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

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Senior managers and directors who are often studied in relation to business successes, may be regarded as a neglected species when it comes to safety performance.

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11 Conclusions and recommendations

11.1 Conclusions

Introduction

In the following sections we present our conclusions about the pre-research available knowledge, such as the theories, concepts and phenomena used to develop our research model. These are referred to as 'Known-knowns' in Section 11.1.1. We then enter the area of risk reduction, wondering where organisations are strong and weak where the incident prevention process is concerned. We developed a Risk Reduction Cycle to clarify this. We developed a Safety Leadership Model in order to determine how organisational leaders relate to risk reduction and to safety. This model, in combination with the Risk Reduction Cycle, enabled us to resolve the principal research query: "Can leaders of organisations help to prevent safety incidents?" Preceded by our findings about risk reduction and about a leader's influence on safety, the resolution to this principal research query is presented in Section 11.1.2. We have called this section 'Unknowns Revealed'.

11.1.1 *Known-knowns*

In this study the 'known-knowns' pertain to a comprehensive treatise of relevant behavioural theories explaining why people behave as they do in an organisational setting, the role of leadership and the influence of situational context on employee behaviour. We also discussed contemporary risk management concepts and theories. Amongst other things, we addressed the complexity of different organisational requirements acting in different, sometimes opposite, directions, as vectors in one integrated system. The 'uncertainty' phenomena and the 'precautionary principle' have emerged prominently as counterweights in finding a stable and responsible balance for the types of effort required to make the primary process safe, and how a leader should behave in this dynamic context. We developed our research model on the basis of these theoretical known-knowns, as explained in Chapter 2, Theory, Concepts and Context.

11.1.2 *Unknowns revealed*

In search of the role of leaders in the prevention of safety incidents, we first determined the process required to prevent safety incidents. This led to the development of a Risk Reduction Cycle. According to this model five phases have to be completed in order to effectively reduce safety risks: the recognition of risks, ability to intervene, motivation to intervene, courage to intervene and timely taken remedial Action. We then determined four leadership orientations: Relation-, Process-, Production- and Dominance-oriented leaders. We developed a set of survey indicators so as to be able to label each leader with a specific leadership orientation.

Finally, we developed a Safety Leadership Model, consisting of three nodes: the five risk reduction phases, the four leadership orientations, and a node representing the respondents' perceptions of safety (Event History, personal Sense of Safety and Risk Potential). We determined the relationships between risk reduction, leadership orientations and perceived safety through five different lenses: an online prospective survey, reflection on the survey outcomes by senior leaders, a retrospective analysis of the contribution of leaders to safety incidents, interviews with risk analysis experts, and a review of incident investigation reports by the Dutch Safety Board. We uncovered a wide variety of previously unknown data, and resolved the principal research query.

In this section we present a summary of the relevant revealed unknowns.

11.1.2.1 Risk Reduction Capacity

With respect to the risk reduction related outcomes of this research, the data analysis shows that in general employees are overly optimistic where the recognition of safety risks is concerned. This outcome was derived from the information obtained from incident analysts and risk analysis experts, who report that the recognition of risks is the weakest link in the risk reduction process, aimed at preventing serious safety incidents. We also found that timely remedial Action appears to be a weak link in the risk reduction process phase; the data analysis shows that remedial Actions are either not implemented, or not implemented in a timely manner.

We also discovered that in general employees are intrinsically motivated to intervene when safety risks have been recognised, but the ability and courage of employees to intervene when safety risks have come to their knowledge did not appear to improve the process from the recognition of safety risks to remedial Actions.

Analysis of the data by individual business sectors revealed that respondents working in the process industry are reluctant as regards having the courage to intervene. Nevertheless, if and when safety risks have become obvious, remedial Action is taken in a timely manner. The respondents working in the sector where, more than in other businesses, the individual safety of the respondents themselves is at stake (the oil and gas industry), delivered the highest scores where the recognition of risks and timely remedial Action are concerned. In the general infrastructural sector, the employees reported that safety risks are well recognised and that remedial Action is taken in a timely manner, but on

an operational level this sector indicates little courage to intervene, suggesting that the employees are somewhat optimistic where the efficacy of remedial Actions is concerned. An analysis of the data delivered by the business sectors not mentioned above did not reveal results that were different from average.

We discovered that respondents in higher hierarchical positions in organisations returned relatively high scores. This indicates that managerial respondents have a more favourable view regarding the state of safety in their organisations than the lower ranked employees. Support staff members (i.e., HSEQ staff) were clearly the most critical population where the Risk Reduction Capacity of their organisations is concerned. This group returned the lowest scores of all hierarchical levels.

11.1.2.2 Leaders' influences on safety

The outcomes of this research suggest that leaders can indeed help to prevent safety incidents, but not all leaders are equally influential in this respect. The different orientations of leaders have different influences on the Risk Reduction Capacity of organisations and thereby on the level of safety in organisations. The effectiveness of a leader with respect to the prevention of safety incidents therefore depends a great deal on their specific leadership orientation.

Based on the outcomes of this research, we found that Process-oriented leaders, as the only leaders who actively contribute to the prevention of safety incidents and who increase the Sense of Safety of their followers, may be considered 'safe' leaders. Production-oriented leaders were primarily focused on their production targets and maintained a (sometimes intuitive) decisive way of leadership. At times these leaders are known for following their gut feeling and then even ignoring formal procedures. Relation-oriented leaders were identified as a predominantly social group.

Where safety is concerned, however, Production- and Relation-oriented leaders have to be watched closely in order to prevent work practices that may prompt safety incidents, because Production-oriented leaders seek mainly to achieve production targets and Relation-oriented leaders may demonstrate a laissez-faire type of leadership, leaving their teams too much freedom.

Dominant leaders are considered status-addicted individualists, who have no respect for their co-workers. In relation to the other leadership orientations, dominant leaders can be seen as an extreme form of Production-oriented leader, and also as the opposite of Relation-oriented leaders. Dominant leaders are therefore to be considered a 'safety aversive' group, who should not be selected to lead primary processes involving safety risks.

Taking the survey indicators defining a Process-oriented leader into account, we argue that leaders who motivate their followers to intervene when safety risks appear, who can forgive people when they do this needlessly (by mistake), who ensure that necessary improvements are made and who credibly convey the message that operational safety is their top priority, are the best candidates for success in preventing safety incidents.

11.1.2.3 Resolution of principal research query

> On the basis of the above statements, we conclude that the prevention of safety incidents in organisations is best served by Process-oriented leaders, who focus on the Recognition of risks and ensure timely remedial Action.

The principal research query of this research "Can leaders of organisations help to prevent safety incidents?" is resolved according to the above statement.

In this section we presented the 'known-knowns', which were reconfirmed by this study, and the 'revealed unknowns', which were new discoveries made by this study concerning the relationship between leadership and safety. We concluded this section with the resolution of the principal research query.

We continue our dissertation with an overview of recommendations, intended to foster Process-oriented leadership in order to improve operational safety.

11.2 Recommendations

Introduction

This research delivered evidence about known and unknown aspects of the role of leaders in the prevention of safety incidents.

As described in Section 11.1.2.3, the resolution of the principal research query, reads as follows: 'The prevention of safety incidents in organisations is best served by Process-oriented leaders, who focus on the Recognition of risks and ensure timely remedial Action'. Subsequent to this, leaders are expected to follow behavioural characteristics such as:

- Sincerely caring for safety;
- Ensuring that necessary improvements are implemented in a timely manner;
- Motivating team members to intervene to prevent safety incidents;
- Forgiving people who intervene by mistake.

