Doctoral Thesis

Safety at work: An Issue of Daily Management Behavior

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SAFETY AT WORK:
AN ISSUE OF DAILY MANAGEMENT BEHAVIOR

A dissertation submitted for the degree
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(Dr. sc. ETH Zurich)

presented by

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2015
For Verena
PREFACE

A dissertation based on years of practical experience relies on many inputs. With profound appreciation I would like to thank the persons who have enabled and influenced most my professional journey in the field of safety management. The first one is Dr. Max D. Amstutz, the former delegate of the Board of Directors of Holcim, who taught me the art and science of management. Theophil H. Schlatter, the CFO of Holcim at the time, opened the door for me to Occupational Health & Safety and Dr. Thomas Knöpfel, EXCO-member, gave me a free reign to explore the field of safety, where I was strongly supported by my team-members Dave Reynolds and Dr. Stephan Navert as well as by Keith Kimmons, Carlos Quattrini, Mark Sterling and Dr. Carlos Tirado Meza, all safety experts active in some of the Holcim subsidiaries. Oliver Dohn and Jochen Weyandt entrusted me with the mission to chart OC Oerlikon’s safety journey and to support it across the globe.

On the academic side I thank Prof. Jean-François Manzoni for introducing me to his model, Prof. Roman Boutellier for accepting me as his PhD student and PD Dr. Marino Menozzi for agreeing to serve as co-examiner. Roman Boutellier, with his unique combination of a business and an academic career, not only guided me regarding the academic characteristics of a thesis but also opened the door for me to teach some courses at the ETH. My final thank-you goes to my American sister Sally Redmond who made sure that the language was proper US English.

Researching and writing a dissertation at the end of a professional career was an exciting endeavor, putting me in contact with today’s PhD students who gracefully accepted me as a colleague and bringing me back to the ETH where I had started my studies in October 1969.

Mark Füllemann
September 2015
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ABBREVIATIONS

ALARP  As Low As Realistically Possible
BA    Bachelor of Arts
BSc   Bachelor of Science
CHF   Swiss Francs
CIP   Continuous Improvement Process
CSI   Cement Sustainability Initiative
CVT   Continuously Variable Transmission
EUR   Euros
FAC   First Aid Case
FDI   Foreign Direct Investment
FLM   First Line Manager
FY    Full Year
HA    Holcim Apasco
HIRA  Hazard Identification and Risk Assessment
HR    Human Resources
HSE   Health, Safety & Environment
HWP   Hazardous Work Permit
IB    International Business
IDR   Indonesian Rupees
INA   Insurance Company of North America
JSA   Job Safety Analysis
KPI   Key Performance Indicator
LTA   Lost Time Accident
LTAEFR Lost Time Accident Frequency Rate
LTI   Lost Time Incident
LTIFR Lost Time Incident Frequency Rate
MNE   Multi National Enterprise
MTI   Medical Treatment Incident
NGO   Non-Governmental Organization
OH&S  Occupational Health & Safety
OSH   Occupational Safety and Health
OSHA  Occupational Safety & Health Administration
PDCA  Plan – Do – Check - Act
PPE   Personal Protective Equipment
SLC   Safety Leadership Course
SLS   Safety Leadership Seminar
SOP   Standard Operating Procedure
SOT   Safety Observation Tour
SUVA  Schweizerische Unfallversicherungsanstalt
SWP   Safe Working Procedures
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>USD</td>
<td>US Dollar</td>
</tr>
<tr>
<td>VSL</td>
<td>Visual Safety Leadership course</td>
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<tr>
<td>WBCSD</td>
<td>World Business Council for Sustainable Development</td>
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ABSTRACT

Nobody wants to get harmed at work and most people have had training on how to work safely. Why then do incidents occur every day, inflicting harm? To be safe at work means to minimize the risk of getting into contact with a technical condition – mostly a source of energy – that could harm a human body upon contact. Many studies published state that the root cause for incidents is observable behavior of people and consequently concentrate on employee behavior change as the key to a safer work world. This thesis focuses on daily management behavior needed to improve safety at work.

Two models were used to gather evidence from more than 800 managers and employees of two globally active industrial companies, the first one developed by INSEAD professor Jean-François Manzoni identifying six levers influencing behavior, the second one a own development outlining four steps to go through when changing behavior. The case studies proved the usefulness of both models. Managers stated their own visible behavior to be the most important of the six levers. This insight however did not lead to a widespread involvement on their side, a lack of understanding of how to act and a reluctance to cross organizational boundaries being the strongest barriers. The four-step model showed that people can and do change to a safer behavior if and when they know, understand, accept and do (i.e. apply) safe behavior procedures and if they are supported by management acting as teachers, coaches, motivators and mentors. Teaching and coaching is usually a mission for first line- and middle managers whose didactic skills need further enhancement. Top and senior managers influence more by motivating and mentoring, both achieved by frequent Safety Observation Tours, a best practice that needs to be spread more across all functions.

Performance management today is more of a hindrance to safety than of a support. It relies far too much on lagging indicators. There is a need to develop leading ones and – a new idea – ability-oriented ones. Even with more relevant indicators employees are not necessarily incentivized by reward and recognition, preferring clarity of rules well communicated.

Two special issues conclude the thesis. The first one concerns contractor safety. Statistics show that contractor employees are more at risk. Management should accept responsibility for their safety as well which requires respecting that the contractor is another company. Consequently, solutions must be applied focusing on extensive upfront preparation and joint action during execution. The final case shows that safety can have a positive impact on legitimacy of a foreign company and create a positive spillover, influencing markets to give preference to a safer supplier.
1. INTRODUCTION

1.1 Are we safe at work?

Leaving our homes in the morning to drive to work most of us are so convinced that we will return safely in the evening that we do not even think about the risk of an incident. But are we safe driving to work? Are we safe when working the whole day (or the whole shift)?

Let us look at some recent numbers. From the traffic news on the radio we know that there are daily road incidents harming people. The Federal Statistical Department of Switzerland reported for the year 2014 a total of 17803 traffic accidents where people had been harmed which translates into 2.16 incidents per 1000 inhabitants. For the US the relevant agency estimated in June 2015 that 32675 people had died as a result of a motor vehicle accident during 2014, i.e. 0.1 per 1000 inhabitants. And what about safety at work? Holcim Ltd, the Swiss Cement Group, reported in their Sustainable Development Report for 2014 41 fatalities and a Lost Time Incident Frequency Rate LTIFR of 1.6 (base: 1’000’000 hours) which translates into a total of about 200 LTIs (base: 67584 employees and 1800 work hours per year). OC Oerlikon Ltd., another global Swiss industrial group reported for the year 2014 0 fatalities, 96 LTIs and a LTIFR of 0.75 (base: 200’000 hours). All those reported incidents are related to safety, since this thesis focuses on safety, leaving out issues of occupational health.

The incidents mentioned above are not the result of major catastrophes such as Three Mile Island (1979), Bhopal (1984), Chernobyl (1996), Texas City Refinery (2005) or Ali Enterprises Garment Factory (2012). Such major incidents catch the headlines and are well examined, followed by the publication of extensive recommendations to managers. Our safety on the road or at work, however, is to a large degree at risk by small daily occurrences, events that did not harm but had the potential to do so (Near Misses) or incidents that caused harm, anything from a cut in the finger (First Aid Case) to a fatality. It is important for our safety to ask what can and should be done to prevent the incidents from happening and it is interesting to ask why there are still so many incidents taking place, knowing that the first professional associations for the prevention of

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1 Bundesamt für Statistik BFS: Unfälle nach Verkehrsträgern
3 holcim.com Corporate Sustainable Development Report 2014, p 38
4 See Perrow: Normal Accidents (for Three Mile Island and Bhopal) or U.S. Chemical Safety and Hazard Board (for Texas City Refinery)
accidents had been mandated by law in Germany in 1884 and knowing also that the first real studies of fatalities and not-fatal incidents at work had been done more than 100 years ago.

1.2 Is safety at work relevant for companies and their management?

The purpose of nearly all companies with the exception of a few consultancies is not safety. Drucker wrote: “The reason for the existence of a business enterprise is that it supplies economic goods and services. To be sure, the business enterprise must discharge its economic responsibility so as to strengthen society, and in accordance with society’s political and ethical beliefs. But these are (to use the logician’s term) accidental conditions limiting, modifying, encouraging or retarding the economic activities of the business enterprise.” Safety is one of those limiting conditions a company and its management has to comply with. In the language of Operations Research safety creates a set of restrictions that determine the space for finding optimal business solutions. Companies will try to comply with the restrictions for different reasons. Depending on what managers perceive the primary reason to be they will formulate their safety messages differently which in turn will have a substantially different impact on the motivation of the employees to work safely. It is thus relevant to explore the four different reasons mentioned most frequently in literature:

- Legal obligation
- Cost
- Ethics: value question
- Market considerations

The legal reason is the most obvious one. All countries have laws and regulations that aim at preventing incidents, which could harm people. All governments permanently analyze whether more laws and regulations are necessary as shown in the following example: in 2003 a report by the Royal Commissioner argued “a new paradigm must be established by which projects are completed safely, on time and within budget, rather than just on time and within budget”. The report recommended 19 changes for workplace safety. Most companies have a code of conduct that states in

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5 Unfallversicherungsgesetz: Bildung von Berufsgenossenschaften. See Weber: Arbeitssicherheit
6 The Pittsburgh Survey (1907-1908) was a pioneering sociological study of the city of Pittsburgh, Pennsylvania, USA funded by the Russell Sage Foundation of New York
7 Drucker: The Role of Management, p 7
8 HSA Ireland: Managing Health and Safety; Bay Area Builders: 10 Reasons
9 Quoted from Lingard, Occupational Health, p.3
one way or other that they and their subsidiaries try hard to always comply with local rules and regulations. Justifying the efforts of a company with the necessity of legal compliance however does not set the stage very well. Firstly, compliance means that someone has to do something instead of wanting to do something. There is a saying that service can become joy\textsuperscript{10} but for most people an obligation remains a burden until it becomes at least partially a value. As the Bradley curve (see chapter 3) shows, compliance means getting stuck in the dependent stage with little hope for sustainability. Secondly, laws cannot cover every eventuality and thirdly large international or even global groups must ask themselves whether “Dual Standards” are acceptable. Can a corporation active in many countries with different legal safety standards just require local compliance from its subsidiaries? Today more is expected from corporations: they should set one standard for all their subsidiaries, not copying just the most stringent one but one that follows from ALARP: As Low As Reasonably Practicable.

