A review of the literature on effective leadership behaviours for safety

Prepared by the Health and Safety Laboratory for the Health and Safety Executive
There is widespread agreement between industry, regulators, academics and the press that leadership is a key component of a safe organisation. This view is widely supported by findings from almost all major incident inquiries and investigations. However, the widespread agreement that leadership is central to safety does not extend to how leadership should deliver safety, what needs to be done, and rather importantly, who should be doing it. While there is considerable literature on leadership, very little of this addresses the issue of safety, particularly in the major hazard sector.

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HSE Books
KEY MESSAGES

• Transformational and transactional theories of leadership have received considerable empirical support suggesting that they can be appropriate for the effective management of safety. Other leadership theories, such as authentic leadership, whilst holding great promise lack empirical research regarding their impact on safety.

• Managers can have a positive influence on safety outcomes by articulating a clear vision for safety, and motivating employees to achieve it, acting as role models and showing concern for the welfare of employees (e.g. transformational leadership), communicating and setting clear goals and standards for safety, monitoring and recognising positive safety behaviours (e.g. transactional leadership).

• Effective leaders are coaching-oriented, supportive, provide the necessary resources and encourage worker involvement in safety.

• Managers’ leadership styles and behaviours can impact on safety directly but also through indirect mechanisms. Managers who actively champion safety can foster perceptions of a positive safety climate, which in turn impact on safety.

• Management commitment to safety, active involvement and participation in safety and consistent enforcement of safety policies is associated with positive safety outcomes, such as positive perceptions of safety climate and reduced levels of risk taking behaviours.

• Safety communication and worker involvement in improving safety have a positive impact on safety. Good working relationships between management, typically supervisors and employees, and perceptions that management values safety influence the ‘bottom up’ communication of safety concerns.

• Trust in management is an important determinant of safety as it enhances perceptions of a positive safety climate and employees’ motivation to work safely, and reduces accident involvement and injuries. Perceptions that management values safety and encouragement of two-way safety communications help promote trust.

• Consistent safety messages need to be demonstrated at all management levels, from senior management to supervisors.

• Managerial training interventions can have a positive influence on occupational safety and may be an effective means of enabling managers to develop leadership skills that are conducive to safety.
EXECUTIVE SUMMARY

Background

There is widespread agreement between industry, regulators, academics and the press that leadership is a key component of a safe organisation. This view is widely supported by findings from almost all major incident inquiries and investigations. However, the widespread agreement that leadership is central to safety does not extend to how leadership should deliver safety, what needs to be done, and rather importantly, who should be doing it. While there is considerable literature on leadership, very little of this addresses the issue of safety, particularly in the major hazard sector.

Aim of the review

The aim of the review is to identify specific leadership styles, attitudes, behaviours and practices that represent effective leadership for safety. The specific objectives are to:

• Carry out a review of key leadership literature in the appropriate business domains.

• Evaluate different leadership theories and determine their appropriateness for the management of safety risks.

• Based on the literature and subsequent analysis, develop a framework describing the key requirements of safety leadership.

Method

An extensive review of published evidence over the last 10 years was carried out in order to capture current knowledge in the area of leadership. It included both peer-reviewed journal papers and policy research reports. In addition, accident reports and relevant discussion papers for a sample of sixteen major incidents were reviewed in order to identify any recurrent themes in the causation of these incidents. The emphasis was on those issues that either represented leadership failures or have leadership implications for the management of safety.

Findings

A total of forty papers were included in the review, of which thirty-five were quantitative studies and five were qualitative studies. All quantitative studies were published in academic journals, with the exception of one, which was a policy research report. Of the five qualitative studies, two were published in peer-reviewed journals and three were policy research reports. The majority of quantitative studies employed cross-sectional designs, thus limiting the extent to which causal inferences may be drawn between specific leadership styles, attitudes or behaviours and safety outcomes. The empirical literature showed some consistent associations between specific leadership styles and safety outcomes. Specifically:

• Transformational leadership (e.g. acting as a role model, inspiring and motivating employees to work safely and showing concern for employees’ welfare) enhances a number of safety outcomes including fostering perceptions of a positive safety climate, promoting higher levels of employee participation in safety activities, compliance with safety rules and procedures and safety citizenship behaviours (e.g. participation in safety committees, looking out for workmates’ safety).
• **Transactional (contingent reward) leadership** (e.g. clarifying performance expectations, monitoring and rewarding performance) is associated with perceptions of a positive safety climate, positive safety behaviours and reduced accident rates.

• **Passive leadership** (i.e. turning a blind eye to safety) is associated with lower levels of safety consciousness, negative perceptions of safety climate and an increase in safety-related events and injuries.

• The effects of transformational and transactional leadership are both direct and indirect. In the latter case, positive effects are achieved through the promotion of a positive safety climate. In addition, transformational leaders can influence safety by enhancing employees’ levels safety consciousness (i.e. knowledge).

• The benefits of transactional leadership are enhanced when safety is valued across different levels of management. Transformational leadership styles combined with trusting relationships between management and employees enhance employee safety performance such as safety citizenship behaviours.

• **Trust in management** influences perceptions of safety climate as well as accident involvement. Behavioural consistency, honesty and integrity, sharing and delegation of control, openness and accuracy of communication, and demonstration of concern are qualities that influence the development of trust in leaders.

• The quality of relationships between employees and management, particularly supervisors, impacts on safety. **High quality leader-member exchanges, characterised by mutual trust, and openness** are associated with higher levels of upward safety communications, safety citizenship behaviours and reduced levels of safety-related events. Safety citizenship behaviours in particular, are pronounced when, in addition to high quality leader-member exchanges, leaders emphasize the value of safety and promote a positive safety climate.

Studies that have focused on specific safety management attitudes, behaviours and practices have consistently shown that:

• **Management commitment to safety** is associated with a reduction in risk-taking behaviours and violations, lower levels of self-report incidents and higher levels of learning from safety events.

• **Perceptions that safety policies and procedures are enforced** and consistently implemented are associated with lower levels of incident under-reporting, self-report injury incident and higher levels of satisfaction with the organisation.

• **Leader support for safety and openness to safety suggestions** is associated with higher levels of employee willingness to raise safety issues, lower levels of self-report injuries, higher levels of satisfaction with the organisation and can lead to a long-term improvement in safe working practices.

• **Safety communication** between management and the workforce is associated with a reduction in the levels of risk-taking behaviours, promotion of positive safety behaviours and reduced levels of self-report work-related pain.

• **Active involvement in safety** helps promote perceptions of a positive safety climate and fosters increased levels of employee accountability and responsibility for safety.
The analysis of sixteen major incidents identified nine overarching themes as contributing factors to these incidents:

- **Commitment to safety** (including priority given to safety and resources dedicated to ensuring safety operations) and **complacency and lack of oversight** (e.g. the extent to which organisations tolerate unsafe working practices or failing to act promptly on safety concerns) were implicated in 12/16 and 11/16 incidents reviewed respectively.

- **Training and competence**, relating to inadequate training in dealing with unexpected events and emergencies, and inadequate knowledge of hazards, was implicated in 11/16 incidents reviewed.

- **Learning from previous incidents** (including an organisation’s attentiveness to potential precursor events and carrying out incident investigations to identify root causes) was implicated in 10/16 incidents.

- **Adequacy of procedures** (including violation and/or poor enforcement, poor usability and/or absence of procedures) was a contributory factor in 9/16 incidents.

- **Safety communication** (including open and trusting channels for sharing safety-related information), and **hazard awareness and management** (including an organisations’ use of audits and risk assessments to identify problems and put the necessary control measures in place) were identified as contributory factors in 8/16 and 9/16 incidents respectively.

- **Clarity of roles and responsibilities regarding safety** (such as accountability for safety at different levels of management) was implicated in 5/16 incidents.

- **Management of change** (the extent to which changes equipment or staffing resources are carried out by taking into consideration any potential consequences for the management of major hazards) was identified as a contributory factor in 5/16 incidents reviewed.

Although a complex interplay of factors at different organisational levels was involved in the causation of major incidents, leadership failings were a common contributory factor across the different incidents. Taken together, the findings from the empirical literature and the review of major incidents suggest that managers can positively influence safety by adopting active forms of leadership (as exemplified by transformational and transactional leadership styles) and promoting a positive safety culture and trusting employee-management relationships.

**Implications**

The findings from this review have some important *implications for practice*:

- Managers can have a positive influence on safety by embracing transformational and transactional (contingent reward) leadership styles. These have been shown to have several safety benefits and are also crucial for the development of a positive safety culture. Training interventions may be an effective way of helping managers to develop these leadership skills.

- Management needs to actively demonstrate a visible commitment to safety. This may be done through prioritising safety and allocating the required resources, becoming involved in health and safety activities, encouraging staff to voice their safety concerns and make suggestions to improve safety in their workplace.

- Leaders should pay attention to the importance of open and trusting safety communications with the workforce. Developing good working relationships characterised by openness, support and mutual respect, behavioural consistency, sharing and delegation of control as well as demonstration of concern are some factors that help promote trust.
This review has identified some notable gaps in relation to safety leadership, which suggest several potential avenues for future research. Specifically:

- Although research on active forms of leadership (i.e. transformational and transactional contingent reward) have identified what managers should do to enhance safety outcomes, it is equally important to identify the consequences of managers ‘turning the blind eye’ or ignoring safety issues. Further, research into other types of leadership styles, such as how leaders identify and manage errors may be particularly relevant for high hazard organisations. Similarly, authentic leadership is another leadership style that holds promise but requires further research to explore its effectiveness with regards to safety outcomes.
- More research is required to examine the types of leadership behaviours that are conducive to safety in high hazard organisations. This will require a consideration of other measures of safety performance (such as process safety performance) beyond those used to measure occupational health and safety.
1. INTRODUCTION.................................................................2
2. IMPLICATIONS.................................................................3
3. METHODOLOGY.................................................................6
4. REVIEW OF MAJOR LEADERSHIP THEORIES.......................7
5. RESULTS............................................................................19
6. LEADERSHIP STYLES AND SAFETY.................................20
7. MANAGEMENT ATTITUDES, PRACTICES AND
   BEHAVIOURS IN RELATION TO SAFETY.........................29
8. EFFECTIVE SAFETY LEADERSHIP: OVERVIEW OF KEY
   FINDINGS............................................................................37
9. REVIEW OF MAJOR INCIDENTS: KEY THEMES....................44
10. INTEGRATION OF FINDINGS FROM EMPirical
    RESEARCH AND MAJOR INCIDENTS...............................50
11. REFERENCES.......................................................................53
12. APPENDICES.......................................................................60
1. INTRODUCTION

1.1 BACKGROUND

There is widespread agreement between industry, regulators, academics and the press that leadership is a key component of a safe organisation. This view is widely supported by findings from almost all major incident inquiries and investigations. However, the widespread agreement that leadership is central to safety does not extend to how leadership should deliver safety, what needs to be done, and rather importantly, who should be doing it. While there is considerable literature on leadership, very little of this addresses the issue of safety, particularly in the major hazard sector.

1.2 AIMS AND OBJECTIVES

This project seeks to equip HSE to understand and evaluate safety leadership advice, guidance and practice and, through that, to inspect and enforce in the area of safety leadership in respect of major hazards. The aim of the review is to identify specific leadership styles, attitudes, behaviours and practices that represent effective leadership for safety. The specific objectives are to:

- Carry out a review of key leadership literature in the appropriate business domains.
- Evaluate different leadership theories and determine their appropriateness for the management of safety.
- Based on the literature and subsequent analysis, develop a framework describing the key requirements of safety leadership.
2. IMPLICATIONS

This review considered different sources of evidence in an attempt to identify the requirements for effective safety leadership. The empirical literature showed some consistent associations between specific leadership styles, behaviours and practices and safety outcomes. However, the overwhelming majority of studies adopted cross-sectional designs, which limit the extent to which causal inferences may be drawn between specific leadership styles or behaviours and safety outcomes. These limitations notwithstanding, the empirical literature and the analysis of a selection of major incidents revealed several common issues that appear to be crucial for leadership and the effective management of safety. In this section, we discuss the implications of these findings for organisational practice as well as suggest potential avenues for future research.

2.1 IMPLICATIONS FOR PRACTICE

The findings from this review revealed that transformational and transactional theories of leadership have received consistent support in the literature suggesting that they are effective approaches for the management of safety. Specifically, embracing transformational and transactional (contingent reward) leadership styles have been shown to have several safety benefits and are also crucial for the development of a positive safety culture (see section 4.2.4 for a discussion of these leadership styles). Both leadership styles comprise active forms of leadership and emphasize the importance of not turning a blind eye to safety through demonstrating an active involvement and commitment to safety. A transformational leadership style requires managers to take an active role in safety and demonstrate behaviours, such as articulating a safety vision for the organisation and explaining how it can be achieved, acting as a safety role model and exemplifying the importance of safety in both words and deeds, showing concern for employees’ welfare and respond and act upon their safety concerns (e.g. Yukl, 2010; Flin & Yule, 2004). A transactional leadership (contingent reward) style requires managers to clarify performance expectations and set high safety performance standards as well as recognise and reward positive safety behaviours and practices. Training interventions may be an effective way of helping managers to develop these leadership skills. For instance, safety-specific transformational leadership training has been shown to be an effective approach to improving occupational safety (Mullen & Kelloway, 2009).

In addition, it is important for management to actively demonstrate a visible commitment to safety. This may be done through their involvement in health and safety activities, such as holding safety discussions with staff during site visits, encouraging staff to voice their safety concerns and suggest health and safety improvements as well as allocating resources for health and safety. Prioritisation of safety over productivity is another means whereby management can demonstrate a visible commitment to safety. Investigations into major accidents have revealed that pressures between safety and production have been a contributory factor in the causation of these incidents. It is argued that organisations with good safety records do not view safety and production goals as pulling in opposite directions; rather safety is seen as integral to their productivity and profitability (Flin & Yule, 2004).

Further, findings from both the literature and the major incident analysis suggest that leaders should pay attention to the importance of open and trusting safety communications with the workforce. Leader behaviours as well as the quality of relationships that they develop with employees are crucial for developing trust and promoting open safety communications. Leaders can influence the extent to which employees will communicate safety issues and concerns by developing good working relationships characterised by openness, support and mutual respect (e.g. Mullen, 2005; Kath et al., 2010b). Other factors that promote trust include behavioural
consistency, sharing and delegation of control as well as demonstration of concern (Whitener, 1998; cited in O’Dea & Flin, 2003).

Finally, one key issue that was evident from the review of major incidents is that the effectiveness of any given safety management system depends on the quality of leadership as it will shape and influence how it will be implemented. Roughton & Mercurio (2002) argue that in the absence of leadership, safety management systems will fail. Similarly, it is argued that well-designed policies and procedures will be ineffective unless they are embedded within a work environment that supports and values safety (e.g. Kath et al., 2010a). Effective safety leadership is particularly important in the context of major hazard organisations because, as evident from the major incidents reviewed, failures and errors can have catastrophic consequences. Hopkins (2009) argues that ‘mindful leadership’ could avert major disasters, such as the BP Texas City in 2005, and offers several guidelines that leaders can use to promote ‘mindful leadership’. For instance, it is important that leaders are aware that their actions and behaviours send important messages to the workforce about safety and make sure that their ‘actions and words’ are congruent (Hopkins, 2009). This is consistent with a transformational leadership style as it suggests that ‘mindful’ leaders act as safety role models and lead by example. It is further recommended that leaders should try to find out about any potential problems personally through site visits and talking with front line staff about any safety issues that they face (Hopkins, 2009). Site visits are an inexpensive means whereby leaders can engage with employees on safety issues that affect them whilst at the same time promoting perceptions of a positive safety climate (Frankel et al., 2008).

2.2 IMPLICATIONS FOR FUTURE RESEARCH

This review has identified some notable gaps in relation to safety leadership, which suggest several potential avenues for future research.

First, empirical research has predominantly examined active forms of leadership, namely transformational and transactional leadership, and their impact on safety-related outcomes and performance. Although this line of research is important in identifying what managers should do to enhance safety outcomes, it is equally important to identify the consequences of managers’ ‘turning the blind eye’ or ignoring safety issues. Empirical findings have shown that passive leadership styles have distinct, negative (rather than null) effects on safety outcomes including safety climate, safety knowledge and behaviour (e.g. Kelloway et al., 2006). Identifying the types of passive leadership behaviours that managers may engage in and the consequences of not championing safety seems a fruitful avenue of future research.

Second, examining the potential effectiveness of other leadership styles, other than transformational and transactional leadership, in the context of safety management is crucial. For instance, Rodriguez and Griffin (2009) note that leadership research has predominantly focused on how leaders can motivate and inspire followers but there has been insufficient attention on how leaders identify and manage errors. It is further argued that ‘management by exception-active’ leadership styles may be an effective leadership approach as it allows leaders to proactively monitor the environment and take corrective actions where necessary (Rodriguez and Griffin, 2009). This leadership style may be particularly relevant for high hazard organisations whereby the consequences of error may be potentially catastrophic. For instance, management by exception-active leadership styles are characteristic of high reliability organisations (organisations that have consistent records of good safety performance despite the fact that they operate in high hazard contexts) whereby managers actively monitor employee decisions and actions and take appropriate corrective actions when required (Roberts, 1993). Similarly, authentic leadership is another leadership style that holds promise as a potentially
effective leadership style. For instance, recent qualitative research has shown that it is important for senior managers to be perceived as sincere, ‘walking the talk’ and delivering on their promises (Roger, Flin, Mearns, & Hetherington, 2010). However, quantitative studies are required to examine the impact of authentic leadership and examine the potential mechanisms whereby authentic leaders can influence safety outcomes.

Finally, with the exception of a small number of studies (e.g. Fleming, 2001; O’Dea & Flin, 2001; Mearns et al., 2003; Conchie & Donald, 2006; Yule et al., 2007), the majority of studies identified have been conducted in non-major/low hazard organisations. More research is required in the context of major hazard organisations to identify specific leadership styles and behaviours that may be critical in such contexts. This is because high hazard organisations have extremely small margins for error given that errors may have very serious consequences. Therefore it is important to gain a more nuanced understanding of leadership in these contexts. For instance, as was mentioned earlier, an understanding of the types of leadership behaviours that promote error detection and prevention may be especially relevant. Studying leadership in high hazard contexts will likely require the development of appropriate measures to examine its impact on safety outcomes. Traditionally, research has used occupational health and safety measures in examining the effectiveness of leadership, such as self-report measures on near misses, accident involvement and injuries. However, major incident findings suggest that these measures may not be sufficient in examining the effectiveness of leadership in high hazard contexts because occupational health and safety performance does not guarantee high levels of process safety performance (e.g. Hopkins, 2009), which is crucial in these contexts. Therefore, the examination of leadership in high hazard industries will necessitate the development of appropriate, context-specific measures of safety.
3. METHODOLOGY

A ‘state of the art’ review of published evidence was undertaken. This type of review aims to reflect current knowledge on a particular topic by focusing on the most recent evidence in the area. Three sources of evidence were used: peer-reviewed empirical studies and reviews published in academic journals, non-peer reviewed studies (e.g. policy research reports), and accident reports of major industrial incidents. In addition, specialist texts on leadership were examined in order to provide an overview of major leadership theories.

To reflect current knowledge, empirical papers published from January 2000 onwards were considered eligible for inclusion. However, review papers were also included to ensure that relevant research published before 2000 was also captured. The literature review process is summarised in Figure 1. Further details on the methodology can be found in Appendix 1.

Figure 1. Key stages involved in the literature review process
4. REVIEW OF MAJOR LEADERSHIP THEORIES

4.1 DEFINITION OF LEADERSHIP

Although leadership has been conceptualised from various perspectives, according to Northouse (2010) central to all the conceptualisations are the following characteristics:

1. Leadership is a process that involves influence; and
2. Leadership occurs in groups and involves common goals and purpose.

On the basis of the above, leadership may be defined as ‘a process whereby an individual influences a group of individuals to achieve a common goal’ (Northouse, 2010, p. 3). Further, Kelloway & Barling (2010) define leadership as a process of social influence that is enacted by individuals in formal positions of power or leadership positions within an organisation, such as managers and supervisors. Although leadership is not confined to individuals in formal leadership positions, it is argued that these individuals may have a particularly wide remit of influence within an organisation (Kelloway & Barling, 2010).

Leadership is not tantamount to management although they both share some common characteristics. For instance, they are both concerned with influence, working with people and meeting goals (Northouse, 2010). However, the functions of management may be distinguished from those of leadership. In particular, management is concerned with planning and budgeting (e.g. setting timetables and allocating resources), organising and staffing (e.g. establishing rules and procedures) and controlling and problem solving (e.g. developing initiatives and generating solutions) (Kotter, 1990; cited in Northouse, 2010). On the other hand, leadership involves establishing a direction (e.g. creating a vision and establishing strategies), aligning people with organisational goals (e.g. communicating goals and seeking commitment) and motivating and inspiring people to achieve organisational goals (e.g. empowering subordinates) (Kotter, 1990; cited in Northouse, 2010). Despite these differing functions, leaders are also involved in planning and organising tasks in order to get the job done (i.e. management function) and similarly managers are often involved in helping groups achieve their goals (i.e. leadership function) (Northouse, 2010).

4.2 OVERVIEW OF LEADERSHIP THEORIES

Leadership theories are commonly categorised into trait, behavioural, contingency and influence or power approaches (e.g. Hofmann & Morgeson, 2004; Northouse, 2010). Prior to the 1970s, the main leadership approaches were trait, behavioural and contingency approaches. Power or influence approaches constitute the ‘newer’ leadership theories, which were introduced in the 1970s and 1980s. They are also the most widely researched in the safety literature, and hence have the most support regarding their effectiveness and applicability with regards to the management of safety. Table 1 provides an overview of leadership theories (starting from the oldest to the newest) and summarises the core themes emphasised within each approach.