Leaders with these behavioural characteristics are called Process-oriented leaders.[1]

These leaders are considered able to create a sustainable context in which their teams are enabled to safely conduct their operational tasks. In our role as researchers, we consider it our obligation to develop and present a set of recommended leadership principles in order to support Process-oriented leaders in their responsible duty. In the next sections we will explain the development process of our recommended Process-oriented Safety Leadership Principles, aimed at the board room level of organisations.

To broaden the scope of our development process, we use four academic safety lead-

1 The behavioural characteristics of Process-oriented leaders are derived from the 'Concluding taxonomy of classification of leadership indicators' (ref. 7.4).

ership concepts, which we consider helpful to foster Process-oriented leadership. We then summarise the recommendations derived from these concepts. After that we discuss the results of two empirical research studies, which we believe complement the outcomes of our research. Next, we present our recommended set of Process-oriented Safety Leadership Principles. Finally, we present our recommendations for external parties, that is, governmental inspectorates, certifying authorities and safety training institutes.

11.2.1 *Fostering Process-oriented Safety Leadership: the academic approach*

In the next sections we discuss four theoretical leadership concepts: High Reliable Organizing, Psychological Safety, Growth Mindset and Transformational Leadership. Thereafter, in Section 11.2.1.5, we present a summary of four recommended Academic Safety Leadership Practices as derived from these theoretical concepts.

11.2.1.1 High Reliable Organizing[2, 3, 4, 5]

In High Reliability Organisations (HRO's) the term 'collective awareness' serves as the master key. With this key, albeit a container term, organisations are considered able to discover unknown potential hazards and to manage the involved risks *optima forma*. Although container terms are useful to describe the scope of a concept they are of little use to leaders, who are faced with the challenges of day-to-day operations and need to know what to do in order to increase this awareness in their teams. We will therefore translate 'collective awareness' into relevant, operationally applicable proposals, which, if implemented, foster the Process-oriented qualities of leaders. We refer to observed similarities in the behaviours of Process-oriented leaders and the HRO principles as described in Section 7.2.3.2.

The HRO principles "preoccupation with failure", "reluctance to simplify interpretations" and "focus on operations" relate to the survey indicators 'considering operational safety as top priority' and 'motivating followers to intervene in case of suspected safety risks.' The principle "deference to operational expertise" refers to respect for competence on an operational level, which is in alignment with our survey indicator about 'forgiving followers after they have mistakenly interrupted operations for safety reasons.'[6] According to Weick and Sutcliffe, the 'operational expertise' qualification should be interpreted as "an assemblage of knowledge, experience, learning and intuition that is seldom embodied in a single individual. Even if expertise appears to be confined to a single individual, that expertise is evoked and becomes meaningful only when a second person re-

2 Weick and Sutcliffe (2007).
3 Groeneweg (2019).
4 De Bruine (2018).
5 Slagmolen, Van Dalen and Tolk (2017).
6 Regarding this HRO principle we refer to Hopkins, who argues that leaders "… should be sensitive to experience of frontline operators, encouraging them to speak up."

quests it, defers to it, modifies it, or rejects it." A positive response to, possibly false, safety alarms raised by low ranked personnel in particular, is where Process-oriented leaders show their mindfulness and where their leadership stands out from other leadership orientations. The HRO principle "commitment to resilience" is closely related to our survey indicator 'ensuring implementation of required improvements'. Weick and Sutcliffe explain: "The essence of resilience is the intrinsic ability of an organisation to maintain or regain a dynamically stable state, which allows it to continue operations after a major mishap and/or in the presence of a continuous stress."

Primarily, we propose that leaders dare to discuss normalised deviant behaviour with their followers. We refer here specifically to differences between 'work-as-intended and work-as-done', for example working according to self-invented work practices, deliberate non-compliance with procedures, or skipping procedural steps (short cuts). In a study into the motives of employees who deviate from agreed work procedures, Hudson et al. found that more than 70% of procedure-violating employees do this because they consider their violation a way to increase the efficiency of the work; they violate the rules for the company's benefit, trying to contribute positively to the production process.[7]

Associated with the previous proposal, leaders should not avoid debates about the (ignorance of) seemingly unimportant deviations from normal, also known as 'weak signals.' These signals may appear as feelings, such as being surprised, puzzled or anxious about something not looking, sounding, or smelling as it normally does. Trust those feelings! They are a solid clue that something is really wrong. Do not ignore them, and investigate their origin, before continuing your planned course of action.

'Hidden' risks are of a different nature, and seemingly have nothing to do with operational safety. As superficially 'normal', but latently risky examples, we note personnel changes in operational staff, supervisors or management; understaffing; changes in delegated responsibilities; and changes in contracts with third parties. These merely administrative changes, are not always associated with possible operational disturbances, however, they could have a tremendous negative impact on the stability of primary processes.

More closely associated with operations, we propose to identify whether there are variances in operation procedures between departments, sites or time periods (e.g., days/nights, weekends, holidays). There are probably good reasons for these differences, but inexplicable differences should be noted and investigated. In this respect, leaders should create a climate in which open dialogue is easily facilitated between all relevant operating and supervisory staff in order to determine why the identified differences exist. With respect to Process-related communication, leaders should be alert concerning team members who are often absent when it comes to evaluating, reflecting and learning.

Concerning risks specifically associated with organising work processes, leaders should realise that 'plans create blind spots.' Weick and Sutcliffe state "The problem with blind spots is that they often conceal small errors that are getting bigger and can produce disabling brutal audits." We therefore propose that leaders be aware and respect this type

7 Only a very small minority (±15%) violates rules for personal comfort or individual benefit.

of risk, and also motivate their team members to take this into account during their operations. In general, we propose that when anyone, rightfully or not, waves a red flag, suggesting that a safety risk is apparent, leaders should respond positively, should verify the message and be prepared to take all remedial actions needed to prevent escalation in a timely way.

These proposals to foster Process-oriented leaders can be summarised in the following: "Expect the unexpected and always assume that during operations something can go wrong!"

11.2.1.2 Psychological Safety[8, 9]

The requirement to create a psychologically safe environment (referred to by Edmondson as a 'Fearless Organisation'), may be considered an important quality in a Process-oriented leader. Psychological safety develops an atmosphere of mutual respect across people of different hierarchical status and disciplines, predicts engagement in safety activities, and is a key antecedent of speaking up and learning behaviour in teams. Engagement, as physically, cognitively and/or emotionally connected, is essential for overcoming powerful barriers to safety improvement

As a material intervention we note 'leader inclusiveness', which means the 'words and deeds exhibited by a leader that indicate an invitation and appreciation for others' contributions.' This directly pertains to situations characterised by status or power differences, and pertains more narrowly to behaviours that invite and acknowledge the views of others. Leader inclusiveness helps cross-disciplinary teams overcome the inhibiting effects of status differences, allowing members to collaborate in process improvement. Leader inclusiveness helps to include others, through direct invitation, in discussions and decisions in which their voices and perspectives might otherwise be absent. But there is a pitfall noted: without mutual respect and sincere appreciation, the initial positive effects of being invited to provide input will be insufficient to overcome the hurdle presented by status boundaries.

Building psychological safety is a threefold process: setting the stage, inviting participation and responding productively. The recommended leadership tasks and objectives, plus the related interventions for these stages are explained below.

Setting the stage (objective: shared expectations and meaning)

Frame the work; set expectations about failure, uncertainty and interdependence to clarify the need for voice; emphasise purpose; set the tone from the top; identify what is at stake, why it matters and for whom.