The second reason is cost. Incidents harming people cost money. Bird\textsuperscript{11} starts the first chapter of his book by stating “Most people do not understand how much incidents cost”. The Swiss Public Insurance company SUVA calculated for the year 2005 that the cost for accidents (incidents harming people) at work had been CHF 4300 Million or about CHF 5880 for each of the 731000 reported cases. The total cost was approximately equal to 2 % of the total salary sum.\textsuperscript{12} The Irish Health and Safety Authority analyzed 20 case studies and wrote 2007 in the executive summary: “The case studies show that a wide range of negative costs and effects resulted from the accidents. In terms of financial costs to employers, the amounts varied greatly from EUR 0 to EUR 3.8 million . . . . . The costs found were in almost all cases underestimates as productivity losses . . . were not recorded by employers”\textsuperscript{13}. OSHA, a division of the United States Department of Labor recommends to multiply the direct cost of accidents by a factor of 4.5 for direct costs below USD 3000 and by a factor of 1.1 for direct costs above USD 10’000\textsuperscript{14} to arrive at the total cost. Calculating the true total cost of an accident is difficult for the following reasons:
- Direct cost is mostly covered by insurance. How should the premium paid be redistributed over the totality of the incidents?

\textsuperscript{10} I slept and dreamt that life was joy. I awoke and saw that life was service. I acted and behold, service was joy. \textit{Rabindranath Tagore} (1861-1941), Nobel Price for Literature 1913

\textsuperscript{11} Bird: Practical Loss Control Leadership

\textsuperscript{12} www.suva.ch Unfallstatistik UVG 2007

\textsuperscript{13} H&SA; The costs and effects

\textsuperscript{14} www.osha.gov/Region7/fallprotection/safetypays
- Does Lost Time lead to opportunity cost? Much depends on the utilization rate of the facility.
- How much is the value of lost co-worker time? How much is leader-time valued, spent in incident investigation, preparing reports, being involved in re-training?
- Does the incident have an impact on production (quality, volume) with a subsequent customer reaction?
- What could be the ledger cost of property damage (for the uninsured part)?
- How much could fines, penalties and the like cost?

For a global group currency exchange rates can confuse the picture and end up in very delicate questions: If the recorded cost of a fatality in India (translated into USD) is much lower than the cost of a similar fatality in the USA does this mean that a life in India is valued less than in the US? As understandable as it is to ask for the cost/benefit relation of investments and activities in favor of safety it should not be the only or even the prime reason for preventing incidents. It is sufficient to know that incidents will produce costs and will have an impact on profits and that the amounts are usually underestimated. Incident prevention will save cost and therefore have a positive impact on the bottom line.

If legal compliance and saving cost are both necessary but not sufficient as a reason for safety efforts then let us turn to values, i.e. to overall ethical considerations. This also seems obvious; most companies today publish a safety vision that in essence says “Zero Harm”. Krause wrote: “the predominant motive driving senior leaders to improve safety is human compassion”\textsuperscript{15}. How well compassion holds, however, when margins begin to get tight and competition fierce is open to question; furthermore safety needs to be led by all levels of management, not only the senior level\textsuperscript{16}. This overall ethical approach locates safety somewhere in the sphere of so-called “triple bottom line thinking”, mixing values, objectives and restrictions. Rather than entering a discussion that is politicized companies should turn to business ethics, remembering one basic ethical business rule, namely “pacta sunt servanda” (agreements must be kept)\textsuperscript{17}. When a company that has a clear safety vision signs a contract with an employee then the company promises the employee to do all necessary that the employee

\textsuperscript{15} Krause: Leading with Safety, p 18
\textsuperscript{16} One middle manager in the Philippines asked me: Why do you insist so much on the rules for defensive driving for our logistics contractors? We count 57 road fatalities in the area of Greater Manila every weekend.
\textsuperscript{17} This basic principle of civil law was despite the Latin language not developed in Roman times but in the Medieval ages and surfaced the first time in a publication by the pope Gregor IX (1167 – 1241): Liber Extra
reaches his home every day safe and sound. If this commitment is not kept then all other commitments – quality of products, timely paying suppliers, informing shareholders in a “true and fair” way, etc. - are not worth much either. Safety as a commitment therefore is rooted deeply in business ethics.

The fourth and final reason concerns a potential market impact, if and when customers associate a good safety record with a reliable company performance, especially with quality. This topic is somewhat special and will conclude the case studies presented in chapter 4.

1.3 The gap in theory

Safety literature today unanimously states that human behavior is the root cause of incidents: “In a majority of cases – from 80% to 95% - accidents are caused by unsafe behavior”\(^{18}\) or “Research by DuPont and others suggest that 80 to 90 percent of today’s incidents are a result of unsafe acts rather than unsafe conditions”\(^{19}\). What “behavior” means, however, has fundamentally changed over time. Early last century unsafe behavior meant not following orders: “Under the chain-of-command principle, people caused accidents when they failed to carry out an order. This belief was reinforced by industrial accident records ‘proving’ that more than 90% of the time the employee was at fault”\(^{20}\). This amounted to a “blame the victim” attitude, sometimes coupled with a “blame the system” attitude, system standing for social, technological and organizational causes\(^{21}\).

Management cared about machines, not about people: “If we were to get a new machine in a plant and were uncertain about it, we shouldn’t think of putting it in the line and running it without finding out a lot about it . . . For some reason, with a new human, about whom we may in fact be equally uncertain, we don’t worry about the characteristics, abilities, skills, and potentialities. We assign him more or less at random, and if he does not work, we get another.”\(^{22}\) Bird writes: “The question was, ‘What was wrong with the people that caused them to injure themselves’?”\(^{23}\). The issue with this line of thinking was that it did not work, i.e. did not give any practical tools to act: “A key prediction of their theory was that certain people were accident-prone, but nobody could identify a personality type that fit the

\(^{18}\) Krause: The behavior-based safety process, p 12

\(^{19}\) McSween: The Values-based Safety Process, p 2

\(^{20}\) Bird: Practical Loss Control Leadership, p vii

\(^{21}\) See Lingard: Occupational Health and Safety in Construction

\(^{22}\) Haire: Psychology, p 3

\(^{23}\) Bird: Practical Loss Control Leadership, p viii
accident-prone definition”24. A first move away from this singular focus on unsafe acts as violation of an order took place when Heinrich studied from the 1930ies onwards a large number of accident reports and attempted to model the causes of accidental injuries. His so-called “domino-theory” is still known by the safety community worldwide.

![Figure 1.1: Heinrich's Domino Theory of Accident Causation](image)

At first glance this theory seems to reinforce the notion of “blame the victim”. What was new, however, is that Heinrich brought the timeline into the focus, i.e. a sequence of events. Furthermore, he explained that the fault of the person could have been caused by ignorance or lack of communication by the management. Bird and Loftus incorporated this role of management into the domino effect26. Enhancing safety asks “how can this injury, and others like it, be prevented in the future?”27, i.e. to understand the relationship between an event and a resulting injury.

The next major development step is associated with the names of Haddon and Gibson28. They proposed that injury prevention should move away from the preoccupation with the unsafe behavior of people and focus first and foremost on the scientific cause for injury. Haddon wrote in 1963: “The second and more important group of injuries comprises all those in which the damage is caused by the delivery to the body of amounts of energy in excess of the corresponding local or whole body injury.

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24 Bird: Practical Loss Control Leadership p viii
25 Disaster Management Institute: The Domino Theory
26 Bird: Loss Control Management
27 Krause: Leading with Safety, p 11
28 For the history of this step see Guarnieri: Landmarks
threshold” and then repeated even more forcefully in 1964 that the root cause of an injury was a source of energy that came in contact with a recipient: “The etiologic basis is the various forms of energy exchange which must occur in excess of body injury threshold[ . . . . ] The forms of energy involved in producing so-called ‘accidental injuries’ of all types, and without which they cannot occur, include thermal energy, ionizing radiation, mechanical energy, electrical energy, and chemical energy, each in a variety of forms.” Haddon was very critical of the term “accident”. For him “accident” represented an interpretation of “accidental” and he found it unacceptable to associate injuries with something that cannot be controlled. He thought the notion of an accident to be descriptive, not etiological: “Most of the behavioral science literature is highly inbred and concerned almost exclusively with studies and programs centering on the descriptive notion of ‘accident’”. When mentioning the literature he made one exception and praised an article by Gibson. Haddon himself went on to become the first Administrator of the National Highway Safety Bureau of the United States, having been nominated to this post by President Lyndon B. Johnson. In an editorial in 1979 The Los Angeles Times credited him with the prevention of at least 50,000 fatalities since 1966.

At this point let us look at a first short case study to show that Haddon’s concerns are still valid today. Many managers tend to look at personal issues of an injured worker first when an incident has happened. The two safety courses for managers that serve as a basis for most of the case studies (see chapter 2.3) end with a sequence on incident investigation. The participants were given the real case in figure 1.2 to read. Then they (in groups of two) had to prepare the questions they would ask if the incident investigation was assigned to them. Having done this exercise more than 60 times the list of questions reads as follows:

- Did he have proper and clean safety shoes?
- Did he rush?
- Did he carry tools in his hand?
- Did he receive a phone call while stepping into the ladder?
- Did he drink the evening before?
- Was somebody else in the room distracting him?

29 Haddon: A Note
30 Haddon: The changing approach
31 Dictionary.com: happening by chance, not planned; unexpected
32 Haddon: The changing approach
33 Gibson: The contribution of experimental psychology
34 Los Angeles Times, August 3, 1979
35 Text and photographs are a copy from the official Oerlikon Safety Alert
- Did he have health problems – physically or mentally?
- Did he have personal problems?
- Was he tired?

An Accident occurred at Solar

A person was injured . . .

On Wednesday, February 22, at approximately 0620 am an employee of Oerlikon Solar Ltd had to check in the Trübbach plant an alarm device which is located on a maintenance platform one level above the ground floor. While descending a ladder to go back to the ground floor he fell down from about three meters height and suffered injuries causing a transfer to a hospital. A subsequent inspection of the ladder (see photographs) found it to be in safe working condition.

Figure 1.2 Description of a real incident

All groups without exception asked those questions. It stands to reason that most people reading the case would ask them as well. But are those questions not insinuating that the worker had personal deficiencies (health problems) or broke rules (not proper safety shoes)? Even today the temptation to blame the victim at least partially seems just one step away. Since the case is a real one the answer to the mentioned questions can be given: it is a clear “No” to all of them. When questioned what had happened the worker said: “I had just begun to go down on the ladder. The next thing I knew is that I was lying on the floor and it hurt”. Using Haddon’s scientific approach, the answer to the question “why did he fall down” would be “because he was up”. This non-personal, no-guilt answer then can lead to a safer solution, independent from the person having been harmed.