<table>
<thead>
<tr>
<th>Prominence</th>
<th>Approach</th>
<th>Core themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930s</td>
<td>Trait</td>
<td>Leaders are ‘born’ rather than made; focus on innate characteristics and abilities that distinguish effective from non-effective leaders</td>
</tr>
<tr>
<td>Prominence</td>
<td>Approach</td>
<td>Core themes</td>
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<td>---------------</td>
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<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>1940s – 1950s</td>
<td>Behavioural</td>
<td>Focus on what the leader does; attempts to distinguish effective from ineffective leader behaviours. Particular emphasis on task-oriented and relationship-oriented leadership behaviours</td>
</tr>
<tr>
<td>1960s-1970s</td>
<td>Contingency</td>
<td>Leader effectiveness depends on the context; different leadership styles will be best suited in different contexts/situations</td>
</tr>
<tr>
<td>1970s</td>
<td>Leader-member exchange</td>
<td>Leaders develop qualitatively different relationships with subordinates (‘in group’ versus ‘out group’ members)</td>
</tr>
<tr>
<td>1970s – 1980s</td>
<td>Transformational/transactional</td>
<td>Focus on leader vision and ability to inspire followers (transformational); leader clarifies performance criteria and ‘rewards’ subordinates for meeting performance expectations (transactional).</td>
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</tbody>
</table>

4.2.1 Trait approaches

Early leadership theories focused on identifying the personality characteristics associated with good leaders (commonly referred to as ‘great man’ theories; Northouse, 2010). The assumption was that leaders have certain innate characteristics or traits that distinguish them from others i.e. non-leaders (Northouse, 2010).

Trait research focused on identifying specific physical characteristics as well as personal attributes that may be associated with leader effectiveness. Stogdill (1974; cited in Glendon, Clarke, & McKenna, 2006) analysed and synthesized 287 studies on leadership traits conducted between 1904 and 1970 and identified several characteristics associated with effective leaders. These included:

- Good interpersonal skills,
- Self-confidence and achievement-orientation,
- Persistence in the pursuit of goals,
- Ability to cope with interpersonal stress and tolerate frustration, and
- Ability to engage in creative problem solving.

In a later review of empirical trait studies, it was shown that other characteristics that distinguish good from poor leaders included integrity and honesty, a desire to lead and job-related knowledge (Kirkpatrick & Locke, 1991; cited in Glendon et al., 2006). More recently, there has been an increasing focus on identifying the relationships between leadership and the Big Five model of personality. According to this model, personality is made up of 5 factors: neuroticism (i.e. being anxious, depressed and/or insecure), extraversion (i.e. being sociable), openness (i.e. being creative and insightful), agreeableness (i.e. being trusting and accepting) and conscientiousness (i.e. being thorough and organised) (McCrae & Costa, 1987; cited in Northouse, 2010). Judge, Bono, Ilies & Gerhardt (2002; cited in Northouse, 2010) conducted a meta-analysis of 78 trait and leadership studies carried out between 1967 and 1998 and found...
that the extraversion factor was most strongly associated with effective leadership followed by conscientiousness, openness and low neuroticism.

4.2.1.1 **Strengths and limitations of trait approaches**

One of the limitations of trait approaches is that they provide a reductionist and simplistic view of leadership as they imply that the presence of certain personality characteristics will enable a leader to be effective across different situations (Glendon et al., 2006). However, this assumption has not been empirically supported and a set of ‘universal’ traits has not been identified (Yukl, 2010). In other words, there is not a definitive list of personality traits that are likely to be equally effective across a range of situations (i.e. thus lack generalisability). Indeed, it has been argued that different situations may require a combination of different leadership qualities, which suggests that leadership effectiveness is context-specific (Northouse, 2010). For instance, leaders will have to deal differently with subordinates depending on their levels of experience or competence; it is likely that the requirement for leadership may be less pronounced where subordinates are characterised by high levels of motivation and competence (Bass & Bass, 2008).

Finally, another important limitation of the trait approach is that it is not possible to train or develop individuals to become leaders, given that traits are considered innate and relatively stable over time (Northouse, 2010). In addition, no studies were identified that attempted to link specific personality traits with effective safety leadership. Therefore, the applicability of the trait approach for the effective management of safety is limited.

4.2.2 **Behavioural Approaches**

Given the limitations of the trait approach, in the 1950s there was a shift in focus towards identifying the types of leader behaviours that good leaders exhibit i.e. what it is that good leaders do. Thus, unlike the trait approach, the behavioural approach focuses on the leaders’ behaviours and actions (Den Hartog & Koopman, 2001).

Early research on this approach was conducted in the 1950s by researchers at Ohio State and Michigan Universities. In particular, researchers at Ohio State University identified two types of leadership behaviours: consideration and initiating structure (Fleishman and Harris, 1962; cited in Glendon et al., 2006). Leaders who exhibit a considerate leadership style tend to focus on building good relationships and two-way communications with subordinates and are attentive to subordinate needs and feelings. On the other hand, leaders that exhibit initiating structure behaviours tend to focus on planning, communicating and allocating tasks and expect tasks to be completed to deadlines and to certain standards. Thus, they are task rather than relationship-focused (Fleishman & Harris, 1962; cited in Glendon et al., 2006). Early research carried out on these two types of behaviours showed that considerate supervisors were more effective, in terms of reduced levels of employee voluntary turnover and fewer grievances (Fleishman & Harris, 1962; cited in Yukl, 2010). The opposite effects were observed for supervisors who used initiating structure behaviours i.e. had higher voluntary turnover rates and a higher number of grievances. However, it has been suggested that both types of behaviours, whereby leaders both nurture employees and provide the appropriate structure for tasks, are important for effective leadership (e.g. Northouse, 2010).

Parallel research carried out by researchers at Michigan University identified two types of leadership behaviours: employee orientation, which focuses on being attentive and considerate of employee needs, and overlaps with the considerate leadership style discussed earlier (e.g. Bowers and Seashore, 1966; cited in Northouse, 2010), and production orientation leadership behaviours, which share much in common with an initiating structure leadership style as they
focus on behaviours targeted towards getting the work done (e.g. Bowers and Seashore, 1966; cited in Northouse, 2010).

Several studies were conducted in an attempt to identify the best combination of both relationship and task-oriented behaviours that would be effective across different situations and thus generate a universal theory of leadership. However, the findings from these studies were inconclusive and consistent associations between task and relationship-oriented behaviours and outcomes, such as employee performance or satisfaction have not been established (e.g. Yukl, 1994; cited in Northouse, 2010).

Finally, drawing on findings from the behavioural approaches, Blake & Mouton (1964; cited in Northouse, 2010) developed one of the best known models of managerial behaviour called the Managerial Grid. The model focused on two leadership behaviours: concern for production that assessed the extent to which leaders are concerned with getting the work done (overlaps with task-oriented leadership behaviours) and concern for people that assessed the extent to which leaders attend to interpersonal relationships within the organisation (such as developing trust and ensuring good working conditions; overlaps with relationship-oriented behaviours). The grid portrayed five leadership styles depending on whether leaders emphasised a concern for production or a concern for people. According to the model, the most effective leaders are those that exhibit a ‘team management’ leadership style, which involves focusing on getting the work done but also being attentive to interpersonal relationships within the organisation (i.e. maintaining a balance between a concern for production and a concern for people) (Blake & McCanse, 1991; cited in Northouse, 2010).

4.2.2.1 Strengths and limitations of behavioural approaches

The value of the behavioural approach was that it helped shift the focus of leadership research towards understanding what leaders do and the impact of their actions. In addition, it helped describe leadership behaviours depending on whether they were task or relationship-oriented, and highlighted the need for leaders to balance effectively these two types of behaviours (Northouse, 2010).

Behavioural approaches have several limitations. First, the empirical evidence regarding their effectiveness tends to be inconclusive in so far as studies have failed to identify consistent relationships between task and relationship behaviours and work outcomes, such as performance (Yukl, 1994; cited in Northouse, 2010). Second, behavioural approaches suggest that the most effective leaders are both task and relationship-oriented, combining both a high concern for production and meeting deadlines as well as for employee needs and growth (Blake and Mouton, 1964; cited in Bass and Bass, 2008). However, it has been argued that high levels on both types of behaviours may not be necessary depending on follower and/or situational factors. For instance, for complex tasks, leaders may need to provide both task direction and be attentive and supportive towards employees. However, for tasks that are simple or routine task leadership may not be necessary (Northouse, 2010).

4.2.3 Contingency approaches

Contingency approaches gained prominence in the 1960s and 1970s and focused on understanding the circumstances or situations where leadership behaviours will be effective. The basic premise of these approaches is that different leadership styles will be effective depending on the situation. In other words, the basic tenet of this approach is that the effectiveness of leadership is context-specific (e.g. Yukl, 2010).
Two of the most well known contingency theories are Fiedler’s (1967) Least Preferred Co-worker (LPC) contingency model and House’s (1971) path-goal theory.

4.2.3.1 Least Preferred Co-worker contingency model

Fiedler’s (1967; cited in Northouse, 2010) LPC contingency model focused on the interplay between a leader’s behaviours and style and different situational characteristics. It was argued that individuals have certain ‘fixed’ leadership styles and that a leader’s effectiveness depends on the match between his/her style and a given situation. According to the model, situations are described in terms of the following three factors:

- Leader-member relations: the degree of confidence and trust that exists between leaders and subordinates,
- Task structure (high vs. low): the degree to which tasks are clearly defined, and
- Position power (strong vs. weak) – the amount of authority a leader has to reward or punish subordinates.

Depending on the combination of the aforementioned factors, Fiedler (1967; cited in Northouse, 2010) classified situations according to their degree of favourableness as follows:

1. Favourable are those situations where there are positive leader-member relations, tasks are clearly defined and the leader has a high position power.
2. Moderately favourable are those situations that are characterised by good leader-subordinate relations, low task structure and a low level of positional authority or by poor leader-subordinate relations, high task structure and high positional authority.
3. Unfavourable are those situations where there are poor leader-subordinate relations, poor task structure and weak positional authority.

Fiedler (1967; cited in Northouse, 2010) argued that in favourable and unfavourable situations (i.e. situations that lie at the opposite ends of a continuum) a task-based leadership approach would be most effective. On the other hand, in moderately favourable situations, a relationship-oriented approach would be most effective. Although there has been some empirical support for Fiedler’s theory, the reasons as to why task-based leadership behaviours are most effective in extreme situations (i.e. either favourable or unfavourable) are unclear (Northouse, 2010).

4.2.3.2 Path-goal theory

House’s (1971; cited in Yukl, 2010) path-goal theory focuses on the way that leaders’ behaviours can influence subordinate performance and satisfaction. It draws upon the expectancy theory of motivation (Vroom, 1964; cited in Yukl, 2010) to explain a leader’s impact on subordinates. Specifically, expectancy theory focuses on the factors that influence an individual’s decision to exert effort on a task. According to the theory, the amount of effort that an individual will expert on a task depends on the likelihood that the effort will result in desirable outcomes (such as higher pay or promotion) whilst avoiding negative ones (such as layoffs or reprimands) (Vroom, 1964; cited in Yukl, 2010). Thus, according to the theory, individuals are more likely to invest efforts in completing a task when they feel that their efforts will be rewarded i.e. result in valued outcomes. Leaders’ behaviours play an important role in motivating and supporting subordinates to achieve certain desired outcomes (House, 1971; cited in Yukl, 2010).

House & Mitchell (1974; cited in Yukl, 2010) identified four types of leader behaviours:
1. Supportive leadership – attentiveness to subordinate needs and feelings and showing concern for their welfare (overlaps with a considerate leadership style),
2. Directive leadership – scheduling and organising tasks, clarifying performance expectations for subordinates and checking compliance with rules and procedures (overlaps with an initiating structure leadership style),
3. Participative leadership – consulting with employees and taking into account their views in decisions,
4. Achievement-oriented leadership – setting high standards for performance and motivating subordinates to attain them.

According to the theory, the effectiveness of leaders’ behaviours will vary depending on the nature of the task (e.g. complex, repetitive) and individuals’ characteristics (such as preferences for structure or desire for control). For instance, the theory proposes that a supportive leadership style will be most effective in situations that involve the completion of tasks that are monotonous, tedious or dangerous, as this leadership style will help increase subordinates’ self-confidence and decrease anxiety. However, a supportive leadership style is not going to be as effective for tasks that are interesting and enjoyable (i.e. intrinsically motivating) (Yukl, 2010). On the other hand, when tasks are complex, unstructured and subordinates are inexperienced, a directive leadership style will be more effective as it will provide guidance and reduce ambiguity regarding how a task should be completed, which in turn should result in higher levels of subordinate satisfaction and effort (Yukl, 2010).

4.2.3.3 **Strengths and limitations of contingency theories**

One of the strengths of the contingency approach to leadership is that it draws attention to the importance of matching specific leadership styles to specific situations and the need for leaders to adapt their behaviours depending on the nature of the task and subordinate characteristics. Although some contingency theories (such as Fiedler’s LPC theory) have received considerable empirical support, in some cases evidence tends to be mixed (e.g. Schriesheim et al., 1994; cited in Glendon et al., 2006). For instance, although the path-goal theory has been extensively researched, reviews and meta-analytic studies indicate that the findings for the theory tend to be mixed (e.g. Wofford and Liska, 1993; cited in Yukl, 2010).

Further, another criticism of contingency theories is that, due to their complexity, they may be of limited practical value in enabling managers to become more effective. Yukl (2010) cites some of these criticisms; in particular, contingency theories suggest that different leadership styles will be most effective depending on situational and/or subordinate characteristics. However, the hectic and fast-paced nature of managerial work means that it may be difficult for managers to apply different behaviours depending on the situation to ensure optimal performance (McCall, 1977; cited in Yukl, 2010). In addition, contingency theories fail to provide some general guidelines for managers to use in different situations and for different types of problems (McCall, 1977; cited in Yukl, 2010).

Another limitation of contingency theories for the purposes of this review is that they have not been sufficiently tested within a safety context. Therefore it is unclear how effective a contingency approach to leadership is in relation to safety outcomes (Glendon et al., 2006).

4.2.4 **Power or influence approaches**

Power or influence approaches focus on the ways that leaders can influence subordinate decisions and/or behaviours. The two most dominant approaches are leader-member exchange theory (Dansereau, Graen & Haga, 1975; cited in Northouse, 2010) and transformational-transactional leadership (Bass, 1985; cited in Northouse, 2010).
4.2.4.1 Leader-member exchange (LMX) theory

Leader-member exchange (LMX) focuses on the interaction between the leader and the subordinate i.e. the influence of the leader in the context of dyadic relationships (dyadic refers to the relationship between two individuals, in this case between a leader and a subordinate). The basic tenet of LMX theory is that leaders develop qualitatively different relationships with subordinates and that the quality of this relationship influences a number of affective and behavioural subordinate outcomes. Therefore, LMX theory acknowledges that leaders do not treat all subordinates in the same way (Glendon et al., 2006).

Early research on LMX showed that the relationship between a leader and a subordinate influences the extent to which a subordinate will be considered as part of an ‘in group’ or ‘out group’. Membership of the ‘in group’ or ‘out group’ is determined by the extent to which the leader is able to work well with the subordinate and the extent to which the latter is willing to carry out activities that go beyond his formal job description (Liden & Graen, 1980; cited in Bass & Bass, 2008). For instance, Dansereau, Graen & Haga (1975; cited in Bass & Bass, 2008) interviewed 60 leaders and their subordinates over nine months and found that leaders’ relationships with members of the ‘in group’ were characterised by mutual trust, respect and liking. In contrast, relationships with members of the ‘out group’ were more formal and lacked a sense of common purpose or goal. Unlike members of the ‘out group’, members of the ‘in group’ were more likely to volunteer for activities that went beyond their formal job description and take on a variety of responsibilities. In exchange, leaders were more likely to reward members of the ‘in group’ by sharing information and showing more confidence as well as concern towards them (Dansereau et al., 1975; cited in Northouse, 2010).

Later research moved away from studying the differences between leaders and ‘out group’ and ‘in group’ subordinates towards examining how the quality of the LMX relationship impacts on both individuals and organisations (Northouse, 2010). On the whole, this line of research has demonstrated that high quality LMX, characterised by trust, mutual respect and support, is related to a number of positive individual and organisational outcomes, including more positive employee attitudes toward the organisation (e.g., higher levels of commitment and overall satisfaction and less intentions to quit), enhanced job performance and improved job promotion opportunities (e.g. Graen et al., 1995; cited in Northouse, 2010; Gerstner & Day, 1997; cited in Bass & Bass, 2008).

Researchers also attempted to explain how leader-member exchanges develop over time. Graen & Uhl-Bien (1991; cited in Northouse, 2010) suggested that leader-member exchanges go through three phases: the stranger phase, whereby leaders and subordinates relate to each other in a formal manner and compliance with the leader is motivated by self-interests (such as achieving economic rewards for example). The second phase is referred to as the acquaintance phase, and forms a testing period for the leader-subordinate relationship during which the leader tries to ascertain whether the subordinate is willing to take on more roles and responsibilities (and thus become a member of the ‘in group’). The subordinate, on the other hand, examines whether the leader is willing to provide more challenges and opportunities. Successful exchanges during this phase help develop trust and respect between leaders and subordinates. Finally, during the final phase, leader-member exchanges develop into mature partnerships characterised by mutual trust, respect and obligation. This phase is characterised by high-quality exchanges whereby subordinates rely on leaders for support and encouragement and leaders rely on subordinates for extra assignments and assistance. In high quality LMXs, leaders and subordinates work beyond their own self-interests towards the common good of the team and the organisation (Graen & Uhl-Bien, 1991; cited in Northouse, 2010).
Strength and limitations of LMX theory

LMX theory is intuitive and accurately depicts how leader-member relationships actually work in the workplace; that is, leaders relate differently with different members of a group, such that those employees ‘who contribute more, receive more and others contribute less and get less’ (Northouse, 2010, p. 155). The theory also uniquely focuses on the quality of dyadic relationships, unlike other theories that focus on the characteristics of leaders, followers and/or situations (Northouse, 2010). In addition, it has received empirical support in the context of safety leadership; for instance, there is evidence suggesting that the quality of interactions between a leader and a subordinate influence subordinate safety citizenship behaviours and the number of safety-related near misses (e.g. Hoffman, Morgeson, & Gerras, 2003).

One criticism of LMX theory is that it fails to describe how high quality leader-subordinate relationships can be created and evolve over time (Northouse, 2010; Yukl, 2010). For instance, the theory suggests that trust, respect and a sense of obligation are building blocks to high quality LMX but it is unclear how these can be fostered or the processes that need to be in place. It also fails to consider issues of fairness within an organisation (e.g. salary increases or bonuses, promotion opportunities) and how these may affect the development of high quality leader-member exchanges (Northouse, 2010). Further, the theory has been criticised for failing to offer a precise definition regarding what constitutes a ‘high quality exchange’ relationship. For instance, it is unclear whether high LMX is any different from overall satisfaction with the leader or trust towards the leader (Yukl, 2010). Finally, the theory fails to consider how situational factors (such as organisational context, subordinate characteristics, job factors) may influence the type and quality of relationships formed between a leader and a subordinate (Yukl, 2010).

4.2.4.2 Transformational and transactional leadership

Although transformational and transactional leadership could be considered behavioural approaches to leadership, Hofmann & Morgeson (2004) view them as power or influence approaches because they are concerned with a leader’s influence on subordinate attitudes in order to align them with the organisation’s objectives and strategies (Yukl & Van Fleet, 1992; cited in Hofmann & Morgeson, 2004).

Transformational leadership was initially introduced by Burns (1978; cited in Bass & Bass, 2008) who defined transformational leaders as those that are able to inspire individuals to meet goals (organisational, team) beyond their own and enable them to see the value of meeting those goals beyond their self-interests. However, later work by Bass (1985; cited in Northouse, 2010) further expanded and refined this model, which has become the most influential conceptualisation of transformational/transactional leadership. Bass conceptualised leadership as a continuum ranging from transformational to transactional and laissez-faire leadership. Transformational leaders act as role models, inspire and challenge employees as well as act as mentors. Unlike transformational leaders, transactional leaders’ influence focuses on motivating employees to attain certain performance standards and meet task objectives, in exchange for rewards. They are less concerned with inspiring employees or attending to their individual needs. At the very end of the continuum lies the laissez-faire leadership factor, which captures the absence of leadership i.e. complete avoidance of leader responsibilities (Bass, 1985; cited in Northouse, 2010).

Transformational leadership factors

Early research by Bass (1985; cited in Bass and Bass, 2008) identified four components of transformational leadership: charisma or idealised influence, individualised consideration, intellectual stimulation and inspirational motivation. Bass asked 70 senior managers to provide descriptive statements on the ways that one leader they had known had influenced their careers.
The resulting statements were sorted into either transformational or transactional dimensions and were distributed to 104 U.S senior Army officers. They were asked to rate each statement according to which their immediate superior displayed each of the behaviours. Subsequent factor analyses identified the four abovementioned components. In particular, according to Bass (1985; cited in Bass and Bass, 2008), transformational leaders:

- Inspire employees to achieve goals that transcend their own self-interests and cause employees to identify with them; they articulate a vision that followers see as worthy of their effort and behave in a fair manner inspiring trust and respect from followers (Idealised influence).
- They challenge assumptions and traditional ways of doing things, invite new ideas and encourage followers to ‘think outside of the box’ (Intellectual stimulation).
- They can clearly articulate a vision that followers can aspire to and seek to attain (inspirational motivation), and
- Are attentive to the needs and concerns of their followers for achievement and growth; they play an important role in the growth of subordinates by creating a supportive climate and promoting learning opportunities to meet follower needs; for instance tasks are delegated by taking into account subordinate developmental needs (individualised consideration) (Bass, 1985; cited in Bass & Bass, 2008).