8 Nembhard and Edmondson (2006)

9 Edmondson (1999)

Inviting participation (objective: confidence that voices are welcome)
demonstrate situational humility; acknowledge gaps; practice enquiry; ask purposeful questions; model intense listening; set up structures and processes; create forums for input; provide guidelines for discussion

Responding productively (objective: orientation toward continuous learning)
express appreciation; stimulate blameless reporting; listen, acknowledge and thank; destigmatise failure; look forward; offer help; discuss, consider and brainstorm the next steps; sanction clear violations

11.2.1.3 Growth Mindset[10, 11, 12]

Process-oriented leaders show behaviours belonging to a Growth mindset. People with a Growth mindset are constantly monitoring what's going on. They are sensitive to positive and negative information, but they are attuned to its implications for learning and constructive action. They question themselves: What can I learn from this? How can I improve? How can I help others do this better?

People are not static beings; everybody can grow if their leaders stimulate and value personal development and the growth of employees. Growth-minded leaders believe in human potential and development, and they show that they do. Instead of using the organisation as a vehicle for their greatness, they use it an engine of growth for themselves, the employees and the company as a whole. Don't talk royalty, talk journey. Growth minded leaders nurture employees by visiting factories and having frequent chats with front-line employees. These leaders are obliged to make these visits and comply with visit schedules by blocking time slots in their diary. They also emphasise that everyone is part of a team by limiting the use of the words 'I' and 'me'; using 'we' and 'us' instead. Self-confidence is "the courage to be open and to welcome change and new ideas regardless of their source." When things have not gone as expected: be understanding and supportive, help people through and be a guide, not a judge.

When selecting and hiring people, leaders should focus more on a candidate's mindset and less on their pedigree. A resume doesn't say much about 'inner hunger': look for people who are filled with passion and a desire to get things done. A Growth-minded leader opens up dialogue and channels for honest feedback; they asks their team members what they like and dislike about the company, and what they think needs changing. This is also typical behaviour for a Process-oriented leader. Where people show self-importance, shut down elitism. Dare to clean up and get rid of brutal 'bosses'; foster productivity by mentoring, not by authoritarian terror. When new ideas prove to work well, don't reward the single originator of the idea, but reward the team that brought the idea

10 Dweck (2012).
11 Dweck (2016).
12 Ruijters and Simons (2012), pp. 399–407.

to fruition; reward teamwork rather than individual genius. As a consequence, leaders will share the credit with their teams rather than take the full credit themselves. Management and supervisory team meetings are not 'centres of expertise', so when expertise is required Growth-minded leaders support collaboration across organisational boundaries, ignore hierarchy, and invite input according to the operational competence and experience of all relevant disciplines.

11.2.1.4 Transformational Leadership[13, 14, 15, 16, 17]

Above all, transformational leadership is distinguished by the possession of a moral core. With reference to our research project, this core is 'safety'. This also applies to Process-oriented leaders. Transformational leadership is determined around the four so-called 'leadership dynamics': idealised effect, inspirational motivation, intellectual stimulation and individualised consideration. These four leadership dynamics are related to workplace safety, and transformational leadership is, among other things, associated with psychological safety, work motivation and unit performance. Leaders who challenge their subordinates to work towards a collective goal of safety are considered to have the quality of 'inspirational motivation'. These leaders are able to intellectually stimulate their subordinates to think about novel and innovative ways to adhere to safety. Leaders with high levels of the 'idealised effect' leadership dynamic are, like Process-oriented leaders, more likely to focus on the long-term benefits of safety goals rather than a short-term focus on productivity pressures. As regards proposing useful interventions to foster Process-oriented leadership, we refer to Zohar and Luria, who studied a specific and successful intervention method in which Process-oriented leadership plays a key role.

In three intervention studies designed to modify the supervisory monitoring and rewarding of subordinates' safety performance, Zohar and Luria argue that supervisory-level interventions should be expanded to the transformational leadership dimension. These scholars suggest that the hierarchical nature of organisations allows for behavioural safety interventions at the supervisory level, that is, above the shop-floor level where injuries may occur. This implies that complementary interventions can be conducted concurrently on several hierarchical levels. The organisational context must be well integrated in intervention programs, taking into consideration that changes taking place at any hierarchical level must be supported by concomitant change at other levels in order to maintain change over time. For instance, senior managers in the air traffic management industry indicated that a flatter organisational hierarchy fosters a stronger sense of leadership effect, because it creates a better flow of communication between leaders and subordinates.

13 Zohar and Luria (2003)
14 Zohar (2002)
15 Bass and Steidlmeier (1999)
16 Wong, Kelloway and Makhan (2016)
17 Gregory Stone, Russell and Patterson (2003)

Intervention models must assume a multi-level perspective, because processes take place at any organisational level and are affected by adjacent levels, that is, processes at different levels are interconnected. This implies that cross-level effects must also cover a third hierarchical level, because changes in supervisory practice must be supported by higher management, that is, the intervention must involve, at least, two layers of management in order to ensure maintenance of change.

Whereas conventional behaviour-directed interventions often depend on external observers to provide feedback and deliver incentives, effective supervisors obtain the same information and deliver incentives as part of their daily routine. For example, an effective Process-oriented leader would observe whether work on a difficult task is performed properly and express approval or disapproval immediately thereafter.

The specific intervention implemented in these studies encompassed weekly feedback to line-supervisors concerning the frequency of safety-oriented interactions with subordinates.

Supervisory-level intervention consisted of providing weekly personal feedback to line supervisors, accompanied by the communication of (high) safety-priority from direct superiors (i.e., operational/department managers). Feedback concerned randomly timed episodic interviews with subordinates. During interviews, workers described their most recent interaction with their supervisor.

It is important to emphasise that incentives delivered by superiors (e.g., personal attention and recognition) have consistently been shown to provide the strongest reinforcement value in the organisational context, surpassing material and social incentives. Zohar and Luria reported that their results indicated a change in supervisory safety practices (i.e., frequency of safety-oriented interaction with subordinates) over a short period, from a baseline rate of 9% to a new plateau averaging 58%. This, in turn, resulted in a significant decrease in minor injury rates. Continued improvement during the post-intervention period suggests that managerial policy concerning the role of line supervisors in behavioural safety was modified, and long-term effects were expected.

11.2.1.5 Summary of Academic Safety Leadership Practices

Albeit in different wording, the theoretical concepts (High Reliable Organizing, Psychological Safety, Growth and Transformational Leadership) as presented above are in many ways complementary, and are not incompatible. All descriptions of these concepts show elements of multiple analogous subjects, are objectively aligned, and unvaryingly concern the development of Process-oriented behaviours. Within these concepts we observed a series of safety leadership practices, a summary of which, catalogued by the four characteristics of Process-oriented leaders (sincerely care for safety, ensure that necessary improvements are implemented timely, motivate team members to intervene to prevent safety incidents, forgive people who intervene by mistake[18]) is shown below.

18 The behavioural characteristics of Process-oriented leaders are survey indicators included in the 'Concluding taxonomy of classification of leadership indicators' (ref. 7.4).