With a clear definition of what caused injuries the way was open to go back to behaviors, this time however based on analysis what safe behavior had to be in regard to the view of the energy sources that could harm a person. Additionally, rules could be and were developed to describe the conditions necessary to limit probability and impact of a conjunction of energy sources with human beings. These rules were mostly developed by Governments or
– as in the case of Germany – semi-governmental organizations\textsuperscript{36}. On the behavioral side the focus moved away from teaching and imposing safe behavior steps to asking what management could do to influence employees to actually work according to safe behavior rules. An important author in this context is Thomas Krause. 1990 he showed how findings from the works of the Harvard psychologist B. F. Skinner, especially touching on the role of consequences and the influence of reinforcers\textsuperscript{37}, could help management. His work as well as similar publications in journals do not show which components of behavioral safety programs make an impact and why. Ray, Bishop and Wang concluded in 1995 “most of these programs consisted of a number of components, e.g. safety training, safety performance feedback, goal setting, incentives to performance safety . . . consolidated into a single treatment. . . . it is not clear which components of the safety programs contributed most to the improvement.”\textsuperscript{38} From their study they concluded that safety training alone is not enough, that feedback of safety performance can improve and that goal setting can enhance – a careful wording that does not yet reach a stage where recommendation for managers could be worded. Ten years later DeJoy looked again at behavior-based programs and wrote: “For example, a behavior-based program may show that the application of positive reinforcements increases the use of protective eyewear at a construction site. However, when this reinforcement is no longer provided, the usage of this protective equipment should gradually return to baseline level”\textsuperscript{39} His proposals, however, stay at a rather high level: “... two tasks are critical. The first task is to configure a comprehensive process by which safety-related problems can be identified, remedied and monitored . . . “\textsuperscript{40} In conclusion he states “there have been relatively few attempts to create taxonomies of critical supervisory and management behaviors specific to safety”\textsuperscript{41}. The many theoretical gaps to be filled are well summed up by Wirth and Sigurdsson in 2008 who proposed several areas for research: Surveillance and reviews, best-practice research, risk analysis, goal setting, training and prompting, observation and management, performance feedback, rewards and celebrations\textsuperscript{42}.

\textsuperscript{36} This refers to the German “Berufsgenossenschaften”. For an insight into their early development see Moses: Foreign Workers
\textsuperscript{37} Krause: The Behavior-based Safety Process
\textsuperscript{38} Ray, Bishop, Wang: Efficacy of the components
\textsuperscript{39} DeJoy: Behavior change versus culture change, p 107
\textsuperscript{40} DeJoy: Behavior change versus culture change, p 118
\textsuperscript{41} DeJoy: Behavior change versus culture change, p 121
\textsuperscript{42} Wirth and Sigurdsson; When workplace safety
In summary the literature states that injuries are the result of incidents where an above-threshold amount of energy from a technical source hit a human body, that controlling the technical sources and developing behavior rules to minimize probability and impact from incidents are a management task as well as teaching those rules and having them accepted. The current safety literature reveals at the same time several gaps, associated with wide practice variations and with uncertainties about intervention practices. Wirth and Sigurdsson concluded that addressing even a part of those topics would bring knowledge to managers that could significantly improve worker safety. Research should help to answer a manager’s question: “What should I do for safety Monday morning at seven?”

1.4 The gap in practice

From 2012 to 2015 more than 450 senior and middle managers were asked at the beginning of a one or two-day Safety Leadership Course (see chapter 2.3) why incidents happen. Right after having looked at the safety results of the past 12 months the participants were asked two questions:
- Do you know anybody who comes to work in the morning with the intention of hurting himself/herself?
- Did any of those injured persons not have any relevant safety training?

Regarding the first question only twice somebody mentioned knowing a person who at least did not care if he was hurt. Obviously everybody wants to go home safely in the evening or at the end of the shift. The answer to the second question was nuanced. The managers stated that generally speaking nobody had been allowed to work on their sites without prior safety training. Whether that training had been the right one, whether each person had fully understood and was still doing the task for which he had been trained they were not able to judge.
Conclusion: nobody wants to get hurt and everybody had some form of safety training. As a next step the managers (group work in groups of two) had to find five reasons why incidents happened although nobody wanted to get hurt. Photographs, one of them shown in figure 1.3, documented 24 of those sessions
The combination of those 24 records is presented in table 1.2. Each reason given was labeled whether this reason was tied to the individual working, to management of the site or to equipment.

<table>
<thead>
<tr>
<th>Reason mentioned</th>
<th># of sessions</th>
<th>Ind</th>
<th>Mgmt</th>
<th>Eq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distraction</td>
<td>24</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Fatigue</td>
<td>24</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lack of <strong>proper</strong> training</td>
<td>24</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carelessness</td>
<td>23</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rush</td>
<td>23</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Not following procedure</td>
<td>23</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of improper tools</td>
<td>23</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Use of improper PPE</td>
<td>23</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taking shortcuts</td>
<td>21</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Routine</td>
<td>21</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lack of hazard identification</td>
<td>20</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Nuisance factor</td>
<td>18</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not paying attention</td>
<td>18</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complacency</td>
<td>18</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>“Mr. Know All”</td>
<td>18</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment failure</td>
<td>17</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Conditions (Narrow, lack of signs)</td>
<td>17</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lack of preventive actions</td>
<td>16</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lack of Change Management</td>
<td>15</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Habit</td>
<td>14</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Table 1.2: Reasons for incidents as seen by managers

<table>
<thead>
<tr>
<th>Reason mentioned</th>
<th># of sessions</th>
<th>Ind</th>
<th>Mgmt</th>
<th>Eq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overconfidence</td>
<td>14</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>13</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignorance</td>
<td>12</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lack of order and cleanliness (5S)(^{43})</td>
<td>12</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Reckless acts</td>
<td>8</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Lack of communication</td>
<td>8</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Unnoticed special conditions</td>
<td>7</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Third party interference</td>
<td>6</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Lack of hazard controls</td>
<td>5</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Laziness</td>
<td>3</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Only two reasons given were linked to equipment, which is realistic since behind the equipment there are always human beings as shown in figure 1.4.

Figure 1.4: The equipment is a result of people activity

What the managers said is that incidents occur because people are humans, i.e. show human behavior. Incident prevention therefore must be directed at human behavior, first at the behavior of the persons at risk, second at the manager’s behavior whose acts and decisions set the conditions for more or less hazards and influences the behavior of the persons at risk. The exercise showed a need to search for specific management behaviors

\(^{43}\) 5S refers to a workplace organization method that uses a list of five Japanese words: seiri, seiton, seiso, seiketsu, and shitsuke and is part of OC Oerlikons Operational Excellence drive. See Hirano: 5 Pillars
related to the different mentioned reasons for incidents: what could be effective in the case of distraction or carelessness or routine, just to pick three of the mentioned reasons.
2. RESEARCH APPROACH

2.1 Research question

Incidents at work harming people are still a big challenge for companies whose interest is to live up to business ethics, to save cost, to be legally compliant and to create opportunities. For many years researchers and practitioners have concentrated their efforts on the behavior of the people at risk. Less attention has been given to daily management behavior influencing employee behavior. This leads to the research question for this thesis:

What kind of daily management behavior is needed to improve safety at work?

Through an analysis of levers influencing and shaping the behavior of people recommendations can be distilled advising managers regarding their behavior when they go through the PDCA cycle.

![PDCA cycle diagram](image)

Figure 2.1: The PDCA cycle

As a corollary future research areas can be specified to find an ever better road map for the journey to “Zero Harm to People”.

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44 PDCA (plan–do–check–act or plan–do–check–adjust) is an iterative four-step management method used in business for the control and continuous improvement of processes and products. It is also known as the Deming cycle. See Moen: Foundation
45 “Zero Harm to People” is the safety vision of both the Holcim Group and the Oerlikon Group.
2.2 Research approach

The approach was based on the one used by Montagne\textsuperscript{46} and is shown in figure 2.2. The numbers refer to the sections of the thesis.

![Research approach diagram]

Figure 2.2 : Research approach

Essential to this approach were the selection of a model to be tested, to what degree it could help to answer the research question, and the focus on case studies to do the test. The case studies were done as
a) surveys: questions were put to a group of people to be reflected on either individually or in small subgroups; answers were then collected on a flip-chart.
b) interviews: structured questionnaires on a one-on-one basis
c) observations: passive note-taking of the results of a human act (example: having put up a sign “audio protection necessary”)
d) workshops with some initial questions, followed by an interactive discussion.

\textsuperscript{46} Montagne: Management von Risiken
2.3 Research frame

The managers and employees involved in the case studies came from the subsidiaries of the Holcim Group for the years 2007 to 2011 and from the segments, business units and sites of the OC Oerlikon Group for the years 2012 to 2015, the only exception being a class of bachelor students of the Duale Hochschule Baden-Württemberg in Schwenningen-Villingen. Holcim as well as Oerlikon had mandated all top and senior managers to participate in a one-day Visual Safety Leadership (VSL) course; Oerlikon extended this obligation to middle managers who participated either in a one-day Safety Leadership Course (SLC) or a two-day Safety Leadership Seminar (SLS). These different training sessions took place at the locations of the subsidiaries all over the world and presented a unique opportunity for surveys and interviews, built into the training sessions, which were all run by myself in my function of Senior Vice President for Occupational Health & Safety at Holcim 2007 to 2011 and as Head of Health, Safety and Environment for OC Oerlikon 2012 to 2015. All additional interviews and observations as well as one workshop were held in production facilities of Holcim or OC Oerlikon. The result was a substantial empirical input: more than 800 managers and employees gave feedback to one or more questions and more than 300 observations were recorded. The details are given in table 2.1

<table>
<thead>
<tr>
<th>Type of study</th>
<th># of specific topics</th>
<th># of groups</th>
<th># of total participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surveys</td>
<td>6</td>
<td>From 1 to 60</td>
<td>~ 740</td>
</tr>
<tr>
<td>Interviews</td>
<td>5</td>
<td>From 3 to 54</td>
<td>~ 100 (without overlap with surveys)</td>
</tr>
<tr>
<td>Workshops</td>
<td>1</td>
<td>4</td>
<td>45</td>
</tr>
<tr>
<td>Observations</td>
<td>7</td>
<td>NA</td>
<td>351</td>
</tr>
</tbody>
</table>

Table 2.1: Empirical input
2.4 Two remarks on terminology

The research question “what kind of daily management behavior is needed to improve safety at work?” uses the term “daily management behavior”. The literature on behavioral-based safety uses predominantly the term leadership. This is not contradictory. Krause wrote “site level safety improvement elements are managed, but organizational culture and safety climate are led”47; as this research deals with daily issues at site level, the term management is applicable. Furthermore, superiors need to be both leaders and managers, as Mintzberg wrote: “Let's stop the dysfunctional separation of leadership from management. We all know that managers who don’t lead are boring, dispiriting. Well, leader who don’t manage are distant, disconnected.”48 Consequently throughout the text the terms “manager” and “management” will be used, knowing that they have to possess at the same time “constructive transactional” as well as “transformational” capabilities, the second one usually associated with leadership.

