The influence of leadership on the prevention of safety incidents: on risk reduction, leadership, safety principles and practices

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The Fixed mindset makes you concerned with how you'll be judged; the Growth mindset makes you concerned with improving.

CAROL DWECK

10 Valorisation

This research aimed to answer the principal research query of whether leaders can help to prevent safety incidents. This answer is considered a valuable guide with respect to enabling leaders to lead their teams in the delivery of the required product or service, while ensuring the safety of the operations. In high-risk processes where the prevention of safety incidents is considered of primary importance, even if-and-when it interrupts or halts the production process, 'safety leadership' is more important than all other roles of leaders.

We discussed the effects of leaders of different orientations on operational safety, and ultimately identified the orientation that will probably lead to optimal incident prevention. Our research was guided by the presumption that safety is increased when risks are reduced, and that leaders affect this risk reduction process. In order to achieve our aim, we initially introduced a Risk Reduction Cycle, explaining five specific phases to be accomplished in order to reduce safety risks. We then designed a Safety Leadership Model, explaining the relationships between (the levels of) Safety, Risk Reduction Capacity and Safety Leadership. In order to identify these relationships, we examined 33 different organisations in six different specific business sectors through five different lenses: prospectively through an online survey among 4561 respondents, followed by reflections on the survey outcomes by senior leaders; retrospectively by analysing incident reports; verbally by interviewing risk analysis experts; and visually by reviewing incident reports by the Dutch Safety Board. These different approaches generated some interesting insights regarding how different orientations of leaders affect the safety of their operations.

In this chapter we discuss the most salient results of this research, and evaluate our findings with respect to their value in an operational setting. First, we present our findings about the three individual nodes of the Safety Leadership Model: Safety, Risk Reduction Capacity and Safety Leadership. We will then focus on the relationships between these nodes through the resolution of three research questions. Following that we will discuss the meaning of the findings of this research, and, as proof of the value of this study, we will explain the applicability of the Safety Leadership Survey as a means to establish and develop Safety Leadership.

10.1 Findings

10.1.1 *Safety*

The results concerning the 'Safety' node in the Safety Leadership Model explain that our survey respondents experience a relatively low number of safety incidents in their organisations, and that, individually, their sense of the safety in their workplace is relatively positive. In general, our respondents indicated that they are comfortable about the future, as they expect a relatively low level of potential risk. When comparing the six different specific business sectors, however, we found that the hospital sector and the oil and gas industry are exceptions to this. These two sectors stand out as particular risky sectors in which a comparatively large number of safety incidents are recorded, and where employees clearly don't feel as safe as in other sectors.[1]

10.1.2 *Risk Reduction*

Regarding the 'Risk Reduction Capacity' node, our respondents clearly reported that operational level safety risks are well recognised. This means that our respondents pretend that risk awareness is well in place. Another salient finding is that these respondents reported that, after a risk was recognised and communicated, the required remedial Action is not taken, or not taken in a timely manner. Interestingly, we also obtained contradictory information in connection to these findings. Professional incident investigators reported that not recognising risks is considered the most common contributing cause of major incidents. Experienced risk analysts explained that, due to the substandard quality of risk analyses in hazardous processes, major incidents are often caused by unforeseen risks, not identified in hazard analysis processes, and therefore not recognised by operational staff, nor by their leaders. Many incident investigation reports, as issued by the Dutch Safety Board, describe 'lack of risk awareness' as an important contributor to major incidents. The perception of our respondents that people at an operational level clearly recognise the safety risks around them, is thus not supported by experts.

What do these different views mean?

The effective detection of risks requires process knowledge, motivation to actively find and report risks, vocational experience, process expectations, and some luck (in finding unanticipated risks). Our research findings suggest that these qualities are not always present to a sufficient degree to warrant the effective recognition of safety risks.