Re. Sincerely care for safety

a. Showing exemplary behaviour in relation to safety by demonstrating situational humility by acknowledging gaps in own performance.
b. Framing of work by setting clear expectations about failure, uncertainty and interdependence to clarify the need for voice.
c. In selection and hiring processes, looking for people who are filled with passion and a desire to get things done. Shutting down elitism and getting rid of brutal 'bosses'; fostering productivity by mentoring. Talking about the journey, instead of royalty, limiting use of the words 'I' and 'me'; using 'we' and 'us' instead.
d. Showing that the organisation values and stimulates the personal development and growth of employees.
e. Fostering open dialogue by:
    i. Opening up dialogue and channels for honest feedback; asking team members what they like and dislike about the company and what they think needs changing, for example by setting up structures, processes and forums for input, and providing guidelines for discussion.
    ii. Supporting collaboration across organisational boundaries by inviting input from people with relevant operational competence and experience in all meetings and consultations, ignoring hierarchy and departmental barriers.
    iii. Welcoming change and new ideas regardless of their source;
    iv. Including all team members, through *direct invitation*, in discussions and decisions in which their voices and perspectives might otherwise be absent;
    v. Daring to discuss identified normalised deviant behaviour.
    vi. Not avoiding debates about the (ignorance of) seemingly unimportant deviations from normal, also known as 'weak signals.
    vii. Leaders be aware and respect that unknown risks (blind spots) may exist and also motivate their team members to take this into account during their operations.
f. Maintaining an effective policy concerning compliments and incentives:
    i. Rewarding teamwork rather than individual genius.
    ii. Rewarding people who report (perceived) safety risks by ensuring that all reports are analysed, decisions on remedial actions taken, and that the people reporting them receive feedback on actions taken (even if that feedback is to explain the reasons for a lack of action).
    iii. Delivering incentives as part of the leader's daily routine, for example weekly feedback to line-supervisors concerning the frequency of safety-oriented interactions with their subordinates, accompanied by the communication of high safety priority from direct line management and feedback from randomly timed episodic interviews with subordinates, in which workers describe their most recent interaction with their supervisor.
    iv. Ensuring that incentives delivered by superiors (e.g., personal attention and recognition) consistently provide the strongest reinforcement value in the organisational context, surpassing material and social incentives.

Re. Ensure that necessary improvements are implemented in a timely manner

g. Stimulating reporting of safety risks and operational disturbances, expressing appreciation by listening, acknowledging, responding positively, verifying the message and being prepared to take all remedial actions needed to prevent escalation in a timely way.
h. Identifying whether there are variances in operation procedures between departments, sites or time periods (e.g., days/nights, weekends, holidays), initiating an open dialogue between all relevant operating and supervisory staff in order to determine why the identified differences exist, and acting on findings.
i. Considering that changes take place at any hierarchical level, intervention initiatives must be supported by concomitant change at other levels, because processes take place at any organisational level, and are affected by adjacent levels; that is, processes at different levels are interconnected.
j. Being alert for team members who are often absent when it comes to evaluating, reflecting and learning, and acting on findings.

Re. Motivate team members to intervene to prevent safety incidents

k. Emphasising purpose by identifying what is at stake, why it matters and for whom.
l. Conveying the message to expect the unexpected and always assume that things can go wrong during operations.

Re. Forgive people who intervene by mistake

m. Fostering a just culture by focusing on system flaws, not on individuals, but sanctioning clear violations.
n. Practicing enquiry by asking relevant purposeful questions and listening intensively.
o. Being understanding and supportive when things have not gone as envisaged, and helping employees through, acting as a guide, not as a judge.
p. Destigmatising failure through looking forward, offering help, discussion, consideration and brainstorming the next steps.

11.2.2 *Fostering Process-oriented Safety Leadership: an operational approach*

Introduction

The previous section highlighted recommended leadership practices derived from four theoretical concepts, each underpinning (elements of) Process-oriented Safety Leadership. Most of these recommended leadership practices are abstract in nature, and are only to a limited extent tuned to leaders working in operational conditions. Primary Process-focused leaders have less affinity with abstract theoretical concepts. They tend to act upon risks they assess as 'real', present at this very moment and considered a threat to their own area of responsibility. In that respect, it is important to distinguish between theoretical and applied approaches in risk assessment between a scholar's conceptual

world and a leader's real world. Van Asselt argues that recommendations may suffer from either or both of the following disadvantages:

– The recommended practices do not address the most salient uncertainties/risks; and/or
– The recommended practices are not understandable to non-scientists in general and decision-makers in particular."[19]

According to Van Asselt, in order to support leaders to behave as Process-oriented safety leaders, clear operationally focused risk-related leadership directives are needed. Nevertheless, it is considered important to realise that, with respect to the effectiveness of recommended leadership practices, there is no guarantee of success. Concerning safety, we face the constraint that it is not possible to determine an absolute 'safe-unsafe distinction'. As mentioned earlier in this dissertation, there is no universally unambiguous definition of safety (ref. 2.1.1) and the many uncertainties around the risk assessment process also do not strengthen our trust in its conclusions (ref. 2.2.3.1). Whether the recommended leadership practices, if fully implemented, will prevent all safety incidents in all organisations, also cannot be tested scientifically, simply because of the impossibility of assigning representative control groups where these practices are not implemented.

Still, our research has delivered convincing evidence that Process-oriented leaders, who focus on the recognition of risks and timely remedial Actions, have a positive effect on operational safety. We explicitly emphasise, however, that any scientific study, conducted in an operational environment *always* contains some degree of ambiguity created by the specific situations in the organisation(s) being surveyed when the data was collected (actual processes at hand, available respondents, contextual conditions, etc.). Consequently, despite the evidence offered in this research, we cannot guarantee that any recommended practice based on the outcomes of this study will lead to the prevention of *all* incidents, *anytime,* in *all* operational situations, in *every* organisation. With respect to our recommended practices, we therefore apply the well-known disclaimer: "Results achieved in the past, do not guarantee success in the future!" Despite this, where the *effect of leaders on safety* and the *effect of interventions* are concerned, data acquired in operational settings is the most representative information and therefore the most convincing approach to measure effects.

In order to develop recommendations to optimally foster Process-oriented Safety Leadership, we referred primarily to the outcomes of our research. We used the outcomes of two other empirical research studies conducted in 'real life' operational conditions as complementary sources to broaden the scope of our recommendations. These two complementary studies demonstrate two different views on safety leadership practices: a study by Flin (on the influence of management regarding safety) and a study by Hale et al. (on the effectiveness of intervention strategies). We describe the relevant selected content of these two studies below.

19 Van Asselt (2000), p. 6.

11.2.2.1 Management influence on safety (Flin)[20]

There is sufficient evidence that supervisors, site managers and senior managers all have distinctive influences on the health and safety of their co-workers. The safety culture of an organisation is determined by the perceptions of management's commitment to safety, as judged by the workforce. As in any other facet of management, it is the behaviours that are demonstrated in relation to safety that are critical. Senior management commitment is best indicated by the proportion of resources (time, money and people) and support allocated to health and safety management, and by the status given to health and safety. Time especially is a crucial factor, as it is the strongest signal of commitment by busy managers with little time to spare; if these leaders do not prioritise enough of their time to listen to safety concerns or warning signs, the primary process is at risk.

