



IMPROVING CONSTRUCTION SITE SAFETY THROUGH SAFETY COMMUNICATION OF FOREMEN

1. Organisations involved

The study involved two large multinational enterprises in Denmark. The names and locations of the construction sites are, on request of the participating companies, confidential.

2. Description of the case

2.1. Introduction

The majority of enterprises in the construction sector have a reactive approach to risk management, only taking action after accidents or injunctions occur, rather than being proactive as regards safety promotion. In daily on-site communication, production is usually prioritized over safety.

Supervisory feedback and recognition are among the most powerful incentives influencing workers' job performance. Daily supervisory feedback indicates whether a company gives priority to production or to safety. A leader-based safety intervention is an efficient way to change safety behaviour and safety climate, and to promote safety on construction sites.

Many proactive safety observation techniques have been developed over the last few decades, at least two of which have shown to be predictive as regards accidents. Laitinen, Marjamäki, and Päiväranta's (1999) safety index provides a proactive measure of the physical and behavioural safety level at a work site (percent correct vs. incorrect safety observations), as do traffic light observation systems that rate safety conditions/behaviour as red - high-risk, yellow - medium-risk, green - low-risk (Mikkelsen, Spangenberg, & Kines, 2010).

A number of studies provide evidence showing that the aspects management prioritize have a spill-over effect on workers' attitudes and behaviour (Zohar, 2008). Studies regarding leader-worker exchanges and safety communication, safety climate, and safety citizenship have used questionnaires focused on social exchange theory and measuring the quality of exchanges (Hofmann, Morgeson, & Gerras, 2003; Hofmann & Morgeson, 1999). They found that leader-worker exchanges tended to stimulate employees to raise safety issues. A meta-analysis performed by Stajkovic and Luthans (2003) indicated that supervisory feedback and recognition were amongst the most powerful incentives influencing job performance. Daily supervisory feedback regarding safe and unsafe behaviour and conditions provides an indication of the true priorities between production and safety, particularly when work is performed under extreme time pressure. Such data led Zohar and colleagues to develop a proactive leader-based safety intervention method focusing on the modification of supervisory monitoring and rewarding practices, by encouraging supervisors to express high safety priority during daily informal exchanges with workers (Zohar, 2002; Zohar & Luria, 2003).

Their method was based on quasi-random sampling of on-site supervisory interactions, using the exchange recipients (i.e., workers) as the pertinent data sources. Workers were approached at random times during the workday by a member of the intervention team asking them to report about their most recent exchange with their supervisor. Supervisors received bi-weekly feedback and coaching concerning the frequency of their safety related communication with subordinates. The supervisors used the data to self-monitor progress toward designated improvement goals.

The intervention is leader based, rather than worker based, and the information collected is primarily used to motivate change in supervisory/managerial safety practices, and secondarily and indirectly to motivate change in worker safety practices. This puts focus on possible contributing accident factors both proximal and distal to adverse events (accidents/injuries), allowing managers and supervisors to positively influence the worksite safety climate in combination with coordinating the production processes. As opposed to behaviour-based interventions targeted solely at the worker level, this

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leader-based approach recognizes that contributing factors to adverse events are multifaceted and complex, requiring conditions allowing for true company (multi-level) priority of safety. In this way the leader-based intervention is both more feasible and effective as the variables that influence worker behaviour (e.g., supervisor exchanges) are placed under tighter control. The above studies had been carried out in manufacturing, food processing, and the military (Zohar, 2002; Zohar & Luria, 2003), but yet had to be tested in the construction industry.

2.2. Aims

The Danish study aimed to test the effect of increasing leader-based on-site verbal safety communication on the level of safety and safety climate on construction sites. The study sought to apply coaching and feedback of foremen/supervisors in a previously unexplored sector, i.e. the construction industry. The goal was to increase the frequency of safety-orientated communication across management levels and between leaders and workers, in order to improve safety behaviour.

The hypothesis was that the daily exchange would result in an increase in the frequency of verbal safety exchanges between foremen and workers, increased levels of worker's safe behaviour, and a heightened safety climate.

2.3. What was done, and how?

The study was carried out using a pre-post intervention-control design with two intervention groups and three control groups. Seven foremen and their workers from two different enterprises at four construction sites were involved in the study. Four of the foremen were a part of the leader-based safety intervention, and the other three foremen and their workers served as controls.

The intervention consisted of eight bi-weekly coaching sessions to teach the foremen to include safety issues in their daily conversations with workers, and bi-weekly feedback on three dimensions: production, quality, and safety. The results of the intervention were gathered by interviewing workers weekly on their recent exchanges with their foremen and by safety observations of worker behaviour and work-site safety. Safety climate was measured pre- and post-intervention with a questionnaire.

First, over a period of three to ten weeks, the Danish researchers gathered information regarding foreman-worker safety communications, safety performance, and safety climate in the intervention groups in order to establish a baseline. The intervention lasted 16 weeks in both groups, and follow-up was at 8 and 16 weeks. During this time, the research team visited the sites weekly. In the control groups, the foremen were only informed of the measuring of the content of foreman-worker verbal communications, and were not informed of the intervention study.

Safety communication between foremen and workers was measured by experience sampling methodology (ESM) interviews. Workers were interviewed individually and their participation was voluntary and anonymous. In the interviews they were asked about 1) their activities during the day, 2) their last conversations with their foreman, 3) the main themes of the conversation, and 4) the importance of quality, safety, welfare, and/or other topics in it. The bi-weekly feedback to the foremen was based on the percentage of safety-related communications out of all communication.

Safety performance on the site was measured by observing working conditions and behaviour. The research group conducted weekly walk-rounds at the site and made at least 100 observations in order to obtain a representative sample. The safety observations included safety aspects relating to guard rails and coverings, scaffolding and ladders, machinery and equipment, access ways, order and tidiness, and personal protective equipment, which are the most significant construction industry risks expressed in injury statistics. Each safety observation was marked as correct if it met the safety requirements, otherwise the safety observation was marked incorrect. A safety index of the site was calculated and presented as a percentage of correct safety observations out of all safety observations.

Safety climate was measured using an updated version of a Danish safety climate questionnaire, which consists of 27 items distributed across seven dimensions: 1) Immediate supervisor's general leadership and 2) Safety leadership, 3) Safety representative's engagement in safety, 4) Safety



instruction, 5) Safety compliance, 6) Attention to safety and 7) Workplace involvement (Nielsen & Mikkelsen, 2007).

2.4. What was achieved?

1. Safety communication between leaders and workers on the tested construction site significantly increased.
2. Increased safety communication was followed by an improvement in the rate of safe behaviour and safer working conditions.
3. The level of communication regarding safety topics increased without decreasing the levels of communication regarding production and quality topics.

2.5. Success factors

Safety communication is an important factor for safety culture, leadership and group climate. It is important that communication is supported by actual commitment to and engagement in safety by both foremen and company management. Safety communication should be an integral part of the entire construction process, from planning to construction and operation. Group influence should also be taken into account when designing an intervention. In order to increase the impact of safety communication on the safety index, feedback should include anonymous descriptions of specific observed unsafe behaviours and working conditions.

2.6. Further information

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2.7. Transferability

Even though transferability to other construction sites and construction site organizations was not tested in the Danish study, improving communication between management and workers will always improve safety at any given workplace.

The Danish research group recommended that future studies include coaching and feedback at all organizational levels and for all involved parties in the construction process.

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