Transformational leaders generate trust, respect and admiration from followers, which are considered important facilitators and motivate followers to perform beyond expectations (Yukl, 2010). Zacharatos, Barling & Iverson (2005) argued that transformational leaders have a positive impact on safety by acting as safety role models and demonstrating a high priority for safety over other organisational goals (idealised influence). In addition, transformational leaders will encourage and motivate employees to work towards high standards of safety (inspirational motivation), and to try out new ways of working safely (intellectual stimulation). They will demonstrate a real concern for the well-being and safety of employees (individualised consideration). It is further argued that transformational leaders have a positive influence on safety by enhancing perceived fairness and employee organisational commitment and creating a positive safety climate (Zacharatos et al., 2005).

**Transactional leadership factors**

Transactional leadership encompasses three elements: contingent reward, management by exception – active, and management by exception – passive. Contingent reward is described as a constructive interaction whereby leaders agree with followers the tasks to be completed and clearly articulate performance expectations in exchange for rewards; that is, followers are rewarded when performance expectations are successfully met (Bass & Bass, 2008). Rewards may be material in nature (such as a raise in salary) or psychological (positive feedback and praise) (Bass & Bass, 2008). Management by exception is regarded as a corrective form of leadership because it concerns the degree to which a leader intervenes or takes corrective action on the basis of followers’ behaviours. Corrective actions may include discipline, negative feedback or disapproval (Bass & Bass, 2008). Active management by exception includes leaders actively monitoring subordinates’ behaviour to ensure it complies with expected standards of performance (i.e. ensuring compliance with rules and procedures for example) and intervening before problems arise. On the other hand, passive management by exception

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1 Idealised influence is also referred to as charisma or charismatic leadership, which is considered by some as one component of transformational leadership (Bass, 1985); Others treat transformational and charismatic leadership as equivalent/ interchangeably (e.g. House, 1995 and Hunt, 1999 cited in Bass & Bass, 2008).
involves leaders intervening only after problems have occurred; thus, unlike active management by exception, it represents a reactive form of leadership (Bass & Avolio, 1990; cited in Yukl, 2010).

Finally, laissez-faire leadership has been described as an absence of leadership and/or avoidance of responsibility whereby the leader avoids making decisions, ignores subordinate problems or needs and provides neither feedback nor rewards (Bass, 1990; cited in Northouse, 2010).

**Strengths and limitations**

Transformational/transactional leadership is supported by a large body of empirical research and has received the greatest amount of empirical attention in the safety literature demonstrating that they may be effective leadership styles for the management of safety. Further, the theory provides a new perspective on leadership in so far as leadership is not solely dependent upon the actions and behaviours of the leader but rather it emerges from the interactions between leaders and followers (Northouse, 2010).

The strengths of the theory notwithstanding, critics argue that the theory is too broad and offers little guidance regarding how leaders should act in particular situations (Northouse, 2010). This issue is compounded by the fact that the four transformational leadership factors (e.g. idealised influence, inspirational motivation, intellectual stimulation and individualised consideration) tend to correlate highly with each other. As a result, it has not been possible in several studies to examine separately the effects of each of the four components of transformational leadership. Thus, researchers often opt for a composite score on transformational leadership, which does not allow for an examination of the effects of the individual component behaviours on outcomes (Yukl, 2010).

In addition, some concerns have been expressed regarding the potential ‘dark side’ of transformational leaders. In particular, it has been argued that transformational leaders may deceive or manipulate followers as a means of attaining self-serving interests (e.g. Price, 2003). This has much in common with the concept of ‘narcissistic leadership’, which refers to situations where leaders’ actions are driven by egomaniac needs and beliefs (e.g. preoccupation with unlimited success and power, excessive need for admiration) (Rosenthal & Pittinsky, 2006).

Although the majority of research has focused on the positive effects of transformational leadership, there have been some attempts to identify potential individual and contextual factors that may influence the extent to which leaders will ‘abuse’ their power to meet self-interested goals. In a series of experiments, Maner & Mead (2009) showed that leaders with high levels of dominance motivation (i.e. an individual’s tendency to use power in order to control others) were more likely to withdraw important information from the group (and thus jeopardise the group’s performance) and exclude valuable team members in situations where their power and position was threatened. Although this study did not examine transformational leadership, it is one of few studies that have highlighted the factors that facilitate the use of power to meet self-interested goals.

**4.2.4.3 Authentic leadership**

Authentic leadership is an emerging area of research. It is rooted in positive organisational behaviour, which focuses on the ‘study and application of positively oriented human resource strengths and psychological capabilities that can be measured, developed and effectively managed for performance improvement’ (Luthans, 2002, p. 698).
Authentic leaders are defined as those who are self-aware, confident, genuine, optimistic, moral/ethical, balanced in terms of decision-making, and transparent in enacting leadership (Avolio and Gardner, 2005; Avolio, Griffith, Wernsing, & Walumbwa, 2010). They have a clear sense of what their beliefs and values are, act in a manner that is consistent with their values and beliefs and relate to others in a transparent manner (Avolio Gardner, Walumbwa, Luthans, & May, 2004). They are described as being both ‘true to themselves and to others’ behaving in way that is consistent with their beliefs and values and generate trust in their followers (Bass & Bass, 2008, p. 223).

There appears to be consensus in the literature (Walumbwa, Avolio, Gardner, Wernsing, & Peterson, 2008; Avolio, Walumbwa & Weber, 2009) that authentic leaders display the following behaviours:

1. Balanced processing, which refers to the ability to consider multiple perspectives on a given issue and assess information in a ‘balanced’, impartial manner before making a decision.
2. Relational transparency refers to behaviours that promote an open and transparent sharing of information between leaders and followers.
3. Internalised moral perspective refers to the ability to behave in a manner that is consistent with one’s own values and beliefs and not being susceptible to peer pressure or organisational demands.
4. Self-awareness refers to the extent to which leaders are aware of and appreciate their strengths and weaknesses as well as how others in the organisation view them and their style of leadership.

It is argued that authentic leaders generate respect and trust from followers, as a result of behaving in accordance with their values and convictions, which in turn facilitate a process whereby followers’ identify with them (Avolio et al., 2004). This mechanism of personal identification overlaps with transformational leadership and the concept of idealised influence (Bass & Bass 2008). A second proposed mechanism through which authentic leaders influence followers is social identification i.e. followers feel a sense of belonging with team/organisation. It is suggested that authentic leaders act morally and for the best interests of the group, which enhances individuals’ sense of social identification (Avolio et al., 2004).

**Strengths and limitations**

Some of the strengths of authentic leadership models are that they provide some guidelines regarding the types of qualities that leaders need to develop for ‘authenticity’. Further, the assumption is that leaders can develop these qualities over time; that is, authenticity is not viewed as an inherent trait, rather as a quality that individuals can learn and develop (Northouse, 2010). For instance, Avolio et al. (2004) proposed that positive attributes such as hope, optimism, resilience and confidence can enable individuals to develop an authentic leadership style.

However, authentic leadership requires further research to identify first, how it differs from other leadership models, such as transformational leadership, and second to explore the mechanisms whereby authentic leadership influences individual and organisational outcomes. With regard to the first issue, recent empirical research suggests that authentic leadership is distinct from transformational leadership (Walumbwa, Luthans, Avey & Oke, 2011).
Recent research has shown that authentic leadership is associated with several positive outcomes such as promoting group trust and psychological capital (i.e. confidence in succeeding at challenging tasks, perseverance, optimism and resilience), which in turn enhance group performance and citizenship behaviours (Walumbwa et al., 2011). However, its links with safety outcomes, which are the focus of this review, need to be determined.
5. RESULTS

A total of thirty-five quantitative studies were deemed as appropriate for inclusion in the review. It is evident from these studies that leadership has been examined from various perspectives; some studies have focused on specific leadership styles and on the exchanges between leaders and subordinates, whilst others have examined specific management attitudes and behaviours (such as commitment and support for safety). In this latter case, management attitudes and behaviours have sometimes been studied within a safety climate perspective (e.g. Yule, Flin & Murdy, 2007).

All quantitative studies were published in academic journals, with the exception of one, which was an HSE report (Fleming, 2001).

Specifically, of the thirty-five studies reviewed:

- Fourteen studies focused on specific management attitudes, practices and behaviours, such as safety communication and involvement in health and safety (Fleming, 2001; Mearns, Whitaker & Flin, 2003; Frankel, Grillo, Pittman, Thomas, Horowitz, Page, & Sexton, 2008; Cigularov, Chen, & Rosecrance, 2010; Kath, Marks, & Ranney, 2010b), commitment to safety (Rudmo & Hale, 2003; Watson, Scott, Bishop, & Turnbeaugh, 2005; Yule et al., 2007; Hansez & Chmiel, 2010; Ginsburg, Chuang, Berta, Norton, Ng, Tregunno, & Richardson, 2010), concern and support for safety (Fleming, 2001; Parker, Axtell, & Turner, 2001; Huang, Chen, Krauss, & Rogers, 2004; Mullen, 2005), implementation or enforcement of safety policies and practices (Huang et al., 2004; Probst & Estrada, 2010), and leading by example (Fleming, 2001).

- Seven studies focused on transformational leadership (Barling, Loughlin & Kelloway, 2002; Kelloway, Mullen & Francis, 2006; Clarke & Flitcroft, 2008; Conchie & Donald, 2009; McFadden, Henagan & Gowen, 2009; Mullen & Kelloway, 2009; Innes, Turner, Barling & Stride, 2010).

- Three studies focused on transactional leadership (Zohar, 2002a; Zohar & Luria, 2003; Luria, Zohar & Erev, 2008).

- Three studies examined both transactional and transformational leadership (Zohar, 2002b; Clarke & Ward, 2006; Lu & Yang, 2010).

- Three studies focused on the dyadic exchanges between leaders and subordinates (Hofmann, Morgeson & Gerras, 2003; Michael, Guo, Wiedenbeck, & Ray, 2006; Kath, Magley & Marmet, 2010a).

- Four studies focused on trust in leaders (Watson et al., 2005; Conchie & Donald, 2006; Conchie & Donald, 2009; Luria, 2010).

- One study focused on authoritarian and participative leadership styles (O’Dea & Flin, 2001).

In addition, five qualitative studies were identified. Of these, two were published in peer-reviewed journals (Bentley & Haslam, 2001; Mullen, 2004) and three were HSE reports (Ernst & Young, 2001; McMahon, Shaw, Cash, Wright, & Antonelli, 2006; King, Lunn, & Michaelis, 2010).
6. LEADERSHIP STYLES AND SAFETY

6.1 TRANSFORMATIONAL LEADERSHIP

Seven studies were identified that examined the impact of transformational leadership on safety outcomes (Barling et al., 2002; Kelloway et al., 2006; Clarke & Flitcroft, 2008; Conchie & Donald, 2009; McFadden et al., 2009; Mullen & Kelloway, 2009; Innes et al., 2010).

Overall, the findings suggest that transformational leadership is associated with a number of safety-related benefits, including reduced levels of occupational injuries (Barling et al., 2002), positive perceptions of safety climate (Clarke & Flitcroft, 2008; Mullen & Kelloway, 2009), higher levels of employee safety participation (Innes et al., 2010), safety compliance (Lu & Yang, 2010), and safety citizenship behaviours (i.e. participation in safety committees, looking out for colleagues’ safety) (Conchie & Donald, 2009).

Furthermore, the findings suggest that transformational leaders exert their influence both indirectly and directly. Indirect effects on safety are achieved when transformational leaders enhance employee safety consciousness (i.e. knowledge) and foster perceptions of a positive safety climate (Barling et al., 2002; Kelloway et al., 2006; McFadden et al., 2009).

6.1.1 Direct effects

Four studies demonstrated direct associations between transformational leadership and employee safety performance (Innes et al., 2010), perceptions of safety climate (Clarke & Flitcroft, 2008; Mullen & Kelloway, 2009), safety citizenship behaviours (Conchie & Donald, 2009) and perceived safety-related events and injuries (Mullen & Kelloway, 2009).

Innes et al. (2010) examined the impact of supervisor transformational leadership on employee safety performance (safety participation and compliance) and further explored whether the effects of transformational leadership were confined to one organisational context (i.e. context-specific) or whether they carried over across different contexts (i.e. context spill over). The authors carried out a cross-sectional survey of 159 individuals who held two jobs in different organisations. The findings showed a positive relationship between transformational leadership and safety participation but not safety compliance (in either the primary or secondary jobs). Further, the effects of transformational leadership were context-specific whereby transformational leadership in the primary job did not predict safety performance (e.g. safety compliance and participation) in the secondary job.

Mullen and Kelloway (2009) conducted a longitudinal intervention study to examine the impact of transformational leadership training interventions (general versus safety-specific) on both leader (e.g. safety attitudes, intent to promote safety, and self-efficacy in promoting safety) and employee safety outcomes (ratings of leaders’ transformational leadership, safety climate, safety compliance, safety participation, safety-related events and injuries). Their sample comprised 54 nurse managers and 115 employees across 21 Canadian healthcare organisations. Managers were randomly assigned to the training interventions (general versus safety-specific) or control group (no training). Employee and manager outcomes were measured at two time points: one week before the training intervention (Time 1) and 3 months following the training intervention (Time 2).

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2 It has been argued that safety-specific leadership behaviours should be preferred over generic leadership styles based on the assumption that good leaders are not necessarily good safety leaders (Conchie & Donald, 2009; Mullen & Kelloway, 2009). Leadership studies tend to use either general transformational leadership measures or safety-specific ones.
Results showed that managers who attended the safety-specific transformational leadership training had improved safety attitudes and higher levels of self-efficacy in promoting safety compared to the general transformational and control groups. In terms of employee safety outcomes, ratings of safety climate were higher for the safety-specific transformational leadership training group compared to the control but there were no differences with employee ratings for the general transformational leadership group. Finally, there was a reduction in perceived safety-related events and injuries among employees who were under the direct supervision of managers that had attended the safety-specific transformational training than the other two groups (Mullen & Kelloway, 2009). Thus, safety-specific transformational training was more effective in so far as it resulted in more positive safety attitudes and feelings of self-efficacy in promoting safety among managers, as well as in improving perceived occupational safety among employees.

Clarke and Flitcroft (2008) examined the impact of transformational leadership on employee perceptions of safety climate. The study involved the development of an intervention focused on enhancing managers’ leadership skills and safety-related knowledge. The intervention was administered to managers in 4 Small and Medium sized Enterprises (SMEs). Climate data was collected at two time points: before the intervention (T1) and five months after the intervention (T2). At T1 80 managers and 463 employees from 14 SMEs participated whereas at T2 data was collected only from the 4 SMEs that participated in the intervention. The sample at T2 was 25 managers and 130 employees. The results showed a positive association between transformational leadership and perceptions of safety climate. In addition, there was a significant lagged effect whereby transformational leadership at T1 predicted safety climate at T2. The authors suggested that a transformational leadership style could result in a more positive safety climate over a 5-month period.

Finally, Conchie and Donald (2009) examined the impact of safety-specific transformational leadership on safety citizenship behaviours and explored whether this relationship was either moderated or mediated by safety-specific trust. Safety-specific trust is defined as “an individual’s willingness to rely on another (i.e. a leader) based on positive expectations that he or she will act safely or intend to act safely” (Conchie, Donald & Taylor, 2006; cited in Conchie & Donald, 2009 p. 137). The authors carried out a cross-sectional survey of 139 construction workers and 33 supervisors. The results showed that safety-specific trust moderated, rather than mediated, the relationship between safety-specific transformational leadership and safety citizenship behaviours. Specifically, employees were more likely to engage in safety citizenship behaviours when a leader’s transformational leadership style was combined with high levels of trust towards the leader. However, the positive effect of safety specific transformational leadership reduces when trust weakens. These findings suggest that a transformational leadership style combined with trusting leader-subordinate relationships optimises employee safety citizenship behaviours.

6.1.2 Indirect effects

Three studies showed that transformational leaders exert positive influences on safety indirectly by fostering a positive safety culture (Barling et al., 2002; Kelloway et al., 2006; McFadden et al., 2009), and increasing the levels of safety consciousness among employees (Barling et al., 2002; Kelloway et al., 2006).

McFadden et al. (2009) examined the impact of hospital CEOs’ transformational leadership style on patient safety initiatives and outcomes in 212 hospitals. For each hospital, assessments of CEOs’ transformational leadership style, patient safety culture, patient safety initiatives (i.e. implementation of actions designed to improve patient safety) and patient safety outcomes (i.e. in terms of reduction in the frequency, severity and impact of medical errors) were made.
Results indicated that CEOs’ transformational leadership style had an indirect impact on patient safety outcomes through a positive patient safety culture and an enhanced implementation of patient safety initiatives. The authors argued that CEOs’ transformational leadership style ‘triggers’ a chain of events that ultimately influence patient safety. Improving patient safety starts at the top whereby transformational leaders are ultimately responsible for creating a culture of patient safety, prioritising safety and investing the necessary resources in order to maximise patient safety outcomes (McFadden et al., 2009).

Kelloway et al. (2006) examined the impact of both active (i.e. transformational) and passive (i.e. leaders turning a blind eye to safety) leadership on safety-related outcomes that included safety consciousness (safety knowledge and behaviours), safety climate, safety-related events (e.g. overextending when lifting or moving things; object falling during work task) and injuries (e.g. sprains, cuts, lacerations). Their sample consisted of 158 employees working in various organisations. They found that active and passive leadership had distinct positive and negative effects on safety-related outcomes respectively. Specifically, passive leadership was associated with a decrement in safety-related outcomes in terms of safety consciousness and safety climate; it was also associated with an increase in safety-related events and injuries. On the other hand, transformational leadership had positive effects on safety consciousness and perceptions of safety climate and was indirectly associated with a decrease in safety-related events and injuries. The authors argued that ignoring safety issues and not championing workplace safety has negative (rather than null) effects.

Barling et al. (2002) examined the impact of safety-specific transformational leadership and safety climate on occupational safety (self-report safety-related events/misses and injuries). Using two separate samples of employees from the food/restaurant and services industries (174 and 164 employees respectively), they showed that employee perceptions of transformational leadership were positively related with perceived safety climate and safety consciousness (i.e. individual awareness of risks). Safety climate predicted safety-related events, which in turn were related to occupational injuries (self-report). In other words, transformational leadership had an indirect effect on occupational injuries through positive perceptions of safety, increased levels of safety consciousness, and safety-related events.

6.2 TRANSACTIONAL LEADERSHIP

Three studies were identified that illustrated the benefits of a transactional leadership style for a number of safety-related outcomes. These included reduced accident rates, improved safety behaviours and perceptions of safety climate (Zohar, 2002a; Zohar & Luria, 2003; Luria et al., 2008). In addition, the benefits of a transactional leadership style appear to be optimised when there are high levels of worker visibility; that is, when supervisors can easily monitor workers’ behaviours (Luria et al., 2008).

Zohar conducted a series of leadership intervention studies designed to modify supervisory monitoring and rewarding of subordinates’ safety performance (Zohar, 2002a; Zohar & Luria, 2003). The findings suggested that increases in the frequency of safety-related interactions between supervisors and subordinates resulted in concomitant improvements in safety behaviour and perceptions of safety climate as well as a reduction in injury rates. The intervention studies illustrated that when supervisors actively monitor and reward safety performance, subordinates are more likely to work safely than when they are not actively monitored (e.g. Zohar, 2002a). In addition, it was shown that training supervisors to engage in effective safety-related behaviours resulted in safety improvements at both individual and unit/organisational levels, which lasted 5-months post-intervention (Zohar, 2002a).
Building on the findings showing that frequent safety-related interactions between supervisors and subordinates lead to an improvement in worker safety behaviours, Luria et al. (2008) examined the role of situational factors in influencing the effectiveness of supervisor-subordinate interactions. Specifically, the authors examined the impact of visibility (i.e. the extent to which supervisors could easily monitor worker performance) on the frequency of safety-related interactions and worker safety behaviours as indicated by the use of earplugs in five manufacturing organisations. Data was collected through a series of interventions aimed to enhance supervisory safety interactions with workers. Baseline data on supervisor’s interactions and workers safety behaviours were collected 2 months prior to the intervention and again following the intervention. Daily safety-related supervisory interactions were recorded using an experience-sampling methodology that captured the frequency and nature (i.e. productivity vs. safety-related) of interactions between supervisors and workers. Data on earplug use was collected through observational methods. A total of 955 workers and 57 supervisors across 5 manufacturing companies participated in the study. The results showed that supervisors in high visibility departments had more frequent safety interactions with workers compared to those in low visibility departments (where workers were more dispersed). Further, workers in the high visibility departments behaved more safely compared to those in the low visibility departments. The authors suggested that visibility encourages more frequent supervisory-worker safety interactions, which result in improved safety behaviours (Luria et al., 2008).

6.3 TRANSFORMATIONAL AND TRANSACTIONAL LEADERSHIP

Three studies were identified that examined the simultaneous impact of transformational and transactional leadership on safety outcomes (Zohar, 2002b; Clarke & Ward, 2006; Lu & Yang, 2010).

Lu and Yang (2010) examined the impact of workers’ perceptions of senior managers’ safety leadership on safety performance. Their cross-sectional study included 336 employees from five major container terminal companies. Employees were asked to rate senior managers’ on two aspects of transformational leadership: their safety concern (the extent to which senior managers reward safety behaviour and encourage worker participation in safety decisions) and safety motivation (the extent to which senior managers act as role models and stress the importance of safety). Safety policy was also assessed as an aspect of transactional leadership, which concerned the extent to which senior managers set clear goals and standards for safety behaviours. Lu and Yang (2010) found that when senior managers were perceived as being motivated and concerned for safety, employees were more likely to comply with safety rules and procedures (safety compliance) and participate in safety activities (safety participation). On the other hand, perceptions of senior managers’ transactional leadership style were associated with safety participation only.