We also learned that many safety risks are discovered in retrospect, after incidents have taken place. Incident investigators use multiple resources; they examine the location by looking sharply around, listen to people, read documents and find all that can reasonably be found, including information not accessible by operational staff. Investi-

1 Here it should be noted that the Event History scores of respondents working in hospitals are probably focused on patient safety incidents. The text offered for the Sense of Safety ("I feel safe in my organisation") means that the respondents' focus is on themselves here.

gators, in their independent role, have the power to demand access to all relevant information, to look anywhere necessary, to interview people (regardless of their hierarchical position), to read all documents they consider relevant to their investigation, and to combine and interpret this different data. Incident investigators thus have the opportunity to see and hear what was invisible (or simply not observed), unheard, and sometimes also unimaginable (or not imagined) before the investigated incident, at least to the people operationally involved. In this way incident investigators discover information previously unknown, and therefore often draw surprising conclusions regarding an organisation's management and operational staff. The incongruence between retrospective observations by expert investigators and the limited risk awareness of people in operations, should not therefore be considered contradictory, but as a logical result of the different opportunities inherent in prospective and retrospective views. The different views identified show a gap in risk awareness, which, we believe represents the true picture of the real world.

10.1.3 *Safety Leadership*

An interesting finding was noted with respect to the Safety Leadership node. Initially, based on the leadership literature, we specified the characteristics of leadership behaviour using three behavioural orientations: Task, Relation- and Self orientation., We designed our survey questionnaire on the basis of that theoretical framework, and it was used in an online prospective survey. In this framework the Task behavioural orientation referred simply to Production-oriented behaviours, but after we subjected the acquired survey responses to EFA and CFA analyses, we discovered that the behavioural orientation actually included two distinctly different sub-orientations. These factor analyses revealed that one part of the related indicators emerged as indicators for a *quantitative* approach to the primary production process of an organisation, while the other related indicators were predominantly indicative of a *qualitative* approach to the primary production process. Following this discovery, we decided to separate the initial Task behavioural orientation into two different orientations; a primarily quantitative or Production-related orientation, which we named 'Production' and a qualitative or Process-related orientation, which we named 'Process'.

Based on these findings, we re-arranged the three original behavioural orientations into four different leadership orientations: Production, Process, Relation and Dominance.[2] We also shortened the term "behavioural orientation" to "orientation", which implicitly implies someone's behaviour. This rearrangement of leadership orientations resulted in a final taxonomy for classifying leadership indicators (ref. 7.4).

2 We renamed the "Self orientation" as a Safety Leadership orientation as "Dominance orientation", which was considered a more appropriate term.

10.2 Resolution of research questions

We proposed the following research questions related to the relationships between Safety Leadership, Risk Reduction Capacity and Safety in order to resolve the principal research query (*"Can leaders of organisations help to prevent safety incidents?"*):

1. Does risk reduction relate to safety in organisations?
2. Do leaders' behavioural orientations (read: orientations) relate to risk reduction?
3. Do leaders' behavioural orientations (read: orientations) therefore relate to safety in organisations?

A Structural Equation Modelling path analysis (ref. 8.4) showed that leaders demonstrate their influence over safety according to two different pathways: a) *indirectly* (or mediated) by the risk reduction process, and b) *directly* due to the effect of Safety Leadership behaviours on the Safety node. These two pathways are visualised in Figure 32 below.

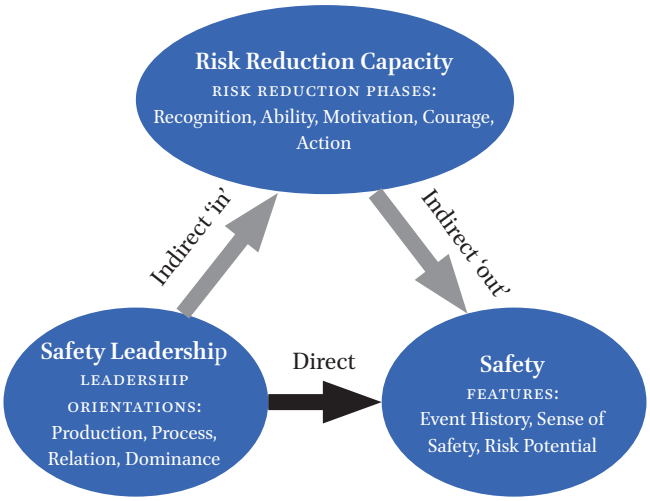

FIGURE 32 Direct and indirect influences on Safety

We will distinguish these two different pathways when resolving the three research questions. We thus present the nodes of the Safety Leadership Model as three different relational levels: Safety Leadership, Risk Reduction Capacity and Safety. These levels are visualised in below Figure 33.

