safety culture (Biggs et al., 2013). Furthermore, it was described that obstacles to a change in safety culture could include management problems at the subcontractor level, a rapid pace of change within the organisation, and reporting requirements that led to a lot of paperwork. A positive safety culture makes workers feel responsible for their own and others' safety, and working to develop a positive safety culture can be a good tool for improving safety in construction (Choudhry et al., 2007). Another study comparing 12 construction projects found that Site management, operational risk management, and staff management were the three factors most strongly connected to safety performance (Winge, Albrechtsen & Arnesen, 2019). Strong connections were also found between risk management and immediate supervision and between risk management and worker actions (Winge, Albrechtsen & Mostue, 2019).

Levitt & Samelson (1993) described how planning can improve the safety of a construction project in two ways. First, planning helps to identify particularly suitable equipment and tools needed to do the job efficiently and safely. This means that the necessary equipment will be

available and ready when a work operation is to be performed. Secondly, planning improves safety as it eliminates crisis situations that arise when a work team is suddenly exposed to unexpected situations. This can further reduce the number of accidents. A well-planned project experiences fewer crises, which prevents an excessive level of stress among managers and workers (Levitt & Samelson, 1993). Planning should take place as early as possible to have the opportunity to control and eliminate risk in the upcoming work (Levitt & Samelson, 1993). Since the construction industry is particularly at risk, early planning is especially important to prevent injuries and fatalities.

According to Kjellén (2000), the purpose of Job Safety Analysis (JSA) is to identify and evaluate the risk to which employees are exposed when performing work operations. He further describes how the object of analysis is the job, which constitutes a sequence of activities. The following factors form the basis for the selection of work operations when a JSA must be performed: 1) jobs in which serious or frequent accidents or near misses have been experienced before or where there is potential for serious consequences after accidents; 2) jobs that take many working hours; and 3) new or changed jobs, in which the consequences for safety are uncertain. In a study undertaken regarding JSA analysis (Albrechtsen, Solberg & Svensli, 2018), six interwoven benefits of the JSA were identified; formalisation of work; retrospective and prospective accountability; worker participation and a possibility to influence their own work; organisational learning in communities of practice; improved situational awareness; and loss prevention in dynamic systems. The benefits are both in terms of safe and efficient operations, which underline the link between safety, quality, and effectiveness (Albrechtsen et al., 2018).

Central concepts within the perspective of decision-making and goal conflicts are the sharp end of the danger and the blunt end of the danger (Rosness et al., 2010). Hollnagel (2010) described four cornerstones that make up a resilient system: 1) the ability to respond to the current and know how to respond to common and unusual disturbances by either implementing a set of responses or adapting to normal function; 2) the ability to address the critical, know what to look for, and how to monitor what is or may be a threat in the near future; 3) ability to anticipate potential, know what to expect; this means anticipating developments, threats and opportunities further into the future; and 4) ability to learn from the actual situation, learn from experience, and learn from both failure and success. All factors must be present for the system to be able to act resiliently. The cornerstones enable the system to respond to various events and varying circumstances, which can increase the ability to recycle should undesirable situations arise successfully. In resilience engineering, resilience can be built into a system by introducing the four cornerstones. Recent safety research emphasises a need to learn from both failure and success (Hollnagel et al., 2013). The purpose of learning from mistakes is to prevent the same mistakes from happening again. This learning process allows the company to summarise, analyse, and find out why the error occurred (Xie et al., 2014)

Safety rules and procedures are used to control behaviour. Rules are usually short and precise, whereas procedures are often longer, detailed descriptions of how a work operation should be performed. Violations and deviations from procedures are often described as the cause of accidents. For example, O'Dea & Flin (2001) found that 'deviations from the rules' were considered the third most important cause of accidents among offshore platform managers, after 'not thinking well enough through the task' and 'carelessness'. There are several researchers in the field of safety who are investigating the use of safety rules and procedures. However, criticism that rules are considered an important single cause of accidents has emerged (for example, Hale & Borys, 2013; Dekker, 2005; Hollnagel, 2004).

