Abraham Lincoln as CEO of a major hazard facility? How a wider understanding of leadership can enhance process safety leadership.

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Shelves in the business sections in book shops are groaning under the weight of books about leadership. This is not only because of humankind's longstanding fascination with the topic, but also because evidence has shown that it matters. Well led organisations are more likely to achieves their goals. For both reasons, people want to know how leadership works. Process safety management as a topic has been around for a long time, but more recently regulators, non-governmental organisations and industry associations have published frameworks for process safety leadership (CCPS 2019; Cogent 2011; COMAH Competent Authorities 2019; HSE 2009; OECD 2012). The guidance is helpful because the practices of management are distinctly different from those of leadership. Yet a company wanting to raise its game on process safety leadership faces the challenge of how best to use the guidance, which by and large is a list of process safety practices and competences. Taking such a transactional approach misses the opportunity to maximise the effectiveness of the programme achievable by applying what is sometimes called transformational leadership style processes. For example, existing guidance identifies the need for senior leaders to understand the consequences of major accidents, but says little about how to engage the workforce in an inspiring process safety vision of how to avoid those consequences. Furthermore, a company setting out on a process safety leadership initiative could consider integrating it into a broader leadership programme. This paper will make the link to wider leadership principles to address those two potential enhancements - how a transformational leadership style would help and how to integrate process safety into a wider leadership programme. It will give a short grounding on some principles and current thinking on leadership and highlight key factors in the link between leadership and culture. Finally, it will highlight how the practices mentioned in the guidance can be organised into a five-step process.

In short, the paper will take the "what is" of process safety leadership and make recommendations on the "how to". Leadership practices and approaches will be illustrated by reference to historical figures, and ask the question, what kind of process safety leader would Abraham Lincoln have been?

Keywords: Process Safety Leadership, Transformational Leadership, Transactional Leadership,

Introduction

Investigations following major process safety accidents, indeed major accidents in general, often identify underlying leadership failings. Given that leadership has been found to be positively correlated with organisational objectives, it is not surprising that duty holders and regulators are interested in the relationship between leadership and process safety performance. Most leadership research has focused on outcomes for productivity, profit, turnover and worker satisfaction. There has been little if any research published on the relationship between leadership and process safety performance. There could be a number of reasons why this is the case, including the difficulty of measuring the performance. Mendeloff et al. (2013) found that the small number of process safety incidents reported with Tier 1 and 2 severity using the ANSI/API RP 754 criteria, made statistically significant comparisons of performance between anything other than large refineries to be of limited value.

However, research has been carried out looking at occupational safety as an outcome (O'Dea and Flin 2003). Safety leadership has been found to positively correlate with safety climate and occupational safety performance (Wu T et al. 2011). The relationship between style of leadership and occupational safety outcomes has also been the subject of research (Zohar 2003; Lekka and Healey 2012)).

By publishing guidance and frameworks for process safety leadership, regulators and stakeholders have quite reasonably made the assumption, even in the absence of research to support it, that good leadership should drive process safety performance. This paper makes the further assumption that learnings about leadership styles which proved effective in other domains will be similarly effective for process safety. In particular, this paper will look at transactional and transformational leadership styles and how integrating those concepts into a process safety leadership programme could make it both more effective and more efficient.

Just Managing or Leading the Way?

There is no single definition of leadership. A review of 587 publications found 221 distinctly different definitions (McChrystal 2018). Furthermore, sometimes the line between leadership and management gets blurred. In German there are words for leadership, leading and directing, but managing, as English speakers mean it, does not readily translate either as a word or as a concept (Schein 2004). This paper will highlight some examples in published guidance where the line between process safety leadership and process safety management has become blurred, and make the case that a sharper focus which differentiated leadership skills would be helpful. There is a distinct difference between managing and leading an organisation. Both are important when determining organisational performance and developing a high level of operational discipline. Leadership inspires and motivates, as well as directs. Management provides resources and controls the activities of the organisation. (Angiullo 2009)

Management is the process of reaching organisational goals by working with and through people and resources. Leadership is a management skill, associated with several practices. Leaders are not always managers; some people exert influence purely by the power of their vision. This is especially the case in politics with notable examples like Nelson Mandela and Mahatma Gandhi. In corporations, people without management responsibilities can show leadership behaviours and thereby influence others, however, the recent focus on process safety leadership has been on senior leaders who both manage and lead. This

paper is mainly concerned with the practices of leadership of senior managers, although many of the recommendations are relevant at other levels of an organisation.

Managers keep the trains running on time. When the trains are not running on time, it takes leadership to make the necessary changes to fix the problem. There are two types of change which might be necessary: to the organisational arrangements; and to the organisational culture. Organisational arrangements provide the scaffolding around which the organisation is built, but they cannot prescribe everything which needs to happen. It is for the culture to fill the gaps. Organisational culture has been described as "the way we do things round here" (Hopkins, 2005 p7). It is by inspiring and motivating their constituents that leaders ensure, when the practices which need to happen are not defined by the organisational arrangements, that the culture takes care that people nevertheless do the right things.

Edgar Schein (2004 p11) emphasises the cultural relevance of leadership:

> *"If one wishes to distinguish leadership from management or administration, one can argue that leadership creates and changes cultures, while management and administration act within a culture."*

According to Hopkins (2019), it is the structure of the organisation, which is one aspect of the arrangements, which creates the culture. But he brings it full circle by pointing out that leaders create the structure.

Leaders first create cultures when they create groups and organisations. Once cultures exist the groups determine the criteria for leadership and thus determine who will or will not be a leader. In that way, culture and leadership are two sides of the same coin (Schein, 2004 p22).

A literature review by Lekka and Healey (2012) found that 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

If there is a lack of clarity about what process safety *leadership* is, regulators are clear about what process safety *management* is. The need for a systematic approach to managing major accident hazards is enshrined in legislation. In the European Union, the Seveso Directive (Official Journal of the European Union 2012) requires operators of major hazard establishments to have in place a safety management system (SMS) addressing certain topics. In the US, the OSHA Process Safety Management of Highly Hazardous Chemicals standard (US OSHA 1999) specifies a similar list of elements with which employers operating hazardous processes are required to comply (Table 1). Attending to these regulatory requirements is a basic requirement for managers.