Clarke and Ward (2006) carried out a cross-sectional study to examine the impact of leader behaviours associated with transformational and transactional leadership styles, on workers’ levels of safety participation. They further explored whether leader influence tactics may impact directly or indirectly - through perceptions of a positive safety climate - on workers’ safety participation. The authors carried out a survey of 105 workers in a UK glass-manufacturing organisation. Employees reported on their organisation’s safety climate, leader influence tactics and the extent to which they participate in safety activities (i.e. safety participation). The findings showed that leaders are more influential when they i) emphasise the importance of a particular task and arouse enthusiasm (i.e. inspirational tactics), ii) involve workers in the decision-making process (i.e. consultation tactics), and iii) communicate and justify the reasons behind a request (i.e. rational persuasion). Clarke and Ward (2006) showed that these tactics impact both directly and indirectly on workers’ safety participation. In the latter case, leader behaviours helped foster perceptions of a positive safety climate, which in turn affected levels...
of safety participation. It was argued that behaviours associated both with a transformational (inspirational and consultation tactics) and transactional (rational persuasion) may have a positive impact on safety performance (Clarke and Ward, 2006).

Zohar (2002b) examined the relationship between supervisory leadership style, safety climate and assigned safety priority (i.e. the extent to which supervisors’ immediate superiors emphasized the importance of safety) on injury records. The sample consisted of 411 workers in a metal processing plant specialising in constructing industrial lifting equipment. Data on leadership style and safety climate was collected using a cross-sectional survey. Injury data was obtained from company records six months after the collection of the leadership and climate data. Zohar found that transformational and transactional leadership were associated with a reduction in injury rates through the promotion of a positive safety climate characterised by open safety communication. Further, when supervisors’ superiors emphasized safety (high assigned priority), transactional supervisory leadership resulted in more positive safety climate perceptions; however it had little effect when safety was not a priority. On the other hand, transformational leadership styles resulted in positive safety climate perceptions under conditions where safety was both high and low in priority. For supervisors with a corrective leadership style (e.g. management by exception active and passive modes), there was a positive association with safety climate only in conditions where safety was a priority and a negative association with safety climate under conditions of low safety priority. Therefore, corrective supervisors adjust performance standards according to their assigned priorities. Zohar (2002b) noted that the impact of leadership on safety may vary as a function of the importance that is placed on safety. This is applicable for all leadership styles with the exception of transformational leadership.

6.4 PARTICIPATIVE LEADERSHIP

O’Dea & Flin (2001) carried out a cross-sectional survey of 200 offshore installation managers (OIMs; i.e. site managers) from 36 UK offshore oil and gas installations in order to explore the links between managers’ levels of experience, leadership style and the types of attributions they make regarding accident causation. The authors found no significant associations between managers’ experience and leadership style or the types of attributions they made regarding accident causation. Interestingly, their findings showed that the majority of OIMs adopted directive leadership styles (i.e. imposing decisions rather than consulting with subordinates) despite acknowledging that participative leadership styles represented best practice. For instance, the types of behaviours that site managers perceived as best practice for safety leadership included:

- Visibility and leading by example,
- Developing open and trusting relationships with the workforce,
- Encouraging workforce involvement in planning and decision-making, and
- Adopting a proactive approach to safety.

Although this study did not examine the impact of leadership on safety outcomes, its findings are interesting as they show that middle-level managers may be aware of best practice but do not always follow it (O’Dea & Flin, 2001); however, the reasons underlying this were not explored. In addition, more experienced OIMs and those with participative leadership styles were more aware of the challenges in getting workers to report near misses and have personal accountability and ownership of safety (O’Dea & Flin, 2001).

Previous research carried out at supervisory levels has also shown that more participative and supportive leadership styles whereby supervisors encourage and initiate safety discussions and
provide positive feedback on safety issues are most effective (e.g. Simard & Marchand, 1994, 1997; cited in Flin & Yule, 2004 and O’Dea & Flin, 2003). For instance, in a study of 97 manufacturing plants, Simard & Marchand (1997; cited in O’Dea & Flin, 2003) showed that co-operative supervisory-workgroup relationships and a participative management style were the most important predictors of safety compliance. In particular, safety compliance was highest when supervisors had some influence over safety decisions that affected their workgroups and involved workers in activities aimed toward accident prevention.

6.5 TRUST

In a review of management leadership behaviours that are conducive to positive safety outcomes, O’Dea & Flin (2003) recognised the importance of trust between management and employees as an important determinant of safety. For instance, a study carried out by Kivimaki et al. (1995; cited in O’Dea & Flin, 2003) in a sample of 428 power plant workers showed that employees perceived fewer nuclear safety risks when they trusted top management to prioritise safety over other organisational goals, demonstrating the important role of employee trust in senior management for safety outcomes. Factors that influence perceptions of managerial trustworthiness include behavioural consistency and integrity, sharing and delegation of control, openness and accuracy of communication, and demonstration of concern (e.g. Whitener, 1998; cited in O’Dea & Flin, 2003). A recent study showed that honesty (an indicator of integrity) was the most important quality in the development of both trust and distrust in supervisors (Conchie, Taylor and Charlton, 2011).

Three studies were identified that confirmed the findings that trust in management is an important factor impacting on safety-related outcomes, such as perceptions of safety climate and actual number of injuries (Luria, 2010), self-report accident involvement (Conchie & Donald, 2006), perceived work environment safety (Watson et al., 2005). In addition, one study examined the factors that are conducive to trust in management (Kath et al., 2010a).

Conchie and Donald (2006) examined the impact of distrust towards different groups (management, supervisors, workmates and contractors) on offshore safety performance. They carried out a cross-sectional survey of 203 frontline workers in one offshore gas installation. Workers completed measures of trust and distrust towards management, supervisors, workmates, contractors and the organisation as a whole and self-report measures of their involvement in incidents and near misses (both offshore and at the installation). The authors found that distrust towards offshore managers predicted worker involvement in offshore accidents whereas distrust toward workmates was the only significant predictor of near miss involvement.

Although the authors did not examine the mechanisms through which trusting supervisor-employee relationships impacts on safety, recent research has shown that trust in supervisors improves safety performance (in terms of reduced number of injuries) by fostering perceptions of a positive safety climate (Luria, 2010). Specifically, Luria (2010) carried out a cross-sectional survey of 2024 soldiers across 105 platoons to examine the impact of trust between leaders (platoon commanders) and subordinates on perceptions of safety climate and actual number of injuries (obtained from military medical records). The author found that trust in leaders had both direct and indirect effects on safety performance; trust was directly associated with a reduction in the number of actual injuries and indirectly through fostering perceptions of a positive safety climate.

Watson et al. (2005) examined the impact of supervisory trust, management commitment to safety and co-worker safety norms on employees’ perceptions of workplace safety and engagement in risk behaviours. Their sample consisted of 395 production workers in a steel
manufacturing plant. Their results showed that co-worker safety norms predicted both perceived work environment safety and at risk behaviour. Trust in the supervisor was positively associated with perceived work environment safety whereas perceptions of management commitment to safety were negatively related to at risk behaviours. These findings suggest that trust in first line leadership/supervisors and management commitment to safety influences perceptions of safety and the extent to which employees are likely to engage in behaviours that increase the risk of accidents.

Kath, Magley and Marmet (2010a) examined the impact of two facets of safety climate on organisational trust: upward safety communication (referring to the extent to which workers can raise safety concerns with management) and management attitudes to safety (the extent to which workers perceive management as valuing safety). The authors also examined organisation trust as a potential mediator of the relationship between safety climate and individual outcomes safety motivation (the extent to which workers are motivated to engage in safe behaviours), job satisfaction and turnover intentions. Their study comprised a cross-sectional survey of 599 workers across 97 teams of a grocery chain store. It was shown that both management attitudes toward safety and upward communication about safety were positively related to organisational trust. In addition, increased levels of trust predicted workers’ safety motivation as well as job satisfaction and turnover intentions. The authors argued that perceptions that management values and prioritises safety and encouragement of two-way communications about safety are important in developing a trusting environment (Kath et al., 2010a).

6.6 LEADER-MEMBER EXCHANGE

Three studies examined how the exchanges between leaders and subordinates influence safety outcomes. The evidence suggests that high quality LMX, characterised by mutual trust, respect and obligation between leaders and subordinates, is associated with positive safety outcomes, including higher levels of upward safety communication (Kath et al., 2010b) and safety citizenship behaviours (Hofmann et al., 2003) as well as reduced levels of safety-related events/near misses (Michael et al., 2006).

Kath et al. (2010b) examined the factors that predict upward safety communication (defined as the freedom employees feel in discussing safety issues with management) in a sample of 548 Canadian rail workers. The authors used a cross-sectional survey to examine the relationship between leader-member exchange, perceived organisational support and job safety demands (i.e. tension between job demands and safety) and upward safety communication. The authors found a positive association between LMX and upward safety communication suggesting that employees were more likely to discuss their safety concerns in the context of high quality relationships with their supervisors. In addition, there was a positive association between upward safety communication and perceptions of management safety attitudes. Perceived organisational support did not exhibit a significant association with upward safety communication. Safety job demands had a positive association with safety communication suggesting that workers are more likely to discuss safety concerns with their supervisors when job demands interfere with safety (Kath et al., 2010b).

Michael et al. (2006) examined the impact of leader-member exchange (LMX) between supervisors and workers and safety communication on safety-related events and injuries. It was hypothesized that open and positive working relationships between supervisors and subordinates as well as good safety communications would result in employees’ experiencing fewer safety-related events. Their sample consisted of 598 workers from five wood products manufacturers. Workers provided data on LMX, safety communication and safety-related events. Archival data on OSHA recordables was also obtained from the companies’ records as a more objective measure of safety-related events. The results showed that high quality LMX was
negatively related to self-report safety-related events but not to OSHA recordables. Safety communication was related to neither self-report safety-related events nor OSHA recordables.

Hofmann et al. (2003) examined the relationship between leader-member exchange (supervisors and subordinates), safety climate, safety citizenship role definitions (i.e. the extent to which safety is seen as part of one’s job role) and safety citizenship behaviours (i.e. frequency with which workers exhibited behaviours such as helping - getting involved in safety activities and committees; voice - making safety related recommendations; stewardship - protecting others from safety hazards and initiating safety-related changes). Their sample consisted of 94 subordinates across 25 military teams. The results suggested that in high quality LMX relationships subordinates were likely to view safety as part of their job responsibilities, which in turn resulted in higher levels of employee safety citizenship behaviours (e.g. getting involved in safety activities and committees, making safety related recommendations and protecting others from safety hazards). In addition, the findings showed that subordinates were more likely to view safety as part of their job responsibilities when the supervisor promoted a positive climate for safety (Hofmann et al., 2003). Thus, the findings illustrated that the positive effects of high quality LMX on safety may be pronounced when they are combined with a work environment that emphasises and promotes safety.

## 6.7 SUMMARY OF FINDINGS ON LEADERSHIP STYLES

There is consistent evidence that transformational leaders enhance a number of safety-related outcomes, including reduced levels of self-reported occupational injuries, positive perceptions of a positive safety climate, higher levels of employee participation in safety activities and compliance with safety rules and procedures (e.g. Barling et al., 2002; Kelloway et al., 2006; Clarke & Flitcroft, 2008; Innes et al., 2010; Lu & Yang, 2010). Furthermore, the mechanisms through which transformational leaders exert their positive influence are both direct and indirect. Indirect effects on safety are achieved when transformational leaders enhance employee safety consciousness (i.e. knowledge), and foster perceptions of a positive safety climate (e.g. Barling et al., 2002; Kelloway et al., 2006). Similarly, studies have consistently demonstrated that a transactional leadership style is associated with reduced accident rates, improved safety behaviours and perceptions of safety climate (Zohar, 2002a; Zohar & Luria, 2003; Luria et al., 2008).

The small number of studies that have examined the simultaneous effects of both transformational and transactional leadership styles have shown that both predict important safety outcomes, such as safety participation and compliance (Clark & Ward, 2006; Lu & Yang, 2010) as well as actual injury levels (Zohar, 2002b). In this latter case, transformational and transactional leadership were associated with a reduction in injury rates through the promotion of a positive safety climate (Zohar, 2002b).

Contextual factors appear to influence the relationship between different leadership styles and safety climate. In particular, these relationships are moderated by the importance placed on safety by the leader’s immediate superior. The benefits of a transactional leadership style are enhanced when safety is perceived to be a priority across different management levels (Zohar, 2002b).

Trust and distrust in management is an important factor impacting on safety-related outcomes such as perceptions of safety climate and actual number of injuries (Luria, 2010), self-reported accident involvement (Conchie & Donald, 2006), and perceived work environment safety (Watson et al., 2005). Transformational leadership styles combined with trust increase the likelihood that employees will engage in safety citizenship behaviours, such as raising safety
concerns (Conchie & Donald, 2009). Positive management attitudes toward safety and two-way communications between employees and management help promote trust towards the organisation (Kath et al., 2010a).

Studies that have focused on the dyadic interactions between leaders, typically supervisors, and subordinates have shown that the quality of these relationships influences safety. Specifically, high quality leader-member relationships or exchanges, characterised by openness, trust and respect are associated with higher levels of upward safety communication (Kath et al., 2010b) and safety citizenship behaviours (Hofmann et al., 2003) as well as reduced levels of safety-related events/near misses (Michael et al., 2006). These findings, therefore, suggest that employees are more likely to discuss their safety concerns in the context of high quality relationships with their supervisors and engage in safety citizenship behaviours (e.g. getting involved in safety activities and committees, making safety related recommendations and protecting others from safety hazards). Safety citizenship behaviours, in particular, are pronounced when, in addition to positive exchanges, leaders emphasize the value of safety and promote a positive safety climate (Hofmann et al., 2003).
7. MANAGEMENT ATTITUDES, PRACTICES AND BEHAVIOURS IN RELATION TO SAFETY

A total of nineteen studies explored specific management attitudes, practices and behaviours in relation to safety. Of these, fourteen were quantitative studies and five were qualitative studies. Of the fourteen quantitative studies, thirteen were peer-reviewed journal papers and one was an HSE report (Fleming, 2001). Of the five qualitative studies, three were HSE reports (Ernst & Young, 2001; McMahon et al., 2006; King et al., 2010;) and two were peer-reviewed journal papers (Bentley & Haslam, 2001; Mullen, 2004). We first review the quantitative studies followed by the evidence provided by the qualitative studies.

7.1 QUANTITATIVE STUDIES

7.1.1 Management commitment to safety

Six studies examined the impact of management commitment on safety-related outcomes showing significant direct relationships with employee involvement in routine and situational violations (Hansz & Chmiel, 2010), risk taking behaviour (Watson et al., 2005), learning from patient-safety events and near misses (Ginsburg et al., 2010), self-report incidents (Mearns et al., 2003), and actual time that senior managers spend on safety activities (Rudmo & Hale, 2003). Management commitment also has indirect effects on employee risk taking behaviours through knowledge and training in health and safety (Yule et al., 2007).

Direct effects

Ginsburg et al. (2010) examined the relationship between formal and informal leadership and learning from patient safety events (e.g. preventable adverse events and near misses) in a sample of 49 acute general hospitals in Canada. Formal leadership concerned the extent to which senior management were committed to and prioritised patient safety. Informal leadership focused on patient safety champions that do not have formal ‘authority’ positions. Learning was defined as activities aimed at the ‘identification and analysis of events as well as change and dissemination activities designed to help reduce re-occurrence of similar events in the future’ (p. 610). The authors carried out two cross-sectional surveys: one with patient safety officers (PSOs) who were senior individuals responsible for patient safety and a second one with patient care managers (PCMs). PSOs provided data on their respective organisations’ learning responses to four types of patient safety-related events (e.g. minor, moderate and major events, major near misses, and major event dissemination/communication). PCMs provided data on senior management leadership (formal leadership) and informal leadership (i.e. the influence of patient safety champions that provide advice on patient safety that is beyond their formal responsibilities). Ginsburg et al. (2010) found that formal leadership was positively associated with four of the five patient safety learning events (learning from minor and moderate events, learning from near misses and major event dissemination/communication). Further, the results showed a significant interaction effect between hospital size, formal leadership and major event dissemination/communication. Specifically, smaller hospitals with strong formal leadership engaged in higher levels of major event dissemination/communication. Informal leadership did not exhibit significant relationships with any of the patient-safety learning events. The authors argued that formal leadership and the extent to which senior management is committed to and values patient safety is an important influence on learning from patient safety events. In addition, senior leaders may be more visible in smaller than larger hospitals and consequently may be more effective in disseminating major events (Ginsburg et al., 2010).
Hansez and Chmiel (2010) carried out a cross-sectional survey to examine the relationship between management commitment to safety (as well as job demands and job resources) and safety behaviour in terms of situational and routine violations. Their sample consisted of 3,506 employees of an energy company in Belgium, of which the majority were employees (64.8%), followed by direct supervisors (17.7%), executives (15%) and top management (0.6%). They found that perceived management commitment to safety was associated with a reduced number of self-report routine and situational violations.

Watson et al. (2005) examined the impact of management commitment to safety (as well as co-worker safety norms and trust in the supervisor) on perceptions of workplace safety and self-report risk taking behaviours. The authors used a cross-sectional survey drawing on a sample of 408 production workers in a steel manufacturing company. The results indicated that when management was perceived as valuing safety, employees reported lower levels of risk-taking behaviour (but no significant associations were found with perceptions of workplace safety). On the other hand, co-worker safety norms were associated with reduced levels of risk-taking behaviour and positive perceptions of workplace safety. Finally, trust in the supervisor was associated with positive perceptions of workplace safety only (Watson et al., 2005).

Management commitment to safety is also associated with actual time spent on safety-related activities (Rudmo & Hale, 2003). Rudmo and Hale (2003) examined the impact of safety attitudes on behavioural intentions and actual behaviours in a sample of 210 senior managers working in a company supplying aluminium products. They found that high levels of management commitment to safety, low levels of fatalism and high levels of risk awareness are particularly important attitudes for managers as they were linked with behavioural intentions and actual engagement in safety activities (Rudmo & Hale, 2003).

Mearns et al. (2003) examined the relationship between safety climate, safety management practices (i.e. actual practices used to maintain safety) and safety performance (using both self-report and company accident data) in 14 offshore installations. Survey data was collected in two separate years (the sample size was N=682 and N=806 respectively) with a total of nine offshore installations providing data across both years. Of relevance to this review was the finding that safety management practices relating to management commitment were associated with lower levels of self-report accidents.

**Indirect effects**

Indirect associations between management commitment to safety and safety behaviours have also been found. Yule et al. (2007) carried out a survey in six UK power stations to examine the relationship between safety climate, using the HSE safety climate survey, and risk-taking behaviours. Data was collected in 1999 from 1023 employees. The authors found that senior management commitment to safety had an indirect impact on employee risk-taking behaviours through knowledge and training in health and safety. Senior management commitment to safety is likely to manifest itself in increased resources invested in health and safety training.

**7.1.2 Supportive leadership and enforcement of safety policies**

Three studies examined the relationship between leader openness and support for safety and safety-related outcomes, including safe working (Parker et al., 2001), risk of injury, and injury incidence (Hung et al., 2004) and communication of safety concerns (Mullen, 2005). In addition two studies examined the relationship between implementation of safety policies and incident under-reporting (Probst & Estrada, 2010) as well as injury risk and incidence (Huang et al., 2004). The findings suggest that supportive leadership results in safe working (Parker et al., 2001), promotes communication of safety concerns (Mullen, 2005) and is associated with lower levels of reported injuries (Huang et al., 2004). The consistent implementation of safety policies
is associated with lower levels of reported injuries (Huang et al., 2004) and lower levels of accident under-reporting (Probst & Estrada, 2010).

Parker, Axtell and Turner (2001) carried out a longitudinal study to examine the impact of several work characteristics (such as supportive leadership, quality of communication, job autonomy, role overload and conflict, training adequacy and job insecurity) on safe working (e.g. compliance with safety procedures and use of PPE). Data was collected from 161 operational (blue collar) employees in a UK glass manufacturing company at two time points over an 18-month period. Supportive leadership was the only work characteristic that had a positive lagged effect on safe working 18 months later. The authors concluded that considerate, coaching-oriented supervisors lead to an improvement in safe working practices over an 18-month period. In addition, positive associations were observed between job autonomy, communication quality and safe working, although these effects were not lagged. Training adequacy, role overload and conflict and job insecurity did not emerge as important factors (Parker et al., 2001).

Mullen (2005) examined the impact of a number of contextual factors on employees’ willingness to communicate safety issues with management. Specifically, it was hypothesised that perceived organisational support for safety, top management openness to employees’ safety suggestions and perceived norms for safety (i.e. peer group support and acceptance for raising safety issues) would have a positive impact on employees’ willingness to raise safety issues. It was further hypothesised that these factors would have a positive effect on employees’ willingness to raise safety concerns by fostering positive employee perceptions that their safety concerns would be addressed (perceived probability of success) and that doing so would not have negative consequences on their image (as a competent worker for example). Mullen (2005) tested this model on a sample of 178 employees working in manufacturing and service industries using a cross-sectional survey. The results provided partial support for the hypothesised model. Specifically, employees were more likely to raise safety issues when they perceived that their safety concerns would be addressed (perceived probability of success). Perceived probability of success was in turn was predicted by perceptions that top management were open and supportive of safety and by the presence of norms that favour the open discussion of safety issues. In other words, perceptions that top management is open and supportive (as well as the presence of norms encouraging safety communication) had a positive influence on employee perceptions that their safety concerns would be acted upon, which in turn increased the likelihood that employees would raise their safety concerns with management. However, perceived organisational support and perceived image risk (i.e. likelihood of being perceived as an incompetent worker) were not significant predictors of willingness to raise safety issues.

Huang et al. (2004) examined the impact of the quality of safety policy implementation (i.e. how well they are implemented and whether they are followed), supervisory support for safety, and employee safety control on satisfaction with the organisation, injury risk and injury incidence. The sample consisted of 1,607 employees across 13 transport organisations. Perceptions of the quality of safety policies were a positive predictor of injury incidence and satisfaction with the company. Further, employees who perceived their supervisor to be supportive of safety, reported fewer injuries and higher levels of satisfaction with the organisation.