The framework that peoples have for making decisions will vary based on whether they are at the sharp or blunt end of the danger. Rosness et al. (2010) described various challenges related to blunt and sharp decision-making. For example, managers at the blunt end will often have an educational background and daily work far from danger, which can lead to a limited understanding of the risk picture. This means that managers at the blunt end may write off or downplay warnings about risk from the sharp end. In addition, financial incentives will often be aimed at short-term gains rather than long-term measures such as safety. On the sharp end, workers have strong incentives to prevent accidents, as the outcome can be serious for them or close colleagues (Rosness et al., 2010). At the same time, people at the sharp end may have a limited overview of the overall risk picture they are exposed to. This is related to the room afforded for the individual actor to manoeuvre, a room for manoeuvre that is influenced by the actions of other actors. This part concludes the problem formulation earlier stated: How do planning and project management affect the safety of a construction project?

Materials and Methods

The article's focus was used as a basis for choosing a qualitative method. The research questions were: 1) how different frameworks affect the safety of construction projects and 2) characteristics of successful lifting operations. The Scopus database was used in the literature search, and this has been shown to contain many relevant research articles from the field. In cases where desired articles were not available in the database, Google and Google Scholar were used.

After an assessment of different interview methods, a semi-structured interview was chosen as the method. A semi-structured interview uses a list of questions (interview guide) to structure the content of the interview, but there is flexibility in the order of the questions and opportunities to ask follow-up questions along the way (Bryman, 2012). The semi-structured interview was chosen because, among other things, it provides both flexibility and structure.

The interviewees were recruited from two different companies. Persons in key HSE roles were contacted to find relevant informants (skilled workers and management functions). To be able to answer the problems of the current study, there was a desire to interview skilled workers involved in lifting operations, and these were recruited with the help of the management on the construction site. This can be called a purposeful selection which intends to select participants in a strategic way so that they are relevant to the research question (Bryman, 2012). All the interviews were carried out by authors 1 and 2. That meant that they had hands-on knowledge from all the interviews and could scaffold on points from one interview to another. This also means that there are two interviewers to follow up and interpret the material and validate it.

Audio recordings provided the opportunity to reproduce the informants' statements better than only written notes would do during the interview (Bryman, 2012), and tape recorders were used during all the interviews in this study. An advantage of using a tape recorder includes the researcher not having to concentrate on writing detailed notes, and thus could be present in the interview and the conversation. All the informants were informed that it was voluntary to be recorded on tape, and all agreed to this in advance. Attempts were made to avoid leading questions during the interview, but such questions were used to summarise what was said along the way and to ensure that the meaning had been perceived correctly. The informant thus had the opportunity to make corrections and add supplementary information, which happened on several occasions. Verification that the researcher has understood the meaning of what is said is used for leading questions in qualitative interviews (Kvale, 1997; Kvale & Brinkmann, 2009; Denzin & Lincoln, 2011). Another advantage of transcribing interviews is that it gives the researcher the opportunity to perform a thorough analysis of what is being said and to re-

examine respondents as the analysis is performed (Bryman, 2012). All interviews in this study were transcribed. An advantage of transcribing all the material was that the researchers got a repetition of what was said during the interviews and a better knowledge of the material.

In qualitative research, the analysis of the data material is often characterised by certain general features. For example, inductive methods are often used, the data are often coded, and it is common for the analysis to influence the further collection of the data material (iterative strategy) (Bryman, 2012). In this study, thematic analysis was used to analyse the data. According to Bryman (2012), thematic analysis is a method in which the findings are grouped into themes. He further describes how a topic can be a category that is identified through the data material or that is related to the research question. Braun & Clarke (2006) argued that thematic analysis is an accessible and flexible approach to analysing qualitative data material. They felt that this method is too little recognised in relation to other research methods that have a stronger foothold in qualitative research (Braun & Clarke, 2006). The thematic analysis started during the interviews, where it turned out that certain topics reoccurred. It also became clear along the way that there were certain topics on which the informants had more views than other topics. These experiences inspired the analysis. Within each topic, relevant quotes from several informants were presented in tables. This helped to bring out differences and similarities between their opinions. Thagaard's book (2002) describes the use of matrices in thematic analysis. The matrices she described are designed in a way like the tables used in this study. She described how this way of producing the data material is suitable for comparing different findings, as it gives a visual picture of the data material (Thagaard, 2002). The current study visited four different projects, and 15 interviews were conducted. The people who participated also had varied backgrounds and could illuminate the issues from several different angles. In addition, several of the informants answered the questions based on experience in the industry, not only based on the experience of the individual project. Documents from the construction projects were also used to obtain an overview of the situation; the client's SHA plan and JSA are examples of documents that were requested during the visits.