11.2.2.2 Effective intervention strategies (Hale et al.)[21]

In a scientific evaluation set up to assess the effectiveness of interventions aimed at reducing accidents, including 29 companies, Hale et al. found, among others, two discriminating factors generating enough energy to overcome the inertia against change: the contribution of the safety professional and the support of the director(s). Three of the five most successful projects were coordinated by the three most active, persistent and creative of the safety professionals encountered in this study. In companies where the support of site managers was absent or detached, the company was three times as likely to be unsuccessful, and all of the companies where that support was active and participative were successful. This study clearly showed the importance of support from safety professionals and top management as the 'engine' for the successful implementation of safety interventions. Several discriminating factors emphasised the importance of dialogue between the workforce and line-management as the most essential factor in ensuring that organisations learn and change. Central to this dialogue was reporting dangerous situations (Recognition!) The most successful companies in the study were the companies where the workforce and managers were more actively encouraged to look for safety hazards; these companies showed spectacular increases in hazard numbers. This was then seen as a sign of success (not of an increase in danger). These companies facilitated this 'hunt for dangerous situations' by providing employees and supervisors with digital cameras to record them. Above all, reporting was rewarded by ensuring that all reports were analysed, and decisions and remedial Actions taken on them (!), and that the reporters would receive feedback on actions taken (even if that feedback was to explain the reasons for a lack of action). This process encouraged dialogue about actions, which could also be pursued in toolbox meetings. As a result of this process the workforce was empowered to refuse to work under unsafe conditions, which despite management fears was used highly responsibly. Note: The complete intervention process as described

20 Flin (2003)

21 Hale, Guldenmund, Van Loenhout and Oh (2010)

above might be included as a measurable goal (KPI?) as part of the responsibilities of department or site managers.

As another intervention in this study, top and line-managers were offered safety leadership training. The companies in which top management attended this training, were distinguished as the most successful companies. The researchers (Hale et al.) suggested that top management, despite of what it may think of itself, needs this kind of training to obtain a clear vision, motivation and knowledge of what to achieve and how to do it. The evidence obtained by this study suggests that safety leadership training enables leaders to better fulfil their motivating role in energising interventions.

11.2.2.3 Proposed Process-oriented Safety Leadership Principles (Board room reality)

As mentioned in the introduction to Section 11.2.2 'Fostering Process-oriented Safety Leadership: an operational approach', leaders of organisations have no other option than to live with (and trust) the available risk assessments and their individual interpretations by the people working in these organisations. Nevertheless, where the nature and the intensity of safety measures and interventions are concerned, the leaders' evaluations and consequential decisions are conclusive. This responsibility is at the hearts of a leader's responsibility for operational safety. In this section we aim to offer optimal support for this important leadership task. We thus felt that recommending a set of Academic Safety Leadership Principles was an overly-operational approach, without the required obligation as expected from committed leaders.

Principles are about 'what things to do', *practices* are about 'how things to do'.[22] Principles are thus stronger, and are clear about what objectives should be achieved, whilst leaving room for leadership interpretation regarding how to realise those objectives. Principles require the highest degree of commitment, and the kind of strong obligation that may be both required and expected, from the leadership level of organisations. We therefore developed a set of eight recommended Process-oriented Safety Leadership Principles.

We direct our recommended Process-oriented Safety Leadership Principles to leaders at all organisational levels (Supervisory Board, Board of Directors, CEOs, managers and operational supervisors). Different leaders are expected to interpret our recommendations within the context of their different individual responsibilities in the different organisations they lead.

We concluded in our research that operational safety is best served by Process-oriented leaders, who focus on the recognition of risks and timely remedial actions (ref. 11.1.2.3). We used this conclusion as the nucleus point of reference in developing the Process-oriented Safety Leadership Principles. We also used Flin's publication[23] about *managerial*

22 The summarised safety leadership practices mentioned in Section 11.2.4, may serve as useful guidelines about 'how to do it'.

23 Flin (2003)

influence on safety (ref. 11.2.2.1) in the development of our Process-oriented Safety Leadership Principles. Flin clearly identified three criteria to be observed by senior leaders: time, money and people. For instance; by allocating sufficient time for dialogue with their workforce, leaders show their commitment to being fully informed about safety concerns or (even weak) warning signs as recognised by the operational workforce. Flin argues that if leaders don't allocate enough time to conduct this dialogue, the primary process is at risk. We concur with Flin's strong argument in our proposed Process-oriented Safety Leadership Principles. We also considered the report on the *effectiveness of intervention strategies* by Hale et al.[24] (ref. 11.2.2.2), which clearly noted the importance of the active coordinating role of top management and the importance of professional support via the safety function, in the development of our Process-oriented Safety Leadership Principles. These authors also refer to hazard identification and empowering the workforce to intervene as important areas of attention. Safety Leadership training for top management and leaders is considered an important prerequisite to optimising the effectiveness of interventions.

Taking into account: a) the behavioural characteristics of Process-oriented leaders (ref. 7.2.3.2), b) the Academic Safety Leadership Practices (ref. 11.2.1.5), and c) the findings by Flin (ref. 11.2.2.1) and Hale et al. (ref. 11.2.2.2), we recommend that organisations adopt the following Process-oriented Safety Leadership Principles.[25]

1. Don't skimp on safety;
2. Ensure a sufficient number of competent staff;
3. Enable all employees to perform their duties in a safe way;
4. Empower employees to refuse to work under unsafe conditions;
5. Arrange professional safety leadership training for all leaders at all levels;
6. Allocate sufficient time for dialogue with the workforce at their workplaces;
7. Actively encourage the identification and communication of safety hazards;
8. Monitor the implementation and achieved effects of risk reducing measures.

In order to confirm their overarching effect with respect to corporate safety, we suggest that these principles are embedded in corporate governance policies and incorporated into the corporate governance statements of organisations. We elucidate these proposed Process-oriented Safety Leadership Principles below.

1. Don't skimp on safety

Sufficient time, money and people are valuable aspects of safety. Operational safety starts with safe and reliable equipment in a safe environment, operated and maintained by competent people. Cutting costs on equipment/machinery and its maintenance re-

24 Hale, Guldenmund, Van Loenhout and Oh (2010), pp. 1026–1035

25 The specific relationships between the Process-oriented Safety Leadership Principles and their sources (the behavioural characteristics of Process-oriented leaders, the Academic Safety Leadership Practices and the findings by Flin and Hale et al.) are shown In Appendix 15.12.

sults in substandard operating, or even malfunctioning equipment. Operating staff are determined to keep primary processes running. In the event of equipment failure, operating personnel are tempted to improvise in order to ensure the continuation of critical processes. Safety functions may then be overridden and operational equipment kept running using home-made 'solutions', resulting in unsafe operations.

2. Ensure a sufficient number of competent staff
The leaders of organisations must ensure the availability of predetermined required staff levels and the related competences defined by formal competence criteria, to be observed in hiring and selection procedures. Where applicable, leaders should facilitate all staff to meet these competence criteria. Primary Process-related vocational knowledge, skills and experience are considered the primary competences required for operational and supervisory staff. Operational safety is also everybody's responsibility, so this also encompasses the safety aspects of vocational knowledge and skills. In order to ensure substantive advice, leaders should arrange for determined safety professionals, and cooperate closely with this support function.

3. Enable all employees to perform their duties in a safe way
People's safe performance requires a series of contextual conditions to be met. These include, for example, fail safe equipment that is safely operable, a sufficient number of competent workers, and the absence of error-enforcing conditions and incompatible goals. It is the leader's responsibility to ensure these conditions are optimally provided.

4. Empower all employees to refuse to work under unsafe conditions
This is probably the most counter-intuitive instruction to leaders, who face production targets, but it is the responsibility of top management to convince all employees that they are committed to preventing safety incidents 'by all means', including refusal to (continue) work under unsafe conditions. An effective way of motivating employees to intervene to prevent safety incidents is to recall examples where people intentionally, but by mistake, interrupted the primary process, after which leadership reacted in an understanding way, without any negative consequences for the employee in question. Where these kinds of experiences are not available, building trust is the only strategy to make people believe that safety is the top priority of the organisation.