Secondly: following Haddon the term “incident” will be used except when the quoted text contains the term “accident”.

47 Krause: Leading with Safety p. 18
48 Mintzberg: Enough Leadership
3. RESEARCH MODEL AND DEFINITIONS

3.1 The Manzoni model for behavioral change and its four steps extension

As stated in the introduction, current safety literature holds that controlling the technical sources of energy and developing behavior rules to minimize probability and impact from incidents are a management task; equally so management must teach those rules and have them accepted. For this they need to know “what behaviors of theirs are necessary to convey to the organization that they are serious about change and to stimulate the right behaviors” 49. A very clear message that safety is first of all a management issue is given by the safety video “I chose to look the other way”50. The manager in the video says towards the end: “Now I speak up every time I see somebody putting his safety at risk, not to criticize, but to help”, the reason being that people are not robots and are apt to forget things (the first worker in the video says: “I must have forgot”).

A very useful model to analyze behavior change that eventually leads to a cultural change was developed by Jean-François Manzoni who integrated it in the courses he taught at the IMD business school in Lausanne / Switzerland. He showed at that time (2004) the model in the form reproduced in figure 3.1 but also used it in later publications51 after having

![Figure 3.1: The Manzoni model](image)

49 Krause: Leading with Safety, p 17
50 This video is on sale by the American Training Resources group for commercial use but also available on YouTube for personal viewing
51 Manzoni: Building and nurturing. Also published in: The folly
rejoined the INSEAD business school where he is currently teaching at the Singapore campus. The first important part of the model states that the culture of a company cannot be changed directly but is the result of changing the behavior of many employees, represented by the detail of his model shown in figure 3.2.

![Diagram](image)

**Figure 3.2: Employee behavior shapes culture**

With this approach Manzoni sides with the predominantly bottom-up approach of the behavior change oriented safety community as opposed to the culture change oriented one which is top-down according to DeJoy who wrote critically “Some have argued that safety culture has become essentially a catch all term for anything related to organizational and social-psychological factors”\(^{52}\). When a management of a company calls for a new and improved safety culture then the term “culture” appears to be well defined; people tell you “this is the way we do business around here” and ask you to observe the results. When however challenged with change, with reaching a new and improved culture, then all of a sudden the term “culture“ becomes less clear. It seems that to define approaches on how to change a culture is more difficult than observing and describing an existing culture working backwards on the few employees who have not yet bought into the “new way of doing business around here.” Culture is then represented by an attitude working on the behavior of individuals. A good case for this behavior – attitude – behavior sequence is the collection of glass bottles in Switzerland that have to be thrown into containers according to the color of the glass. First people had to change their behavior, namely to not dispose them any more through ordinary waste collection. 2011 71% of glass was recycled separated by color. Enough

\(^{52}\) DeJoy: Behavior change versus culture change, p 115
people in Switzerland have shown the new behavior long enough that it has become an attitude which leads people to make remarks when they see somebody not properly disposing glass according to color in the right container: the attitude works backwards. The second important part of the model is the introduction of the six levers with which to influence behaviors of employees. As this model was developed with general employee behavior in mind the model has to be adapted to each specific use, in this case to safety at work, which will be done in section 4.1.

In order to fully understand the influence of the six levers on the behavior of others it is important to be aware of what it takes to change one’s own behavior. To see what barriers stop people from changing their behavior the Manzoni model is complemented by a second one, called “Four steps to achieve behavior change”, shown in figure 3.3.

Figure 3.3: Four steps to achieve behavior change

This four-steps-model is an own development, based on a suggestion in 1987 by a local Mexican project manager, Lucas Sanchez, and rooted in a quote from Friedmann Schulz von Thun who had adapted a quote from the behavior-oriented scientist Konrad Lorenz in the following way:

„gedacht“ ist nicht gesagt...
„gesagt“ ist nicht gehört...
„gehört“ ist nicht verstanden...
„verstanden“ ist nicht gewollt...
„gewollt“ ist nicht gekonnt...
„gekonnt und gewollt“ ist nicht getan...
In English this reads as: “Thought is not said, said is not heard, heard is not understood, understood is not wanted, wanted is not being able, being able does not mean done and done is not yet sustainable.”

This model can be used in two ways, to ask what an individual needs to go through to achieve behavior change and to ask what management behaviors will help an employee to go through each of the four steps.

### 3.2 Application and critical test of the model

#### 3.2.1 The importance of the levers as seen by managers

The managers participating in the Safety Leadership Courses were asked to indicate the relative importance of each of the six levers with respect to its potential to influence the safe behavior of employees. Having given their opinion, they were subsequently asked to estimate how much time they spent on topics directly related to safety of employees. Some of the managers were individually interviewed at the end of the training regarding the time they had spent on safety matters. The results will be presented in chapter 4.1.

#### 3.2.2 Barriers to completing the four steps

Even when the six levers are applied, individuals might be kept from changing their behavior. The four-step-model is an opportunity to learn about the barriers stopping individuals by looking at each step twice. First short cases are used to find the difficulties an individual faces when attempting to go through each step. In a second round the question is asked what managers can and should do to support their employees achieving success with each step. The results are presented in chapter 4.2.

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54 Own translation
3.2.3 Managing Safety with Numbers

The research question aims at advising managers on their behavior when they go through the PDCA cycle. When a visitor walks today through plants of the OC Oerlikon Group he will see PDCA boards everywhere displaying numbers which represent performance indicators. Peter Drucker wrote in 1954: “Here, then, is the first task of a discipline of business enterprise: to develop clear concepts and usable measurements to set objectives and to measure performance…”55. Peters and Waterman wrote “We sneak by the performance indicator board to find out how we are doing. We respond – more than we likely know or realize – to comparative performance information”56 Managers use numbers to make things happen, following Drucker who wrote “For the measurement used determines what one pays attention to. It makes things visible and tangible. The things included in the measurement become relevant; the things omitted are out of sight and out of mind57. This statement “If you can’t measure it, you cannot manage it” has made it into the “clicks-age” unchanged58 – hence the extensive reporting schemes in any company or corporation. The American Statistician W. Edwards Deming said: "In God we trust, all others must bring data.”59

When applying measuring to Occupational Safety it is important to take into consideration a statement by the American investor Warren Buffet who “found it ‘extraordinary' that academics studied such things. They studied what was measurable, rather than what was meaningful. 'As a friend [Charlie Munger] said, to a man with a hammer, everything looks like a nail.” 60. What could be measurable and at the same time meaningful will be explored in chapter 4.3

3.2.4 Reward, Recognition and Consequence Management

Once measurements are agreed upon, managers can start to influence the safety behavior of their people, i.e. to manage performance. Usually Performance Management is defined in broad terms, such as:

55 Peter F. Drucker: Business Objectives
56 Peters and Waterman: In Search of Excellence, p 268
57 Drucker: The Role of Management, p 61
58 Simon, Phoebe: You Can’t Manage
59 Quoted from Hahn: The Evolution of Six Sigma
60 Roger Lowenstein: Buffett: The Making of an American Capitalist
“a process which contributes to the effective management of individuals and teams in order to achieve high levels of organizational performance. As such, it establishes shared understanding about what is to be achieved and an approach to leading and developing people which will ensure that it is achieved”\textsuperscript{61}.

For the use of the Manzoni model, however, the lever called Performance Management was defined in a much narrower way: Performance Management is the way the company uses the positive incentives of Reward and Recognition and the negative incentive of Consequence Management to foster safe behavior of people at work. Guided by quite a number of authors who stated that commitment of employees is based on reward and recognition\textsuperscript{62} the working hypothesis was that Reward and Recognition work better than Consequence Management. As the Holcim subsidiary in Indonesia had a well-structured reward and recognition program in existence for some years a number of structured interviews were conducted in one of their plants in October 2011 to test the said hypothesis. The results are presented in chapter 4.4.

3.2.5 Creating a new culture through behavior change

The Manzoni model states that a new culture has replaced the old one when enough employees for long enough show the changed behavior. If management is more visible and if performance management is well applied is there a noticeable change? The Mexican subsidiary of Holcim, Holcim Apasco, had worked extensively with the consulting company BST, based in California, which was founded by Thomas Krause (see literature list) in 1979. This project focused on visible management behavior. On November 2011 a number of interviews were conducted with workers and some managers to find out whether workers perceived changes and why. The results are presented in chapter 4.5.

3.2.6 Sustainability

“For long enough” in the Manzoni model touches on sustainability. What can be done to evade the slow degrading of safety over time if and when the numbers as well as the practical experience of the workers show that safety has much improved? One method to keep the attention up is the daily Safety Moment. Chapter 4.6 explains the Safety Moment and the resulting

\textsuperscript{61} Armstrong: Performance Management
\textsuperscript{62} Andrew: The impact of perceived leadership. For a good overview see Danish: Impact of Reward and Recognition
needs to enhance the didactic skills of First Line Managers to deliver such Safety Moments.

3.3 Extension of the case studies

3.3.1 Contractor Safety Management

All the analysis so far concentrated on safety for employees. Much more at risk however are the employees of contractors. Contractor Safety Management stays a headache. As Lingard\textsuperscript{63} explains, contractor worker suffer more than twice the number of accidents. The cement companies associated with the World Business Council for Sustainable Development published similar results\textsuperscript{64}. Chapter 4.7 analyzes the root causes for this higher risk level and shows a case study on how to handle this challenge.

3.3.2 Creating opportunities

The final case study is included as an outcome of a doctoral seminar with Jonathan Doh\textsuperscript{65} in May 2012. One of the assignments was to draft an article on legitimacy and spillovers in the context of Foreign Direct Investments. Holcim Colombia had experienced a practical case where safety contributed to create positive spillovers, thereby enhancing legitimacy which created additional market share. Jonathan Doh gave feedback on the first draft and encouraged an inclusion in the thesis. It is found as chapter 4.8.

3.4 Some Definitions and Concepts

When a safety vision reads “Zero Harm to People” then it is necessary to define what “Harm” and what “People” means. Therefore, the notion of harm according to the Bird pyramid (a) and the definition of people (b) in accordance with the Cement Sustainability Initiative is introduced at this point. The third definition describes the most basic process in safety, namely HIRA including the Hierarchy of Control (c), finalizing with the Bradley curve as a tool to judge sustainability (d).