In a similar vein, Probst & Estrada (2010) carried out a cross-sectional survey to examine the impact of supervisory enforcement of safety practices on accident under-reporting in a sample of 455 employees across 5 US industries (manufacturing, heating and cooling, pulp and paper mill, dental clinics, and restaurants). They found that perceived enforcement of safety practices was associated with lower under-reporting of accidents. Specifically, when employees perceived
low levels of supervisory enforcement of safety practices, there was a higher under-reporting of accidents. On the other hand, when supervisory enforcement was high, employees reported all accidents that they experienced (Probst & Estrada, 2010).

7.1.3 Leading by example, safety communication and quality of supervisor-employee relationships

Fleming (2001) examined the impact of supervisory safety management practices and safety climate on subordinates self-report risk taking and safety behaviours. The study built on earlier qualitative work by Mearns et al. (1997; cited in Fleming, 2001), which explored the supervisory behaviours that are effective for managing safety. Specifically, Mearns et al. (1997; cited in Fleming, 2001) explored the practices of 23 offshore supervisors that were rated as effective and ineffective by their subordinates and found that:

1. Effective supervisors valued their subordinates more, visited the worksite more frequently to check if subordinates required assistance and encouraged participation in decision-making.

2. Ineffective supervisors abdicated responsibility for subordinate safety, focused more on productivity and deadlines and felt under pressure to get the job done often at the expense of safety. (Mearns et al., 1997; cited in Fleming, 2001)

The subsequent study by Fleming (2001) examined the impact of the abovementioned safety practices on subordinates’ risk taking and safety behaviours using a cross-sectional survey. The sample comprised 92 supervisors and 217 subordinates across nine North Sea gas and offshore installations. Fleming (2001) found five supervisory safety management practices and behaviours that influenced subordinates’ risk taking and safety behaviours. Specifically, encouraging safety by leading by example, safety communication (e.g. attendance at pre-job safety meetings and toolbox talks) and the ability of the supervisor to motivate staff to work safely reduced levels of subordinate risk-taking. Leading by example was the strongest predictor of subordinate risk-taking behaviours. Additionally, subordinates reported positive safety behaviours when supervisors were perceived as valuing individuals’ contributions and showed concern for the welfare of the team. Although not acknowledged by Fleming (2001), it is worth noting that the safety management practices identified as important for promoting subordinate safety behaviours overlap with a transformational and transactional leadership style. Leading by example and showing concern for the welfare of subordinates are characteristics of transformational leaders (Bass, 1985; cited in Bass & Bass, 2008), whereas frequent safety interactions and communications are an important element of transactional leadership (Zohar, 2002a). However, the findings by Fleming (2001) should be treated with caution as their analyses included single statements (rather than factors), which may compromise the reliability of the findings.

Cigularov et al. (2010) examined the effects of supervisory safety communication (e.g. discussion of safety issues) and perceived error management climate (e.g. open communication and sharing of errors, learning from errors) on workers’ self-report injuries, pain and safety behaviours. Their sample consisted of 235 workers from a construction company. Employees completed measures on supervisory safety communication, error management climate with reference to contractors, and injuries, experience of physical pains and safety behaviours (e.g. reporting of accidents, near misses; voluntary attendance at safety meetings). Their results showed that both perceived error management climate and supervisory safety communication was associated with improved safety behaviours, and a reduction in work-related pain but not injuries. Promoting a constructive approach to error management (e.g. promoting the learning and sharing of errors) and enhancing safety communications (e.g. discussing safety issues,
encouraging workers to offer ideas for improving safety) can influence positive safety behaviours and reduce the experience of work-related pain.

The importance of safety communication has also been highlighted in previous reviews on safety leadership research. For instance, Flin & Yule (2004) cite empirical findings that show that supervisory safety communication is indirectly associated with employees’ safety commitment and lower accident rates in manufacturing samples (e.g. Hoffman & Morgeson, 1999; cited in Flin & Yule, 2004). In particular, it is argued that effective safety communication helps create a positive safety climate which in turn influences safety-related outcomes, such as enhanced safety commitment and reduced accident rates (e.g. Hoffman & Morgeson, 1999; cited in Flin & Yule, 2004).

### 7.1.4 Active involvement in safety

Two studies were identified that examined the impact of leaders’ active involvement in safety activities on safety outcomes (Yule et al., 2007; Frankel et al., 2008). Overall, these studies show that active involvement in safety activities is associated with positive perceptions of safety climate (Frankel et al., 2008) and increased levels of employee accountability and responsibility for safety (Yule et al., 2007).

Frankel et al. (2008) examined the impact of patient safety leadership walk rounds on employee perceptions of safety climate in 2 hospitals. In the study, senior leaders attended a training course on implementing patient safety walk rounds as a means of engaging with staff on safety concerns. Following the training, senior leaders implemented weekly or bi-weekly patient safety walk rounds. Employee perceptions of safety climate were assessed prior to and 18 months post the implementation of the walk rounds. The results suggested that patient safety leadership walk rounds were associated with significant improvements in perceptions of safety climate in one hospital and approached statistical significance (p<.06) in the second hospital. The authors concluded that safety walk rounds may be an inexpensive and effective means whereby managers can influence safety over time (Frankel et al., 2008).

The previously cited study by Yule et al. (2007), using a sample of 1023 employees across six UK power stations showed a direct, positive relationship between supervisory involvement in safety and teamwork as well as employee accountability and responsibility.

Further, O’Dea & Flin (2003) review several pre-2000 studies that provide evidence that when managers are actively involved in safety activities there are benefits for safety performance (e.g. Cohen et al., 1975 and Cohen & Cleveland, 1983; cited in O’Dea & Flin, 2003).

### 7.2 QUALITATIVE STUDIES

King et al. (2010) examined directors’ motivation to lead on H&S and the types of leadership practices that they implemented in a sample of 30 organisations representing various sectors including transport, construction and healthcare. The authors carried out a total of 75 interviews with directors, health and safety managers and shop floor employees. Their findings suggested that there was variation in how directors demonstrated a visible commitment to safety and the types of leadership practices they employed. These included:

- Physically displaying up-to-date information that employees could refer to,
- Carrying out H&S shop floor inspections,
- Providing safety equipment and relevant training to employees,
- Using committees to keep up to date with H&S issues, and
- Having dedicated H&S managers or seeking H&S advice from external consultants.
Directors’ motivation to lead on health and safety included wanting to portray an image of being a good employer, enhance employees’ motivation to work safely by creating a safe organisational climate and keeping injuries and sickness absence down. Further, directors also varied in the extent to which they involved workers in H&S with some adopting a more active approach than others. For instance, some directors relied on employees to approach them regarding H&S issues rather than actively seeking feedback whilst there were a few instances where schemes were in place to actively encourage employees to suggest H&S improvements. Leading by example was viewed as an important element of effective leadership by many of the directors interviewed; this involved directors following the same H&S procedures as are expected of employees. Moreover, many directors felt that the impact of leadership behaviour on H&S performance was ‘intangible’ and difficult to measure.

McMahon et al. (2006) examined the health and safety practices that directors employed in eight organisations from a range of different sectors including transport, construction, retail and food. Case study interviews revealed that key leadership practices adopted by senior management included leading by example (e.g. following the same safety procedures as employees), ensuring that H&S is at the top of the agenda at business meetings, discussing with other managers the key health and safety challenges that they face, attending relevant conferences, chairing H&S committees, attending H&S training courses, keeping up to date with relevant industry journals on health and safety, acknowledging successes as well as failures, and carrying out site walkabouts and behavioural audits. Key motivations for health and safety were adhering to health and safety regulations, safety being seen as a corporate risk, social responsibility, potential productivity improvements, response to requirements of investors, clients or insurers.

Mullen (2004) explored the factors that influence individual propensity to behave unsafely. Seven interviews were carried out with individuals from different occupations (e.g. police officer, power company technician, healthcare provider). Factors that emerged as influencing individual unsafe behaviour included:

- Role overload: not having enough time or resources to carry out the work safely,
- Performance over safety: coercive pressure from co-workers and/or management to behave unsafely i.e. rushing or not wearing PPE for example, and
- Safety attitudes: lack of concern and overall commitment to safety from management and co-workers.

Bentley & Haslam (2001) explored the use of safety management practices by supervisors in postal delivery offices with low and high accident rates (in terms of slips, trips and fall accidents). The authors conducted twenty interviews with delivery office managers from low accident rate offices (10 interviews in each). Five types of ‘desirable’ safety management practices were identified that included:

- Safety communications and supervision (e.g. team briefings),
- Hazard management (e.g. reporting and recording of hazards),
- Equipment and uniform management (e.g. use of PPE explained/encouraged),
- Adverse weather practice (e.g. cancellation of deliveries),
- Accident investigation, reporting and prevention (e.g. human and physical contributory factors).
Further, supervisors in low accident offices discussed safety matters more frequently with their staff and carried out more thorough accident investigations aiming to identify contributing factors and putting measures in place to prevent them from re-occurring in the future. Time and workload constraints, as well as lack of health and safety knowledge and training were commonly cited reasons for postal delivery managers not engaging in desirable safety management practices, such as safety communications and supervision as well as hazard management (i.e. reporting and recording hazards).

Ernst & Young (2001) developed a ‘leadership resource pack’ to assist Offshore Safety Division inspectors in health and safety discussions with senior managers. The authors developed a seven-stage model to describe the potential influence of senior managers on health and safety. In particular, the model describes the extent to which:

- Health and safety features on senior managers’ business agenda,
- Senior managers are accountable for health and safety,
- Senior managers actively demonstrate their commitment to safety and prioritise safety over other organisational goals,
- Integrate health and safety into other business goals,
- Health and safety performance is monitored and measured, and
- Health and safety knowledge is promoted within the organisation.

This model was tested across nine organisations representing the oil and gas, chemical, aerospace and mining sectors. It sought to identify the types of leadership practices that directors used. Overall, senior managers across the nine organisations viewed H&S as valuable to their business and as an important criterion in business decision-making. The types of leadership practices and behaviours described by senior managers included:

- Talking to staff, contractors and safety representatives during site visits and through formal discussions,
- Supporting internal training programmes and participating in contractor health and safety training;
- Rewarding good health and safety practices,
- Developing trusting relationships by supporting an open incident and near miss reporting culture, seeking feedback from staff on health and safety, and empowering staff to implement health and safety changes,
- Involvement in the investigation of incidents to identify root causes,
- Allocating the necessary resources for health and safety, and
- Providing examples to illustrate that safety is a priority (e.g. shutting down operations to investigate health and safety concerns).

### 7.3 Summary of Findings on Management H&S Attitudes, Practices and Behaviours

The findings from the quantitative studies provide consistent evidence that management commitment to safety is associated with a number of safety outcomes, including routine and situational violations, learning from patient safety events and near misses, risk taking behaviours and self-report incidents. Managers that report high levels of commitment to safety are also more likely to spend time on safety activities. Perceptions that safety policies are enforced and consistently implemented are associated with lower levels of incident under-reporting, self-report injury incidence and higher levels of satisfaction with the organisation.

Support for safety promotes employee communication of safety issues, and is associated with fewer self-report injuries, higher levels of satisfaction with the organisation and can lead to an improvement in safe working practices over an 18-month period.
In addition, one study showed that where supervisors lead by example, and motivate staff to work safely then employees are less likely to engage in risk-taking behaviours. Valuing individual contributions and showing concern for subordinates’ welfare are both associated with higher levels of employee safety behaviours. However, as these findings emerged from a single study, they should be treated with caution.

The quantitative findings also suggest that safety communication is associated with reduced levels of risk taking behaviours, positive safety behaviours and reduced levels of self-report work-related pain. In addition, where managers are actively involved in safety activities there is a positive influence on employee perceptions of safety climate as well as increased levels of employee accountability and responsibility for safety.

The qualitative studies illustrated a number of safety leadership behaviours and practices that different levels of management engage in. At the senior management level, these include demonstrating a visible commitment to safety, leading by example, providing the necessary resources for H&S, and developing trusting relationships with employees. At the supervisory level, these include providing regular safety communications, being involved in safety activities such as accident investigations, and managing hazards.
8. EFFECTIVE SAFETY LEADERSHIP: OVERVIEW OF KEY FINDINGS

In this section, we summarise and discuss the key themes that emerged from the quantitative studies regarding the leadership styles, behaviours and practices that are conducive to safety. The discussion primarily focuses on leadership styles, behaviours and practices that have received the strongest support (i.e. have shown consistent associations) regarding their impact on safety outcomes. Throughout the discussion, we will relate the findings to the major theories of leadership and discuss their relevance for the effective management of safety. We then draw on the key findings from the literature in order to develop a safety framework outlining the key requirements (in terms of behaviours, leadership styles and practices) for effective safety leadership.

8.1 LEADERSHIP STYLES

Table 2 summarises the leadership styles that have been associated with positive safety outcomes from the 35 quantitative studies.

<table>
<thead>
<tr>
<th>Leadership styles</th>
<th>Source</th>
<th>Safety benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformational leadership</td>
<td>Innes et al. (2010)</td>
<td>Reduced levels of occupational injuries</td>
</tr>
<tr>
<td></td>
<td>Lu &amp; Yang (2010)</td>
<td>Perceptions of positive safety climate</td>
</tr>
<tr>
<td></td>
<td>McFadden et al. (2009)</td>
<td>Successful implementation of safety initiatives</td>
</tr>
<tr>
<td></td>
<td>Mullen &amp; Kelloway (2009)</td>
<td>Enhanced levels of safety participation and compliance</td>
</tr>
<tr>
<td></td>
<td>Conchie and Donald (2009)</td>
<td>Increased levels of safety citizenship behaviours</td>
</tr>
<tr>
<td></td>
<td>Clarke &amp; Flitcroft (2008)</td>
<td>Increased levels of safety consciousness/risk awareness</td>
</tr>
<tr>
<td></td>
<td>Clark &amp; Ward (2006)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kelloway et al. (2006)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Barling et al. (2002)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zohar (2002b)</td>
<td></td>
</tr>
<tr>
<td>Transactional leadership</td>
<td>Lu &amp; Yang (2010)</td>
<td>Positive perceptions of safety climate</td>
</tr>
<tr>
<td></td>
<td>Luria et al. (2008)</td>
<td>Reductions in injury rates</td>
</tr>
<tr>
<td></td>
<td>Clark &amp; Ward (2006)</td>
<td>Enhanced levels of safety behaviours (i.e. use of PPE)</td>
</tr>
<tr>
<td></td>
<td>Zohar &amp; Luria (2003)</td>
<td>Enhanced levels of safety participation</td>
</tr>
<tr>
<td></td>
<td>Zohar (2002a)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zohar (2002b)</td>
<td></td>
</tr>
<tr>
<td>Positive supervisory-subordinate</td>
<td>Kath et al. (2010b)</td>
<td>Enhanced upward safety communication</td>
</tr>
<tr>
<td>exchanges</td>
<td>Michael et al. (2006)</td>
<td>Higher levels of safety citizenship behaviours</td>
</tr>
<tr>
<td></td>
<td>Hofmann et al. (2003)</td>
<td>Reduced levels of safety-related events/near misses</td>
</tr>
</tbody>
</table>
From Table 2, it can be seen that both transformational and transactional leadership have received considerable support in the literature and have been consistently shown to promote perceptions of a positive safety climate, employee compliance with safety procedures and involvement in initiatives that help promote safety within the organisation, as well as positive safety behaviours and improvements in occupational safety. These findings suggest that managers should take an active role in promoting safety and that behaviours associated with a transformational and transactional leadership style may be an effective means of creating an environment where safety is valued and supported. Behaviours associated with a transformational leadership style include leaders conveying a safety vision for the organisation and clearly articulating how it may be achieved, acting in a manner that is consistent with the values that they embrace i.e. act as safety role models, as well as showing concern for the welfare and safety of employees. Behaviours that are part of a transactional leadership style include setting clear safety-related goals and performance standards, monitoring and rewarding positive safety behaviours (Bass, 1985; cited in Bass & Bass, 2008).

Thus, the empirical findings indicate that transformational and transactional leadership theories may be effective approaches for the management of safety. They constitute active forms of leadership whereby leaders actively talk about, support and reward safety. On the other hand, passive forms of leadership where leaders do not talk about safety and in essence communicate the message that safety is not a priority have detrimental effects on safety (Kelloway et al., 2006; Kelloway & Barling, 2010).

Research that has focused on the dyadic relationships between leaders, typically supervisors, and subordinates has provided consistent evidence that the quality of that relationship has important safety benefits. Specifically, high quality leader-member exchanges, characterised by mutual trust, respect and support, promote upward safety communication, employee involvement in activities that promote safety and go beyond their formal job role and decrease the incidence of safety-related events.

**8.2 MANAGEMENT ATTITUDES, PRACTICES AND BEHAVIOURS**

Table 3 provides a summary of studies that examined the effects of specific attitudes, behaviours and practices on safety outcomes. It can be seen that perceived commitment to safety has been consistently linked with positive safety outcomes, including reduced levels of employee violations and risk taking behaviours, lower levels of incidents and improved learning from patient safety-related events and near misses. It is worth noting that some studies have shown significant associations with safety-related outcomes by examining management commitment within a safety climate perspective (e.g. Mearns et al., 2003; Yule et al., 2007). In fact, management commitment to safety is a factor that is consistently captured in measures of safety climate (Flin, Mearns, O’Connor & Bryden, 2000). These findings suggest that management actions that show a visible commitment to safety are important in shaping employees’ perceptions of a positive safety climate within the organisation (Hoffman and Stetzer, 1996; cited in O’Dea and Flin, 2003). For instance, consistent implementation of safety policies and procedures is associated with lower levels of injury incidence and accident under-reporting; it is likely that these practices have a positive effect by sending the message to employees that management is committed to safety.
Table 3. Leadership attitudes, behaviours and practices associated with safety-related outcomes

<table>
<thead>
<tr>
<th>Leadership attitudes, behaviours and practices</th>
<th>Source</th>
<th>Safety benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment to safety</td>
<td>Ginsburg et al. (2010)</td>
<td>Reduced levels of violations</td>
</tr>
<tr>
<td></td>
<td>Hansez &amp; Chmiel (2010)</td>
<td>Reduced levels of employee risk taking behaviours</td>
</tr>
<tr>
<td></td>
<td>Yule et al. (2007)</td>
<td>Predicts engagement with safety activities</td>
</tr>
<tr>
<td></td>
<td>Watson et al. (2005)</td>
<td>Lower levels of self-report incidents</td>
</tr>
<tr>
<td></td>
<td>Rudmo &amp; Hale (2003)</td>
<td>Learning from patient safety events</td>
</tr>
<tr>
<td></td>
<td>Mearns et al. (2003)</td>
<td></td>
</tr>
<tr>
<td>High risk awareness Low fatalism/Beliefs that accidents can be prevented</td>
<td>Rudmo &amp; Hale (2003)</td>
<td>Predicts engagement with safety activities</td>
</tr>
<tr>
<td>Safety communication</td>
<td>Cigularov et al. (2010)</td>
<td>Reduced levels of work-related pain</td>
</tr>
<tr>
<td></td>
<td>Fleming (2001)</td>
<td>Positive safety behaviours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduced levels of employee risk taking behaviours</td>
</tr>
<tr>
<td>Enforcement of safety policies</td>
<td>Probst &amp; Estrada (2010)</td>
<td>Lower levels of injury incidence</td>
</tr>
<tr>
<td></td>
<td>Huang et al. (2004)</td>
<td>Lower levels of accident under-reporting</td>
</tr>
<tr>
<td>Involvement in safety activities</td>
<td>Frankel et al. (2008)</td>
<td>Positive perceptions of safety climate</td>
</tr>
<tr>
<td></td>
<td>Yule et al. (2007)</td>
<td>Increased levels of employee responsibility for safety</td>
</tr>
<tr>
<td>Leading by example</td>
<td>Fleming (2001)</td>
<td>Reduced levels of employee risk taking behaviours</td>
</tr>
<tr>
<td>Showing concern for subordinates</td>
<td>Fleming (2001)</td>
<td>Positive safety behaviours</td>
</tr>
<tr>
<td>Valuing subordinate contributions</td>
<td></td>
<td>Lower levels of risk taking behaviours</td>
</tr>
<tr>
<td>Motivating staff to work safely</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supportive leadership/supervision</td>
<td>Mullen (2005)</td>
<td>Improvement in safe working practices</td>
</tr>
<tr>
<td></td>
<td>Huang et al. (2004)</td>
<td>Lower levels of self-report injuries</td>
</tr>
<tr>
<td></td>
<td>Parker et al. (2001)</td>
<td>Higher levels of employee willingness to raise safety issues</td>
</tr>
</tbody>
</table>
Other management behaviours that have emerged from the literature as conducive to safety include getting involved in activities that demonstrate a visible involvement in safety, such as safety leadership walk rounds, as well as engaging in regular and effective safety communications with employees. These may include holding regular discussions on safety issues and encouraging workers to contribute ideas to improve safety. In addition, leader support for safety is important safety management behaviour. Empirical findings suggest that leaders that are perceived as approachable and open to workers’ safety suggestions and provide the necessary resources for workers to work safely promote safe practices among the workforce in the long-term and increase employees’ willingness to raise safety issues within the organisation (e.g. Parker et al., 2001, Mullen, 2005).