5. Arrange professional safety leadership training for all leaders at all levels
All leaders, from top management to operational supervisors, should attend formal safety leadership training to obtain a clear vision, motivation, knowledge and skills of what to achieve and how to do it. This enables leaders to better fulfil their roles and to energise interventions.

6. Allocate sufficient time for dialogues with workforce at their workplaces
No aspect of a leader's task is more important than being informed about concerns, and

(weak) signals emitted by operational staff. All leaders at any hierarchical level should allocate time to meet with their operational staff in a setting which this workforce considers 'secure'. These dialogues should be held on an informal basis, as well on the basis of a structured schedule, communicated to all people who are supposed to attend these meetings. Top management should allocate sufficient time to ensure that they have sufficient opportunities to have a dialogue with operational staff about safety topics. In addition to structured meetings, intermediate walk-arounds by managers, and taking time to chat over a cup of coffee are also highly recommended.

7. Actively encourage the identification and communication of safety hazards
'Chronic unease' is the required state of mind of all leaders of organisations.

Encouraging people to find potential sources of safety incidents is crucial in order to reduce complacency regarding the recognition of safety risks. If leaders and operational staff are aligned about the reasons why and how hazard identification should be implemented, the discovery of unsafe situations may be seen as a sign of success (not of an increase in danger). Facilitating employees and supervisors with the proper tools (time, knowledge and hardware) is a key requirement. Welcoming the reporting of hazards, regardless of the source of information, will stimulate the people reporting them to inform leadership in future cases. Ensuring that all hazard reports are analysed and decisions and remedial actions are taken in a timely manner is an important motivator. Clear feedback given to the people who reported issues regarding the actions (planned to be) taken, even if that feedback is to explain the reasons for a lack of action, is a key factor of success.

8. Monitor the implementation and the achieved effects of risk-reducing measures
Where the identification of a safety hazard has resulted in a plan of action, a certain level of urgency has been determined, but the issues of the day are strong, urgency is an easily-evaporating state of mind, and planned safety measures are easily labelled as less urgent. It is common that over the passage of time identified hazards lose their perceived urgency and are even downplayed. To prevent this, it is critical to install a rigid system for recording identified hazards and capturing the preventive or remedial measures determined. The implementation and effectiveness of these measures should be monitored by top management and corrective action taken when deviations from planning are detected. Compliance with this process might be included as KPI, as part of the responsibilities of the leaders involved.

11.2.3 *Recommendations for external parties*

The Process-oriented Safety Leadership Principles as proposed in the previous section are considered key tasks and objectives for leaders in organisations, however, experience has shown that many organisations face incompatible goals. We note the 'Efficiency-Thoroughness Trade-Off'-principle (ETTO), addressing the continual conflict between

producing in the most efficient way and optimally managing safety risks at the same time, as presented by Hollnagel[26] (as mentioned in e.g., Section 2.1.2.4).

Where the economy is involved, economic objectives and safety goals may interfere, exposing employees and/or local residents to safety hazards. Supervisory mechanisms, that is, regulatory and certification systems, have been installed to protect these people. Organisations operating in the Netherlands operate within these systems, and different supervisory bodies monitor (semi-) private organisations regarding compliance with the applicable safety requirements. As noted by Hale, the safety function plays a key role in the safety performance of these organisations. This requires an appropriate vocational education and training infrastructure to develop the safety professionals involved.

In conclusion, we consider it of importance that, as a minimum, supervisory bodies and safety training institutes include these eight Process-oriented Safety Leadership Principles in their supervising/educating strategies.

Next, we present our considerations and recommendations directed at the three types of supervisory/educational organisations operating in the business sectors that are the focus of this research.

11.2.3.1 Governmental Inspectorates

Every society has created a legal framework to regulate the tension between societal expectations and economically driven processes, defining the obligations, responsibilities and accountabilities of all parties involved. In the context of this research, we refer specifically to legislation issued to protect people by preventing safety incidents. Different governmental inspectorates have been established to monitor compliance with the various laws, rules and regulations. As referred to in Section 2.4.1.1, a European initiated deregulation process, ranging from a prescriptive to a goal-setting approach in the 1980s, did not lead to the intended reduction of legislation. Instead, it created a legislative vacuum. This was filled by even more extensive, newly developed accreditation and certification rules. Operational prescriptive text was replaced by, for example, requirements to set performance criteria but these leave room for interpretation, and are therefore hard to operationalise univocally. This changed European approach left the governmental inspectorates with the task of inspecting the 'administrative completeness of systems, compliance with checklist procedures and presence of related certificates.' This is entirely different to the physical verification of the effectiveness of operational safety appliances. This European-driven change in legislation meant that the roles of governmental inspectorates, and simultaneously the competence requirements of its inspectors, have changed tremendously.

Kluin[27] clearly revealed the operational effects of the change in inspection strategies in a publication entitled 'Optic compliance'. She found that, where the prevention of

26 Hollnagel (2009)
27 Kluin (2014)

safety incidents is concerned, organisations follow their own policies and prepare for governmental inspections as far as necessary to keep a valid licence to operate. In practice this means that the safety departments in organisations are charged with the task of keeping all required system documentation, incident reports and certificates up to date. Kluin wonders whether this contributes to operational safety. The prime motivation behind this work seems to be protecting organisations and their leaders from legal proceedings and prosecution. Apparently, the paper world gives people (the leaders of organisations as well as the governmental inspectors) a feel-good experience.

There is a clear gap between the inspector's paper world and the leader's real world; governmental inspectors dealing with printed paper, organisational leaders dealing with the day-to-day reality of risk management. Still there is a point where they meet: the continuation of business. Safety departments keep systems and records up-to-date, to prevent a compulsory shut down by governmental authorities. In the case history involving the shutdown of tank storage in the Rotterdam area, referred to in Section 2.4.1.4, governmental inspectors detected a lack of administrative compliance (reporting of incidents). This led to a next-level physical inspection, discovering many effective safety appliances, resulting in a prohibition on continuing operational activities. In that particular case, a failure to keep administrative systems up-to-date, resulted in serious liabilities and economic losses. Moreover, this experience triggered multi-departmental governmental inspections across the entire tank storage sector, which revealed a serious number of shortcomings in many similar organisations. Reporting safety incidents and keeping paperwork up-to-date has proven to be an essential task in preventing the discontinuation of business.

But this 'success story' of a governmental intervention required a tremendous workforce from different governmental departments, which cannot easily be repeated in organisations with more complex primary processes. Governmental inspectorates simply lack a quantitatively and qualitatively sufficient and competent workforce.

A lack of available and sufficient competent experts, means that physically monitoring the safety of their complex primary processes is impossible for all business sectors involved in this study.

With this in mind, we believe that the efficiency of governmental inspectorates, in their role as the protectors of people, and the general public, who, either as employees or as hospital patients, are exposed to safety hazards, is below the level expected by society. We thus believe that these inspectorates require a different modus operandus. We believe that they would be more 'safety-effective' if they shifted their focus from system descriptions and other safety-related paper markers to different observable indicators of the safety of the real world of organisations.

Based on the outcomes of our research and taking the above into account, we recommend that governmental inspectorates consider adopting our proposed Process-oriented Safety Leadership Principles as a reference framework to be incorporated in their inspection policies, evaluation criteria and executive operations vis-à-vis the business sectors they supervise.

11.2.3.2 Certifying bodies

The perceived conflict between the economy and safety often causes discussions between the owners of economic power and other parties whose interests are affected by safety risks taken by that economic power, but in some relations, safety arguments are strong enough to supersede the economist's arguments and lead effectively to reduction of risks. An interesting case is the discussion between ship owners and the insurers of their vessels.