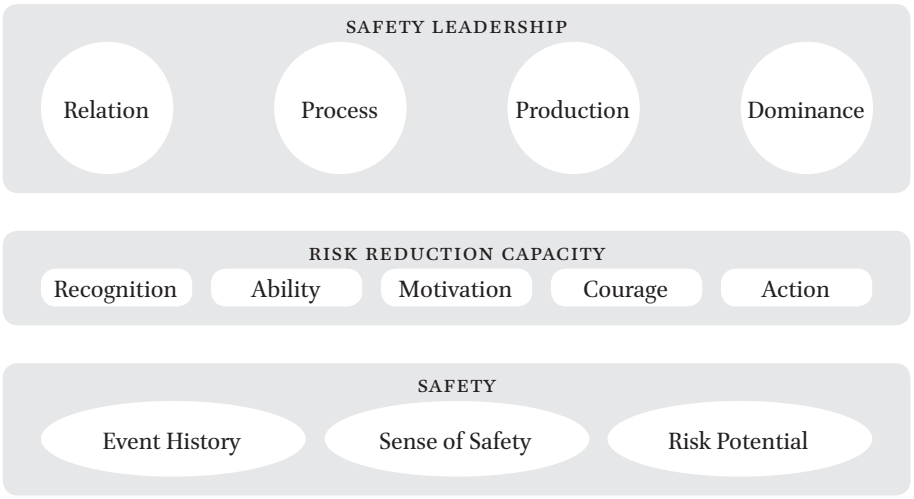

FIGURE 33 Three relational levels of the Safety Leadership Model

Next, we will resolve the research questions.

10.2.1 *Does risk reduction relate to safety in organisations?*

This question concerns the 'downstream' sector of the mediated pathway from Risk Reduction Capacity to Safety, in Figure 32, indicated as Indirect 'Out'.

SEM path analysis showed that the answer to this research question is partly positive; the five different risk reduction phases do indeed affect safety, but in individually different ways. These individual influences are shown in Figure 34 below.

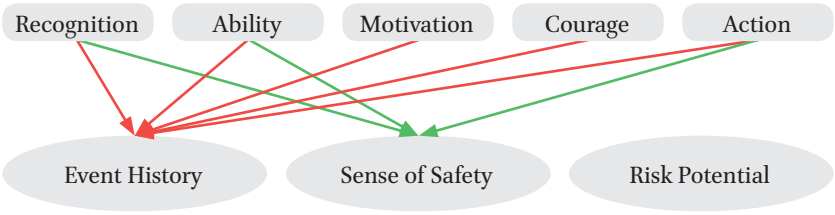

FIGURE 34 Influences of the risk reduction phases on safety

Green arrows represent the positive effects of risk reduction on safety, and red arrows represent the negative effects of risk reduction on safety. We specify these different effects below.

The risk reduction phases showing a negative effect on Event History (preventing safety incidents) and a positive effect on the Sense of Safety are *Recognition, Ability* and

Action. If we apply the features related to these risk reduction phases to this outcome, we see that the combination of an optimal recognition of risks, by competent staff, who know what to look for, who are offered the opportunity to intervene and who are working in an environment where safety risks are remedied in a timely manner, is an effective recipe for reducing safety incidents and generating a positive Sense of Safety for followers.

The *Motivation* and *Courage* risk reduction phases both also showed negative effects on Event History (preventing safety incidents), but these risk reduction phases only had negligible effects on the Sense of Safety of our respondents. These findings suggest that these risk reduction phases do indeed have a reducing effect on the occurrence of safety incidents, but that efforts made by organisations to improve people's motivation, and programmes to stimulate their courage to intervene, will probably not improve their employees' appreciation of safety.

Finally, the SEM path analysis revealed that none of the risk reduction phases have any noteworthy mediating effect on potential future risks, which, due to the very nature of the risk reduction process, is an understandable finding.

A table showing the standardised regression coefficients of these relationships is presented in Appendix 15.10.

10.2.2 *Do the behavioural orientations of leaders relate to risk reduction?*

This question concerns the 'upstream' sector of the mediated path from Safety Leadership to Safety, shown in the above Figure 32 as Indirect 'In'. The SEM path analysis showed that the answer to this research question is also partly positive, meaning that leaders with different orientations have different effects on the five different risk reduction phases. These individual influences are shown in Figure 35 below.