Overall, evidence on specific leader behaviours and practices that promote safety lend support to both behavioural as well as transformational/transactional approaches to leadership. For instance, leader behaviours, such as involvement in safety activities and safety communication overlap with behaviours encompassed within the transformational leadership approach. Leading by example and an active involvement in safety activities are ways in which transformational leaders become role models and lead by example (i.e. the ‘idealised influence’ factor of transformational leadership). On the other hand, safety communication is crucial for leaders to effectively articulate a vision for the organisation and emphasize that safe work practices should not be compromised for performance and profits. This is consistent with behaviours that capture the ‘inspirational motivation’ facet of transformational leadership (Bass, 1985; cited in Bass & Bass, 2008). Similarly, findings on leader behaviours, such as support for safety and showing concern for subordinates overlaps with the ‘individualised consideration’ facet of transformational leadership according to which leaders are attentive to subordinate needs and create a supportive work environment (Bass, 1985; cited in Bass & Bass, 2008). These behaviours are also consistent with behavioural approaches to leadership, which focus on specific leader behaviours and actions. For example, support for safety and showing concern for the welfare of employees is consistent with the ‘employee orientation’ and ‘consideration’ leadership behaviours identified within the behavioural approaches to leadership as they focus on the leaders’ attentiveness to employee needs.

8.3 LIMITATIONS OF STUDIES

The findings from this review need to be considered in light of the limitations of the empirical studies. In particular:

- Data are often collected from the same source, which increases the risk of common method bias; that is, finding ‘artificially’ significant relationships.

- The overwhelming majority of studies have employed cross-sectional designs; these limit the extent to which conclusions can be made regarding a causal relationship between specific leadership styles, behaviours or attitudes and safety outcomes.

- Studies have often utilised small sample sizes and/or have been conducted in single organisations, which limit the extent to which findings can be generalised to other organisational contexts.

- Some studies have examined specific attitudes and behaviours without linking them to a specific leadership theory while others have studied constructs, such as management commitment to safety, within a safety climate perspective. This poses difficulties in terms of integrating the findings from these diverse studies and identifying potential commonalities between different leadership theories (such as transformational/transactional and behavioural approaches).
8.4 DEVELOPMENT OF A SAFETY LEADERSHIP FRAMEWORK

One of the aims of this review was to develop a framework specifying the leadership requirements for the effective management of safety drawing on the empirical findings reviewed. The framework specifies the leadership styles, behaviours, attitudes and practices that are conducive to safety and outlines the mechanisms whereby positive safety outcomes may be achieved (see Figure 2).

In developing the framework, a distinction was made between macro and micro-organisational factors. The former captures factors that have a more distal or ‘removed’ influence on employee outcomes and behaviours and are informed by empirical findings regarding senior management effective leadership styles, behaviours and attitudes. On the other hand, micro-organisational factors are those that operate at the shop floor level and may have a more immediate, direct impact on employee safety behaviours. These focus principally on the relationships between supervisors and workers and the influence that supervisory leadership styles, practices and behaviours have on safety outcomes. The distinction between micro and macro-level factors is based on arguments and empirical evidence suggesting that different levels of management have different levels of responsibility for safety. For instance, O’Dea and Flin (2003) argue that senior levels of management are more concerned with strategy and making decisions that affect the organisation in the long-term whereas supervisors are involved in operational matters, such as co-ordinating work activities. Further, research has shown that micro-organisational factors, such as co-operative relationships between supervisors and workgroups and a supervisory participative style of management, are the most important predictors of workgroups’ propensity to comply with safety rules and procedures (Simard & Marchand, 1997; cited in O’Dea & Flin, 2003). On the other hand, macro-organisational factors have a more distal effect on safety through their impact on micro-organisational factors.

8.4.1 Macro-organisational factors

As mentioned, macro-organisational factors in the framework have been summarised based on empirical studies that have focused on senior levels of management. The model highlights specific attitudes, practices and leadership styles that have been consistently linked with positive safety outcomes at the senior management level. For instance, senior management commitment to safety appears to be crucial for effective safety leadership. Commitment may be demonstrated in various ways including articulating a clear vision for the organisation in terms of safety performance, clarifying roles and responsibilities so that all levels of management and employees are clear about what performance is expected, and encouraging employee participation in decision-making that affects their safety (Roughton & Mercurio, 2002). Further, both transformational and transactional leadership appear to be effective safety leadership styles. At the macro-organisational level, transformational leadership may be evident when senior managers encourage workers to participate in safety decisions and act as safety role models. Transactional leadership, on the other hand, may be evident when senior managers develop a clear safety policy setting clear goals, standards and responsibilities for safety.

The framework shows that macro-organisational factors impact on safety through both direct and indirect mechanisms. The indirect mechanisms relate to promoting and fostering norms and practices that send the message that safety is important, thus creating a positive safety climate, as well as fostering perceptions among employees that safety issues will be addressed (perceived probability of success) (Mullen, 2005).
Macro-level factors

Attitudes:
- Management commitment
- Beliefs that accidents can be prevented (low levels of fatalism)
- High levels of risk awareness

Interpersonal factors:
- Trust

Practices/Behaviours:
- Implementation of corporate safety policies
- Openness and support for safety

Leadership styles:
- Transformational
- Transactional

Safety benefits

Positive safety climate

Perceived probability of success

Micro-level factors

Attitudes:
- Safety as a priority

Interpersonal factors:
- Trust / Distrust
- Supportive/coaching-oriented supervisors
- Concern for welfare of team

Practices:
- Supervisory involvement in safety activities
- Enforcement of safety practices/policies
- Leading by example
- Two-way safety communications

Leadership styles:
- Transformational and Transactional
- Positive leader-member exchanges

Safety benefits

Positive safety climate

Safety consciousness

Safety benefits

Perceived probability of success

Positive safety climate

Perceived risk of injury and injury incidence (self-report)

Safety participation and safety citizenship behaviours
Finally, the framework depicts micro-organisational factors as having a direct influence on micro-organisational factors, which represent the behaviours of managers (such as supervisors) that have a more direct involvement with the workforce. Previous research has shown that senior managers have an important impact on the behaviours and attitudes at other management levels. For instance, they influence the priorities placed on safety by other management levels such as supervisors (Zohar, 2002b), as well as the extent to which supervisors are involved in safety decision making and in joint safety activities with their workgroups (Simard & Marchand, 1997; cited in O’Dea & Flin, 2003).

8.4.2 Micro-organisational factors

Micro-organisational factors focus on empirical studies carried out at lower levels of management, predominantly on supervisors. These represent the majority of studies included in this review.

Supervisors’ responsibilities differ qualitatively from those that are characteristic of other management levels as they focus primarily on the scheduling and co-ordination of work activities as well as looking after the welfare of their workgroups (Flin & Yule, 2004). Studies carried out at this management level show that both transactional and transformational leadership styles as well as the quality of the supervisor-subordinate relationship are important for achieving positive safety outcomes. Collectively these studies suggest that effective supervisors engage in frequent safety interactions and communications with their workgroup, actively monitor and reward safe behaviours, motivate staff to work safely and show concern for their safety and welfare, as well as lead by example and are actively involved in safety activities and decisions. Trusting relationships between supervisors and subordinates is another important mechanism through which supervisors can influence safety. Studies have consistently shown that employee perceptions of trust in management is associated with number of injuries (Luria, 2010), accident involvement (Conchie & Donald, 2006) and perceived workplace safety (Watson et al., 2005).

Further, among the other practices and behaviours outlined in the framework, it is worth drawing attention to the importance of effective safety communication. This is due to consistent empirical findings that when employees feel encouraged to discuss safety issues with management (supervisors) safety benefits result in terms of reduced injury rates, improved safety commitment (e.g. Hofmann and Morgeson, 1999; cited in Flin & Yule, 2004) as well as promoting safety behaviours and reducing the experience of work-related pain (Cigularov et al., 2010). Safety communication between employees and management is likely to promote an increased understanding of safety policies and procedures, improved monitoring of worker compliance with procedures and facilitate the discussion of safety concerns and development of preventative measures to address them (Kath et al., 2010b).

Finally, as was the case with macro-organisational factors, micro-organisational factors also impact on safety via both direct and indirect mechanisms. Indirect mechanisms include perceptions of a positive safety climate, and an increase in subordinates’ safety knowledge. In particular, where supervisors engage in active forms of leadership (such as transformational and transactional- contingent reward) which involves talking about, promoting and championing safety then they help foster a climate where safety is seen as a priority as well as help raise subordinates’ awareness and knowledge of safety.
9. REVIEW OF MAJOR INCIDENTS: KEY THEMES

In this section, we present the findings from the thematic analysis of incident reports and relevant discussion papers. The aim of this stage of the review was to identify any recurrent themes in the causation of major incidents, with particular emphasis on those issues that either represent leadership failings or have leadership implications for the management of safety. It should be noted that the thematic analysis focused on the key issues that emerged across the incidents and it does not represent an exhaustive analysis of all the contributory factors that were implicated in these incidents. A detailed description of each incident and the contributory factors associated with each incident can be found in Appendix 2.

Table 4 presents the common themes identified across a sample of 16 major accidents. Our analysis identified nine overarching themes: training and competence, learning from previous incidents, safety communication, hazard awareness and management, commitment to safety, clarity of roles and responsibilities, complacency and lack of oversight, adequacy of procedures and management of change.

Prior to discussing these themes in detail, it is worth mentioning that our analysis concurs with that of previous research. In particular, Joseph, Kaszniak, & Long (2005) reviewed 23 completed investigations on major incidents carried out by the U.S. Chemical Safety and Hazard Investigation Board (CSB) in order to identify any common underlying causes. Their analysis identified the following: lack of hazard awareness and inadequate training, poorly managed organisational change, poor hazard evaluation associated with high-risk activities, inadequate plant design and/or poor maintenance and inadequate emergency response plans and procedures.

9.1 TRAINING AND COMPETENCE

There were many examples where inadequate levels of training and competence were found to have contributed to major incidents. These failings, which were typically related to inadequate training in dealing with unexpected events and emergencies and inadequate knowledge of hazards, were identified as contributory factors in 11 of the 16 major incidents. For instance, inappropriate operator training in emergency preparedness was identified as a major contributing factor to the release of radioactive gas in the Three Mile Island incident in 1979. Operators were trained to run the plant during routine operations and lacked the knowledge to diagnose and respond appropriately to equipment malfunctions and multiple failures. Inadequate emergency response training proved to be one of the root causes of the accident (Meshkati, 1991).

Similarly, operators at the Bhopal plant had been given little or no training on the health and safety hazards on site and had little knowledge of the toxic substances on site. This lack of safety knowledge was coupled with operators’ lack of understanding of the procedures they were using; in particular, training on the use of safe operating procedures promoted learning by rota and as a result operators did not have an adequate understanding of the rationale behind the procedures they were using (Meshkati, 1991). Further, the plant was run by managers with little relevant experience and inadequate training both about the hazards and the appropriate operating procedures (Meshkati, 1991; Bell & Healey, 2006).
9.2 LEARNING FROM PREVIOUS INCIDENTS

The analysis of the incidents indicated that in many cases, there had been previous precursor events that had either been ignored or the organisation had failed to identify the root causes and implement the necessary control measures. Failure to learn from previous incidents was identified in 10 of the 16 incidents reviewed. An example of failure to learn from previous incidents can be illustrated with the Piper Alpha incident in 1998 where 167 workers died after a major explosion on an offshore platform. Prior to the 1998 incident, there had been a similar incident on Piper Alpha during which a man had been killed; the incident had involved similar failures that ultimately led to the disaster in 1988, namely a poor implementation of the permit to work system resulting in a breakdown of communications and errors during shift handover (Paté-Cornell, 1993; cited in Gordon, 1998).

Similar failures to learn from previous incidents were also evident in the Bhopal gas tragedy in 1984, the Zeebruge ferry disaster, the Russian submarine K431 explosion in 1985 and the RAF Nimrod Incident in 2006. In the case of Bhopal, at least six serious incidents had occurred prior to the 1984 disaster, however management failed to carry out root cause investigations and take appropriate corrective measures to prevent future incidents (Gupta, 2002). Similarly, in the Zeebruge ferry disaster, ferries had previously sailed with their doors open before but these incidents had not been reported to the directors responsible for safety (Spooner, 1995; cited in Gupta, 2002). In 1985 an explosion occurred during the process of re-fuelling a Russian nuclear submarine, the reactor lid of the submarine was raised too high resulting in an explosion. The Russian army had experienced a similar incident 20 years earlier but any lessons that might have been learnt were apparently forgotten (Howard, 2010). Finally, failure to learn from previous incidents was a contributory factor in the RAF Nimrod incident that suffered a catastrophic mid-air fire during a routine mission, leading to the total loss of the aircraft and the death of all fourteen service personnel on board. An independent review into the incident showed that there had been warning signs prior to the incident in 2006 but they were treated as ‘one off’ events and no attempts had been made to identify potential systemic problems and put the necessary controls in place to prevent future similar incidents (Haddon-Cave, 2009).

9.3 SAFETY COMMUNICATION

Safety communication was another recurring theme that was implicated in half of the major incidents reviewed. This theme encompasses the extent to which there are open, clear and trusting communications between management and staff, and effective sharing of (safety critical) information. For instance, in the case of the Columbia space shuttle disaster in 2003 there was a lack of honest and open communications, which were identified as a contributory factor to the accident. In particular, NASA promoted a culture, which discouraged the communication of bad news, and when these were communicated they were ignored (Kadri & Jones, 2006). Similarly, a breakdown of communication during shift handover was identified as a contributory factor in the Piper Alpha disaster. Safety critical information regarding the removal of a safety pressure valve was not passed on during the shift changeover, which resulted in starting a pump that should have been out of service (Paté-Cornell, 1993; cited in Gordon, 1998). Another example is the Clapham rail incident in 1988, which cost the lives of 35 passengers and crew staff and injured nearly 500 people. The incident resulted when a crowded commuter train ran into the rear of a stationary train just south of Clapham Junction. Although the immediate cause of the incident was a signalling failure due to wiring errors, ineffective safety communications between management and employees was identified as a contributory cause to the incident (Hidden, 1989).
Table 4. Recurrent themes identified across major incidents

<table>
<thead>
<tr>
<th>Incident</th>
<th>Commitment to safety</th>
<th>Complacency and lack of oversight</th>
<th>Training and competence</th>
<th>Learning from previous incidents</th>
<th>Adequacy of procedures</th>
<th>Hazard awareness and management</th>
<th>Safety communication</th>
<th>Clarity of roles and responsibilities</th>
<th>Management of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Three Mile Island</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
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<tr>
<td>(1979)</td>
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<tr>
<td>5. Longford (1998)</td>
<td>√</td>
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<td>√</td>
<td></td>
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<tr>
<td>7. BP Texas City</td>
<td>√</td>
<td>√</td>
<td>√</td>
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<td>(2005)</td>
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<td></td>
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<tr>
<td>11. Russian submarine (1985)</td>
<td></td>
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<td>√</td>
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<tr>
<td>15. Chernobyl (1986)</td>
<td>√</td>
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<td>√</td>
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<td>√</td>
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<td><strong>Total</strong></td>
<td><strong>12</strong></td>
<td><strong>11</strong></td>
<td><strong>11</strong></td>
<td><strong>10</strong></td>
<td><strong>9</strong></td>
<td></td>
<td><strong>9</strong></td>
<td><strong>8</strong></td>
<td><strong>5</strong></td>
</tr>
</tbody>
</table>

Please see Appendix 3 for a detailed summary of the factors contributing to the Deepwater Horizon incident.
9.4 HAZARD AWARENESS AND MANAGEMENT

Hazard awareness and management relates to the proportionate response of an organisation to the relevant hazards, which includes consideration of the organisations’ use of audits and risk assessments to identify problems and put the necessary control measures in place. Poor hazard awareness and management was identified as a contributory factor in 9 of the 16 incidents. For instance, The Longford Royal Commission into the Esso gas plant explosion in 1998 found that a systematic failure to identify major hazards contributed to the incident that killed two workers and injured several others. In particular, Esso had failed to identify the safety-critical hazards at the plant where the incident took place due to lack of resources; an assessment of the hazards would have resulted in the development of protective measures (including operating procedures) to deal with the warm oil flow (Hopkins, 2000).

In other cases, an inadequate understanding of major hazards meant that organisations were focusing on the control of personal safety at the expense of process safety risks. For instance, the findings from the Baker Panel report into the BP Texas City incident in 2005 highlighted that BP management focused on controlling personal injury rates as a means of attaining a good level of process safety performance; this combined with a poor understanding of process safety had given BP management the false belief that major hazards were adequately controlled (Baker et al., 2007).

9.5 COMMITMENT TO SAFETY

Failure to demonstrate commitment to safety including investing the necessary resources for the maintenance of equipment and prioritising safety over production was evident in 12 of the 16 major incidents. The Columbia space shuttle incident is an example where pressures to go ahead with the launch resulted in compromises in safety. The physical cause of the incident involved a failure in the shuttle’s thermal protection system, which resulted in its disintegration upon re-entering into the earth’s atmosphere (Kadri & Jones, 2006). Among the contributory factors highlighted in the Columbia Accident Investigation Board report was the fact that NASA was under immense resource constraints and scheduling pressures to complete the launch. These factors had contributed to an environment where employees felt that they could not raise any safety concerns that could compromise the launch. Despite this, there is evidence that NASA engineers tried several times to communicate their concerns to management but their safety concerns were either ignored or downplayed by the mission managers (Kadri & Jones, 2006).

Another incident where the prioritisation of cost over safety was identified as a contributory factor was the capsizing of the Herald of Free Enterprise. Staff had requested repeatedly for the installation of a warning light system that would indicate the readiness for ferry departure, however, due to cost cutting efforts the system was not installed. On the day of the incident, the ferry departed with the bow doors open in an attempt to maintain its excellent record of punctuality (Sheen, 1987; cited in Roger, Flin, Mearns & Hetherington, 2010). Other incidents that illustrate a poor management commitment to safety are the Longford Esso gas plant explosion and the Buncefield incident. In the case of Longford, The Royal Commission found that management had not demonstrated ‘uncompromising commitment to identify and control every hazard at Longford’. A lack of investment in necessary resources was one of the factors identified for the failure to identify systematically all potential risks and put the necessary controls in place (Hopkins, 2000). Similarly, the Buncefield incident in 2005 is another example whereby management failures to prioritise safety resulted in the fire and explosion due to the overfilling of a tank. In particular, the tank had two levels of control to alert operators that the tank was overfilling to critical levels, however, at the time of the incident neither were working. Investigations into the causes of the incident identified a number of factors that had created a culture where keeping the process operating was the primary focus, and process safety did not
receive the attention, resources or priority that it required (Major Incident Investigation report, 2008; HSE, 2011)

9.6 CLARITY OF ROLES AND RESPONSIBILITIES

The thematic analysis showed that diffusion of responsibility and poor clarity regarding roles and responsibilities for safety was a recurrent theme that was implicated in five of the sixteen incidents reviewed. For instance, poor definitions and accountability for safety at different levels of management, including senior management, middle management and supervisors, was identified as an underlying cause of the BP Texas City incident in 2005. In particular, the Baker Panel report (2007) concluded that BP was unclear about roles and responsibilities regarding process safety performance, which resulted in confusion and in situations where nobody was accountable for important safety decisions. This lack of definition regarding roles and responsibilities extended to refinery plant managers who were not given clear performance expectations. This was partly attributed to the complexity of the organisation as well as to frequent re-organisations that had resulted in new positions and shifting responsibilities.

The Potters Bar rail incident in 2002, which killed seven people and injured seventy-six is another example where unclear roles and responsibilities were implicated in the incident. The immediate cause of the derailment was a failure of the points - the bolts that held the stretcher bars that keep the rails apart (HSE, 2002; 2003). The HM Railways Inspectorate investigation into the incident found that there were two separate inspection and maintenance systems, one involving permanent way personnel and the other temporary signalling staff. The existence of these two separate systems resulted in confusion over roles and responsibilities and a lack of a clearly defined approach to maintaining the points in a safe condition (HSE, 2003). Similarly, unclear job descriptions and expectations were also identified as contributory factors in the Clapham Junction rail incident in 1988 where thirty-five passengers died and another five hundred injured (Hidden, 1989).

9.7 COMPLACENCY AND LACK OF OVERSIGHT

Another recurring theme that emerged from the analysis of the incidents involved a ‘culture of complacency’ and lack of management oversight whereby organisations failed to consider the ‘bigger picture’, tolerated unsafe working practices and failed to act on safety concerns. In many incidents, it was evident that previous successes had created a culture of complacency where safety deviations were either ignored or accepted as ‘normal’ practice. This theme was evident in 11 of the 16 major incidents reviewed. For instance, in over 100 missions flown prior to the Columbia disaster there were problems with foam shedding but as the missions had been ‘successful’ (i.e. had not resulted in accidents) this safety deviation had been accepted as normal and no control measures were implemented (Kadri & Jones, 2006). In other words, NASA had developed a culture of complacency whereby great risks were accepted because of prior successes (Boin & Schulman, 2008). Another incident that illustrates management complacency over safety and a lack of oversight is Ladbroke Grove. In the case of the Ladbroke Grove rail incident in 1999, 31 people died, and more than 520 were injured when a passenger train went through a red signal and collided with a high-speed passenger train. One of the contributory factors identified was that management failed to take appropriate actions in response to train drivers’ complaints regarding the visibility of various signals (Cullen, 2001).

9.8 ADEQUACY OF PROCEDURES

Procedural problems, including violation and/or poor enforcement, poor usability and/or absence of procedures, have also emerged as contributing factors to several major accidents. This theme emerged in nine of the sixteen major incidents reviewed. For instance, poor
implementation of the permit to work system was identified as a contributory factor to the Piper Alpha explosion in 1988 where 167 workers died. In particular, the system had become too relaxed and employees relied on too many informal communications between shifts (Fire and Blast Information Group, 2009). The Chernobyl accident is another illustration of problems with procedures. The accident occurred because of severe deficiencies in the design of the reactor compounded by the violation of operating procedures (Bell & Healey, 2006). Procedural issues were also implicated in the Deepwater horizon oil spill in 2010 at the Gulf of Mexico. Although the Deepwater Horizon investigation report (2010) identified a flawed well plan, insufficient amount of cement used, and the failure of the blow-out preventer as immediate causes to the incident, the crew was inadequately prepared to deal with well control emergencies and there was an absence of adequate procedures to deal with high flow emergency situations. Further, according to the Chief Counsel’s report in 2011, BP had failed to provide site leaders and crew staff with detailed procedures on interpreting a negative pressure test. As a result, rig crew and well site leaders incorrectly interpreted the results of the test and failed to put the necessary controls in place.