EU Seveso Directive requirements for a Safety Management System	Elements of the OSHA Process Safety Management of Highly Hazardous Chemicals Standard
1. The roles and responsibilities of personnel involved in the management of major hazards at all levels in the organisation; 2. Adoption and implementation of procedures for systematically identifying major hazards and the assessment of their likelihood and severity; 3. Operational control — procedures and instructions for safe operation, maintenance and inspection; 4. Management of change; 5. Planning for emergencies; 6. Monitoring performance; 7. Audit and review.	1. Process safety information 2. Process hazard analysis 3. Operating procedures 4. Employee Participation 5. Training 6. Contractors 7. Pre-startup safety review 8. Mechanical integrity 9. Hot work permit 10. Management of change 11. Incident investigation 12. Emergency planning and response 13. Compliance audits 14. Trade secrets

Table 1; Regulatory requirements for process safety management

Following the fire at the Buncefield oil storage depot in 2005, the Process Safety Leadership Group was created in September 2007 as a joint industry and regulators group, to drive forward high standards in process safety leadership and to complete the implementation of the Buncefield Major Incident Investigation Board's recommendations (HSE 2009). They published a list of eight principles (Table 2). Comparing the eight principles against the leadership criteria mentioned above, leads to the conclusion that the principles are partly about leadership and partly about management. Principle 6 Monitoring process safety performance, for example, falls directly under requirement 6 of the Seveso SMS requirements. As such, even if a leader needs to take care of it, it is simply a management function to keep that particular train running on time.

In the UK, the authority responsible for major hazard regulation (the COMAH Competent Authorities) publishes operational delivery guides on strategic topics. Their delivery guide on process safety leadership (HSE 2019a) sets out a framework for:

a) inspecting aspects of major hazard leadership at senior levels in companies; and

b) investigating leadership failures at senior levels following a major accident.

The delivery guide is for the use of the regulatory operational staff and may also be used by duty holders as a guide to their staff and to plan for regulatory inspections. It is accompanied by an intervention tool (HSE 2019b), which is organised under the eight PSLG Principles (Table 2). It incorporates key aspects from several industry led documents and lessons from major hazard incidents. It is not intended to be used by inspectors as a checklist, but is nevertheless a comprehensive list of the questions inspectors should ask and examples of the answers, or demonstrations, they might expect to get - what good looks like.

Many of the good practice example demonstrations in the intervention tool are indeed examples of leadership behaviours. For example, under Principle 4 *Board level responsibility*, an example demonstration is:

> *"Senior leaders are visibly present in their businesses and at their sites, asking appropriate questions and constantly challenging the organisation to find areas of weakness and opportunities for continual improvement."*

This is a good example of how a leader can communicate his or her process safety values.

On the other hand, under Principle 5, *Engagement of the workforce is needed in the promotion and achievement of good process safety management*, an example demonstration given is:

> *"Senior leaders involve the workforce in conducting risk assessments, HAZOPs and workplace safety inspections, and in identifying control measures."*

Workforce participation in risk assessments is a standard recommendation in guidance, so this example is more one of management than of leadership.

1. Clear and positive process safety leadership is at the core of managing a major hazard business and is vital to ensure that risks are effectively managed;
2. Process safety leadership requires board level involvement and competence. For companies with boards located outside the UK then the responsibility to show this leadership rests with the most senior UK managers;
3. Good process safety management does not happen by chance and requires constant active engagement;
4. Board level visibility and promotion of process safety leadership is essential to set a positive safety culture throughout the organisation;
5. Engagement of the workforce is needed in the promotion and achievement of good process safety management;
6. Monitoring process safety performance based on both leading and lagging indicators is central to ensuring business risks are being effectively managed;
7. Publication of process safety performance information provides important public assurance about the management of risks by an organisation; and
8. Sharing best practice across industry sectors, and learning and implementing lessons from relevant incidents in other organisations, are important to maintain the currency of corporate knowledge and competence.

Table 2; PSLG Principles of Process Safety Leadership (HSE 2009)

The recently published CCPS book *Process Safety Leadership from the Boardroom to the Frontline* (CCPS 2019) contains a similar mix of leadership and management recommended practices. It provides a recommendation to create a shared vision, clearly a leadership function, and proposes elements of the vision. On the other hand, the chapter headed *Leadership of the Process Safety Management* System describes practices for providing resources and controlling the activities of the organisation, which according to Angiullo's explanation, are about management not leadership. Out of a book of 207 pages, this chapter takes up 76 pages, or 37% of the book.

Business leadership books and programmes do not concern themselves with financial accounting, management accounting or analysing financial statements. Those topics are left for management books and programmes. A company wanting to address process safety leadership could usefully differentiate between content which is management and what is leadership. Taking a business leadership approach to process safety in this way offers the possibility to focus the programme on leadership practices which will drive performance and to be integrated into a business leadership programme. This paper will provide a suggested approach.

Beyond the mystical myth of leadership

If leadership is a good thing, the next questions is what does good leadership look like and what does bad leadership look like? History sometimes helps to put things in perspective.

West Point, the familiar name for the United States Military Academy, was founded in 1802 at a scenic bend in the Hudson River. During the Revolutionary War (or War of Independence) of 1775 to 1783, it had been the Continental Army's most strategic post, as it denied British access to the vital waterway north of New York City (McChrystal 2018). Today it celebrates the role of leadership in America's past, while forging leaders for the future. Its cadets attend classes in, eat their meals in and

retire at night to barracks named after illustrious generals and under the gaze of portraits and busts of famous officers. They are taught not by academics but by young officers recently off the battlefields. They learn that leadership is what leaders do. They suspect, but never speculate out loud, that some of them will make the history which future cadets would study.

Greek biographer and essayist Plutarch (c. AD 46 to 120), profiled 48 noble Greeks and Romans in his book *Lives*. By profiling pairs of Greek and Roman figures, for example Theseus and Romulus the mythical founders of Athens and Rome, he explored what kinds of men they were. He was interested in the common moral virtues and vices of leaders of their time. In the 19th century in the United States, *Lives* was second only to the Bible in volume of sales; it was standard reading for educated people interested in leadership well into the twentieth century. Teddy Roosevelt kept a copy in his breast pocket, "I've read this little volume close to a thousand times", he said. "but it is ever new".

Thomas Carlyle's *Great Man Theory* held that the arc of history is bent by a few great men. In his book *On Heroes, Hero-Worship, and The Heroic in History*, published in 1841, he profiled twelve leaders and their historic achievements in six fields: divinity, prophets, poets, priests, men of letters and rulers. History, he says, does not flow smoothly but in steps and jumps, with "heroes" like Napoleon, Cromwell, Dante and Shakespeare at the inflection points. Taking a view that leadership is what leaders do, does not exclude the possibility that leaders can be flawed, indeed all leaders are. Nevertheless, Great Men should rule and others should revere them. It is their heroic vitalism and creative energy which sets them apart, not their moral perfection.