The safety of cargo vessels has been a point of attention since the Middle Ages, and a variety of safety measures have been taken by different countries to prevent shipwrecks. It took numerous shipwrecks, and until 1890 (55 years after the initial discussions in the UK Parliament about the topic), for the UK to issue a legal requirement to paint a load line (so-called Plimsoll mark) on a ship's hull in the Merchant Shipping Act. This Plimsoll mark indicates the maximum limit to which a ship may be loaded in order to ensure sufficient freeboard and thus safely maintain buoyancy but the reason this safety indicator was finally agreed upon had nothing to do with the safety of the ship's crew members. It was the fact that the main ship insurer, Lloyd's Register, suffered excessive economic losses due to compensation paid to ship owners for insured, but overloaded and thereby sunken vessels. The fate of drowned crew members was enthusiastically used in parliamentarian discussions by the morally motivated honorary Samuel Plimsoll, but in fact the economic arguments and political effect of Lloyd's were what was decisive in implementing the rule. I took until 1930 for the Plimsoll mark to obtain international status, and for it to be agreed that the correct implementation of this important safety requirement would be verified and certified by so-called certifying bodies.

The above history reflects a lengthy negotiation process in which multiple parties with different, sometimes conflicting objectives, agreed upon safety measures to solve an otherwise unacceptable safety risk, vis-à-vis economic objectives. After successful negotiations, agreed measures are published as, for example a standard, a norm, or a code of practice. Compliance with published measures is verified by accredited certifying bodies, who after verification issue certificates of fitness or compliance with the measures. Certification may be part of a requirement by governmental authorities, or, as part of a system of self-regulation, may be based on the mutual agreement of organisations belonging to a certain business sector.

After agreement about certification criteria is reached, the negotiated final results (draft standards, norms, codes of practice) are presented to the relevant governmental authorities for acceptance. If these results meet the requirements set by these authorities, the norm, standard, or code of practice will be operationalised as a reference to comply with relevant goal setting legislation. From that moment onwards, certifying bodies replace governmental inspectorates in their monitoring role. The corresponding factor between legislation and certification is that both act as a prerequisite to carrying out economic activities.

Historically, certificates were issued to, for example, the manufacturers of electrical appliances, cars, vessels, elevators, medical equipment, and so on, but nowadays certifi-

cation is not restricted to hardware systems. It extends to, for instance, the certification of safety management systems, safety cases and vocational competency in various industries and health care sectors. Its wide implementation has created an irreversible formal position for commercial certifying bodies, which operate in an attractive new market place.[28]

An actual example, is that in some business sectors organisations have embraced a certification concept based on a so-called Safety Culture Ladder. This concept was originally developed in the oil and gas industry, and further prepared for certification in the rail sector. This 'ladder' aims to improve the safety culture of organisations in order to prevent safety incidents. The method includes a system 'measuring' the level of cultural development in an organisation. The concept encompasses the induction training of leaders and the workforce to improve the organisation's safety culture. There are five different cultural levels to be achieved. The actual level achieved, is verified by trained 'Safety Culture Ladder-verifiers', who use an extensive verification reference. Upon verification, organisations obtain an official certificate recognised by the Dutch National Standardisation Institute (NEN), proving the achieved safety culture level.

In different business sectors contracting organisations require their contractors to demonstrate their safety culture level and use this as a prerequisite before these contractors are accepted to work in their business sector. Like the Plimsoll mark, this is a case of 'safety improvement driven by economic arguments.' Regardless of the actual validity of the Safety Culture Ladder concept and its pros and cons, however, we believe that both concepts (the Plimsoll mark and Safety Culture Ladder) motivate leaders and their workforce to pay attention to the safety aspects of their operations. Although one may question the difference in calibration….

As referred to in Section 2.4.1.1, the concept of certification is found in every business sector, from oil and gas to hospitals, and is always based on economic objectives. Regardless of the motivational aspect, we see the latter as a weak aspect of certification. This is due to the fact that the parties involved present the concept as a safety improvement instrument based on independent verification by independent certifiers, but all parties involved have an economic interest in the certifying process. We therefore argue that certification should be considered a commercially driven concept, where material interests inevitably play a role. Conversely, this is not the case in verification processes where governmental inspectorates play the verifying role; public inspectors have no material interest in the outcome of their inspections.

In Section 2.4.1.1., referring to the European decision to deregulate, we argued that: "…after existing prescriptive instructions were withdrawn, the transfer to goal-setting regulations has created uncertainty and unexpected room for individual solutions to safety issues. As a response to this unclear situation, the desire appeared to eliminate the indistinctness and regain clear criteria. Private organisations (certifying bodies) and industrial sectoral associations thus rehabilitated old prescriptive rules, which had been declared

28 Zwetsloot, Hale and Zwanikken (2011).

void by the government."[29, 30] As a consequence, the certification business flourished like never before. We therefore wonder whether the envisaged effect of deregulation (reducing the regulatory bourdon on organisations) really has materialised. In our view the only measurable effect is that the duty of care by governments has been shifted to a commercially driven system without effective checks and balances. We fear that this development is an irreversible one, and that governmental inspectorates have lost control for ever. For that reason, we wonder whether the policy of delegating the responsibility for safety verification to certifying bodies really contributes to improved safety in the real world. Due to this uncertainty, we refrain from recommending that our proposed Process-oriented Safety Leadership Principles should be included in certification norms and/or standards. We consider it appropriate to first conduct in-depth research into this dilemma.

11.2.3.3 Safety training institutes

The work by Hale et al. shows that a professional safety function, teamed with top management, indeed leads to better safety results. At present a great deal of education and training programmes for safety practitioners is based on compliance with laws and regulations. This has its roots in the way regulatory bodies and organisations historically viewed the safety function. Despite this, many organisations consider the role of safety practitioners a policing one, focusing on 'catching' safety violations by the operational workforce. This is in no way the contemporary role of the safety function, however; managing operational workforce is part of the leader's function. The outcomes of our research clearly show that improving safety is not about law enforcement, but about a Process orientation.

Unless a safety practitioner is recruited from an operational position in their organisation, and has enough experience on the work floor, they are not sufficiently aware of the ins and outs of the technical and psychological processes at operational level. Experienced operational leaders have much better insights into the constraints the workforce are facing, why they sometimes deviate from agreed work and safety procedures, and why this is unsafe. This requires a different, non-policing and more accommodating and interceding role for the safety function; the safety professional must be prepared to assist leaders in designing and organising, and operators in conducting operational tasks that are 'safety-smart'. In this context an effective safety professional is an inspirational, creative consultant, sometimes acting as mediator between different schools of thought, and in other instances rendering professional safety-specific advice to all levels in the organisation. The knowledge and skills required to execute this role are entirely different than the knowledge and skills that were considered important when the governmental vocational requirements for safety practitioners were defined. The safety profession needs to be reinvented in this respect.

29 Peuscher and Groeneweg (2012).

30 Walker, Throndsen, Reeves, Hudson, Croes, Dahl-Hansen, Stadler and Winters (2010).

It is recommended that safety training institutes reconsider their roles and purpose, and consequently review their curricula to deliver a different, up-to-date kind of safety professional, who is prepared to play a constructive supporting role in Process-oriented organisations.

11.2.4 *From principles to practices*

As every organisation is unique when it comes to how leaders and workforce relate to each other, suggesting ways to implement strategic recommendations, such as Process-oriented Safety Leadership Principles, is a risky manoeuvre in itself. Nevertheless, we believe that leaving this open would be an omission, and hamper the effective delivery of our recommendations to the places they were designed for: the operational departments of organisations.