9.9 MANAGEMENT OF CHANGE

Poor management of change was implicated in five of the sixteen major incidents reviewed. This theme related to the extent to which changes (i.e. to plant, equipment or staffing resources) are carried out by taking into consideration any potential consequences for the management of major hazards. For instance, poor management of change was implicated in the Bhopal disaster where at the time of the incident, the workforce had been reduced by two thirds and carried out jobs that they were not qualified for (Gupta, 2002). The Chernobyl accident in 1986 is another illustration of the importance of having a rigorous and systematic method in place to manage change. The accident occurred during an experiment on one of the power plant’s nuclear reactors to test a safety emergency core-cooling feature during the shutdown procedure. The eventual disaster resulted from unplanned activities that went against the conditions originally set out when planning the experiment (Atherton & Gil, 2008).

Poor implementation of management of change was also a contributing factor in the Deepwater Horizon oil spill in 2010 at the Gulf of Mexico, which had resulted in a lack of clear management accountability for safety and key decisions were not made with a shared purpose in mind. Specifically, prior to the incident, BP had undergone re-organisation, which had resulted in separate reporting structures for engineering and operational staff. In addition, some staff had been moved into new roles. The re-organisation was not managed effectively causing confusion regarding who was responsible for what and for important safety practices. In addition, employees who had moved into new roles were expected to make decisions without being given sufficient time to get up to speed with their new roles (Chief Counsel, 2011).
10. INTEGRATION OF FINDINGS FROM EMPIRICAL RESEARCH AND MAJOR INCIDENTS

In the previous section, we discussed eight key themes that emerged as recurrent contributory factors in major incidents: training and competence, learning from previous incidents, safety communication, hazard awareness and management, commitment to safety, clarity of roles and responsibilities, complacency and lack of oversight, adequacy of procedures and management of change. In this section, we bring together the findings from the empirical studies and the results from the thematic analyses of major incidents in order to identify areas of overlap between the two sources of evidence.

One challenge in integrating the findings from the empirical studies and the major incidents is that the latter represent a complex interplay of failings at different levels within an organisation. However, although the causes of incidents may vary, they may all be seen as symptoms of poor safety leadership. Krause, Groover and Martin (2010) argue that one commonality among major disasters such as the Piper Alpha, BP Texas City and the Columbia Space Shuttle are leadership failings that underlie any proximate, immediate causes of the incidents. It is further argued that leaders have a fundamental influence on the ‘safety fabric’ of an organisation through the decisions they make, their words and deeds and the systems that they implement (Krause et al., 2010). Similarly, Reason (1997, p. 11) argues that decisions taken at management levels or what he refers to as the ‘upper echelons of the organisation’ have the greatest potential to cause latent failures; that is failures that may be ‘removed’ from the incident but are endemic in how work is managed and organised. A recent example demonstrating these arguments is BP’s Deepwater Horizon spill in the Gulf of Mexico. The Counsel’s report on the incident found that ‘while many technical failures contributed to the blowout, the Chief’s Counsel team traces each of them back to a overarching failure of management’ (Chief Counsel, 2011, p. 225).

Looking at the different sources of evidence we can identify several areas of overlap, which allow us to draw some conclusions regarding what constitutes effective safety leadership. Specifically, the promotion of a positive safety climate and trust through the adoption of active forms of leadership are areas where leaders can have a positive influence. At the organisational level, a positive safety climate is considered crucial for effective safety management (Gordon, 1998). There is a consistent body of literature that illustrates the important role that different management levels play in influencing perceptions of safety climate. In particular, leaders’ behaviours, leadership styles and practices influence employees’ perceptions of the importance that the organisation places on safety as well as behavioural expectations regarding safety (Barling et al., 2002; Zohar, 2002b; Kelloway et al., 2006; Clarke & Flitcroft, 2008; McFadden et al., 2009; Mullen & Kelloway, 2009). Safety climate has been defined in terms of shared perceptions of leaders’ behaviours such as management policies and practices, and therefore, as Kelloway & Barling (2010) argue ‘it is a small leap to assume that leaders who are seen as promoting safety would also create a positive safety climate’ (p. 267).

Further, there is consistent evidence regarding the types of behaviours, leadership styles and practices that are conducive to the promotion of a positive safety climate and in turn to a safe working environment. Data consistently support that active forms of leadership and the types of behaviours that are encompassed in transformational and transactional (contingent reward) leadership styles play an important role in promoting a positive safety culture and safety performance in terms of higher levels of employee safety compliance and participation (e.g. Innes et al., 2010; Lu & Yang, 2010; Barling et al., 2002). Leaders who adopt transformational leadership styles lead by example, talk about and communicate a clear vision for safety, motivate the workforce to work safely and show concern for employees’ welfare and safety. Leaders with transactional (contingent reward) leadership styles actively monitor safety
activities, provide clear standards and expectations for safety and reward safe behaviours (Kelloway et al., 2006; Bass, 1985; cited in Bass & Bass, 2008). Conversely, data also show that passive forms of leadership, that is, when leaders turn a blind eye to safety, have negative consequences in terms of lower levels of employee safety consciousness, negative perceptions of safety climate as well as in terms of an increase in safety-related events and injuries (Kelloway et al., 2006).

The analysis of major incidents provided several examples whereby these crucial requirements for effective safety leadership were absent. In particular, several of the major incidents reviewed demonstrated that in many cases passive forms of leadership where the emphasis was on productivity gains had contributed to a culture that bred complacency with regards to safety and an acceptance of safety deviations as normal practice. The capsizing of the Herald of Free Enterprise, the Columbia space shuttle disaster, and the Three Mile Island incident are some of the many examples illustrating these safety leadership failings.

Accident investigations have also identified a host of other factors as contributing to major incidents. One such factor, also supported by the literature, concerns the importance of open and trusting safety communications between management and employees. For example, the breakdown of communication was identified as a causal factor in the 1999 Ladbroke Grove railway incident (Cullen, 2001) and communication failures at shift handover contributed to the Piper Alpha explosion (Gupta, 2002; Bell & Healey, 2006). The Columbia Space shuttle and the BP Texas City refinery disasters are other examples where the absence of an open and trusting culture has detrimental safety consequences. In the latter case, there was a lack of communication from the ‘bottom’ to the ‘top’ and BP’s CEO wanted to hear only ‘good news’. As a result none of his senior managers challenged him and thus important safety problems within the organisation were not communicated (Hopkins, 2009). In the case of the Columbia space shuttle disaster, NASA was under immense schedule pressure to complete the launch, which had created an environment where employees felt that they could not speak up and raise any safety concerns that could compromise the launch. However, even when employees tried to communicate their concerns, these were dismissed (Kadri & Jones, 2006). Findings from the empirical literature also demonstrate the importance of safety communication in promoting positive safety behaviours among employees (Fleming, 2001; Cigularov et al., 2010). Further, data consistently show that leader behaviours as well as the quality of relationships that they develop with employees are crucial for developing trust and promoting open safety communications. For instance, employees are more likely to communicate their safety concerns when management is willing to listen and are perceived as supportive (Mullen, 2005). Thus, leaders can influence the extent to which employees will communicate safety issues and concerns by developing good working relationships characterised by openness and mutual respect i.e. high quality leader-member exchanges (e.g. Kath et al., 2010b).

Moreover, both the literature and the review of major incidents concur that management commitment to safety is an important element of effective safety leadership. Data consistently show that management commitment to safety directly impacts on employee involvement in routine and situational violations (Hansez & Chmiel, 2010), risk taking behaviours (Watson et al., 2005), self-report incidents (Mearns et al., 2003) and learning from safety events and near misses (Ginsburg et al., 2010). Commitment to safety may be demonstrated by behaviours that ensure that safety and production pressures are balanced and through the provision of resources to ensure high levels of safety. For instance, management willingness to invest in the maintenance of equipment is a demonstration of safety commitment because maintenance activities are costly and can interfere with production if not planned properly (Atherton & Gil, 2008). Poor safety commitment demonstrated by a lack of investment in the necessary resources for safety can have serious consequences as has become evident in several major incidents. Malfunctioning of safety critical equipment has been identified in several major incidents.
including Bhopal, Three Mile Island (Meshkati, 1991), and the BP Texas City explosion (Hopkins, 2009).

Finally, the review of major incidents suggests that safety leadership needs to be demonstrated at all management levels, from senior management to supervisors. For instance, the Baker Panel report into the BP Texas City incident identified a lack of effective safety leadership that was apparent at all levels of the organisation’s management as a contributory factor to the incident (Baker et al., 2007). The importance of ensuring that consistent messages and actions regarding safety are demonstrated across all management levels is also supported by literature that shows that inconsistent messages from senior managers and supervisors can have negative effects on employees’ perceptions of risk (Huang et al., 2004). Senior management play an important role in ensuring that safety messages are consistently communicated and enforced as they have an influential role in shaping the safety culture of an organisation; for instance, through investment of the necessary resources for safety, their participation in safety activities and defining accountabilities for safety at other management levels including middle managers and supervisors (Roughton & Mercurio, 2002).
11. REFERENCES


United States Coast Guard (2011). Report of investigation into the circumstances surrounding the explosion, fire, sinking and loss of eleven crew members aboard the mobile offshore drilling
unit Deepwater Horizon in the Gulf of Mexico April 20 – 22, 2010 Volume I.


12. APPENDICES

12.1 APPENDIX 1: DETAILED METHODOLOGY

12.1.1 Databases searched

The databases searched included: Web of Science, PsycInfo and Science Direct, Ebsco host and HSELINE.

12.1.2 Search terms

A combination of search terms was used in order to identify studies that have examined leadership in relation to safety outcomes. The initial search terms used were broad to ensure that all relevant literature was identified. This is because only a small percentage of research has explicitly focused on leadership in relation to safety (Reid et al., 2008).

The combinations for the search strategy were:

Leader* or supervisor* or management or senior manage* or line manage* AND safety OR performance.

The same search terms were consistently used across all databases.

12.1.3 Inclusion criteria

The review has included both quantitative and qualitative studies. In order to identify those articles that were directly relevant, the selection criteria listed below were applied.

**Quantitative studies**

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
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<tbody>
<tr>
<td>Period covered: 2000-2010</td>
<td>Grey, non peer-reviewed literature</td>
</tr>
<tr>
<td>English language only</td>
<td>Unclear research questions and/or measures</td>
</tr>
<tr>
<td>UK and internationally-based research (if reported in English)</td>
<td>Studies based on student samples</td>
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<tr>
<td>Reviews, meta-analysis and empirical studies</td>
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<tr>
<td>Sufficient data to assess validity</td>
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<tr>
<td>Studies in occupational settings</td>
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<td>Studies focusing on safety outcomes</td>
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**Qualitative studies**

<table>
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<tr>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
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</thead>
<tbody>
<tr>
<td>Period covered: 2000-2010</td>
<td>Unclear and unfocused research objectives</td>
</tr>
<tr>
<td>English language only</td>
<td>Insufficient information on methodological approach used</td>
</tr>
<tr>
<td>Interviews or case study-based method used</td>
<td>and/or types of analyses used</td>
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<tr>
<td>Evidence of systematic research process</td>
<td></td>
</tr>
<tr>
<td>Studies in occupational settings</td>
<td></td>
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<tr>
<td>Studies focusing on safety outcomes</td>
<td></td>
</tr>
</tbody>
</table>
12.1.4 Data extraction
A spreadsheet was produced as a database in order to extract key information from each article according to the following categories:
- Author, title and year
- Aims and objectives
- Level/s of management covered (senior, middle, supervisor etc)
- Study type (reviews, longitudinal or cross-sectional studies etc)
- Sample
- Type of industry (services, manufacturing etc)
- Key findings
- Study limitations

12.1.5 Review of major incidents
A combination of approaches were used for the selection of the major incidents that were included in the review, which included discussions with the customer, as well as ascertaining the availability of information on the incidents (such as incident reports and papers) in the public domain.
## 12.2 APPENDIX 2: SUMMARY OF CONTRIBUTING FACTORS IN MAJOR INCIDENTS

<table>
<thead>
<tr>
<th>Accident</th>
<th>Consequences</th>
<th>Contributory factors</th>
</tr>
</thead>
</table>
| 1. Three Mile Island (1979) Nuclear | Radioactive leak following failure of the reactors’ primary and secondary cooling systems. | Two days before the incident, the feed water storage tank valves had been left closed during routine maintenance operations. Although this was recognised as occurring previously, no steps had been taken to prevent recurrence. This caused considerable damage to the reactor’s radioactive core by preventing the cooling of the plant’s core temperature and pressure.  
Inadequate control room instrumentation meant operators typically deduced the level of coolant in the core using the readings from other instruments. Operators also failed to recognise that the relief valve on the pressuriser was open.  
Numerous operators also failed to read the core temperature accurately, therefore failing to realise the true extent of the plant’s status for a further two hours. Only when a replacement shift supervisor arrived were the true readings accurately interpreted.  
Automatic implementation of the first safety system (i.e. the tripping of the turbine) was not enough to render the plant safe. It addressed one problem, whilst simultaneously causing a secondary set of abnormal circumstances, in this instance the lack of pumps resulted in the overheating of the reactor’s core.  
Inadequate training of operators in the suitable emergency response meant they were unable to respond appropriately to the unplanned automatic shutdown of the reactor.  
Other contributory factors identified included:  
• Unclear operating procedures,  
• Failure to resolve safety issues raised,  
• Deficiencies in control room design, and  
• Poor alarm management (at the time of the incident, approximately 100 alarms went off and there was no system to in place to prioritise them). |
| 2. Bhopal (1984) | A maintenance worker failed to isolate sections of the plant during cleaning. | The main factors identified included:  
• Lack of root cause investigations and communication of lessons learnt: Several accidents had occurred before the 1984 disaster but management failed to take corrective measures to prevent future incidents, |
<table>
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<tr>
<th>Accident</th>
<th>Consequences</th>
<th>Contributory factors</th>
</tr>
</thead>
</table>
| Chemical processing | enabling water to enter the storage tank. This caused an exothermic reaction, resulting in temperatures of over 200ºC, and increased pressure within the storage tank. In addition, the failure of six safety systems and numerous latent failures led to a toxic gas leak. | • Poor management of change: The plant’s numerous safety systems were not maintained due to management beliefs that the risks had decreased with the cessation of production. Insufficient maintenance had led to the poor condition of the site,  
  • Ineffective employee training and poor management of change: There had been significant staff reductions with remaining staff not being qualified to do the jobs they were asked to do. Operators were also hesitant to use the warning siren system, only deploying the siren when the leak became severe,  
  • Insufficient understanding of the hazards associated with manufacturing of highly toxic chemicals. The investigation identified that ten times the required daily amount of chemical was stored on site for convenience purposes,  
  • Inadequate plant design and maintenance: Critical instruments were not working properly. |
| Clapham Junction (1988) | A busy commuter train passed a defective signal, continuing into the back of a second commuter train, resulting in a collision with a third train. | A wiring error following alterations to the signal box caused the signal to incorrectly show green. Contributory causes identified included:  
  • Ineffective safety communications between management and employees,  
  • Deficiencies in management training,  
  • Working overtime impacting concentration, performance and ultimately safety (with no monitoring or restricting of excessive work hours),  
  • Poor management of change: staff reorganisation taking place in 1988 was under-resourced and poorly implemented,  
  • Management ignored poor working practices; for instance, the method of leaving wires in place to save time had evolved, despite similar wiring errors made a couple of years previously.  
  • Poor training and lack of monitoring/ supervision,  
  • Unclear job descriptions and consequently staff were unsure about their duties. |

[Sources used: Meshkati, 1991; HSE, 1999; Gupta, 2002; Bell & Healey, 2006]
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<td>4.</td>
<td>Piper Alpha (1988) Offshore</td>
<td>Explosion and subsequent fire on a North Sea oil and gas platform, resulting in 167 fatalities. A pressure safety valve had been removed and replaced with a poor fitting blank flange. The next shift (unaware of the work that had been done) attempted to restart the pump, causing a light oil leak and eventual explosion.</td>
<td>A number of factors contributed to the incident, beginning with a temporary measure that was inadequate for dealing with operational pressures. In addition, communication failures at shift handover and poor implementation of the permit to work system resulted in workers relying on informal communications between shifts. In addition: • Management had inadequate knowledge and expertise, which led to poor practices and ineffective audits, • Poor safety training in emergency procedures for staff, • Audits failed to identify problems and gave message that all was well (i.e. although previous inspections had identified failings, they had been judged to be improving). “While the management was concerned about safety, it did nothing actually to improve it” (Blazier &amp; Skilling, 1995; cited in Gupta, 2002).</td>
</tr>
<tr>
<td>5.</td>
<td>Longford (1998) Oil and gas</td>
<td>A pressure vessel ruptured at one of three gas plants resulted in the release of vapours and liquid. Several fires and major explosions followed. Two employees were killed and eight injured as a result of the incident. In addition, the gas supply to Victoria and parts of South Australia was disrupted for two weeks.</td>
<td>• Inadequate training for both staff and supervisors resulting in poor appreciation of hazards/risks • Failure to carry out a Hazard and Operability Analysis (HAZOP) to identify systematically all potential risks and put the necessary controls in place – lack of resources was the reason given, • Failure of audits to identify problems (e.g. failure to carry out a HAZOP for example), • Preoccupation with management of minor hazards (by focusing on lost time injuries) and complacency about major hazards, • Warning signals were ignored/not reported (e.g. ice on piping which was a precursor to incident was ignored) – Esso’s reporting system did not involve reporting process incidents (only injuries to individuals), • Operators were used to operating the system in alarm mode and could not distinguish critical alarms from nuisance alarms; as a result operators failed to respond to a critical alarm on the day of the incident, • Lack of expertise and senior management oversight: Lack of engineer oversight and expertise on the plant; the management of process upsets were up to the operators and not senior management.</td>
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<td>6.</td>
<td>Columbia space shuttle (2003)</td>
<td>A shuttle suffered a breach of its Thermal Protection System (TPS) during its re- Shortly after the shuttle launch, a section of insulating foam separated from the bipod ramp of the external left tank. This struck the left wing as it fell, causing the eventual TPS breach. Despite engineers’ suspicions, only minor investigations were carried out, neglecting to identify the missing foam or the impact damage.</td>
<td>[Sources used: Gupta, 2002; Bell &amp; Healey, 2006] [Sources used: Hopkins, 2000; Kenney, Boul, &amp; Pitblado, 2001]</td>
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<tr>
<td>Event Type</td>
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<td>Aviation</td>
<td>entry sequence, resulting in melting and weakening of the aluminium structure and loss of control. All seven crewmembers died as the shuttle disintegrated.</td>
<td>The inadequate design of the Bipod ramps was fundamental to this particular incident. In addition, previous failures of the ramps (resulting in no serious damage) had led to management complacency, and therefore confidence based on past successes, instead of a focus on sound engineering practices. The official report also uncovered other ‘cultural traits and organizational practices detrimental to safety’ that were allowed to develop. The shuttle flight schedule was considered unrealistic, and compromised safety by putting excessive pressure on planned launches to go ahead. Deadlines were not regularly re-evaluated to ensure their continuing viability. Organizational barriers to effective communication of safety critical information were identified by the official incident report, along with ‘stifled professional differences of opinion’ and a lack of integrated management across the various program elements. A failure to learn lessons from the past was also identified following similarities with the 1986 Challenger disaster (i.e. ignoring a series of smaller incidents of a similar nature, and a poor safety culture).</td>
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| BP Texas City (2005) Oil and gas | A fire and explosion resulted from the over-filling of a tower with gasoline. As a result, 15 people were killed and more than 170 injured. | A number of factors relating to poor safety culture were identified that included:  
  - Lack of effective safety leadership apparent at all levels of the organisation’s management; more emphasis placed at personal safety and process safety (PS) was not established as a core value; effective safety leadership also suffered from a high turnover of refinery plant managers,  
  - Lack of employee empowerment: Culture not characterised by open, trusting lines of communication between management and employees,  
  - Lack of adequate resources provided to ensure high levels of PS performance,  
  - Operations and maintenance staff worked high rates of overtime, which could have undermined their ability to work safely,  
  - Poor definition of responsibilities and accountability for PS performance for senior management, middle management and supervisors.  
A number of factors were associated with poor PS management systems and included:  
  - Inadequate identification and analysis of hazards,  
  - Poor compliance with internal PS standards relating to areas such as equipment inspections, critical alarms and emergency shut-down devices, and near miss investigations,  
  - Poor implementation of external good engineering practices,  
  - Poor definition of expert knowledge required at different levels of management (executive |
Inadequate PS training given to refinery employees.

In addition, poor performance evaluation and corporate oversight were identified as contributory factors and included:

- Over-reliance on injury rates and poor use of leading and lagging indicators to monitor PS,
- Under-reporting of incidents and near misses giving an incomplete picture of PS,
- Failure to use accident investigations to identify root causes,
- Audits were used primarily to demonstrate compliance with legal requirements and not to assess whether safety management systems were working effectively,
- PS deficiencies were not addressed in a timely manner,
- Executive management did not receive refinery-specific information on PS deficiencies and/or failed to respond timely to the information it received; all levels of management failed to implement an effective PS management system. BP Board failed to monitor PS performance across the refineries.

Some of the Baker panel report recommendations included:

- Process safety leadership: Senior management demonstrate a visible commitment to safety by articulating a clear message on the importance of PS and ensuring that message is consistent with policies and actions they take,
- Define level of process safety knowledge and expertise required from staff and management (including executive management, refinery managers, supervisors).