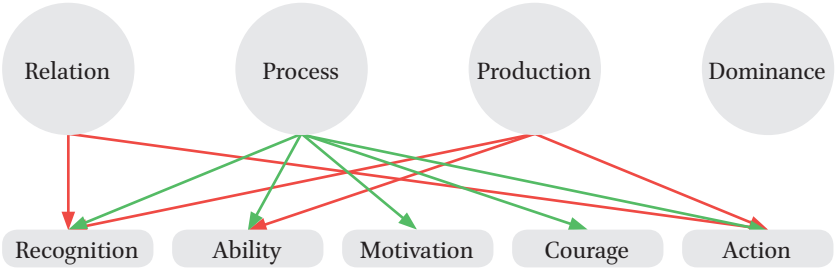

FIGURE 35 Influences of Safety Leadership orientations on risk reduction

Green arrows represent the positive effects of Safety Leadership on risk reduction, red arrows represent the negative effects of Safety Leadership on risk reduction. We explain these different effects according to the leaders' different orientations below.

Relation

Leaders exhibiting a Relation orientation are good listeners, they are compassionate and facilitating, they empower their fellow workers and they support a good working climate. Relation-oriented leaders negate the value of the Recognition of risks, however, as well as remedial Action. Our findings also suggest that Relation-minded leaders have no significant influence over Ability, Motivation or Courage to intervene.

Process

Leaders who have a Process orientation distinguish themselves by their ability to motivate their followers to intervene in safety risks, who can forgive people when they do this when there was no real need, who ensure that necessary improvements are made, and who credibly convey the message that operational safety is their top priority.

According to our survey outcomes, Process-oriented leaders support all risk reduction phases that is, Recognition of risks, Ability, Motivation, Courage to intervene and timely execution of remedial Action. These findings suggest that leaders who show a Process orientation have a positive influence on the entire risk reduction process.

Production

Production-oriented leaders are focused primarily on production targets. They are recognised by their decisive nature and intuitive actions. These leaders have the courage and do whatever they consider necessary, even when procedures prescribe differently. According to our survey outcomes, leaders with a Production orientation have a negative influence on the Recognition of risks, Ability to intervene and remedial Action. These leaders also have no significant influence on Motivation or Courage to intervene.

Dominance

Dominant leaders behave individualistically and value hierarchical status. They abuse the goodwill of other people and come across as hostile. According to our survey outcomes, dominant leaders do not have any significant influence on any risk reduction phase.

According to the above explanation of our survey outcomes, we argue that Process-oriented leaders are most effective where the relationship between leader orientations and risk reduction is concerned.

A table showing the standardised regression coefficients of these influences is presented in Appendix 15.9.

10.2.3 *Do leaders' orientations therefore relate to safety in organisations?*

We argued that the influence of leaders regarding safety follows two different paths: one path from Safety Leadership to the Safety node, *mediated* by the Risk Reduction Capacity node, and a *direct* path from the Safety Leadership node straight to the Safety node. In this section we present the influences of Safety Leadership on Safety for both pathways.

First, we show the results of the mediated influences, and then the direct influences.

Indirect (mediated) influences of Safety Leadership on Safety

The mediated influences of leader orientations on safety involve the indirect pathways from Safety Leadership, via Risk Reduction Capacity, to Safety. In Figure 32 this is shown in the pathways running from Safety Leadership, via 'Indirect 'In'', Risk Reduction Capacity and 'Indirect 'Out'' to Safety. In fact, the full mediated pathway represents the influence of Safety Leadership on the five risk reduction phases (shown above in Figure 35) followed by the influence of the five risk reduction phases on Safety (shown above in Figure 34).

The SEM path analysis of mediated relationships suggests that, in comparison with the above separate Safety Leadership-risk reduction and risk reduction-Safety relations, the mediated influences of Safety Leadership on Safety are reduced. After investigating this finding, we found that this phenomenon originates in the relatively low regression coefficients between the risk reduction phases and the safety characteristics, as identified by the SEM analysis. These low regression values have a detrimental influence on the mediated influences of leaders regarding Safety. The result of these influences is shown in Figure 36. below.