In qualitative research, it is important to make the research as transparent as possible so that the reader can form an independent perception of the quality of the survey (Polkinghorne, 2007). In this study, an attempt was made to keep the research transparent by, among other things, reproducing statements from the interviews together with the interpretation of the interviews conducted during the analysis. We also argue that the interview guide was reviewed by authors 3 and 4. Further, authors 3 and 4 have been participating in draft versions of the article. All in all, it has ensured an analytical distance to the phenomena when analysing the data.

Result and Analysis

In this section, a description of the planning of the construction projects is first given to give an impression of the planning that forms the basis for the discussion. Then characteristics of successful planning and successful construction projects are discussed based on findings from the interviews.

The planning of construction projects varies between different companies. Three different levels of planning were described in the theory section 'Planning of safety in building and construction': 1) large-scale planning, 2) planning of the next week, and 3) daily planning of the current week (Levitt & Samelson, 1993). On the projects that were visited, several plans with different time horizons and levels of detail were used. Project planning reflects the three planning levels. In the early phases (project development and design in the phase model), planning took place as explained by an informant in this study:

The whole process until we get the project can involve the HSE department in how to build the tender and how to respond to the requirements of the client (...) We have four or six different start-up meetings, where one is about only HSE, and the other (which is relevant in this context) is about risk. Then there is risk in a broad sense (...) When we have a start-up meeting about risk, we think of all sorts of different risks. It can be financial, economic, but also HSE (Leader L).

As described in the quotation, much of the work in the project development phase is about meeting the requirements of the client, among other things, by making overall assessments of risk. The expectations and understanding of work are rarely identical to what is needed in practice and how work will be performed (Provan, Woods, Dekker & Rae, 2019). This results in a gap between work as imagined (WAI) and how it is done (WAD) (Hollnagel et al., 2006). Prior to the execution phase, planning takes place through meeting activities, where considerations of economy, efficiency, and safety are combined. The planning described in the quotation is an example of 'large-scale planning', which provides an overall perspective on the project. Closer to start-up (design and execution), several meetings are arranged, and more is done around specific assessments of risk associated with production: 'It is seen from the production plan what we will produce in the next week-fourteen days. Which operation has a special risk associated with it, identify them, and decide when we must do something. It is included in the operational control plan' (Leader L).

The informant says that three different plans are used: a production plan, an overall control plan (not mentioned in the quotation), and an operational control plan. The production plan shows what is to be produced in each period. The overall control plan shows risk factors. In the operational control plan, these two plans are combined so that HSE and risk are seen in connection with production and progress. The planning that takes place in this phase is a combination of large-scale planning (level 1) and planning for the next week (level 2), for which the time horizon is shorter. Based on the quotation, it is assumed that the production plan has a more long-term perspective (large-scale planning), while the operational control plan has a shorter time horizon (planning for next week). A manager (Leader 1) said that his work tasks concern the assessment of risk in the executive phase: 'When it comes to production, it is my job to ensure that a job safety analysis is performed and that we have risk assessed the job based on what we are going to produce.' In the project's executive phase, the planning takes place continuously. Overall plans are used to assess the need for, among other things, Job safety analysis. A Job safety analysis is done in advance of a single work operation and is an example of the third planning level, 'daily planning of the current week', when immediate aspects of operations and production are considered. All three levels of planning are used in this phase.

It was observed that construction supervisors and managers (blunt end) had the most experience with, and insight into, the planning that takes place at the project level, while skilled workers (sharp end) did not have much experience with this planning. Skilled workers (sharp end), on the other hand, had good insight into the planning of work operations. Construction supervisors and managers were asked what constitutes good planning in a construction project, and the answers are shown in Table 1. The answers are grouped into themes and linked to the project phase in which they can be planned.