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<th>8.</th>
<th>Buncefield (2005)</th>
<th>A vapour cloud (resulting from an overfilled tank) ignited causing a massive explosion and fire at the Buncefield oil storage depot.</th>
</tr>
</thead>
</table>

**Immediate causes:**

The tank had two forms of level control, however the employee-monitored gauge was stuck (this had happened intermittently since the tank was serviced in August 2005), and the independent high-level switch (IHLS) was inoperable, therefore there was no means to alert the control room staff that the tank was filling to dangerous levels.

Despite the unreliability of the gauge neither site management nor the maintenance contractors responded effectively. The IHLS was also missing a critical aspect (a padlock required to retain its check lever in a working position), however insufficient communications between the supplier, installer, maintenance contractor and site operator led to its omission.

Following the initial failure to contain the petrol, both the secondary and tertiary containment systems failed. These containment systems were inadequately designed and maintained.

Sources used: Baker et al., 2007; Hopkins, 2009]
A number of factors had created a culture where keeping the process operating was the primary focus, and process safety did not get the attention, resources or priority that it required:

- Despite independent auditing, there were deficiencies in management systems relating to tank filling (and these were not properly followed),
- Increasing pressures on staff before the incident due to limited control over the flow rates and timing of receipt for two of the three pipelines. This meant staff did not have sufficient information available to manage precisely the storage of incoming fuel,
- Throughput had increased at the site, putting more pressure on management and staff and further affecting their ability to monitor the receipt and storage of fuel; the pressure on staff was increased due to a lack of engineering support from Head Office.

Following the incident the investigation board published a series of reports focusing in more detail on the main areas of concern identified in the initial report:

- Design and operation of fuel storage sites (25 recommendations)
- Emergency preparedness, response and recovery (31 recommendations)
- Land use planning and societal risk (18 recommendations)

[Sources used: Major Incident Investigation Board, 2008; HSE, 2011].

| 9. | Deepwater horizon (2010) Offshore | Explosion and oil leak on a drilling exploration rig caused by a blowout. The blowout killed 11 crewmen and ignited a fireball. The resulting fire could not be extinguished and led to the Deepwater Horizon sinking, leaving the well gushing at the sea floor and causing the largest offshore oil spill in American history. | On the day of the incident a management visibility tour was in progress – actively aiming to transfer safety lessons from one rig to another, however none of the indications of the impending incident were identified. **Immediate causes:** flawed well plan and insufficient amount of cement used, blowout preventer (fail safe device) failed. Contributory factors identified included:

- Rig crew and well site leaders incorrectly interpreted a negative pressure test and failed to put the necessary controls in place; the guidelines for the negative-pressure test, which is a critical activity, did not provide detailed steps or specify success/failure criteria and relied on leadership skills and competency of rig leaders,
- Weakness in the testing and maintenance of the blowout preventer,
- Actions to contain the damage were taken too late; actions taken after that failed to control the well. Crew was inadequately prepared to deal with well control emergencies and there were inadequate procedures to deal with high flow emergency situations,
- Allegedly, warning signs in the coming weeks prior to the incident were ignored to save time and money. The investigation team identified a complex interplay of mechanical failures, human judgments, engineering... |
design, operational implementation and team interfaces that initiated and escalated the accident.

[Sources used: Deepwater Horizon accident investigation report, 2010; Chief Counsel, 2011; Hopkins, 2011]


A high-speed passenger train derailed outside Potters Bar station, killing seven people and injuring 76.

The derailment was caused by failure of the points, which failed as the final coach passed over them, and resulted in the front few coaches remaining upright whilst part of the train was wedged between the station platforms and building structures.

Poor maintenance of the points – the bolts that held the stretcher bars (that keep the rails apart) - had come loose or gone missing, resulting in the points moving while the train passed over them.

Reports of vibrations whilst travelling on the line, and visual inspections in the run up to the incident (including the day before) failed to identify problems with the stretcher bars due to the inadequate incident reporting system (which identified the wrong end of the platform as the site for inspection).

Poor maintenance of points (with similar issues identified in other points, and attempts to improve the retention of the stretcher bar nuts identified); Unclear roles and responsibilities due to two separate inspection and maintenance systems.

Recommendations from the Potters bar investigation board included undertaking a review to include consideration of:

- Resources required (i.e. suitably qualified and experienced people and their competencies, training arrangements, time available for the work required, tools specified, control of spares and use of replacement items),
- Rail industry leaders should seek out and maximise all opportunities to make significant strides forward in stimulating a living and vibrant safety culture (i.e. the move to Network Rail). Specifically, promoting a questioning attitude in a no blame environment and adopting the latest approaches to improve behavioural safety,
- Organisations that influence the rail industry should work with industry to identify how they can implement this process efficiently and identify potential barriers to progress (which they should seek to minimise, i.e. placing requirements on industry that divert it away from this path or reverse progress). This partnership approach to enhancing safety culture in the industry should lead to a better understanding of the complementary benefits to business and safety. Those who regulate the rail industry should ask the new Rail Safety and Standards Board (RSSB) to consider taking a leading role in this work,
- Network Rail should undertake a management review, by mapping existing roles, responsibilities and arrangements against a management model for ensuring that safety critical components and systems are fit-for-purpose, to ensure that no significant gaps exist that may compromise safety. This may reveal opportunities for improving business as well as safety.

**Nuclear**

An explosion occurred during the process of refuelling a nuclear submarine. The reactor lid of the submarine was wrongly raised too high resulting in an explosion.

Immediate factors contributing to the accident were:
- Taking a shortcut on the standard operating procedures for refuelling,
- Failure of physical barrier to prevent over-raising of the control lid,
- It is unclear whether risk assessments had been carried out for the refuelling operations; but if they had been, they were clearly inadequate.

Although the direct cause of the accident was the over-raising of the reactor lid and control rods, several poor safety management practices and a poor safety culture contributed to the accident:
- Failure to learn from previous experience: The Russian army had experienced a similar incident 20 years earlier but any lessons that might have been learnt were apparently forgotten,
- Leadership and Management for safety need to be visible at all levels within the organisation: Team leader decisions were not safety-led i.e. taking shortcuts to re-fuelling procedures.

[Sources used: HSE, 2002; 2003]

12. **Southall rail crash (1997)**

**Transport**

An intercity passenger train (travelling at 110mph towards London’s Paddington station) crashed into the side of an empty freight train shunting at slow speed across the line. The crash resulted in seven fatalities and 150 people injured.

The train had passed a signal at danger (the driver's attention had been distracted, so he did not observe the visual signal).

The train was operating at normal speed with a defective automatic warning system (AWS), and although sophisticated automatic train protection equipment (ATP) was fitted (and could have prevented the accident) it was switched off at the time of the accident (the driver was not trained in the use of ATP).

Overall the accident was attributed to driver error, but a number of train operator failings were also identified. In total, 93 recommendations were made, including:
- Emphasise the need for staff to use fault-reporting systems,
- Increase emphasis on rule-book compliance,
- Introduce simulators for driver training,
- Enhance senior managers’ involvement in safety management systems, including introducing safety tours,
- Develop good practice from research into human behaviour and fatigue.

[Sources used: Howard, 2010]


A roll-on roll-off car ferry flooded and capsized resulting in 188 fatalities. The ferry was allowed to

Although a sequence of failures was identified, the crewmember responsible for ensuring closure of the bow doors was absent from his post as the ferry left port. There were no other indicators as to the status of the bow door.

[Sources used: HSC, 1997]
| Transport | leave port without the bow doors being properly secured. Water began entering the car deck, filling quickly due to the internal shape and size of the ferry. Despite the calm sea, the influx of water quickly affected the ferry’s stability, until eventually it capsized. | Poorly organised shifts in combination with a lack of staff monitoring meant that the crew were unaware that the member responsible for ensuring the bow doors were securely closed was absent from his post; reportedly asleep, or that his assistant had not assumed his role. Requests had been made for bow door warning indicators to be installed on the bridge, so that the status could be checked from this remote location. Despite these requests, no such indicators were installed. The car ferry was poorly designed, with its top-heavy structure and inadequate means of removing water from the flooded deck. There was also the significant omission of bulkheads, resulting in the shift in the ferry’s stability. Management failed to emphasise safety adequately, instead pressuring crews to sail early. In order to speed operations up, safety was likely to be compromised, as crew members were likely to follow procedures inaccurately. A ‘negative reporting’ policy was also employed. This meant the crew were to assume that all was well unless anything was heard to the contrary. A positive reporting policy should have recognised the status of the bow doors, potentially preventing this incident. In addition a number of recommendations were made, e.g. consideration of installation of indicator lights, CCTV, berth alterations, emergency lighting and changes to vessel design in relation to current standards. The inquiry also stressed the need for: • Clear and concise orders, • Strict discipline, • Attention at all times to all matters affecting the safety of the ship and those on board (i.e. no ‘cutting of corners’), • The maintenance of proper channels of communication between ship and shore for the receipt and dissemination of information, • A clear and firm management and command structure. |

[Sources used: Department of Transport, 1987; Reason 1997; HSE, 1999; Bell & Healey, 2006]
Transport | 31 people died, and more than 520 were injured in October 1999 when a passenger train went through a red signal and collided with a high-speed passenger train. The collision caused a number of subsequent fires when fuel ignited. | The immediate cause was the signal passed at danger (SPAD), however a number of contributory factors were also identified such as:
- Train driver training procedures,
- Insufficient actions taken in response to train driver complaints regarding the visibility of various signals,
- Inspection procedures,
- Staff actions following the incident, and
- Incorrect set up of interlocking (which did not automatically divert the train passing the SPAD, therefore preventing the ensuing head on collision).

[Sources used: HSC, 2001; Cullen, 2001] |
| 15. | Chernobyl (1986)  
Nuclear | Thirty people died instantly, and over a hundred thousand had to be evacuated when one of four nuclear reactors at the Chernobyl nuclear power station exploded. The explosion resulted in large quantities of radioactive material being released contaminating the atmosphere. | While testing on the fourth reactor of a nuclear plant, numerous operators and electrical engineers disregarded safety procedures and disabled successive safety mechanisms in order to meet their local objective, testing a new voltage generator. The lack of safety systems, in combination with the testing occurring whilst the reactor was run on low power resulted in a loss of control over the chain reaction in the reactor. As operators took action to shut the reactor down, a peculiarity in the design caused a power surge. A steam explosion and a fireball ensued, blowing the heavy steel and concrete lid off of the reactor, breaching containment.

Although the incident resulted from a series of unsafe acts, the most notable was operators incorrectly deciding to continue the testing of the voltage generator when the power level fell below acceptable outputs, despite this being strictly against procedure.

The characteristics of the reactor meant it was particularly unstable at low power, leading to runaway reactions. Despite it being strictly against procedures for the reactor to be run at below 20% power, operators made the decision to disable the appropriate safety systems in order to continue testing.

The presence of a poor safety culture prevented known defects in the safety system, such as the peculiarity with the reactor design from being redesigned or improved. This resulted in operators continuing with testing activities despite the power level falling due to another error. This could also account for the testing task itself, which was considered likely to initiate noncompliance to procedures.

The development of the incident was facilitated by operators whose actions, including disarming the plants safety mechanisms, were due to inadequate training, and resulted from their lack of knowledge regarding the
The lack of an adequate ‘containment structure’ also contributed to the extent of the effect following the disaster. The radioactive material was able to travel, contaminating numerous other countries as well.

Unbeknown to the plant operators, a design flaw in that specific type of reactor meant that the nuclear reaction was liable to speed up, as a result of the internal environment of the reactor. This was exaggerated when the reactor was running at a low power output, making the reactor unstable and highly dangerous.

Design flaws for the Air-to-Air refuelling system components (relating to the original fittings, and subsequent additions and modifications) were identified, however the focus of the review centered around inadequacies in the Nimrod safety case, which was identified as having the potential to prevent the incident.

The Nimrod safety case was inadequate and contained errors in the facts, analysis and risk categorisation. In addition:
- Work on the safety case was poorly planned, managed and executed, and corners were cut,
- Inadequate communication and the incomplete assessment of many hazards for the safety case led to a ‘false sense of security’,
- Project management for developing the safety case was inappropriately delegated to a junior person without adequate oversight or supervision,
- There was inadequate operator involvement,
- Failures to follow the Safety Management Plan,
- Complacency due to the widespread assumption that Nimrod was ‘safe’ due to being successfully flown for 30 years.

Major organisational change affecting the period when the safety case was being compiled may also have contributed to the inadequacy of the safety case:
- A shift in emphasis from ‘functional’ to project oriented within the organisation,
- Re-organisation of the management structure resulting in larger and larger management structures,
- Outsourcing to industry.

A number of previous incidents and warning signs of ‘potential relevance’ were also identified.

The review author states ‘The fundamental failure was a failure of Leadership...lack of Leadership manifested itself in relation to the way in which the Nimrod Safety Case was handled, in the way in which

| 16. | RAF Nimrod (2006) Aviation | During a routine mission over Helmand Province (Southern Afghanistan), RAF Nimrod XV230 suffered a catastrophic mid-air fire, leading to the total loss of the aircraft and the death of all 14 service personnel on board. RAF Nimrod had just completed Air-to-Air Refuelling (AAR) when 90 seconds later two simultaneous warnings were activated. Investigation of the crash scene was limited due to enemy presence however photographs and recording equipment were recovered. The investigation concluded that the probable cause of the was ignition of a fuel source. | plant’s inherent design flaws. |

[Sources used: Meshkati, 1991; Kletz, 1993; Reason, 1997; HSE, 1999]
warning signs and trends were not spotted, and in relation to inexorable weakening of the Airworthiness system and pervading Safety Culture generally. For these reasons, Leadership is a key principle for the future’ (p. 491).

[Sources used: Haddon-Cave, 2009]
12.3APPENDIX 3: DEEPWATER HORIZON INCIDENT SUMMARY

12.3.1 Incident description

The incident involved an explosion and oil leak on a drilling exploration rig caused by a blowout. The blowout killed 11 crewmen and ignited a fireball. The resulting fire could not be extinguished and led to the destruction of the Deepwater Horizon, leaving the well gushing at the sea floor and causing the largest offshore oil spill in American history.

On the day of the incident a management visibility tour was in progress, which was actively aiming to transfer safety lessons from one rig to another, however none of the indications of the impending incident were identified.

12.3.2 Contributory factors

The following themes were identified as contributing to the Deepwater Horizon (DWH) incident and are of interest from a leadership perspective.

Complacency and lack of oversight

• Transocean’s safety management system promoted a ‘culture of complacency’ among the crew (e.g. inhibition of general alarms; routine, repetitive fire drills held at the same time/day each week; drilling personnel excused from exercises; and, unsatisfactory drill documentation).

• The DWH crew did not exercise their ‘stop work’ authority or report unsafe working conditions. Results of a Safety Management System (SMS) Culture/Climate Review (carried out by Lloyd’s Register on behalf of Transocean) indicated that a significant proportion of crew worked with a ‘fear of reprisal if a casualty or near miss occurred’. Respondents also believed that the casualty investigation process was applied to apportion blame. Employees’ fear of reprisal and the significant costs associated with unscheduled shutdown/delay of drilling activities made it unlikely that crew would report safety issues even if they identified risks.

• Ineffective oversight and regulation of DWH, with inspection activities delegated and outsourced. DWH therefore continued to operate despite there being grounds for it to be detained or ordered to cease operation.

• A focus on time and costs rather than control of major accident risks evidenced by a number of BP decisions where time and cost savings were prioritised over safety. Lack of focus on assuring well integrity may have been affected by being 38 days delayed and an estimated $58 million over budget at the time of the incident. On the day of the incident, the DWH crew were congratulated by BP management for achieving 7 years drilling without any ‘lost time incidents’.

Training and competence

• Inadequate negative pressure test, and misinterpretation of the results: There are no industry or government standards for pressure tests, and the pressure test design and interpretation relies on engineering expertise. BP was responsible for designing the test, and provided an emailed instruction that was 24 words long. There was disagreement over the interpretation of the test results and after some discussion, the test was repeated. The crew misinterpreted anomalies in the negative pressure test results, and therefore falsely believed that the Macondo well was stable/properly sealed.
• The crew did not identify the influx of hydrocarbons until they had entered the riser. A number of indicators ‘should have signalled the existence of a kick or well flow’\textsuperscript{4}, however by the time this was detected, drilling mud was blowing up into the derrick and onto the rig floor (delayed detection may be due to failure to learn past lessons – see below).

• Although the crew regularly practised responses to alarms, fires and blowouts, there was a failure to train staff for the worst-case scenario. Instead, drills focused on practicing responses to the usual range of well problems, leaving crew insufficiently prepared for a major blowout followed by explosions and fires (including a total loss of power).

• Detailed handbooks were provided to crew detailing how to respond to signs of a blowout, however crew members hesitated at critical moments, and failed to take decisive steps, and as the drilling crew responded to the blowout, and gas alarms were activated on the bridge, no warnings were given to the rest of the crew.

• Personnel assigned roles within the emergency response team were not provided with training regarding their duties. In addition, Transocean’s training scenarios did not prepare the drilling crew to function as a team under foreseeable hazards identified in DWH Major Hazards Risk Assessment (i.e. a well blowout). Drill records show that although the drill crew performed all required drills, the entire crew did not collectively participate in the fire and abandonment drills due to drilling operations, and contractors were excused from the drills.

• A 2009 audit of DWH (on behalf of BP) revealed numerous problems, with flammable gas and fire detection devices requiring repair. The Drill Shack’s fire and gas detection system panel displayed numerous active alarm conditions. These faults rendered the fire and gas detection system inoperable, whilst the assistant driller and driller on duty were unaware of the fault conditions.

• Transocean failed to ensure its onboard management team and crew had sufficient training and knowledge to take total responsibility for the safety of the vessel. The Master received training on the Safety Management System, which consisted of viewing a PowerPoint presentation. The Master was not aware that he had the authority to activate the Emergency Disconnect System, and the official who received the gas alarms was unaware of procedures relating to the alarm response (i.e. to activate the emergency shutdown system).

Learning from previous accidents

• During exploratory drilling at the Macondo well, there were a number of different well control events and kicks. In the month before the incident, the DWH crew experienced a kick that went undetected for approximately 30 minutes. BP failed to investigate the causes of delayed detection.

Adequacy of procedures

• There was a lack of training or procedures to clarify when conditions warranted activation of the emergency shutdown systems, and what actions to take in the event. When multiple gas alarms were activated on the bridge, the emergency shutdown (ESD) system for the main engines was not manually activated. Immediate activation

\textsuperscript{4} United States Coast Guard, 2011.
of the ESD (on detection of gas) may have avoided or delayed the engine room explosions.

- As the situation deteriorated prior to the incident, crew referred to the procedures to determine what action they should take. The procedures were of limited use, failing to specify when to act, what to do and who to refer to for advice or approval. The crew therefore spent time discussing what to do instead of taking urgent action.

- The DWH crew failed to follow emergency procedures for notifying crew of an emergency, and preparing for evacuation. The crew failed to sound the general alarm after gas detectors were activated. However this may be attributable to the presence of BP and Transocean executives onboard, which also prevented key personnel from attending to well control immediately prior to the blowout. A senior drilling crew member acknowledged that if he and the Master had not been conducting a tour for company executives, he would have been on the Drill Floor while key tests were being conducted.

Safety communication
- There was evidence of a number of ambiguous readings prior to the incident. These indications that things were not as intended were not explored to the point of certainty. Communication and discussions focused on justifying why the situation should be considered safe, and not the precautions required in the event that it was unsafe.

Clarity of roles and responsibilities
- Lack of clarity regarding responsibilities in the client/contractor relationship.

- Confusion regarding crew members’ responsibilities in the event of fire or gas detection. Interaction between the fire and gas detection system and the Emergency Shutdown (ESD) systems relied on crew watching in the Bridge to manually trigger the ESD. Due to the confusion, the Engine Control Room was neither immediately notified to shut down the operating generators, nor were the ESD systems activated.

- A dual-command organisational structure on board the vessel may have impacted the decision to activate the vessel’s Emergency Disconnect System (EDS). Failure to clearly delineate that responsibility for the operation of DWH had shifted from the Offshore Installation Manager (OIM) to the Master, resulted in confusion regarding who was in charge. The Master asked the OIM for permission to activate the EDS, however by this time the sub-sea supervisor had already activated it.

- The Master responsible for the safety of the vessel was on the bridge at the time of the well blowout, however it could not be conclusively determined whether his questionable reaction was due to ‘indecisiveness, a lack of training on how to activate the EDS or the failure to properly execute an emergency transfer of authority as required by the vessel’s operations manual’ (United States Coast Guard, 2011, p. 32).

- There was no evidence of a SMS interface document detailing specific roles and responsibilities (i.e. responsibilities for decision making during emergency operations). On the day of the incident, key decisions were delayed or not made due to the lack of agreement as to who was responsible.
Management of change

- A number of changes preceding the incident were not subject to an appropriate management of change process, such as the decision to operate the blow out preventor (BOP) beyond its design service interval and changes made to the well design.
- There was no document bridging the documents and procedures within each company to align BP and Transocean Management of Change processes, or develop a Management of Change document for implementing the Rig Maintenance System at DWH.

[Sources used: Bureau of ocean energy management, regulation and enforcement, 2011; BP, 2010; Chief Counsel, 2011, Hopkins, 2011, National Academy of Engineering and National Research Council, 2011; Tinmannvik et al., 2011); United States Coast Guard, 2011]
A review of the literature on effective leadership behaviours for safety

There is widespread agreement between industry, regulators, academics and the press that leadership is a key component of a safe organisation. This view is widely supported by findings from almost all major incident inquiries and investigations. However, the widespread agreement that leadership is central to safety does not extend to how leadership should deliver safety, what needs to be done, and rather importantly, who should be doing it. While there is considerable literature on leadership, very little of this addresses the issue of safety, particularly in the major hazard sector.

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