\textsuperscript{63} Lingard: Occupational Health and Safety in Construction Project Management

\textsuperscript{64} CSI: Recommended Good Practice

\textsuperscript{65} Jonathan Doh, Professor in Management & Operations, Herbert G. Rammrath Endowed Chair in International Business, Director of the Center for Global Leadership, Villanova School of Business
a) Harm according to the Bird Pyramid

This pyramid – mostly presented as a triangle – is named after Frank E. Bird Jr. who undertook in 1969 a study of industrial incidents in his function as Director of Engineering Services for the Insurance Company of North America (INA) to determine the ratios of various types of incidents that occur throughout business and industry. He conducted an analysis of 1753498 incidents reported to the INA by 297 cooperating companies. These companies represented 21 different industrial groups, employing 1750000 employees who worked over 3 billion hours during the exposure period analyzed. Figure 3.4 shows this “pyramid” in a slightly adapted way. The red numbers are the ones from Bird’s study; the black ones from a study conducted by ConocoPhilipps Marine in 2003.

Figure 3.4: The Bird Pyramid
(LTI: Lost Time Incident; MTI: Medical Treatment Incident)

Heinrich had found in an earlier study similar relationship.

The safety triangle shows a definition of harm according to severity and the existence of a large number of unsafe situations (acts and conditions) in relation to incidents injuring people and states that reducing minor injuries (the large number at the bottom) leads to a proportionate reduction in

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66 Frank E. Bird: Practical Loss Control Leadership, p 4
68 see Heinrich, Industrial Accident Prevention, p 24
severe injuries and deaths (the small number at the top). Mainly Thomas Krause however criticizes this statement:

“However, statistics over the past 10 years have shown that minor injuries have steadily declined while the number of serious injuries and deaths has not changed. ’The assumption that you could reduce injuries at the bottom and see at the same time reductions all the way up to the top is flawed and turns out not to be the case,’ Krause says. . ’” The assumption, he adds, was based on two mistaken notions: that all mishaps, whether minor or serious, have similar causes and that all lost-time injuries have the same potential to be serious. In fact, similar injuries may have completely different causes, and accidents differ greatly in their potential to be serious, Krause says. For example, a person falling off a railcar may end up bruised. It’s a minor injury, but the potential for a fatality is very high. Another person, on the other hand, may get a bruise by bumping into someone in the hallway.”

In the context of this thesis the Bird pyramid is used first as a means to distinguish between incidents that cause harm – fatalities, Lost Time Incidents, Medical Treatment Incidents, First Aid Cases – and incidents which cause no harm, i.e. Near Misses and Unsafe Behavior. The Unsafe Conditions are added to this group, not because they represent a potential for an incident but because they are the result of an unsafe management act, namely creating unsafe conditions or not eliminating them. Secondly the Bird pyramid tells us that harm in general is the result of a large number of unsafe behavior and unsafe conditions even though there is no scientific formula linking the numbers.

b) Definition of People

For the definition of “People” the definition by the Cement Sustainability Initiative is used.

“Directly employed
Own employees, including full-time, part-time and temporary employees (temporary employees should also include individuals hired on a daily or hourly basis), with part-time and temporary employees reported as full-time equivalents. These include employees in all companies where there is safety management control and companies where there are management/technical agreements.

70 Cement Sustainability Initiative: Safety in the Cement Industry
**Indirectly employed:** Contractors/subcontractors
Contractors and sub-contractors (sub-contractors are defined as contractors of contractors), also reported as full-time equivalents. This includes all individuals, employees of firms or corporations contracting for performance of specified work, either on a short-term (for a specific job) or long-term basis (such as drivers or maintenance crews). Where the company is responsible for the collection or delivery of goods and contracts a transport company to do this, the involved drivers of these trucks are deemed to be contractors/subcontractors.

**Third party**
Any person not categorized as directly employed or as contractor/subcontractor. Third parties typically include, but not limited to:
- Customers and visitors to company locations (whether specifically invited or not);
- Drivers or passengers or other road users involved in off-site accidents with company or contracted vehicles, but only if there is company or employee (direct employed or contractors/subcontractors) culpability
- Workers at someone else’s premises, for example construction sites, involved in accidents but only if there is company or employee (direct employed or contractors/subcontractors) culpability. Where transport is carried out as an independent service (for example by a courier) for goods such as parcels or spare parts for equipment, the related drivers may be regarded as third parties.

**c) The HIRA process**

The HIRA process is the most basic process to stay safe at anything we do. It consists of three steps as shown in figure 3.5. Before executing any kind of activity a person should (mentally or on paper) compile a list of the hazards that could harm him when executing. Following Haddon a hazard is defined as a technical condition that could harm a person when that person gets into a contact with the technical condition. Sometimes a full list is required, mainly when the activity is new or not very familiar; sometimes it is enough to ask whether anything has changed since the last execution. The second one is the most common and also the one where HIRA is executed the least - probably because we do not expect conditions to change. Let us look at a practical example of a plant in the Southern US where the office building has a floor made of polished stone and where some years back it had not rained for six weeks. One night towards the end of June there came a thunderstorm, coupled with heavy rain. One female office employee who came in the morning slipped in the entrance hall due to the combination of the leather soles of her elegant shoes - not being
required to use safety shoes in the office - and water on the polished stone floor. As she broke her wrist the result was an LTI. Quite obviously the hazard she had not considered was the water making the floor slippery.

![HIRA: Hazard Identification and Risk Assessment](image)

**Step I: Identify Hazards**
- List of Hazards

**Step II: Assess Risk**
- High Impact
- Low Impact
- Low Probability
- High Probability

**Step III: Design and decide on mitigating actions**

Figure 3.5: The HIRA Process

In a second step the identified hazards must be classified, asking first how probable it is that an incident occurs due to this hazard, harming the person involved, and then secondly evaluating how severe the harm could be. Minimally the rule should be that nobody is allowed to execute the planned activity if and when at least one hazard is perceived to be in the high/high quadrant.

The third and final step is the designation of mitigating actions, making decisions on them and implementing them. Mitigating actions should be designed using the Hierarchy of Control triangle shown in figure 3.6. The analytic thinking should always start at the top with the question about elimination even though in a work environment it is seldom possible to renounce completely the originally desired result. The practical exercises run during the VSL and SLC trainings showed however that most groups were inclined to start at the bottom, first thinking about Personal Protective Equipment (PPE), although this reduces only the impact, not the probability, and then recommend Safe Working Procedures (Administrative).
The levels in this hierarchy are defined as follows:

- **Eliminate** (Is the result needed? Is the activity/process necessary?)
- **Substitute** (Is there a less hazardous activity/process to reach the same result?)
- **Re-Engineer** (Can the hazard be engineered out of the activity/process?)
- **Isolate** (Can the personnel be separated from the hazard?)
- **Administrative** (Can a step by step procedure be developed to control the hazard?)
- **PPE** (Will using appropriate PPE reduce the severity of an injury?)

Lingard mentions “it is recognized that it is better to ‘engineer’ risks out of a system than to try to protect workers from exposure to these risks.”

**d) The Bradley Curve**

DuPont Sustainable Solutions, a DuPont consulting company developed and used this curve since 1995 to understand the development of an effective safety culture, from its earliest stages to a mature state. The following description is taken from their website.

---

71 Lingard: Health and Safety, p 32
72 DuPont.com/bradley-curve.html
In a mature safety culture, safety is truly sustainable, with injury rates approaching zero. People feel empowered to take action as needed to work safely. They support and challenge each other. Decisions are made at the appropriate level and people live by those decisions. The organization, as a whole, realizes significant business benefits in higher quality, greater productivity, and increased profits.

**Understanding the Bradley Curve**

The Bradley Curve makes it simple for everyone to understand the shifts in mind-set and actions that need to occur over time to develop a mature safety culture.

**Reactive Stage**
People do not take responsibility. They believe that safety is more a matter of luck than management, and that “accidents will happen.” And over time, they do.

**Dependent Stage**
People see safety as a matter of following rules that someone else makes. Accident rates decrease and management believes that safety could be managed “if only people would follow the rules.”
Independent Stage
Individuals take responsibility for themselves. People believe that safety is personal, and that they can make a difference with their own actions. This reduces accidents further.

Interdependent Stage
Teams of employees feel ownership for safety, and take responsibility for themselves and others. People do not accept low standards and risk-taking. They actively converse with others to understand their point of view. They believe true improvement can only be achieved as a group, and that zero injuries is an attainable goal.

This tool helps to determine to what extent a company has progressed towards sustainability. Looking at the interdependent stage we can also see where sustainability might be impaired. This stage relies on teams, i.e. on at least two persons working together and observing each other. For economic reasons single workplaces are becoming more frequent. About this fact Haire wrote already in 1956: This change . . . destroyed the primary face-to-face group whose members depended on one another for both safety and production” 73. According to Krause74 peer pressure is one of the most powerful consequences at work; if somebody works alone, there will be no peers.

73 Haire: Psychology, p 29
74 Krause: The Behavior-based Safety Process, p 24
4. RESULTS FROM THE CASE STUDIES

4.1. Six levers to influence employee behavior

4.1.1 Setting the stage for managers

When working with managers on the issue of their daily behavior pattern and its influence on safety at work two issues have to be clarified from the start. The first one is “behavior change” versus “culture change” as already mentioned in section 3.1. The term “safety culture” is very much in the mind of managers; maybe as part of the use of “culture” as in quality culture, marketing culture, service oriented culture. For this reason the Manzoni model was introduced in all the management courses using the drawing in figure 4.1. The two eggs represent a company in transition. On the left side the company has a red culture because eight out of ten employees show a red behavior. In order for the company to change to a blue culture a clear majority of the employees have now to show a blue behavior which means that six of them have to change their behavior from red to blue.

![Figure 4.1: Going from a red to a blue culture](image)

The second issue was brought up by Krause in 1990 in his book “The Behavior-based Safety Process”. He postulated in this book that the factors in the equation

\[ \text{Safety at Work} = \text{Safe Behavior} + \text{Safe Conditions} \]

should not receive equal weight, behavior being far more important. This was not immediately evident given that many people were still influenced.