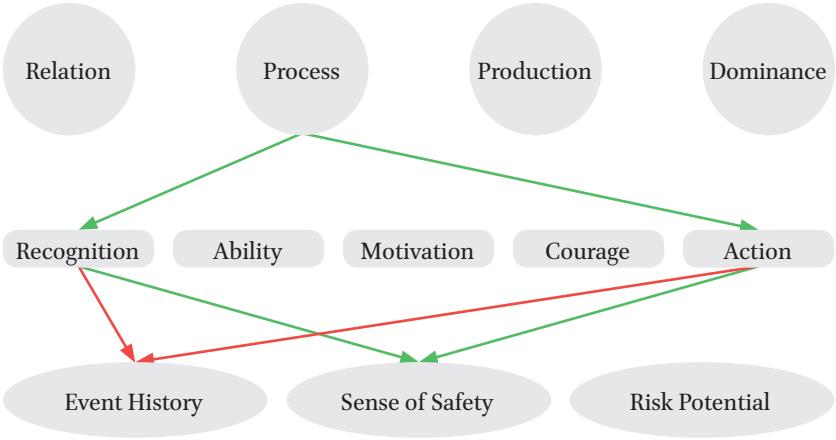

FIGURE 36 Mediated influences of leaders' orientations on safety

Green arrows represent the positive mediated influences of leader orientations on safety, and the red arrows represent the negative mediated influences of leader orientations on safety. We explain these different influences below.

The outcomes of the SEM path analysis for the mediated relationship between Safety Leadership and Safety suggest that only *Process-oriented* leaders affect safety, and specifically when mediated by the Recognition and Action risk reduction phases.

Process-oriented leaders affect Event History through these pathways, as well as the

Sense of Safety. None of the other Safety Leadership orientations (Relation, Production and Dominance) reached the minimum required standardised regression coefficients, and are therefore considered of negligible influence on safety via indirect pathways.

Direct influences of Safety Leadership on Safety

The direct influence of leader orientations on safety relate to the other, direct path from Safety Leadership to Safety. This path is indicated in Figure 32 as the 'direct' pathway. The SEM path analysis revealed that the answer to this research question is also partly positive, meaning that the five different orientations of leaders influence safety, but each in an individually different way. These influences are shown in Figure 37 below.

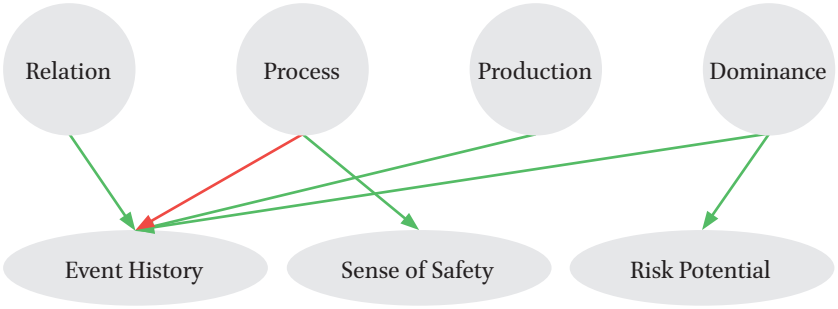

FIGURE 37 Direct influences of leaders' orientations on safety

Green arrows represent the positive direct influences of leader orientations on safety, and the red arrows represent the negative direct influences of leader orientations on safety. We explain these different influences below.

Process-oriented leaders showed a negative direct influence on Event History and a positive direct influence on Sense of Safety. This suggests that Process-oriented leaders have a preventative influence on safety incidents and stimulate a positive Sense of Safety in their followers.

The other orientations (*Relation, Production and Dominance*) show positive direct influences on Event History, suggesting that these minded leaders *increase* the potential for safety incidents to occur. These leaders do not show any significant direct influence on Sense of Safety. This suggests that they have negligible influence regarding their followers' Sense of Safety.

Only leaders with a *Dominance* orientation had a positive direct influence on Risk Potential, showing that people working for these leaders felt that there was the potential for future safety incidents in their organisations. Leaders with *Relation-, Process- and Production orientation*s do not show any significant direct influence on the potential for future incidents.

A table showing the identified standardised regression coefficients for direct and mediated influences of Safety Leadership on Safety is presented in Appendix 15.11.

10.2.4 *Summarized resolution of research questions*

The findings presented in the previous sections have resolved the three research questions as follows:

1. *Does risk reduction relate to safety in organisations?*

Risk reduction relates to safety in organisations in a limited way; only Recognition, Ability and Action show notable influences on Event History (preventing safety incidents) and on the Sense of Safety (inducing a positive Sense of Safety). Motivation and Courage only have a reducing influence on the occurrence of safety incidents. No influences on future Risk Potentials were identified.