Table 1: Characteristics of successful planning according to a blunt end, with themes and project phase

Characteristics of successful planning	Theme/ code	Project phase
Be forward leaning/ Ask many 'stupid' questions/ Prioritise good plans/	Being proactive	Project development, Engineering

Meet the challenges early/ Make early decisions/ The final phase must be planned early on	Planning well in advance	Project development, Engineering
Consider the unforeseen/ Have a Plan B/ Add extra time to the plan/ Recover if there are delays	To add extra time to the plan	Project development, Design Execution
Have a well-thought-out plan/ Plan realistically/ The plan is a 'living' document that is revised frequently/ The plan must be predictable	To plan realistically	Project development, Design Execution
Involve everyone	Involvement of relevant people	Project development, Design Execution
Make detailed plans, incl. Job Safety Analysis (JSA)/ It is important that the plan is easy to read/ Clear division of responsibilities	Content of the plan	Engineering Execution

For several of the characteristics in Table 1, a proactive approach is proposed (for example: 'being proactive' and 'planning well in advance'. Proactivity can be described as 'to act before the occurrence of losses' (Kjellén, 2000, p. 145). A proactive approach to safety work is being promoted in recent safety research, such as Hollnagel's (2010). Within the context of resilience engineering, he argues that proactivity contributes to building resilience in a system. Resilience facilitates 'performance variety', variations in performance. He considers such variations to be crucial to success. Ideally, proactive planning will help make the system more resistant to external stresses.

In the construction industry, time pressure is an important risk factor (Arbeidstilsynet, 2014b). The ability to influence safety in a construction project is greatest in the earliest phases (Szymberski, 1997). This is reflected in Table 1, where several of the findings are related to the earliest project phases (project development and engineering). In addition, several of the characteristics are related to time (for example: 'planning early', 'add-extra time to the plan'). The findings indicate a desire among the informants to plan well to avoid time pressure. The bottom four rows of the table show characteristics that, among other things, are aimed at the execution phase. The 'content of the plan' theme focuses on the user-friendliness and applicability of the plan. The plan must be understandable to those who will use it, and it must be detailed enough. The characteristic involvement of relevant people indicates that people who are going to use the plan should be involved when the plan is prepared. Szymberski (1997) argued that people with experience from the executive phase (sharp end) should be involved in the project development phase. People at the sharp end have a better practical understanding of the risk than people at the blunt end and will therefore be able to identify risk factors that people at the blunt end do not see. An advantage of this is that the practical understanding is taken care of in the planning. It was observed in this study that many people working at the blunt end have practical experience from construction projects, and this was repeated on all the projects that were visited. In the execution phase, it is interpreted from the characteristic that it is important that people on the construction site are involved in the planning that is important to them. In short, time was an important factor in several of the characteristics of successful planning, such as 'being proactive' and 'planning well in advance'. A proactive approach is about avoiding risk factors that can be foreseen and, at the same time, facilitating resilience to stress (Hollnagel, 2010). The focus on planning for sufficient time to execute tasks is seen in connection with time pressure in the industry and indicates a desire among the informants to plan well to avoid time pressure. The characteristics of successful planning have an impact on the early project phases. This is consistent with the findings of Szymberski (1997).

During the interviews, the informants (both people in the sharp and blunt end of danger sources) were asked what characterises a successful construction project. A selection of the most important characteristics that were described by the informants is shown in Table 2. The characteristics are grouped in themes or codes, and phases, where the factors can be planned into the project, are shown in Table 2's right column.

Table 2: Characteristics of a successful construction project according to the informants with themes and project phase

Characteristics of a successful construction project	Theme/ code	Project phase (phase model)
Good planning/ Good safety/ Good logistics	Planning, organisation, and logistics	Project development, Design Execution
That you have the resources you always need	Access to necessary resources	Project development, Design Execution
Hand-picked people for the job/ Skilled workers who see what needs to be done and they go ahead and do it/ Everyone have the necessary training/	Hand-picked/ skilled people for the task	Project development, Engineering
The team has worked together for a long time and knows each other well/ Motivated project team/	Good composition of the skilled team or project team	Project development, Engineering
Communication and cooperation between the construction management and skilled workers/ Information about further activities/coordination of the various professional groups	Good communication and cooperation between the "sharp and blunt end" and between the professional groups	Execution

Table 2 gives an impression of what the informants experience as important in their everyday work. The characteristics are understood as prerequisites or contributors to doing a good and safe job. The top two characteristics are related to how the workplace is organised, with topics such as planning, logistics, and access to necessary resources. These organisational factors form a basis for work execution, and planning often takes place at an overall level. Such organisational factors constitute an important influence on safety, according to Zacharatos et al. (2005). They studied the relationship between high-level work systems and safety and found that organisational factors had a greater impact on safety than individual factors.