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75 Krause: The Behavior-Based Safety Process
by “Unsafe at any Speed”, a book by Ralph Nader that had appeared in 1965. The factor “safe conditions” still played a major part in all activities destined at improving the safety record of the Holcim Group in 2007. Holcim at that time had established a vision for Occupational Health & Safety OH&S (“Zero Harm to People”), had communicated a Policy with a strong focus on “Five Cardinal Rules” and started different workstreams, one of them being the implementation of a Holcim-specific Safety Management System. The Management System was very much rule-based and the Cardinal Rules even more so; as a result the behavior factor had become somewhat of a compliance issue. It was therefore important at the beginning of all the safety trainings for managers to separate behavior from conditions and to focus their attention on behavior.

4.1.2 Evaluation of the Manzoni model by managers

After setting the stage managers were introduced to the Manzoni model, for easiness of reading reproduced once more as figure 4.2

![Figure 4.2: The Manzoni model](image)

Those six levers do not all have the same importance. Depending on the topic involved – in this case safety at work - the relative importance has to be determined in order to use them effectively as well as efficiently. In all

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76 Initially I fell into the same trap, walking through plants with a camera to record mainly unsafe conditions until one day in November 2007 when my colleague in the Thai subsidiary, Mark Stirling, challenged me by saying “you do only hazard hunting and you forget humans and their behavior”.
the courses managers had to give their opinion regarding the relative impact of the six levers applied to safe behavior, coupled with an evaluation how good the company (or the part of the company visible to them) was in using those levers followed by estimation how much they actually were using the levers already. This was done by designing and running an exercise as follows:

Step 1: Defining the six levers in terms of safety:

• Technology: safe conditions
• Management behavior: visible actions by managers of all levels
• Procedures: Written instructions on how to work safely
• Structure: Elements such as location of safety in the organization chart, on the PDCA boards, in management letters and presentations
• Performance Management: KPI’s, reward and recognition, consequence management
• Skills: safety skills of the work force

Step 2: Asking the participants to rank the levers according to their relative importance. For this purpose, each participant had to distribute 15 points among the levers, more points meaning higher importance.

Step 3: Asking the participants to rank the current use of each lever in their organization on a scale of 1 to 5:

• 1: “very bad”; urgent need to start a program the following week
• 2: “Unsatisfactory”: need to start a program during the next three months
• 3: “Satisfactory”: go on with the existing programs as planned
• 4: “Good”: Use Continuous Improvement as a means for sustainability
• 5: “World Class”

During the year 2010 a total of 11 such courses were run with the management teams of 11 subsidiaries of the Holcim Group in South America, Spain and Asia. The countries were Chile, Philippines, India, Spain, Brazil, Vietnam, Bangla Desh, Malaysia, Thailand, Mauritius and Argentina and the number of participants per session varied from 5 to 14. The participants were given five minutes to rank the levers, followed by recording them on a flip chart. Then the participants had another five minutes to grade the use of the levers, which was also recorded in red color on the same flipchart. A typical result is shown in figure 4.3. The selection of the management teams and their countries were random as far as the
Manzoni Model exercise was concerned because the trainings were given according to the availability of the full management teams of the location.

The same type of exercise was integrated into the safety management trainings of OC Oerlikon in January 2012, extending it additionally to middle managers. From June 2012 until May 2014 another 34 such sessions were run, 13 of them with top/senior managers and 21 with middle managers with different management teams of the OC Oerlikon Group. In addition to these in-house trainings a lecture on Change Management, given to Bachelor students at the Duale Hochschule Baden Württemberg in Schwenningen-Villigen in May 2012 was used to get their opinion. The 21 participants followed a curriculum whereby they study for three months and then work the next three months in their company, to continue again with studies etc. These participants had naturally no
management but only practical work experience; an opportunity to inquire whether their view would differ. Their results are presented separately and not added to the total.

4.1.3 Results: Relative importance of the six levers

For each session the ranking points were added up and then the ranking established. If two levers got the same number of ranking points then they got the same rank, which meant that a sequence could be 1, 2, 3, 3, 5, 6. Then the ranks were added up for different groupings of the 45+1 exercises as presented in table 4.1.

<table>
<thead>
<tr>
<th>Total Rank Points</th>
<th>Overall Ranking</th>
<th>Holcim Rank Points</th>
<th>Holcim Ranking</th>
<th>OC Rank Points</th>
<th>OC Ranking</th>
<th>DHBW Rank Points</th>
<th>DHBW Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>168</td>
<td>4</td>
<td>55</td>
<td>6</td>
<td>113</td>
<td>2</td>
<td>39</td>
</tr>
<tr>
<td>Visible Mgmt</td>
<td>48</td>
<td>1</td>
<td>11</td>
<td>1</td>
<td>37</td>
<td>1</td>
<td>82</td>
</tr>
<tr>
<td>Process</td>
<td>154</td>
<td>3</td>
<td>39</td>
<td>3</td>
<td>115</td>
<td>3</td>
<td>49</td>
</tr>
<tr>
<td>Structure</td>
<td>214</td>
<td>6</td>
<td>50</td>
<td>5</td>
<td>164</td>
<td>6</td>
<td>44</td>
</tr>
<tr>
<td>Perf. Mgmt</td>
<td>187</td>
<td>5</td>
<td>40</td>
<td>4</td>
<td>147</td>
<td>5</td>
<td>52</td>
</tr>
<tr>
<td>Skills</td>
<td>146</td>
<td>2</td>
<td>25</td>
<td>2</td>
<td>121</td>
<td>4</td>
<td>49</td>
</tr>
</tbody>
</table>

Table 4.1: Ranking from 45 industrial exercises and 1 student exercise

All 11 Holcim exercises were conducted with managers who were considered top or senior managers. In the case of Oerlikon 13 exercises were run with top or senior managers, 21 with middle managers. Table 4.2 shows the perception of the two different Oerlikon management groups. The spread in the table 4.2 indicates the highest and the lowest ranking within the exercises.

<table>
<thead>
<tr>
<th>OC Rank Points</th>
<th>OC Ranking</th>
<th>Top/Senior Points</th>
<th>Top/Senior Ranking</th>
<th>Middle Mgr Points</th>
<th>Middle Mgr Rank</th>
<th>Spread Top/Senior</th>
<th>Spread Middle Mgr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>113</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>1</td>
<td>1-6</td>
<td>1-6</td>
</tr>
<tr>
<td>Visible Mgmt</td>
<td>37</td>
<td>1</td>
<td>14</td>
<td>1</td>
<td>23</td>
<td>1</td>
<td>1-2</td>
</tr>
<tr>
<td>Process</td>
<td>115</td>
<td>3</td>
<td>40</td>
<td>2</td>
<td>75</td>
<td>3</td>
<td>2-5</td>
</tr>
<tr>
<td>Structure</td>
<td>164</td>
<td>6</td>
<td>66</td>
<td>6</td>
<td>98</td>
<td>6</td>
<td>3-6</td>
</tr>
<tr>
<td>Perf. Mgmt</td>
<td>147</td>
<td>5</td>
<td>60</td>
<td>5</td>
<td>87</td>
<td>5</td>
<td>2-6</td>
</tr>
<tr>
<td>Skills</td>
<td>121</td>
<td>4</td>
<td>44</td>
<td>3</td>
<td>77</td>
<td>4</td>
<td>2-6</td>
</tr>
</tbody>
</table>

Table 4.2: 13 exercises with top/senior managers, 21 with middle managers
In a next analysis the results were split according to world regions to see whether there were perception differences depending on the region. For this purpose only 44 exercises were used as one had been held with the executive leadership team of OC Oerlikon, which could not be assigned to one particular region. The results are given in table 4.3.

<table>
<thead>
<tr>
<th>Total (44)</th>
<th>Europe (19)</th>
<th>Asia (18)</th>
<th>North America (4)</th>
<th>South America (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Visible Mgmt</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Process</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Structure</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Perf. Mgmt</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Skills</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 4.3: Perception according to world region

A last analysis was conducted to see whether there were differences between low and high technology. For this purpose two Oerlikon segments were compared that differ substantially with respect to technology. The results appear in table 4.4.

<table>
<thead>
<tr>
<th>All Oerlikon</th>
<th>High Tech</th>
<th>Low Tech</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Visible Mgmt</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Process</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Structure</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Perf. Mgmt</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Skills</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4.4: Perception according to technology

4.1.4 Results: Ranking of the use of the levers

For the surveys conducted with the Holcim top/senior management teams (11 surveys) only the average grading per lever and team were recorded but not the variety of grades within the teams. The results are presented in table 4.5.
<table>
<thead>
<tr>
<th>Lever</th>
<th>Average grade</th>
<th>Highest grade</th>
<th>Lowest grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>2.81</td>
<td>3.4</td>
<td>2.2</td>
</tr>
<tr>
<td>Mgmt behavior</td>
<td>3.01</td>
<td>3.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Processes</td>
<td>2.93</td>
<td>3.4</td>
<td>2.6</td>
</tr>
<tr>
<td>Structure</td>
<td>3.18</td>
<td>4.0</td>
<td>2.6</td>
</tr>
<tr>
<td>Perf. Mgmt.</td>
<td>2.81</td>
<td>3.6</td>
<td>2.3</td>
</tr>
<tr>
<td>Skills</td>
<td>2.76</td>
<td>3.3</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Table 4.5: Rating of the use of the levers by Holcim teams

From the grading it can be concluded that all teams considered their organizational unit to be advancing regarding the use of the levers but were aware that they had just achieved a somewhat “satisfactory” state, not yet a good one, the largest gap still open concerning “skills”, the number two lever in importance for Holcim managers. When looking at the individual sites that had participated, no pattern could be detected: technology got the highest and the lowest grade each from a small grinding station in a small country; actual management behavior was rated highest from one of the teams in India, maybe because its CEO at the time opened and closed each of his monthly letters to the employees with a paragraph on safety.

When recording the results of the 34 exercises with OC Oerlikon the amount of alignment was also noted in the form of the maximum difference between the lowest and the highest score per team. Table 4.6 gives the grading results; table 4.7 the view on the alignment.

<table>
<thead>
<tr>
<th>Lever</th>
<th>All groups</th>
<th>Top/Senior</th>
<th>Highest</th>
<th>Country</th>
<th>Lowest</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>3.14</td>
<td>3.15</td>
<td>3.8</td>
<td>Germany</td>
<td>2.3</td>
<td>China</td>
</tr>
<tr>
<td>Mgmt. Beh.</td>
<td>3.17</td>
<td>3.32</td>
<td>4.3</td>
<td>India</td>
<td>2.5</td>
<td>US, Germany, France</td>
</tr>
<tr>
<td>Process</td>
<td>3.0</td>
<td>2.97</td>
<td>3.7</td>
<td>Italy</td>
<td>2.1</td>
<td>India</td>
</tr>
<tr>
<td>Structure</td>
<td>2.77</td>
<td>2.83</td>
<td>3.8</td>
<td>Germany</td>
<td>2.2</td>
<td>Germany</td>
</tr>
<tr>
<td>Perf. Mgmt</td>
<td>2.68</td>
<td>2.59</td>
<td>3.4</td>
<td>Lichtenst.</td>
<td>1.9</td>
<td>France</td>
</tr>
<tr>
<td>Skills</td>
<td>2.82</td>
<td>2.92</td>
<td>3.4</td>
<td>Lichtenst.</td>
<td>2.3</td>
<td>France</td>
</tr>
</tbody>
</table>

Table 4.6: Grading results
The numbers in the table 4.7 state how many times the difference between the lowest and the highest ranking was x points.