2. *Do the behavioural orientations of leaders relate to risk reduction?*

Process-oriented leaders have positive influences on all risk reduction phases. Leaders with a Relation orientation relate in a negative way to Recognition and Action. Production-oriented leaders have negative influences on Recognition, Ability and Action. Dominant leaders do not have a notable influence on any risk reduction phase.

3. *Do the behavioural orientations of leaders therefore relate to safety in organisations?*

Leaders' orientations do indeed relate to safety in organisations.

In an *indirect* way, only Process-oriented leaders affect Safety; that is, when mediated by Recognition or Action, they have a negative influence on Event History (preventing safety incidents) and a positive influence on the Sense of Safety of their followers.

In a *direct* way, Process-oriented leaders have a negative influence on Event History (preventing safety incidents) and a positive influence on the Sense of Safety of their followers. Leaders with Relation, Production, or Dominance orientations have direct positive influences on Event History (inducing the potential for safety incidents), and do not have notable influences on their followers' Sense of Safety. Only leaders with a *Dominance* orientation have a (positive) direct influence on the safety characteristic Risk Potential, showing that people working for these leaders felt that there was indeed the potential for future safety incidents in their organisations.

10.3 What do these findings mean?

In the previous sections we presented our findings, obtained using research techniques that conform to contemporary scientific practice. These techniques revealed the perceptions of our respondents. In the following sections we will add meaning to our observations. This requires interpreting the previously presented findings in relation to the operational reality in the surveyed organisations, meaning that our scientific findings are applied to operational practice. We will use our own professional experience and risk management expertise in this process.

Perceptions steer behaviour

With reference to the Thomas[3] theorem, we presume that people's behaviours, among other things, are steered by their perceptions of reality. This applies to everyday life, and, supported by the work of Slovic et al.,[4] we argue that this similarly applies where employee perceptions of safety are concerned.

When people perceive themselves as having good knowledge of safety risks and a good sense about safety, they feel confident in that respect, and will show behaviours according to that state of mind. However, if people perceive that Action is not taken to intervene, and that risk-reducing interventions are not taken in a timely manner, they may conclude that safety is not taken seriously in their department. Regardless of whether the latter is true or false, they will then adapt their behaviours to this perception, and may sometimes they express dissatisfaction, refuse to cooperate, ignore safety measures, or, if they are able to, even decide to leave the organisations. In order to prevent this kind of working atmosphere it is important to be aware of the perceptions of employees, so that interventions can take place before a risky situation escalates. This awareness is what these survey results are about.

The outcomes of this research reflect the perceptions of the survey respondents. The acquired data shows how these employees see their leaders, and is indicative of the extent to which employees will cope with their leaders' behaviours, and vice versa. Such an indication may guide us regarding how to predict the influence of certain leaders on the safety of the primary processes they are supposed to lead, and may consequently play a role in the development of safety improvement strategies.

In the next sections we explain the meaning of the research findings concerning Risk Reduction Capacity, and concerning the influence of Safety Leadership on safety.

10.3.1 *Roles of the five risk reduction phases*

In Section 8.2.2 the survey data show the general findings about the five risk reduction phases. In addition to general findings, these data show some interesting differences between the business sectors. We elucidate these differences below.

10.3.1.1 Salient findings in risk reduction

Recognition

Taking into account the different outcomes of the acquired survey data on the one hand, and the testimonies of the incident investigators and the risk analysis experts and incident investigation reports by the Dutch Safety Board on the other hand, we found that many survey respondents were too positively biased. We therefore conclude that people working in operational spheres feel safer than they actually are. Based on this conclusion

3 Scott (2015).

4 Slovic, Finucane, Peters and MacGregor (2004).

we suggest leaders pay serious attention to the level of risk Recognition in their operations.

The discovery of this difference in risk perception offers leaders the opportunity to act by investigating the reasons behind the limited risk awareness of their followers, and to take appropriate action to improve this situation in their own organisations.

Remedial Action

We observed the lowest average scores of all for the Action risk reduction phase. In order to clarify this, we discussed this outcome with employees at different organisational levels: operational employees, safety professionals, supervisors and managerial leaders. The closer our participants were related to operations (or safety), the more agreement with these low scores we encountered.