Operating in an environment where prescriptive regulations have been replaced by goal setting legislation implies that the way to achieve these goals (or safety objectives) must be decided by the organisations themselves. In this research, 'principles' represent the safety objectives and 'practices' represent possible ways to reach these. Principles are designed to serve as strategic guidance, and even be considered moral directives for those leaders who are intrinsically committed to preventing safety incidents in the organisations they lead. We also argue that safety is part of the vocational DNA of truly professional leaders. For these professionals, our recommended principles should suffice as guidance on how to behave vis-à-vis their teams. Their individual appearance, combined with their professional competence and commitment to improve the safety in their area of responsibility, are fertile soil for creative implementations.

Not all leaders who are committed to achieve optimal safety will be confident about how to implement our recommended principles. These leaders may understand the objectives, the 'what' part of Process-oriented leadership, but they might need some guidance to find answers to the 'how to'-part of it.

Where our recommended principles might lack the necessary leverage to foster Process-oriented leadership behaviour, the explanatory text in Section 11.2.1 'Fostering Process-oriented Safety Leadership: the academic approach', and the related Academic Safety Leadership Practices as summarised in Section 11.2.1.5, may serve as inspirational resources.

It is up to the individual leaders in their specific strategic and/or operational environments to adopt the most applicable practices to meet their proposed principles. The above may not apply to external organisations in the same way, and different policies may be required. Our recommended principles may not match the present law-based, goal setting inspection policies of governmental inspectorates, but with reference to the outcomes of our research, we argue that implementing our recommended principles may help organisations, by fostering Process-oriented Safety Leadership, to meet the objectives as described in health and safety regulations. This is why we suggest inspectorates employ our recommended Process-oriented Safety Leadership Principles to help

organisations to foster a Process-oriented leadership style. Governmental inspectorates may play a useful role by including their experiences in different organisations/sectors when dealing with organisations being inspected or audited.

We imagine it could be useful for certifying bodies to employ our recommended principles during the development processes of new or revised certification references, such as safety norms and standards, but as mentioned before in Section 11.2.3.2, we recommend more in-depth research into the possibilities around certification. Safety training institutes are expected to be able to mobilise their present development and educational qualities to assimilate the concept of Process-oriented Safety Leadership Principles in the review and design of contemporary safety professional training curricula.

In conclusion we emphasise that the implementation of safety leadership principles requires an understanding of the specific needs to reduce the safety risks of the primary processes involved. For some leaders these principles are clear, and enough to encourage them to demonstrate appropriate behaviours, but other leaders may need more guidance and support. As mentioned before, the explanatory words in Section 11.2.1 and the Academic Safety Leadership Principles in Section 11.2.1.5 may be of useful assistance for those leaders.

11.2.5 *Summary*

This research revealed the role of leaders in relation to incident prevention in organisations. In order to be authentic, we refrained from traditional leadership typologies and used different references, which we considered more appropriate for characterising leaders in relation to their behavioural orientations. The acquired data showed different effects by differently oriented leaders. As expected, Dominance-oriented leaders proved to have a negative influence on safety. Relation-oriented leaders appeared to be friendly people with no real influence where risk reduction is concerned. Production-oriented leaders were real achievers; decisive process controllers, committed to meeting production targets.

A new character emerged during our research: the Process-oriented leader. This person proved to be a dedicated safety minded leader, who fulfils their production duties in a responsible way, simultaneously taking care of the reliability of the primary process without compromising the safety of their team members. Initially we assumed that identifying risk management activities would lead to a reliable differentiation of leaders' safety performance. We thus developed a Risk Reduction Cycle, showing the risk management process through five risk management activities. Applying this model revealed that the recognition of risks and implementation of remedial actions are the weakest links. We also discovered that, with respect to safety, people are more sensitive to how their leader behaves than to their leader's influences, mediated by risk management activities.

In conclusion, we argue that this research revealed that, in spite of the generally strong focus on ability, motivation and courage to intervene by the workforce, the effectiveness of incident prevention depends predominantly on the individual behaviour

of their leaders. Consequently, in order to foster Process-oriented Safety Leadership, we decided not to focus on operational safety practices to be carried out by the workforce. Instead, we deliberately emphasise the influential power of the hearts and minds of their leaders, and propose a set of Process-oriented Safety Leadership Principles, directed at the board room level of organisations and three external parties, which we consider instrumental to support organisations in implementing these principles.

11.2.6 *Still unknowns* (*further research required*)

Although much was discovered about the relationship between leadership and incident prevention in this research, there are still unknown issues for further research. We note that this research is the first of its kind, as far as these newly developed leadership orientations are concerned. Inevitably this implies hidden imperfections and unknown biases. As the first implementation of the prospective survey questionnaire, its validation is limited to one survey only. Conducting a second (or more) surveys, replacing the indicators, which were invalidated during the various analyses, with newly developed statements, validly classified by factor analysis, could improve the rigidity of the data. Another reason to re-conduct the study, is to apply the prospective survey in different business sectors in order to verify its applicability in different 'domains'.

An area of interest for exploration is the contradiction concerning the high scores for Recognition versus the expert opinions (ref. 7.3.1). Developing a more representative hazard identification method might be helpful in addressing this contradiction. Such a better method could reduce the dangerous positive bias in the actual risk levels related to primary processes, and further encourage the 'chronic unease' state of mind.

The ambiguous aspects of the concept of certification was an interesting discovery. In our attempts to discover the applicability of the Process-oriented Safety Leadership Principles, we have not been able to reach firm conclusions about the position of these principles in relation to safety-related certification. Due to the increasing societal effect of certification related to safety, we consider this an important topic for further research.

11.2.7 *Limitations*

This research was conducted within the limitations of our operational feasibility.

First, the geographical area in which this study was conducted was limited to the Netherlands. The sectorial selection for collecting the survey data was limited to six specific business sectors and one non-specific category, named 'Other'. The acquisition method, anonymously and through online questionnaires, easily opened doors to many potential respondents, however, by using this acquisition method we were restricted as regards population control.

11.2.8 *Coda*

Following the conclusions of this research, we argue that an accident-free planet is an impossible dream, because:

- High-frequency low-impact incidents will continue to occur, because, although the risks have been clearly identified, a) the potential damage is relatively limited, and therefore b) the urgency is of local (department, location, etc.) importance, and will easily make way for the 'delusion of the day' induced by economic targets, and therefore c) remedial actions are not taken, or are not taken in a timely manner;
- Low-frequency high-impact incidents (calamities/disasters) will continue to occur because people are convinced that they are aware of all the risks, but that is not always the case, as, quoting Rumsfeld, "We don't know, what we don't know",[31] and, quoting Kahneman, "Taking into account information that does not come to mind, perhaps because we have never known it, is impossible."[32]

We concur with Perrow's 1984 statement that "Risk will never be eliminated from high-risk systems, and we will never eliminate more than a few systems at best. At the very least, however, we might stop blaming the wrong people and the wrong factors, and trying to fix the systems in ways that only make them riskier."[33] As we are convinced that the application of our proposed Process-oriented Safety Leadership Principles will reduce opportunities for safety incidents in an organisational setting, we sincerely hope that this dissertation will motivate leaders at any level to embrace these principles and adopt them in their corporate governance policies from top to bottom.

31 Rumsfeld (2013).
32 Kahneman (2012), p. 277.
33 Perrow (1999), p. 4.