<table>
<thead>
<tr>
<th>Difference highest/lowest grade</th>
<th>Technology</th>
<th>Mgmt Behavior</th>
<th>Process</th>
<th>Structure</th>
<th>Perf. Mgmt</th>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9</td>
<td>4</td>
<td>7</td>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>18</td>
<td>16</td>
<td>19</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>11</td>
<td>9</td>
<td>9</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4.7: Degree of alignment

When we consider a difference of more than two grades to indicate a lack of alignment, then a notable lack of alignment resulted from the surveys. Especially regarding performance management and skills more than 40% per group very much disagreed with other group members.

4.1.5 Interpretation

a) Visible management behavior is considered by far the most important lever
This rank was to be expected given the current literature\(^{77}\). Manzoni stated it as follows: “Human beings the world over have a strong propensity to conform to the wishes of credible and legitimate authority figures. In most national and corporate cultures, bosses are seen as such figures and must hence be very mindful of the signals they send – and fail to send.”\(^{78}\) In fact only 3 out of the 45 groups of participants digressed, all of them putting Technology in the first place instead\(^{79}\).

42 management groups agreed that visible management behavior was the most important lever to change employee behavior with regard to safety at work. Neither geography nor hierarchy nor technology made a difference. Given so much agreement the logical next question is to ask whether those managers are acting according to their ranking of the lever. In order to find out the management groups were given an additional assignment:

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\(^{77}\) See Krause: Leading with Safety

\(^{78}\) Manzoni, Building and nurturing

\(^{79}\) Those three groups manage in Singapore, India and Japan. In one case the participants can be considered senior (but not top) managers, in the others middle managers. From such a small sample conclusions cannot be drawn but maybe a further research question formulated: Could it be that the approach during many years of governments in Singapore and Japan to solve social problems via technology (such as video surveillance against littering or electronic dating sites to enhance birth rate) has influenced managers to first consider a technology based approach to behavior change? In all three cases the management teams participating were composed of nationals only.
“For the last full month please write down all the activities you did where the main content was related to safety at work. Estimate the time spent on those activities, the smallest unit being 0.5 hours. Then add up the total time for the month.” Figure 4.4 shows the average number of hours per work group together with the highest and the lowest value.

In each of the groups the highest value came from someone linked with production, the job titles being plant manager, head of manufacturing, technical manager or - when the group was composed of middle managers - head of production or head of maintenance. Assuming 200 work hours per month in a full month without holidays, which is realistic for managers, this meant that these managers were investing between 21% and 3.5% of their time on safety issues. Interestingly enough neither world region nor hierarchy resulted in a pattern.

When the highest number of hours is taken out of the calculation then averages from a high of 13.5 hours (only three values above 10 hours) to a low of 0.7 hours result. Most managers seemed to think that occupational safety was the nearly exclusive responsibility of their manufacturing-oriented colleagues. But each group had said that visible management behavior was the most important lever to achieve a safer behavior by the employees. What also held the managers back translating their perception about the lever into personal actions?

Figure 4.4: Hours spent on safety issues per month (45 exercises; H=Holcim; O=Oerlikon)
At the end of the first three such trainings (held in Chile, Philippines and India in 2010) a brainstorming session was conducted, asking the participants: Why do you not invest more time on safety? All of them (in total 27 managers) were asked to give their personal reasons with the exception of the person with the highest number of hours who was asked why his colleagues were not investing more time. Table 4.8 lists their answers, grouping them into six headings.

<table>
<thead>
<tr>
<th>Heading</th>
<th>Reasons given</th>
</tr>
</thead>
</table>
| Safety is not perceived as a management team topic | • In the management meeting this is the topic of manufacturing  
• It was really perceived as compliance issue that has nothing to do with marketing  
• Safety should not be a finance (=cost) topic |
| Reluctance to interfere                      | • Don’t cross organizational borders  
• I don’t want to interfere if not asked  
• People should stick to their areas of competence  
• We should not do all the things all the time |
| Work overload                                 | • I am challenged time-wise already |
| Lack of understanding of the work performed   | • I do not understand the work of a welder  
• I do not know what to look for  
• I do not know what to ask  
• I do not speak the local language  
• I do not want to look stupid |
| Inability to do a safety inspection          | • I am less qualified than most to take pictures of unsafe cables or the like |
| Fear of giving wrong guidance                | • I would not like to say something that later would lead to an incident because I did not understand the issue |

Table 4.8: Reasons for not investing more hours on safety  
(27 managers interviewed)

During later trainings one or two participants with the lowest number of hours mentioned were interviewed, showing them the six headlines and asking them to give their personal reasons for not investing more time. Altogether answers from 18 top/senior and 34 middle managers could be
collected and are presented in table 4.9. The frequency of their answers is the following:

<table>
<thead>
<tr>
<th>Reason</th>
<th>Top/senior Managers (18 interviews)</th>
<th>Middle Managers (34 interviews)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety is not perceived as a management team topic</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>Reluctance to interfere</td>
<td>17</td>
<td>30</td>
</tr>
<tr>
<td>Work overload</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Lack of understanding of the work performed</td>
<td>15</td>
<td>28</td>
</tr>
<tr>
<td>Inability to do safety inspections</td>
<td>16</td>
<td>25</td>
</tr>
<tr>
<td>Fear of giving the wrong guidance</td>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 4.9: Frequency of reasons for not investing more hours on safety

These results show that top/senior managers do not want to overstep the internal boundaries and if asked to do so are reluctant to go on the shop floor because of a lack of understanding of the work performed. Middle managers mention the same issues; they however were not always considering safety as a management team issue but rather as the issue of a specific management function.

The first conclusion from this exercise is that a CEO has to make it clear that safety is the responsibility of all members of a management team and those visible actions outside one’s own area are not considered overstepping authority but valuable contribution. The second conclusion is that managers must receive training in how to visibly promote safety, one possibility being the periodic “Safety Observation Tour” SOT.\(^8^0\)

b) Relative importance of the other five levers

α) Skills

The perception that skills and as a consequence the training of skills can change behavior was to be expected. The difference between the Holcim cement world and the OC Oerlikon world is also understandable since in cement most hazards outside the quarry operations are linked to maintenance activities that are more difficult to standardize and subsequently to regulate by safe working procedures, requiring more

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\(^8^0\) A Safety Observation Tour focuses on observing people and their behavior during work and then speaking to them about safe behavior. This is different from a Safety Inspection which focuses on technical conditions.
individual skills to keep safe. Work within the OC facilities on the other hand is very much standardized and subject to safe working procedures. Teaching skills alone, however, do not sustainably change behavior as discussed below in chapter 4.2

β) Processes
This lever obtained the same ranking across the board which might be seen as a consequence of many years of compliance thinking in safety. Compliance can only be requested if and when there are rules to be compliant with. In the Western world the terms “rules” and “compliance” have a somewhat negative touch but a case study presented later in chapter 4.4 will show that the interviewed workers stressed very much the need for understandable and uniformly enforced rules. Discussions during the trainings – based on incidents that had happened - showed also the limitations of Processes as an effective lever. The first limitation comes from routine. If a worker has to repeat the same activity over and over again then his awareness of hazards can go into hibernation. A typical example of this situation is a worker in a plant in Turin, Italy. He picks up a gear part of slightly less than eight kilograms, turns ninety degrees to the right, lowers the part into the machining equipment and closes the door. Some minutes later he opens the door, picks up the piece, turns a further ninety degrees to his right and lowers it into the outbox. The calculation showed that he lowers such a piece close to 40000 times a year. Can we really expect from him to be aware of the risk of putting a finger beneath the piece he lowers down every time? The second limitation mentioned were small changes done to a process to increase efficiency. Most of the time such small changes are not subjected to HIRA (Hazard Identification and Risk Assessment) in a systematic way, especially when small changes were applied to assembly procedures.

γ ) Technology
Technology is the area of major difference between the two global Groups. In order to explain this difference one has to remember that the participants were asked to rank technology as a lever to change behavior of employees and not as a means of protecting employees (e.g. building a physical barrier between the hazard and the worker). The cement industry has not seen many technological changes during the working years of the managers participating in the course. Oerlikon on the other hand is a Group where technology is very much in the center of attention and where changes to production technology have considerably impacted the look and feel of production facilities, a good example being the replacement of older metal cutting machines by newer robot machining centers.
An interesting side observation turned up in some of the courses given in Europe where technology was ranked 3rd. A total of 12 out of 205 managers who participated in those 19 courses challenged the notion that new and improved technology would help to shift employee behavior towards a safer one. Their argument was that safer equipment would actually lower the sense of personal responsibility and therefore might even raise the number of incidents. One participant (not an engineer) explained it this way: “the cars have become much safer since I left university 30 years ago. This has certainly contributed to much more reckless driving and speeding excesses”. Indirectly the 12 managers challenged with their remark the hypothesis that people can show a sustainable safe behavior over time: Are humans reliable and to what degree must they be protected by technical means? It is a very interesting question since most of the intellectual efforts have gone onto behavior-related studies whereas government-induced regulations have looked much more at safe conditions. The real question has been formulated already in 1955 by Mason Haire: “It is interesting to speculate on what might happen if we were to build a production line designed to maximize human resources and motivations of the operators and then consider the machines as dependent variables which must be built to conform to the requirements of a system designed to maximize the human’s potentialities”\footnote{Haire: Psychology in Management, p. 2}. If we consider work conditions that depend a lot on the technology as the result of management acts, i.e. management behavior, then technology appears in a very different light.