None of the board members or managers returned a low score for Action. In several conversations with the researcher, they confirmed that they were unaware that any required Action identified was not executed in a timely manner. In contrast, people at supervisory level told us they were very aware of the perception by operational staff that Action was not taken in a timely manner. These supervisors associated this with insufficient feedback about the completion of remedial Action to the people (often operational or safety staff) who reported that Action had to be taken. According to these supervisors, adequate and timely remedial Action was usually taken, but, as some supervisors noted: "this was not always communicated to the work floor." This explanation did not match the statements by the operational and safety staff, however. The latter explained that they had scored this risk reduction phase relatively low, as in their experience that represented the real situation. We conclude that the risk reduction phase remedial Action typically involves differences in 'work as imagined and work as done.' We thus suggest that the risk reduction phase Action also requires particular attention. The data collected also offers leaders the opportunity to discover the reasons behind this situation and to take appropriate action to solve it.

Motivation

The second-highest average score was given for Motivation to intervene, suggesting a high level of trust in people's willingness to intervene, when risks were observed. This is a very important finding as it confirms that employees, when asked, claim they consider safety an important element of their work. This knowledge of positive orientation is considered an important lever for leaders when designing safety improvement strategies.

Ability and Courage

The scores for these two risk reduction phases are in the mid-range. Specifically, the scores for Courage to intervene do not seem to reflect an exceptional influence on risk reduction. We consider this surprising and important information, as many leaders in organisations take a lack of Courage by their followers as a strong reason for not intervening in production processes. We therefore conclude that reluctance to intervene may be

caused by a lack of Ability to intervene, and not necessarily by a lack of Courage. These observations are important indicators for leaders who are responsible for the development of safety improvement strategies.

10.3.1.2 Differentiation by business sector

Improving safety means setting priorities. Here we show how the different business sectors are setting their priorities concerning risk reduction phases. We ranked the five risk reduction phases of the six specific business sectors in order to identify sector preferences.[5] We found both similarities and differences. We present the results of this ranking process in Table 19 below. The numbers in this table represent the different ranks as applicable to the different business sectors: 1 refers to the highest score, and 5 refers to the lowest score.

	Recognition	Ability	Motivation	Courage	Action
Tank storage	2	4	1	3	5
Hospitals	2	4	1	3	5
Process	1	3	2	3	5
Oil & Gas	1	5	2	4	3
Infrastructure general	1	2	4	5	3
Rail infrastructure	2	3	1	4	5
Legend:	Prevalent	Secondary	Mediocre	Marginal	Lowermost

TABLE 19 Ranking risk reduction phases per business sector

We explain the similarities and differences of the different rankings below.

Similarities

Although their primary processes are of entirely different natures, the business sectors tank storage, hospitals, process industry and rail infrastructure show relatively similar rankings. The only differences in ranking identified are the mutual reversals of the middle/marginal ranking of Ability versus Courage and the prevalent/secondary ranking of Recognition and Motivation. All sectors mentioned here show high rankings for Recognition and low rankings for Action. These rankings confirm the results described in the previous Section 10.3.1.1.

5 The data analysis generated by the non-specific 'Other' sector is considered irrelevant here.

Differences

Two business sectors show deviant rankings: oil and gas, and general infrastructure.

The rankings of Action and Ability stand out for the oil and gas industry. The relatively high ranking for Action confirms our suggestion in Section 6.4.1.2.2, that people who are potential victims of safety incidents are themselves optimally motivated to take remedial Action regarding identified safety risks. We are not sure about the origin of the deviances in the general infrastructure sector, as we have not been able to collect sufficient consistent information concerning this phenomenon. We estimate that this ranking pattern is caused by the variety of different primary processes in the surveyed organisations.

Risk reduction related meanings

Ranking the risk reduction phases of each business sector confirmed that organisations are not only optimistic about their skill to recognise risks in absolute terms (as described in Section 10.3.1.1), but also show their confidence in this skill in relative terms by ranking Recognition as the most common risk reduction phase. The low relative ranking of the remedial Action risk reduction phase also confirms the suggestion made in Section 10.3.1.1, that remedial Action regarding identified safety risks has low priority in these business sectors.