It is not only graduates of West Point and readers of Plutarch and Carlyle, who see leadership as what leaders do. We are all influenced by the narratives of the legends which biographers build around famous people. We attribute leadership accomplishments to extraordinary qualities – their courage on the battlefield, their virtues of integrity, far sightedness and competence. The intrinsic nature of the qualities required to be a great leader lead us to the conclusion that leaders are born not made. But if we look closer, we find shortcomings in this analysis.

Plutarch's subjects are male and Carlyle was interested in Great Men, but leadership is not solely a male endeavour. Recent research has found that female monarchs have historically been more aggressive than their male counterparts and more successful at winning lands (Blakely, 2019; Dube, 2019). The study examined the reigns of 193 monarchs including 34 women from the years 1480 to 1913. It found that a state was 39% more likely to participate in conflict if it was ruled by a queen than if it was ruled by a king. It also found that a state was 13% more likely to see territorial expansion if it was led by a queen. Queen Elizabeth I of England (ruled 1558-1603), Boudica who ruled the Iceni of East Anglia c. AD 60, Catherine the Great of Russia (ruled 1762-96) or Isabela I of Léon and Castille (ruled 1474-1503), or Queen Victoria of the United Kingdom (ruled 1838-1901) would have made interesting additions to Plutarch's and Carlyle's books. This patriarchal view of leadership is unhealthy and unhelpful. There is ample data to suggest that gender inequality is counterproductive to firms and to society as a whole. Studies of company senior leaders have found correlation between gender diversity and performance. Causes to do with emotional intelligence have been proposed, but one explanation offered is that firms with female senior leaders do better because female candidates need to be twice as good as their male counterparts to be appointed.

Tolstoy in his book *War and Peace* first published in 1869 (Tolstoy 2005) has a different view than Carlyle not only about Napoleon as heroic leader, but also about Great Men. The novel, set between 1805 and 1820, tells the story of five families at a critical time for European history. Tolstoy puts the story in context with historical and philosophical reflections, much of which addresses how leaders get their power. In 1812 the French army of 600,000 men, led by Napoleon, crossed the River Neman commencing the invasion of Russia. This was an event "which defied human reason" and is explained by *historical fatalism*:

> *When a ripe apple falls, what makes it fall? Is it gravity, pulling it down to earth? A withered stalk? The drying action of the sun? A breath of wind? Or the boy under the tree who wants to eat it?* (Vol III, Part I, chapter 1)

Napoleon throughout his reign kept issuing orders for an expedition to England, and spent more time and effort on this than any other enterprise without ever carrying it out. He did carry out an expedition against Russia, even though as he emphasized on several occasions, this was a country which would make a useful ally. The difference according to Tolstoy, is that in the first case his orders did not correspond with events and in the second case they did.

In Tolstoy's opinion it is the context that matters and when it comes to events in history, so-called great men are nothing but labels attached to events. Abraham Lincoln expressed a similar opinion at his speech to the Young Men's Lyceum of Springfield in 1838. He made the speech in the wake of pro-slavery mobs killing an abolitionist, negroes and negro sympathisers. He described the risk of men like Alexander, Caesar and Napoleon taking advantage of the chaos to thwart constitutional processes and seize power for their own advantage.

General Robert E. Lee is one of West Point's most revered alumni. The near perfect cadet, Mexican War hero, Academy Superintendent and finally the commander of the Confederacy's Army of North Virginia, he cast a long shadow (McChrystal 2018). Lee graduated from West Point in 1829 and his military career ended with the Confederate surrender at Appomattox Court House in 1865. If history had allowed, Plutarch and Carlyle would surely have found Lee an interesting subject. Fellow West Point cadets gave their serious yet charismatic comrade the moniker "Marble Man". Throughout his professional career and for 150 years after his death, the persona of professional leadership which he crafted was sustained. It was one of a disciplined dutiful soldier, devoid of intrigue and strictly loyal to a hierarchy of entities that began with God and his own sense of honour, combined with an extraordinary aptitude for war. He was held in particularly high repute in the Army of North Virginia; they liked to be part of a winning team and admired Lee. But this was despite that an infantryman who joined Lee in 1862 stood an 83.1% chance of succumbing to disease or casualty. This remarkable attrition rate points to a failure of leadership and Lee's lack of attention to administrative arrangements, leading to his soldiers marching staggering distances barefoot and in a state of semi-starvation.

Lee was at his most effective with subordinates who thrived on *mission style* instructions, sometimes better known by its German name, *Auftragstaktik*. In mission style tactics, the commander tells subordinates what they need to accomplish not how they should accomplish it. He earned an impressive record of tactical successes and was at his most successful with subordinates like General "Stonewall" Jackson at the Battle of Chancellorsville (May 1863), who worked well under mission style command. But he struggled with subordinates who needed clearer direction at the Battle of Gettysburg (July 1863). Gettysburg ended his winning streak and was the turning point of the war.

Following the decision of Virginia, Lee's home state, to secede from the Union and join the Confederacy. Lee was faced with a difficult moral decision. For 35 years he had been a serving officer in the United States Army. If he continued to serve he would act on behalf of the Union to put put down the growing rebellion in the South. On one side he had to weigh the moral contradictions of slavery in a nation conceived in liberty and the rights of man. On the other side, abolition would upend Southern society. By deciding to put loyalty to Virginia over that of the Union, he abdicated his decision to the Virginia state legislature and on 20th April 1861 he resigned his commission.

Following the assassination of President John F. Kennedy on 22nd November 1963, Vice President Lyndon B. Johnson assumed the office of president. He immediately set out his social programme under the banner of his "Great Society" and within 21 months he had accomplished everything he set out to do – tax reduction, civil rights, federal aid to education Medicare and voting rights, Such was his success in the first months of his administration that he was re-elected with a landslide majority in 1965. Through his "War on Poverty", helped by a growing economy, many Americans were lifted out of poverty. It has been said that he achieved more of John F. Kennedy's domestic social agenda that Kennedy himself would have done, had he not been assassinated. He was able to do this for two reasons. Firstly, while Senator, he had become expert at navigating the structural machinery of the Senate and had secured strategic committee chairmanships. He had built a strong network of relationships. Secondly, he recognised the tail wind of public opinion created by Kennedy's assassination (Kearns Goodwin 2018). But he did not repeat his social programme leadership success with his foreign policy agenda and Vietnam. When engaging domestic affairs and civil rights, he had a concrete vision of the goals he wanted to achieve. The vision was part of a strategy for implementation through Congress and public opinion. By contrast, in Vietnam he was motivated less by a set of positive goals and more by what he wanted to avoid – failure, loss and a humiliating defeat for himself and his country. He wanted to avoid Vietnam derailing his domestic vision. As North Vietnam continued to infiltrate the South, Johnson's incremental decision making deepened America's involvement, ultimately to 500,000 troops. Anxious that Vietnam would be a distraction from the Great Society, he failed to bring Congress and the American people along with him. Lack of openness that the war would be a protracted and costly struggle broke faith with the American people and initiated a lingering mistrust in government and leadership itself. Anticipating defeat, he selflessly declared that he would neither seek nor accept the Democratic nomination for the 1968 presidential election.