Several of the characteristics in the table are related to the people who will perform a work operation and how they work together. For example: 'hand-picked/skilled people for the task'; 'good composition of the skilled worker team or project team'; and 'good communication and cooperation between sharp and blunt end and between the professional groups'. In a study of success on construction projects, Tabish & Jha (2012) found that trained, competent, and committed people are connected to success on construction projects. They emphasise the need to select competent and trained project managers in the planning of construction projects. The composition of the people on the construction site is affected during planning by selecting skilled individuals or subcontractors for the project. It will often pay to put together teams in which the people are different enough. This is connected to a need to achieve high variation in the measures proposed, a principle called Ashby's law of requisite variety (Kjellén, 2000). 'Group thinking' is another pitfall if people who are very similar are to work together (Myers, 2008). As in the previous section on the characteristics of successful planning, there is also a need in this section to be proactive and plan early. This is supported, for example, by the characteristics 'hand-picked/skilled people for the work task' and 'good composition of the skilled worker team or project team', both of which can be planned and arranged in advance of the project start. In short, aspects related to formal structure, such as planning, logistics, and

access to necessary resources, were described as important contributors to the success of construction projects. In addition, human aspects related to interactions and interactions between people were described as crucial for good safety. Examples of such aspects were ‘good composition of the skilled team and the project team’ as well as ‘good communication between sharp and blunt end’.

Kjellén (2000) stated it is important to shift the focus from accident-prone people to accident-prone workplaces and thus shift the focus of guilt from individuals at the sharp end to overall organisational conditions. Leplat (1998) also argued that it is a safety challenge if rules are formulated in the aftermath of accidents to prevent such accidents from recurring, but if nothing is done about the underlying conditions that led to the accident in the first place.

If HSE is to be taken seriously by the workers at the sharp end, it is important that the management facilitates that they can perform the job in a safe way. The blunt end has a greater impact on the design of the construction site than the sharp end, and they should therefore place great emphasis on planning risk-reducing strategies (Haddon, 1980).

Table 3: Qualities that characterise skilled leaders and help ensure safety at the blunt end.

Informant (quote no).	Statement on management	Interpretation
Skilled worker D (1)	Here you see them. It's possible to talk to them. Especially one. (...) He is out and about on the construction site from seven in the morning to seven in the evening. So, they are out a lot and doing several things. And they're out talking to people. The construction manager is out talking and having a laugh. It will be easier to tell him about an issue if he has a good tone with us.	Experiences that it is easier to talk to managers who are visible on the construction site
Skilled worker B (2)	He is very nice. It is possible to talk to him. It is impossible to talk to someone. They think they are “world champions”.	Some leaders seem superior, ‘think they are world champions.’
Skilled worker A (3)	We do not really need them out on site. But they can show up during the breaks.	It is not necessary that the leaders are visible on the construction site, but I would like to see them at lunch.
Leader I (4)	The project manager here is overqualified to be a project manager. He is very senior in the construction industry, and he has been the project manager for projects that have been much larger than this. He has long experience. You might say that he is demanding, but at the same time, he gives you a lot of leeway. He challenges you regarding your tasks. Or he challenges his team in a very good way. He should be cloned	Describes the project manager as skilled. Challenges their team but also gives them leeway.
Leader N (5)	There is no difference between planning safety and planning progress, finances, or whatever. It's the same. It's about being on the front foot, "on the ball" in advance. The project managers who are skilled at running their project, they are skilled at safety.	Skilled leaders are good in several areas, e.g., economy, safety, and progress.