10.3.2 *Influences of Safety Leadership on Safety*

Different organisations employ different leaders with different orientations, who are differently focused. Not all leaders have the abilities needed to improve safety. Below we set forth the average different influences of the four different leadership orientations (Relation, Production, Dominance and Process[6]) on safety, as identified by the SEM analysis.

In this overview we will describe the direct (non-mediated) influences, followed by the indirect (mediated by the five risk reduction phases) influences of Safety Leadership on Safety.

Different leaders affect safety differently

Process-oriented leaders appear specifically focused on the quality aspects of the primary (production) process.[7] We discovered that Process-oriented leaders contribute strongly to the prevention of safety incidents through direct influences (described in Section 7.2.3.2), and having a strong positive influence on the Sense of Safety of their followers. In addition to these direct influences, Process-oriented leaders, as the only type of leader in this research, generated measurable influences if mediated by Recognition and Action. Mediation by both risk reduction phases had negative influences on the occurrence of safety incidents and positive influences on the Sense of Safety. These findings suggest

6 The survey indicators related to these leadership orientations are presented in the 'Concluding taxonomy of classification of leadership indicators' (ref.7.4).

7 Dweck (2012).

that Process-oriented leaders affect safety positively, in both a direct and in a mediated way.

Relation-oriented leaders (described in Section 2.3.6.2) are good at dealing with their followers.[8, 9, 10] The safety of the primary processes of organisations is not in good hands with these leaders, however. The SEM path analysis revealed that safety incidents are not likely prevented under Relation-oriented leaders, and that there was no notable influence on their followers' Sense of Safety. The same is true of their direct influences on future potential risks. When mediated by any risk reduction phase, leaders with a Relation orientation had negligible influences on Safety.

Production-oriented leaders (described in Section 7.2.3.1) are primarily focused on quantitative production targets; safety is given little priority by these leaders.[11] Safety incidents are likely to occur under their leadership. There were no measurable influences on the Sense of Safety of their followers or future potential risks. When mediated by the risk reduction phases, Production-oriented leaders had negligible influences on Safety.

Dominance-oriented leaders (described in Section 2.3.6.3) were identified as ego-centric leaders; they are considered the most dangerous group where safety incidents are concerned.[12] The leadership of dominant leaders has no influence on their followers' Sense of Safety. The respondents working for dominant leaders were found to actually expect potential future safety risks in their organisations. When mediated by the risk reduction phases, dominant leaders have no influences on Safety at all.

Direct versus mediated influences

The SEM path analyses concerning the influences of the Safety Leadership orientations on Safety revealed that the presumed mediated influences were overestimated. The standardised regression coefficients of the direct influences between Safety Leadership orientations and Safety proved much stronger than the coefficients related to the mediated influences. This phenomenon applies to both positive and negative influences. Based on this finding we conclude that personal relationships between leaders and followers are strong indicators of the influence of Safety Leadership.

According to the feedback of our participants/respondents in this research, the Risk Reduction Cycle is a highly representative and useful model of the risk management process. Mediation by risk reduction phases, however, has a detrimental influence on the relationship between Safety Leadership and Safety. This discovery leads to the conclusion that Risk Reduction Capacity may serve as a useful indicator of the influence of risk

8 McClelland (1967).
9 Pardey (2007).
10 Yukl (2010).
11 McClelland (1967).
12 Post (2004).

management activities, but that this does not necessarily imply that mediation by risk reduction results in notable influences between Safety Leadership and Safety.

The only notable mediated influences were those on Safety by Process-oriented leaders, mediated by the Recognition and Action risk reduction phases. This finding suggests that these risk reduction phases can be considered the two phases most related to safety risks: Recognition identifies potential problems and remedial Action solves the problems. The Ability, Motivation and Courage risk reduction phases serve a more supportive or intermediate role, facilitating the quality of the risk reduction process ultimately leading to the Action phase, but with no autonomous influence on Safety.

A table showing all identified standardised regression coefficients concerning the influences of Safety Leadership on safety is presented in Appendix 15.11.

10.3.3 *Operational applicability of the Safety Leadership Survey*

During the reflective sessions in which we presented the organisations' survey results we obtained much feedback on these results. Most of the times this feedback included recognition and confirmation of the presented survey results by all hierarchical levels.

Often senior leaders in subject organisations expressed their satisfaction with the survey outcomes and confirmed useability of the survey method, especially for internal human resources considerations.