Napoleon, Lyndon Johnson, Robert E. Lee and the other West Point graduates were all effective leaders in their own styles and at their own historical inflection points. But this short review of their performance shows that leadership is not some universal intrinsic capability. The myth of Great Man leadership provides an explanation which is too simple or even wrong. The myth of Great Man leadership comprises a person centred formula consisting of males with certain traits and moral virtues. The reality comprises a diverse population of individuals who understand the dynamic nature and context of their leadership and how their behaviour interacts with their constituents or followers. The good news is that these are skills which can be acquired.

From Theory to a Practical Model of Process Safety Leadership

The above mentioned short list of leaders from history sets the scene for a closer look at leadership theories, and subsequently what that means for process safety leadership and how we can get the most out of a process safety leadership initiative. Many different theories have been proposed to explain leadership performance (Flin et al., 2008 p.135; Turner and Müller, 2005), including trait theories, style theories, contingency (situation) theories, charisma and transformational theories. Following is a description of *trait theory* and the *transactional/transformational theory*. Additionally *context* will be identified as an important piece to be added, and its relevance for process safety leadership will be highlighted.

Trait Theory

The Great Man theory is an example of trait theory. It suggests that leaders are born with certain characteristics which distinguish them from non-leaders – physical, social background, intellectual ability, personality, task orientation and social skills. The theory suggests that leaders compared to non-leaders tend to be higher on intelligence, dominance/need for power, self-confidence, energy/persistence, knowledge of the task. However, although certain traits may influence the willingness to take on a leadership role, there is no evidence that certain traits or characteristics predict who will be an effective leader in every situation.

The concepts of trait theory are attractive to us because of the salience of the characteristics of famous leaders – their celebrity status. But a weakness in trait theory research is that it is often gathered from surveys of leaders done after they have been seen to be successful. Trait theory is descriptive in that it describes the characteristic leaders show, but does not explain how or why these traits are necessary. We cannot conclude that we could drop a Napoleon, a Robert E. Lee or a Lyndon Johnson into a different context and have confidence that they could lead. Fifty years of study have failed to produce one personality trait or set of qualities that can be used consistently to discriminate leaders from non-leaders (Jennings, 1961).

What has been studied though, is what kinds of traits people like to see in their leaders (Kouzes and Pozner, 2007 p.29). Asked what kinds of leaders people will willingly follow, the majority of people answer that they want leaders to be honest, forward looking, inspiring and competent.

Transactional/Transformational Leadership

Transactional leadership is the basis of all management and leads to expected levels of performance. For process safety management, companies build management systems and standards around the process safety management system elements listed in Table 1. Senior leaders assess their subordinates according to the extent to which they effectively implement and manage the elements. Senior leaders focus their attention on information about the functioning of the management system, such as timely completion of equipment integrity inspections and closure of audit findings. Metrics measuring how these things are going are built into financial incentive schemes and are taken into account when considering candidates for promotions. Transformational leaders on the other hand, articulate a clear vision, while treating individuals on their own merits and encouraging free thinking. They use charisma to motivate subordinates to place team or organisational goals ahead of their own, motivate subordinates to have stronger drive for responsibility, challenge and personal growth.

Transactional leadership	Transformational leadership
Contingent reward: Contracts exchange of rewards for effort, promises rewards for good performance, recognises accomplishments. *Management by exception (active):* Watches and searches for deviations from rules and standards, takes corrective action. *Management by exception (passive):* Intervenes only if standards are not met. *Laissez-faire*: Abdicates responsibility, avoids making decisions.	*Charisma*: Provides vision and sense of mission, instils pride, gains respect and trust. *Inspiration*: Communicates high expectations, uses symbols to focus efforts, expresses important purposes in simple ways. *Intellectual Stimulation*: Promotes intelligence, rationality, and careful problem solving. *Individualized Consideration*: Gives personal attention, treats each employee individually, coaches, advises

Table 3; Transactional and transformational leadership styles (Bass 1990)

Transactional leadership on its own can be a prescription for mediocrity, especially if the leader relies on management by exception, engaging only when performance falls short (Bass, 1990). The two styles, transactional and transformational, described in Table 3 lead to very different interactions between the leader and the team, but when combined result in enhanced performance. The two styles are not mutually exclusive and leaders should use both. Transactional interactions form the basis for the management relationship and the transformational leadership builds on this foundation to achieve increased motivation and performance beyond expectations (Flin et al., 2008).

Transformational leaders are viewed more positively by their team and have been found to be more effective in relation to subordinate satisfaction, motivation and performance. Zohar (2003) found that studies consistently indicated that team leaders who show a more transformational style result in fewer unsafe behaviours and occupational safety accidents in the workplace.

A criticism of this approach is that transformational leadership may depend on subordinates being receptive to the delegated flexibility and responsibilities.

A further criticism is brought by Hopkins (2019), if the free thinking associated with transformational leadership would be associated with decentralised process safety management decision making. He argues that major hazard risks should be managed centrally for three reasons. Firstly, in globalised geographically dispersed companies, the salience of major hazard risks might be lower at a site with no first hand experience of a major incident, than for corporate process safety professionals with wider horizons. Secondly, major hazard accidents have consequences which can affect the whole corporation, not just the site where it happened. Thirdly, the resources in the sites might not be suitable or sufficient.

Context

In the same way that US President Lyndon B. Johnson recognised the tail wind of public opinion for his social programme following the assassination of President John F. Kennedy, and Napoleon was able to put together an army of 600,000 men in the context of the political situation in Europe, process safety leaders need to understand the context of their leadership. Style and strategy might need to reflect weak signals coming from audit reports, inspection findings or conversations in control rooms. Or it might need to reflect stronger signals coming from regulator expectations or actual incidents - it has been said, you shouldn't waste a good incident. Leaders should monitor the signals and make changes accordingly.

