

Successful accident prevention

An intervention study in the Nordic countries

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“Successful Accident Prevention” was a joint Scandinavian project (i) to improve accident investigations and (ii) to encourage safe behavior in industry (2). The project consisted of ten intervention studies conducted in Denmark, Finland, Norway, and Sweden.

Increasing safe behavior was selected as the remedy to be evaluated because safety always depends on people. Managers are in a key position to initiate effective accident prevention. Designers decide upon the safety features of machines and technical processes and determine the inherent technical safety of plants. The end users of technical appliances influence safety with their own behavior.

Better accident investigations — More knowledge for prevention

The negative feedback theory was assumed as the model of accident investigations (figure 1). It is an old model of accident prevention recommended by Heinrich already in the 1920s (3). It is also the basis of present-day prevention practice. Injuries are understood as an indication of a deviation from production goals. Injuries are investigated and analyzed in an attempt to adjust production to meet production goals better.

The following three aids for improving accident investigations were applied: (i) new investigation methods (6), (ii) investigation teams (1), and (iii) computerized accident information systems (5, 8).

When a new, more thorough accident investigation method was used in a leather factory, the number of documented causes increased from 0.3 to 2 per accident (6), and the number of preventive measures documented increased from 0.1 to 1.5 per accident. However, no immediate effect on the accident statistics of the factory was seen.

At two breweries accident investigations were reorganized through the formation of investigation groups, and at a tire factory and a warehouse review groups were formed (1). The groups consisted of members from various personnel categories. The investigation groups went to the accident spot and assisted the foreman in the investigation of the injury. The review groups met regularly and discussed the accidents

that had occurred since the previous meeting; and they also checked on the implementation of accident prevention measures for the company as a whole.

The group activities had a positive effect on the interest in safety matters at the workplace. Accidents were investigated more rapidly, and the number of proposals for preventive measures increased. Some members, eg, nurses, claimed that their knowledge of other problems in the work environment and their contact with employees had improved. The effect on accidents was positive but modest.

Two computerized accident information systems were developed, one for a mainframe computer of an airline (5) and the other as a microcomputer-based general purpose system (8). Computers provide the capacity to extract relevant information rapidly from accident reports over several years. The management and safety personnel obtain access to information about accidents from other departments. A computer seems to be relevant in companies with more than 50 accidents per year.

The extent to which better access to an accident data base helps prevent accidents remains to be seen. Experience from the airline has shown that the quality of accident investigations improves when the investigators see themselves as potential users of computerized information. The old procedures gave the investigators (foremen) the feeling of duty without any benefits.

However, with respect to the direct prevention of accidents, the overall experience is dissatisfying. Various motivational obstacles were found in practically all attempts to improve investigations. Successfully

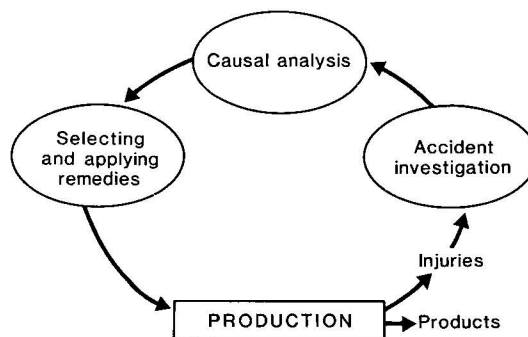


Figure 1. Model of negative feedback.

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implemented investigations yielded more knowledge for prevention, but even then the effect on accidents remained too small.

It is evident that the model of negative feedback does not work as well as assumed. The following reasons seem to make it inappropriate under today's conditions:

1. Very detailed data are today required for preventing accidents. The results of an accident investigation tend to be too general for truly adding to the body of preventive knowledge.
2. Accidents (especially serious ones) are rare events. Yet many different types of accidents could potentially occur, and history might be an insufficient basis for selecting future action.
3. People do not like mistakes, mishaps, errors, or any other failures. When such an event occurs, it is mentally stressing to contemplate it and mentally relieving to forget all about it. The underlying tendency is to forget rather than to investigate and analyze.
4. Fatalism — A study in four branches of Finnish industry with a high injury rate showed that as many as four foremen out of ten attribute accidents to chance. The fewer accidents occur, the more likely people are to think of accidents as unavoidable, though unacceptable. A fatalistic view does not motivate persons to investigate for prevention. To overcome fatalism, it is of utmost importance to prove that accidents

really are preventable and to bring to light the usefulness of preventive measures.