In the first quotation, the informant emphasises how visible the management is on the construction site (Table 3). The leader was described as ‘out talking, having a laugh. This is interpreted as him being perceived as a natural part of the team, ‘one of us’. It is further interpreted that the difference between ‘us’ and ‘them’ decreases when the blunt end is visible and has a good relationship with the sharp end. Skilled worker B experiences that some leaders think they are ‘world champions’ (quote 2). This is interpreted as meaning that some leaders may be perceived as not very humble and difficult to work with. In quote 3, the informant said that it is not necessary for the blunt end to be visible on the construction site, but he would like to get to know them during the breaks. Seen in context, these three quotes show that the relationship to the blunt end is important. Weick (1993) found that informal social relationships

and emotional ties work to keep panic at bay during critical events. Close emotional ties facilitate clearer thinking, which in turn enables people to find a way around obstacles.

The desire of skilled workers to get to know the management on the construction site under informal conditions (quotes 1 and 3) can have a positive impact on safety if an unexpected critical incident should occur. Communication also plays an important role in the description of a skilled project manager in quote 4. The project manager's long experience is an explanation for the manager's success, according to the informant. The leader is described as demanding with the project team; he challenges his team and sets the framework. At the same time, he provides enough space for them to act independently. It is interpreted from this that the manager clearly communicates with the workers. Skilled leaders are good in several areas, according to Leader N (quote 5, Table 3). Leader N further explained:

They are in advance, planning. Those who are not so skilled come running after. And very often, you can see that those projects with financial trouble have safety trouble. And vice versa. Much depends on the ability to plan. And that's what I mean by common sense because those who manage to plan are those who manage to systematise this. And good leaders are the ones who manage to get their organisation to think that way. When we visit projects, we see that in the biggest, most complicated projects, there is a calm atmosphere, and things roll along smoothly. But in smaller projects, it can be a scramble, and it says something about the management and the ability to plan.

In the quote above and from Table 3, the informant believes that leaders who are good in finance are also good in safety and other areas. It is about an ability to plan and be proactive, something the interviewee describes as 'being on the forefront, in advance'.

On larger projects, which often require more experienced managers, the atmosphere is perceived as calm, while on smaller projects, it can be more stressful. In the previous part, in the sharp end, mindfulness and proactivity were discussed. The statement above shows that these terms also describe skilled project managers. The following statement (Professional A) shows how important leadership can be experienced at the sharp end: 'Everything is ultimately about those who govern the place.' The statement is supported by Sawacha et al. (1999), who emphasised the importance of skilled management to achieve good safety. They found a high correlation between safety and the relationship between workers and management on a construction site. In addition, a study of success factors in the construction industry conducted by Aksorn & Hadikusumo (2008) showed that the most effective factor for the successful introduction of a safety program was management support.

Table 4: Statements about cooperation and communication from people on the blunt end

Informant (quote no.)	Statement on cooperation and communication	Interpretation
Leader I (1)	When you think you have conveyed what you wanted to say, but you have not actually done so. Either, you have said too little, giving incomplete communication. Or that they misunderstand the information. Or that you go around thinking that they ought to have understood.	Describes various misunderstandings that can occur (too little information, misconception).
Leader N (2)	We still must be able to apply consequences in both negative and positive cases, and this is about communication. (...) It's about seeing people and that what you do must have a consequence. If we are good, there will be consequences for those who are skilled, but there must at least be consequences for those who do not follow the regulations. Because if you have a set of rules and there are no consequences for breaking them, they lose their value, and they can be seen as rules just for the sake of having rules. You would just be telling people that they don't matter (...) So having a project	Breaking the rules must have consequences. Clarity is essential for success.

	manager who is clear and distinct about consequences is a key to success.	
Leader K (3)	Interviewer: What is the key to success in this project? Informant: I think that is communication with us here and those out on the construction site.	Communication is the key to success in the project.
Leader M (4)	Yes, we have experienced discussions, no doubt. (...) We can disagree on the level of safety. The management sets much higher demands than what they perceive as good enough.	Discussions arise when there is disagreement about the level of safety.
Leader I (5)	What is crucial about collaboration to give a successful result? Informant: Information, openness, and holistic thinking. Being able to share the cake. When you are delivering a project, the client must get the building he has ordered at the agreed price, possibly adjusted along the way (...). The flow of information is always important in a project. The involvement of subcontractors and everyone who participates is important.	The flow of information is important. Involve everyone who will be on the project.
Leader L (6)	When we talk about HSE, the vertical line must be connected all the way. And there can be a lot of challenges in terms of language. In the construction industry today, there are many nationalities.	Many challenges related to language in the industry.