A Process Safety Leadership Model

We have seen that leadership requires more than a static set of traits and, although context is important, is more than the historical fatalism of dealing with events as we find them. It is also more than transactionally managing our process safety systems and more than charismatic transformational interactions between leaders and followers. Successful process safety leadership is a dynamic system of behaviours and interactions between leaders and followers, which is adjusted depending on the context (Figure 1).

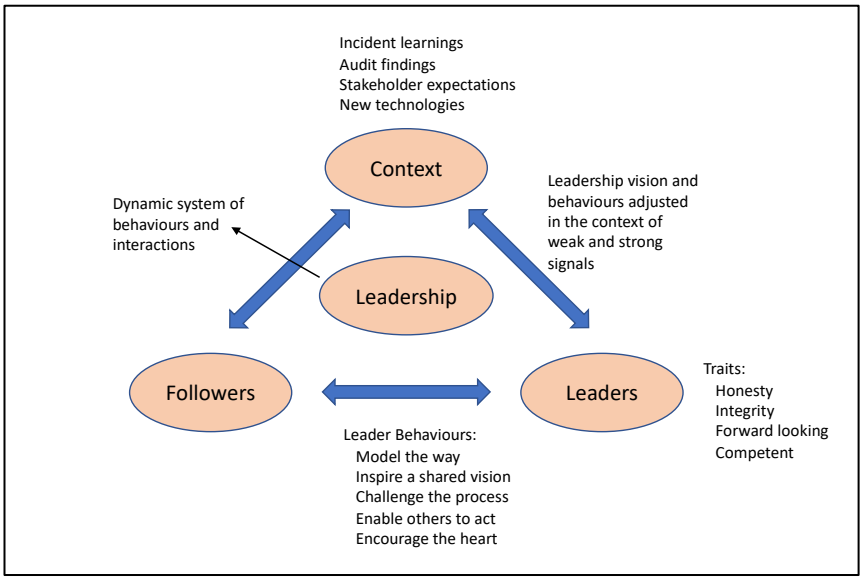

Figure 1; Process Safety Leadership Model, a dynamic system of behaviours and interactions (after McChrystal 2018)

The Five Practices of Process Safety Leadership

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 (Lekka and Nichols 2012) and the efficacy of the transformational leadership model. The following framework adapts the five step process of Kouzes and Pozner (2007), which is a transformational approach, to include the concepts presented in Figure 1:

1. Model the way
2. Inspire a shared vision
3. Challenge the process
4. Enable others to act
5. Encourage the heart

The process is synergistic with CCPS (2019), COMAH Competent Authorities (2019a and 2019b) and other current guidance. The content of each step can be adjusted taking account of what elements the company wants to build in from the published guidance.

1. Model the way

Clarify Values

Exemplary leaders know that if they want to gain commitment and achieve the highest standards, they must be models of the behaviour they expect from others. This starts with having clarity about your own values. Ask somebody to name a leader from recent history they would willingly follow and you will get names like Abraham Lincoln, Dr Martin Luther King Jr., Nelson Mandela or Mahatma Gandhi. One quality stands out above all else for these leaders, their strong beliefs about matters of principle. People admire most those who believe strongly in something and who are willing to stand up for their beliefs.

It will be necessary to convince people of your beliefs. People won't believe in you if they don't know what you believe. You won't be able to convince them if you don't know what you believe.

Affirm Shared Values

Regardless whether you are a senior leader, your values need to be a handful of guiding principles relevant for your team. They should at least be aligned with your company's values, but if you are a senior leader, they are the timeless guiding principles of your company.

Collins and Porras (2011) suggest that developing a corporate vision should start with defining a company's *core ideology*, which in turn is made up of its *core values*, a system of guiding tenets and principles, and *core purpose* the organisation's most fundamental reason for existence. The core ideology defines the enduring character of an organisation and does not change with time. The Disney Corporation's core values of imagination and wholesomeness stem from the owner's belief that these should be nurtured for their own sake. Its core purpose is to make people happy, not to build theme parks or produce cartoons.

People follow first the person and their values, then the plan. People were inspired when Dr. Martin Luther King Jr told them he had a dream. They would have been less inspired if he had told them he had a plan. Plans change but values do not. A good test of a core value is to ask, if the circumstances changed and penalised us for holding this core value, would we still keep it? If the answer is no, it is not a core value.

There is no standard set of values for process safety leadership. Appendix 1 provides some examples and discussion about values and how they fit with a company vision.

But leaders aren't just representing themselves. Leaders must forge agreement around common principles and ideals.

2. Inspire a Shared Vision

The Sunlit Uplands of Process Safety Excellence

In its manifesto for the 2015 United Kingdom general election, the Conservative Party promised, if elected, to give the people of the United Kingdom the choice, via a referendum, whether to remain in or leave the European Union. The UK electorate in the past had shown itself to be disinterested in EU membership, and the Conservative Party's expectations were that the merits of the EU both as a trading block and as a basis for the avoidance of war in Europe, would result in a clear majority to remain. Having been elected in 2015 with a majority in Parliament, the government duly announced the referendum for 16th June 2016. The remain campaign was officially represented by a cross party alliance, Britain Stronger in Europe which included official government support; the leave campaign was represented by Vote Leave. Despite its name, rather than campaign on the advantages of EU membership, Britain Stronger in Europe chose as its central plank to emphasise the severe negative consequences which would result from leaving. The picture they painted was one of damage to the manufacturing and services sectors of the economy, loss of jobs and a diminished stature in world affairs. Vote Leave on the other hand chose to emphasise positive messages. Regarding sovereignty they talked of taking back control and not having to pay the EU membership fee. Regarding trade, they borrowed a phrase from Winston Churchill's "This was their finest hour" speech and talked of the *sunlit uplands* of the UK being able to forge its own trade deals with the US and China. Regarding the UK's position in the world, they created a swashbuckling image of plucky Brits nimbly navigating the seven seas. Against expectations, Vote Leave prevailed and the people of the UK voted to leave the EU.