Increased safety motivation — Better performance and fewer accidents

It is assumed that people work safely when they know the risks and when they have the means to avoid them. The provision of safety information is assumed to alert people and thus direct them to resort to preventive action. Therefore it is usual to arrange campaigns which put the main emphasis on explaining risks.

A poster campaign was organized at a shipyard during the equipping phase of a tanker and of a car and passenger ferry to enhance good housekeeping and safe work practices. Both ships were the first ones of a series of similar ships. The campaigns were tailored to local needs and arranged in all respects to meet the criteria of effective poster campaigns as well as possible.

Interviews with the workers, foremen, and engineers in the ships revealed that the campaigns aroused much positive attention. The slogans presented in the posters were well remembered. The best recalled slogans (i) gave precise and brief instructions ("bring only materials for one workday into the ship"), (ii) had a positive form ("keep gangways free"), and (iii) gave new knowledge ("do not store on stands and scaffolds"). However, the number of accidents in the campaign ships did not differ much from that in the comparison ships. Although the campaign message was well received, it did not bring about changes in behavior.

Much positive attention was obtained by feedback which was given in the form of "roses" and "lashes" (2). Every second week the foremen and the safety "delegates" of the workers inspected the ship together and reported their observations on a special bulletin board in the ship (figure 2). Metalworkers are not used to receiving "roses" for their work. The contrast to the grey workday was evident and well received.

The campaigns added to knowledge but did not affect motivation towards work safely. Unsafe behavior seems to have strong motives which are generated, for instance, by organizational culture, organizational and personal goals, the contingent benefits of unsafe behavior (like learning new skills), satisfaction for mastering a machine or a situation, excitement, or a reputation of being brave (4). Those interventions which succeeded in increasing the positive value of safe behavior and the benefits from safe behavior were much more effective.

The positive feedback from work performance was highly successful in modifying behavior and making accident prevention more effective. Experiments were conducted to improve housekeeping at two production halls of a shipyard (7). Nine specific goals were set for housekeeping behavior. An observation method was designed to measure the index of performance in relation to these goals. Feedback was given as a graph on

THE "ROSES" AND "LASHES" OF SAFETY INSPECTIONS



FOR GOOD ORDER
AND TIDINESS
TO THOSE WORKING
ON DECKS 2 AND 4



FOR DISORDER
ON THE CAN DECK
AND ENGINE ROOM
GANGWAYS

Figure 2. Roses and lashes was a new type of inspection report that was posted on the bulletin boards. Roses praised well performing teams, and lashes reproached teams for dissatisfactory performance (2).

a special board in the halls. The base line was measured from observations of performance two months before the feedback started.

The feedback had an immediate effect on behavior. The mean housekeeping index during the base-line phase was about 60 %, but it rose to 85–90 % within a few days and stayed there throughout the two month's feedback period and the two-year follow-up period. Accidents were reduced by two-thirds in both halls.

Positive feedback was an effective way to motivate safe work. As a style of leadership it created a much more competitive organizational climate than the traditional pinpointing of errors, blaming for disorder, and enforcement of rules.

Concluding remarks

The 10 experiments proved that accidents can be prevented. It also appeared that the safety goals and economic goals of companies are not contradictory, but rather that safety and production can go hand in hand. Safety actions serve several purposes at the same time. When accidents are well investigated, much is also learned about the smooth flow of production. The training of new employees not only helps prevent accidents, but also familiarizes the workers quickly with the new environment.

The safety work in the companies was a fruitful channel for cooperation between the employees and employers. Safety organizations are a forum for worker participation. Although participation and cooperation do not necessarily lead to a reduction in accidents, they are values as such. Active safety work was soon positively reflected in the organizational climate (9).

The most important recommendation that the project group made was "make safety more desirable than risk." Much safety work is based on the faulty premise that people at risk want to avoid risks if they are aware of them. Our present cultural values make risk taking often more desirable than safe behavior.

Risk taking is praised too often and valued in everyday life. To rise above oneself, to test one's skills, and to achieve variety in the dullness of the workday are but a few motives to challenge risks.

The recommendation of the project group was "make safety more rewarding than risk taking." Attach more positive values and feelings to safety. Make safety pay, whether you are a person at risk or a person who decides the risk panorama of others. Choose safety activities which moderate unpleasant feelings against safety. Make safety interesting and attractive.

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