In short, project management plays an important role in safety on the construction site. The management's relationship with the skilled workers is important for the skilled workers to believe that they can talk about safety challenges. According to one informant, the best leaders are skilled in several areas, and skilled leaders are proactive. The findings suggest that project management is about being able to plan.

Limitation of the Current Study

All studies have potential weaknesses that should be taken into consideration. The current study consists of 15 in-depth interviews with various key personnel and observations. The informants are not addressing a specific project but deal with their experiences more in general and are not necessarily limited to current projects that are supported by observation data. This means that observation may or may not cast light on the interviews and vice versa. Memories can be disturbed. Another potential weakness of talking with the interviewees about experiences is that you get different "still pictures" and you address the reflections on action (Schön, 1983). By studying one project in depth, one might get more observations and interviewees complementing each other, and the study also would cover more of the reflection in action (Schön, 1983). At the same time represents more of a "video recording". Another limitation of the current study is that total enterprises are covered. For other projects with more contractors, other aspects might have come up and nuanced the picture. The latter would also be an argument for covering the dynamics and interaction between different actors. Future studies can contribute to increasing the knowledge base on this topic. I. e., a study can be carried out in which it is investigated whether people at the blunt end are exposed to goal conflicts. Since much of the planning is done bluntly, we believe that this study will provide an impression of the various limitations that exist for planning. Piecework wages are another topic that can be studied further. We propose a study of how this possibly affects security. For example, a comparison can be made to see if there are differences in safety levels on projects with piecework compared to the level on projects with fixed hourly wages.

Overall Discussion and Conclusion

Planning is a recurring theme for the current study. The purpose of this qualitative study was to study planning at different levels in construction projects to assess how safety can best be taken care of in these projects. Planning was studied both at an overall level in the form of planning construction projects in its entirety, as well as on a smaller level, where the focus was

on individual lifting operations. We have found that the distinction between sharp and blunt ends (Rosness, 2009) is relevant in evaluating safety planning. Aligning the sharp and the blunt end is important for minimising practical drift (Snook, 2000). People at the sharp end are often not involved in planning at the project level and arrive at the project later than many at the blunt end. Inadequate blunt-end planning leads to sharp-end challenges in the execution phase, such as shifting work tasks, waiting, and overtime work. Several informants said that poor planning has meant that they have had to wait for others to finish their work tasks and then must work overtime to finish their own. People at the sharp end have little impact on the overall planning, but they must align themselves with the plan and ‘stand by’ for the project to be completed on time. During the interviews, we perceived that people at the sharp end accept this as part of the job, in the same way, that many are aware that the job involves high risk. Similar findings were also described by Mostue et al. (2015). As the sharp end starts to work, we believe that it should be efficiently arranged so that they can work safely and securely on the construction site. To achieve this, good planning in advance of the project, as well as a good follow-up during the execution phase, will be important contributions from the blunt end and help identify hazardous areas (Pandit et al., 2019; Carter & Smith, 2006). This could be another example of aligning the processes. We also believe that people at the blunt end must take their share of the responsibility for any errors and deviations that occur instead of blaming people at the sharp end for taking chances.

Several other studies (for example, Behm, 2005; El-Rayes & Khalafallah, 2005; Ning et al., 2010) focused on planning the layout and design of the construction site. In this study, we have instead studied various topics that are based on the informants' perceptions of safety challenges in their everyday work. For future planning, we recommend, among other things, better involvement of the sharp end in the executive phase of the project. This can be achieved by increased meeting activities between sharp and blunt ends in this phase, where the focus is on dialogue and information exchange. We also propose a greater focus on proactive safety planning by addressing a wide range of potential safety challenges because then one is better prepared. Furthermore, we propose better coordination between different professional groups on the projects since the expectations and understanding of work are rarely identical to what is needed in practice and how work will be performed (Provan, Woods, Dekker & Rae, 2019). This results in a gap between work as imagined and how it is executed (Hollnagel et al., 2006). After all, safety is about executing good plans as intended.

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