A behavioural analysis of the two campaigns provides one explanation why the vote went the way it did. Britain Stronger in Europe argued that voting to remain would bring consequences which would escape from or avoid things the voter did not want – job losses, economic decline and diminished world stature. This is *negative reinforcement*. Vote Leave on the other hand, promised that a vote to leave would bring immediate benefits of £350M per week spending on the health service and new trading opportunities which were not available to EU member states. By voting leave, voters would be getting something they wanted, which is *positive reinforcement*. Vote Leave's positive reinforcement message had a stronger influence on voting behaviour than Britain Stronger in Europe's negative reinforcement message. This is entirely in line with what a behavioural analysis would predict and it is clear that Britain Stronger in Europe might have done better had they campaigned with positive messaging (Daniels 1999).

CCPS's book on process safety leadership (CCPS 2019 p. 48) has a section on creating a shared vision, which indeed is an essential component of a leadership initiative. It provides the following advice:

> *"A strong process safety culture begins with the imperative for process safety, and this imperative begins with you as a leader recognising:*
> - *The potential consequences of process safety incidents.*
> - *…*
>
> *…. Reflect the imperative in your words and actions."*

The CCPS advice is that the process safety vision should advocate behaviours which will avoid major accidents, which in a behavioural sense is escaping or avoiding consequences people do not want, negative reinforcement. As with Britain Stronger in Europe, this vision of consequences with negative reinforcement would not have as strong an influence on behaviours as one which provided the promise of positive reinforcement. A process safety leadership vision should paint a positive picture of a place people aspire to reach.

There is no question that leaders need to reflect potential consequences in their vision. But it should be used to build a sense of urgency rather than be part of the optimistically framed envisioned future.

Big Hairy Ambitious Goals and a Vivid Description

A vision should be in two parts (Collins and Porras, 2011): a 10 to 30 year ambitious goal and vivid descriptions of what it would be like to reach the goal. Visionary companies use Big Hairy Ambitious Goals (BHAGs or BeeHags) to stimulate engagement and progress. A vision is what we aspire to become, achieve or create – something which will require significant change and progress to attain. While values are part of the DNA of the company and rarely change, the shared vision can evolve and change.

In the 1950s, Sony's vision was to "become the company most known for changing the worldwide poor-quality image of Japanese products". It made this BHAG vivid by adding, "Fifty years from now, our brand name will be as well known as any in the world … and will signify innovation and quality…. "Made in Japan" will mean something fine, not something shoddy". This vision was created in the context of Japan's defeat in the Second World War, and its rehabilitation into the new world order.

Sony's website currently says that they will "Fill the world with emotion, through the power of creativity and technology" and "Pioneer the future with dreams and curiosity". Sony have changed their vision because the context of Japan's position in the world has changed and they achieved their BHAGs.

BHAGs should be energising and engaging. People should get them right away. People should believe that they can achieve them, but they should not be a sure bet.

The second part of the vision is the vivid description. It should describe what it will be like to reach the BHAG and paint an exciting attractive future, a picture of where people's dreams could take them.

CCPS (2019 p. 85 et seq.) recommends creating a process safety vision around a risk matrix – "We will accept no risk greater than X", "There is a risk we consider major but will accept for (a short time increment) if (list of firm requirements) are met". This is more a policy statement and seems unlikely to inspire or engage people.

Appeal to Shared Aspirations

Exemplary leaders don't impose their vision, they release one that is already there. One way to do this is to identify your constituents and organise focus groups, Ask them:

- What do you like about the way we currently do process safety?
- If you could create your perfect company, what would the process safety situation look like?
- What drives you to do the very best you can to achieve the company's process safety goals?
- In a process safety context, what would you like to be remembered for?

3. Challenge the process

If all you need to do is tweak the current situation, what you need is management not leadership. Leadership always involves some kind of challenge. It is always about change and is inextricably linked to the process of innovation. Innovation does not necessarily mean creating things which are completely new. It can mean taking an idea from somewhere else and importing it or promoting it. The late Trevor Kletz is one of the most famous leaders in process safety and is sometimes mistakenly credited with inventing HAZOP (Hazard and Operability Studies). But as he explains in his autobiography (Kletz, 2000), HAZOP was invented in 1964 not by him, but by the production manager of the ICI Oil Works in Billingham, during the design of the Phenol Plant. At the time Kletz was assistant works manager and as he says, too busy running the existing plants to take much interest in the new one. It was not until after 1968 when he was appointed division technical safety adviser, that his name became linked with HAZOP through his enthusiastic advocacy. HAZOP is now an essential and universally applied methodology for process hazard analysis. Leadership does not involve change for change's sake. ICI's fatal accident rate due to process risks had risen in the four years prior to his appointed to the technical safety position, from 1.2 to 3.8 fatalities per 10^8 workhours. Leadership and innovation was needed to reverse the trend.

Leaders stimulate innovation by encouraging followers to take (the right kinds of) risks and by regarding failures as learning opportunities. A company might pursue advances in digital technology which offer opportunities for improved process safety management – data analytics, mobile devices etc. Leaders who challenge the process accept that success is not guaranteed, and when a new technology turns out to be less promising, people should nevertheless be congratulated for trying and learning.

Leaders are pioneers and pioneers need courage. Trevor Kletz was well known in ICI and beyond for his *Safety Newsletter*. He published the first one in 1968 and they continued until he retired 14 years later, with an ever-growing readership both inside and outside the company. They contained summarised incident reports which brought out key learnings for sharing but nevertheless did not reveal where in ICI the incidents had occurred. He never asked permission to publish the *Newsletter* and notes that if he had, it would probably have been refused. This indicates a certain amount of courage. By the time he retired in 1982, ICI's rate of fatal accident due to process risks had fallen to 0.2 fatalities per 10^8 workhours from 3.8 in 1968. Kletz's work, including the *Newsletter*, undoubtedly contributed to this.

4. Enable others to act

Leaders foster collaboration and build trust. They make it possible for others to do good work. For a senior leader this means being receptive to bad news. Also for senior leaders, the collaboration and trust should extend far beyond the immediate reports. Multiple modes of communication are available to reach the whole company with your process safety message.

Some senior leaders find it easier to engage in occupational safety, for example slips, trips and falls and hand injuries, than they do in process safety. It is to be commended when senior leaders share their concerns and safety passions after an incident, but they must take care that process safety incidents are given emphasis in proportion to their potential significance for the company.

In January 1986, the engineer responsible for the Challenger solid rocket boosters refused to sign off the launch. He was concerned that the outside temperature was too low to ensure the integrity of the O-ring seals between sections of the boosters (CCPS, 2019 p.67). The flight director overrode the engineer and Challenger exploded 73 seconds after launch. Process safety leadership requires recognising the expertise in your team and empowering them to take decisions.

The production versus safety challenge is a familiar one, but is particularly challenging for process safety decisions. The business consequences of a decision, say to erect a scaffold rather than do a job off a ladder, are usually significantly less than say shutting down a cracker to fix a leaking heat exchanger. It is not as simple as just saying, we will always shut down the cracker. Process safety leaders should communicate what their boundaries are and empower their people to act within them. Boundaries can be set using risk assessment to define appropriate mitigation arrangements and time limits.

Enabling others to act is harder for some process safety decisions than others. This is particularly the case for risk mitigation, as opposed to risk prevention measures. Process safety risk prevention measure decisions can often be made using a semi-quantitative methodology such as LOPA. In that case the decision is delegated to the LOPA team working within a tolerability framework. But for example, a decision whether to revamp an emergency control centre or to buy a new fire engine will not come out of a LOPA. Leaders should delegate the decision to an "honest broker", a subject matter expert.

Trusting others pays off. A study on corporate innovation in companies listed in the FTSE100, found that the level of trust was the biggest differentiator between the top twenty percent of companies and the bottom twenty percent.

5. Encourage the heart

Measuring performance with incident rates is deeply entrenched in safety management but has two shortcomings. Firstly, it is a metric which tracks things which have not happened, which is the opposite to most other business metrics. Secondly, it promotes management attention on things which have gone wrong. Leaders will always have to deal with things which have gone wrong, but the associated negative reinforcement has a limited effect on behaviour. According to behaviourists, positive reinforcement, or catching people doing things right, is the category of consequence most likely to cause a behaviour to be repeated. Negative reinforcement generates enough behaviour to escape of avoid punishment, or "just enough to get by". Positive reinforcement taps into people's discretionary effort. Daniels (1999 p.74) goes so far as to recommend managers should deliver a ratio of four positives to every negative.

In summary, the values and process safety vision should form the basis for the short-term goals. It is these goals linked to the vision, rather than incident rates, which chart the organisation's progress to its BHAGs and should be rewarded. Leaders make sure people see the benefit of behaviour aligned with cherished values. Short term goals relating to learning from experience might link to BHAGs which in turn relate to a vision of process safety excellence. Recognition should be designed to reinforce people identifying system failures where nothing actually happened. For example, safety instrumented systems are functionally tested at a pre-determined frequency. When a loop is found during testing to not be performing as intended, the behaviour which a leader would want to encourage by recognition, would be that the defect is investigated rather than just fixed.

Conclusions and the answer to the Abraham Lincoln question

This paper has shown how leadership principles from business management can be integrated with a process safety leadership programme. A company which is considering such a programme can use the principles to assess what leadership topics to focus on; much of what appears in published process safety leadership guidance is management rather than leadership, and depending on the background of the participants, can be omitted or de-emphasised. The importance of context and leadership behaviours, above the traits of the leader, have been demonstrated. The paper has also shown how process safety leadership can be approached in a stepwise process which has as its basis, charismatic transformational principles.

When Abraham Lincoln entered the presidency on 4th March 1861, the house was on fire (Kearns Goodwin 2018 p.211 et seq.). Seven southern states had passed resolutions to secede from the Union and his Republican Party was divided on the best way forward. Lincoln's assessment was that what was at stake was the viability of popular government and whether a minority, in this case the secessionists, has the right to break up the government whenever it chose.

The first thing he did was to appoint a most unusual cabinet, not one of like minded people, but of people representing every faction of the new Republican Party, a combination of conservatives, moderates, radicals, hard liners and conciliators. The country was in peril, these were the strongest and most able men in the country and he needed them by his side. He was not afraid of being challenged, he welcomed the prospect. His *core values* were that he abhorred slavery, but that he respected the Constitution that protected slavery in states where it already existed. His *core purpose* was to abolish slavery and bring the Union back together. During visits to army encampments and conversation with soldiers, he came to realise that slavery was a military advantage to the Confederate war effort. Slaves dug trenches and built fortifications. Slaves served as cooks, teamsters and hospital attendants. On the home front they tilled the fields and raised the crops. If the rebels were relieved of their slaves, the North would gain a much needed advantage. He used this knowledge to *challenge the process*. He could not issue a proclamation to abolish slavery, as that would have been unconstitutional. But by framing emancipation of the slaves as "a military necessity absolutely essential for the salvation of the Union", he was empowered as president to issue a proclamation abolishing slavery.

On 22nd July 1862 he presented his disparate cabinet with a draft emancipation proclamation. In the few short months of his presidency, diverse members had assailed him as too radical, too conservative, brazenly dictatorial, or dangerously feckless. He had welcomed the wide range of opinions. Lincoln was in favour of signing the proclamation immediately, but his cabinet advised him that, following a series of military defeats, the public mood was not right. While waiting for a victory to shift the mood, he agreed some modifications, and a modified proclamation was signed on 22 September 1862. By working with his cabinet he had *engaged them in his vision*. He *encouraged the heart* by publicly acknowledging their contribution to the proclamation and by penning them handwritten notes extending his gratitude for their contributions.

From a long way off, Lincoln had seen the inexorable approach of emancipation: "Whoever can wait for it can see it; whoever stands in the way will be run over by it". He understood the *context* and knew that the time was right.

Abraham Lincoln would have needed some coaching on major accident hazards, but he understood leadership.

References

Angiullo R.J. (2009) Operational Discipline in Learning from High Reliability Organisations, In Hopkins A. (Ed.) *Learning from High Reliability Organisations*. CCH Australia.

Bass B. (1990). 'From transactional to transformational leadership; learning to share the vision'. *Organizational Dynamic* Volume 18 (Issue 3, Winter 1990, Pages 19-31).

Blakely R., (2019). 'Killer queens are up for the fight (and they're better than kings)'. *The Times* 9th November 2019. Downloaded from https://www.thetimes.co.uk/article/killer-queens-are-up-for-the-fight-and-theyre-better-than-kings-v2xw80793

CCPS (2019) *Process safety leadership from the Boardroom to the Frontline*. Wiley

Cogent (2011) *Process Safety Leadership for Senior Executives Standard*. Downloaded on 7th January 2020 from https://www.cogentskills.solutions/wp-content/uploads/2019/06/Process-Safety-Leadership-for-Senior-Executives-Training-Standard-and-Endorsement-Guidelines-Approved-version-2-0.pdf

Collins C and Porras J. (2011). Building your company's vision. In *HBR's 10 Must Reads; On Strategy*. Harvard Business Review Press.

COMAH Competent Authorities (2019a) *Operational Delivery Guide; Inspecting Major Hazard Leadership and Investigating Leadership Failures in Major Accidents*. Downloaded from https://www.hse.gov.uk/comah/guidance/major-hazard-leadership-delivery-guide.pdf

COMAH Competent Authorities (2019b) *Major Hazard Leadership Intervention Tool*. Downloaded from https://www.hse.gov.uk/comah/guidance/major-hazard-leadership-intervention-tool.pdf

Dekker S. (2014). Zero Vision and the Western Salvation Narrative. Downloaded from https://safetydifferently.com/zero-vision-and-the-western-salvation-narrative/ on 5th January 2020.

Dube O, Harish S. (2019). 'Queens'. *Journal of Political Economy*, October 2019.

Daniels A. (1999). *Bringing Out the Best in people; How to apply the astonishing power of positive reinforcement*. McGraw Hill

Flin R., O'Connor P., Crichton M. (2008). *Safety at the Sharp End; a Guide to Non-Technical Skills*. Ashgate.

HSE (2009). *PSLG Principles of Process Safety Leadership* in Safety and Environmental Standards for Fuels Storage Sites; Process Safety Leadership Group Final Report. Downloaded from https://www.hse.gov.uk/comah/buncefield/index.htm

HSE (2009*). Leadership for the major hazard industries.* INDG277. HSE Books

Hopkins A. (2005). *Safety Culture and Risk; The Organisational Causes of Accidents*. CCH Australia

Hopkins A. (2019). *Organising for Safety; How structure creates culture*. Wolters Kluwer Australia

Jennings E.E (1961). 'The Anatomy of Leadership'. *Management of Personnel Quarterly*. Vol 1 Issue 1 Autumn 1961

Kearns Goodwin D. (2018). *Leadership in Turbulent Times; Lessons from the Presidents*. Penguin Books

Kletz T. (2000) *By accident ….* PFV Publications, London

Kouzes J.M. and Posner B.Z. (2007), *The Leadership Challenge*. Jossey Bass.

Lekka C. and Healey N. (2012). *A review of the literature on effective leadership behaviours for safety; Research Report RR952*. Health & Safety Laboratory, Buxton UK.

Leathley B (2018). 'Z is for Zero Harm'. In IOSH Magazine https://www.ioshmagazine.com/article/z-zero-harm Downloaded 6th January 2020.

McChrystal S., Eggers J. and Mangone J. (2018) *Leaders; Myth and Reality*. Penguin Portfolio

Mendeloff J., Han B., Fleishman-Mayer L., Vesely J. (2013). 'Evaluation of process safety indicators collected in conformance with ANSI/API Recommended Practice 754'. *Journal of Loss Prevention in the Process Industries* 26, 1008 - 1014

O'Dea A and Flin R (2003). *The role of managerial leadership in determining workplace safety outcomes. HSE Research Report RR044*. HSE Books.

OECD (2012) *Corporate Governance for Process Safety; OECD guidance for senior leaders in high hazard industries*.

Official Journal of the European Union (2012) DIRECTIVE 2012/18/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC. eur-lex.europa.eu

Schein E. (2004). *Organizational Culture and Leadership*, 3rd Edn. Jossey Bass.

Tolstoy L. (2005). *War and Peace*. Translated by A. Briggs. Penguin Classics

Turner J.R. and Müller R. (2005). 'The project manager's leadership style as a success factor on projects; a literature review'. *Project Management Journal* Vol. 36 (No. 1, 49-61).

US OSHA (1999). Occupational Safety and Health Standards 29 CFR 1910.119. United States Department of Labor Occupational Safety and Health Administration. OSHA.

Wu T., Chang S., Shu C., Chen C, Wang C (2011). ,Safety leadership and safety performance in petrochemical industries: The mediating role of safety climate'. *Journal of Loss Prevention in the Process Industries*. Elsevier.

Zohar D. (2003). The influence of Leadership and Climate on Occupational Health and Safety. In Hofmann A and Tetrick L (Eds) *Health and Safety in Organizations* .

Appendix 1

Process Safety Values and Visions

Zero Harm Visions

Zero harm visions are ones in which all incidents are preventable, no one has an accident, there are no environmental incidents and plants run with no reliability or quality incidents. Arguments in favour of it are that it is the only ethically acceptable target. Arguments against it are that it is unattainable and that its futile pursuit will drive the wrong behaviours.

Sydney Dekker (2014) argues that zero harm, or the pursuit of a world without suffering is rooted in the Western Judeo-Christian salvation narrative, that the elimination of suffering is morally self-evident and unquestionable. Adam and Eve lived in blissful harmony in the Garden of Eden, in close intimacy with the divine and with no suffering. Eve's rule violation by taking a bite of the forbidden fruit spoiled it all, and humankind was condemned to live in a world of suffering caused by human fallibility. This kind of persuasion turns some into 'zero-zealots' and creates cultures where people get blamed and near misses go unreported. He invites us to pursue a zero harm vision which focuses not on the causes of the suffering but on alleviating the consequences that remain inevitable. Consider these two alternative statements of process safety core values, the first being more likely to promote zero-zealotry than the second:

1. We believe all incidents are preventable and this can best be achieved by rigorous systems managing our plants, processes and people.
2. We understand and accept responsibility for the hazardous nature of our processes and aspire to incident free performance We respect the interests of our employees, neighbouring communities and shareholders in the way we make decisions about risk.

Visions of zero harm can run into trouble if they are interpreted as targets. If we say all incidents are preventable, the difficult question is, at what cost? This question is especially likely to come up in the context of process safety, where decisions on whether to implement risk reduction measures are often made with reference to quantitative or semi-quantitative tolerability criteria – "Our LOPA indicated we have sufficient IPLs but there is a still a small but finite residual risk. Is this GoalZero?".

Zero harm visions have been criticised for promoting too much emphasis on minor incidents, while leaving serious injury and fatality rates unchanged (Leathley 2018). The same criticism might also resut in insufficient focus on process safety. Nevertheless zero harm visions have been shown to be successful when used as a rallying call, or as a philosophy.

A vision for Human Factors in Process Safety

Integrating human factors into the process safety strategy of a company is a good example of where clarity of vision could engage people and drive progress. Consider the following vision statement in conjunction with the second core value statement above:

> *We build our plants around our people. Our people come to work every day to do a good job. We will create a working environment which is adapted to human cognitive capabilities. By doing that, we will operate our plants year after year without any process safety incidents, protecting our employees and neighbours. We have great people in this company already doing fantastic pioneering work on human factors. We will not only become good at human factors in process safety, we will become the industry leader."*