δ ) Performance Management

Performance management has been in the focus of many companies over the last twenty years, be it by establishing better indicators, by showing the results visibly everywhere (e.g. on PDCA boards), by coupling variable pay to performance, by managing recognition programs or by strict consequence management. In many cases the reward part, i.e. variable compensation, has spread beyond top management and sales areas and the indicators used have also included safety indicators, at least for managers associated with production, maintenance and logistics. The expectation therefore was that Performance Management should be rated very high. So it was a big surprise that the management teams stated that Performance Management was not an effective lever to influence safe behavior. In order to analyze this low grading it is useful to look at the Bradley curve, introduced in chapter 3.4 once more.
Figure 4.5: The Bradley curve

The strict consequence management mentioned obviously influences the “Dependent” stage. It is certainly necessary but far away from being sufficient. Reward and recognition are more geared to incentivize employees first to strive independently for their own safety and then to also look out for others. Participants in the different safety trainings mentioned that they judged the effectiveness of the lever “Performance Management” with respect to incentivizing workers to change their behavior as being rather low due to the indicator in use within Holcim and OC Oerlikon at the time of the trainings, the LTI FR (Lost Time Incident Frequency Rate), i.e. the frequency of LTIs per 1000000 or 200000 work hours. It was considered to be too far away from the daily activity of a worker to influence his behavior. Furthermore, the LFTIFR makes only sense for sufficiently large units, not for small departments as it is calculated on the
basis of a large number of hours. The daily activity of a worker however takes place in his department.

ε) Structure

Structural elements such as organization charts are static by nature and this is most likely the reason why all teams rated this part the lowest.

4.1.6 Conclusions and Interpretation

The exercise with the Manzoni Model had nearly all management teams agreeing that visible management behavior is the strongest lever to influence the behavior of employees. But it also resulted that most managers thought they had to show this visible behavior only to their own employees, not to the workforce as a whole. As the majority of the employees were active in manufacturing and logistics this amounted to a widespread delegation of the leadership of safety to managers in manufacturing and logistics. When the reluctance to cross organizational boundaries and the uneasiness of talking to a worker whose job one does not really understand is added, then it becomes understandable why the average hours invested into safety per manager is low. The thought that having always the same manager(s) speaking to an employee could degenerate into the routine of an aircrew doing pre-flight safety announcements did not cross their mind; that the observation of superiors often are selectively biased (Manzoni: “What we notice or ignore is guided by our expectations”\textsuperscript{82}) and could be compensated by having a variety of managers observing employees was equally not present. The idea that by venturing on the shop floor “white-collar” managers could contribute to a showing of management alignment did not come up either. Additionally, many organization charts showed the function of “safety manager” which leads to a temptation to delegate safety to the mentioned staff function. Unfortunately, the title “manager” in many countries is used to designate a pay and benefit level, which adds to confusion. This conclusion coincides with a complaint the safety experts of Holcim voiced frequently in functional meetings, namely that line management tried to delegate safety to them.

What is needed to bridge this gap between the need to do and actually doing? As safety is a line management responsibility the top line manager, the CEO, should request that all managers participate in the effort of visible safety leadership, followed by specific management training on how to go

\textsuperscript{82} Manzoni: The Set-Up-to-Fail Syndrome, p 77
about exercising this responsibility, e.g. by teaching and coaching so-called Safety Observation Tours focused on people and their behavior.

Skills came in as second priority overall but with a clear difference between the two companies. Skills were rated high when the work activities were not highly standardized and vice versa. The impact of skills as a lever is recognized by many country legislations, which require a certain number of safety training hours for the induction of new worker.

Safe processes or safe working procedures as they are mostly called came in third. As they are linking specific requirements to specific skills they are necessary to carry out a systematic assessment of risk coupled with mitigating actions, thereby also contributing to safety awareness. They are furthermore necessary for a fair consequence management: employees have to know what is required before any sanctioning mechanism can be put into place. Safe processes however are not sufficient on their own because it is not realistic to expect one hundred percent compliance especially in routine situations.

Technology as a lever is harder to judge than the other five levers because technology can have two effects: it both shapes and influences the behavior of employees and it protects employees against the consequences of their behavior. A fork lift is a good example: does a radar-based warning system which sends different signals according to distance improve safe driving or should it automatically stop the fork lift when a certain distance is underrun? In this survey the question was about the influence on behavior. The large majority of the managers were convinced that safer technology would positively influence safe behavior but also mentioned that safer equipment could lead to overconfidence as well.

The low ranking of Performance Management came as a surprise since both companies had invested considerable efforts in developing goals in a collaborative way, asking for commitment and breaking goals down to all levels of the hierarchy. In the area of safety however very few managers were convinced that it shaped their behavior and even much less so the behavior of the employees. Part of this doubt is certainly based in the indicators in use today: they are lagging indicators, they can be used only for larger groups and they incorporate the severity of the incidents, which is not necessarily linked to the behavior of the employees. Ten seconds or fifty centimeters frequently cause the difference between a First Aid Case and a Lost Time Incident.
Structural elements came in last. They seldom actively shape behavior but the neglect or wrong use of structural elements can be detrimental to safety. This can clearly be understood by the information about safety on PDCA boards on the shop floor. If accurate and timely information about safety is shown it does not automatically influence workers. If, however the information is not updated or wrong then the workers realize that safety is not the top priority it should be.
4.2 Four steps leading to sustainable behavior change

4.2.1 Why do accidents at work still happen?

In chapter 1.4 we have seen that nobody wants to get hurt and everybody has had some form of safety training. Nevertheless, incidents occur every day. Why is the combination of training and wanting not sufficient to achieve what many visions say, namely “Zero Harm to People”? A good starting point to answer the last questions is a scene in the already mentioned (chapter 3.1) safety video “I Chose to Look the Other Way”. The maintenance supervisor requests from a worker, who himself had not blanketed a steam line from a heat exchanger, that he should intervene whenever he saw somebody showing this kind of unsafe behavior. To this the worker replied: “they should know by now, they were in the meeting.” When we replace the word “meeting” by “training” we have arrived at the widely held belief that training leads to safe behavior. The four-steps concept introduced in chapter 3.1 helps to get insights. It is reproduced here again as figure 4.6

![Diagram of the four-steps concept]

Fig. 4.6: The four steps concept

In the following these four steps will be run through twice, first with a view on the individual who wants (or has to) change his behavior, then a second time focusing on what managers can and should do to support the behavior change of their subordinates.
4.2.2 Step 1: We need to know

Working safely starts with knowing the Safe Working Procedures SWP that result from the HIRAs performed for each specific combination of equipment with processes. Most of what employees of a company need to know about SWPs is acquired by initial and then reinforced by refresher trainings as shown in figure 4.7.

![Image of the diagram showing four different training sessions]

**Figure 4.7: Four different training sessions**

Without knowing the rules defined by the SWPs employees will not be safe as every Continental pedestrian has experienced crossing a street in London for the first time: we need to know that the traffic proceeds on the “wrong” side of the road in order to apply safe procedures. To position training now only as a first step does not question the necessity of training but rather serves to establish that training alone is not sufficient. “Knowing” after a training does not yet constitute knowledge as defined by Nonaka and Takeuchi, who state that knowledge must contain beliefs, commitment and a bias for action. Applying their modes of knowledge conversion “to know” signifies the transition from “explicit” to explicit”.

“To know” covers all types of activities at work. Some examples:
a) Working at Height:
   - when does “Height” start? 1.80 meters, 2 meters?
   - what are the accepted fall protection devices? Is a guardrail at 1.20 meter above the floor enough when this floor is actually the flat roof of a building?  

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83 Nonaka and Takeuchi: The Knowledge-Creating Company, chapter 2
b) Isolation & Lockout\textsuperscript{84}
- what is the procedure when two energy sources and three workers are involved?

c) Confined Space Entry
- what are the acceptable levels of oxygen?

That this first step is necessary has been accepted universally. Most countries require such training in their legislation. Universal acceptance however is not only a top-down legal requirement but also a bottom-up requirement coming from the shop floor as can be seen in a survey conducted in October 2011 in a cement plant in Indonesia. A total of 24 workers and supervisors (first line managers) were asked to rate the relative importance of reward, recognition and consequence management. The questionnaire asked the following:

1. How important are the following three topics for you personally as an incentive to behave safely at work? Distribute 10 points among the three topics according to their importance.
   - Reward
   - Recognition
   - Consequence Management

2. Regarding rewards: Which of the two rewards do you prefer
   - Money
   - Prices such as scholarship for children

3. Regarding Recognition: Which is your preferred recognition
   - Publication on the company website and in the company newsletter
   - Positive remarks on the spot whenever a managers observes you showing safe behavior

4. Regarding Consequence Management: Which is the most important element
   - Clear rules for punishment
   - Application of the rules to everybody regardless of rank

Table 4.10 gives the rating of the importance:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reward</td>
<td>42</td>
</tr>
<tr>
<td>Recognition</td>
<td>81</td>
</tr>
<tr>
<td>Consequence Management</td>
<td>117</td>
</tr>
</tbody>
</table>

Table 4.10: Ratings

\textsuperscript{84} Mostly known as „LockOut – TagOut“ although the isolation is important and the tag does not give any protection
The result looks somewhat strange and will be analyzed further in chapter 4.4. Regarding the step “to know” however 17 out of the 24 workers and supervisors interviewed argued with the translator over the fourth question. In one way or other they complained that the list of elements should start with “having clear safety rules”. Asking further questions, it turned out that they did not speak about rules for punishment but stressed that they wanted to know what the company considered safe behavior. Having clear rules extends beyond writing safe working procedures. A common failure is unclear signage, e.g. for audio or respiratory protection (the blue and white signs). A typical situation is an audio protection sign fixed on a door. This says: use audio protection when entering the next room. What management had wanted to say was: use audio protection in the next room if the equipment is operating. And: do signs fixed on the wall next to a door apply to the next room or to the present room?

This first step presents two challenges inherent to any teaching, the sender – receiver relationship: what needs to be done that the participants turn on their receiver and to make the sender send in the frequency of the receiver. In order to cope with these challenges managers must act as teachers as explained below in chapter 4.2.6.

4.2.3 Step 2: We need to understand

Understanding means applying the theory to a specific activity. This step is not easy as all of us know who had lectures in physics, followed the next day by a test where we are asked to apply the learned theory to a practical case. Let us look at three different but typical situations. The first one is a survey undertaken in 2009 with 25 drivers of Ready-Mix Concrete trucks on three different continents. The mixture is transported in the drum on the truck and inside the drum there is a devise keeping it from demixing. These devices have to be checked from time to time. I asked those drivers how they would do that safely in case they had to do the checking by climbing into the drum. 24 of the 25 answered the same way: “I will shut down the engine of my truck and put the key in the pocket of my uniform before I climb in - and by the way: there is only one key!” These answers showed that they knew but did not understand. The principles of Isolation & Lockout state that all sources of energy have to be isolated so that no unplanned or uncontrolled release can happen. For the drivers the engine was the sole source of the energy that would turn the drum while they were inside. None of them thought of the gravitational energy they would bring to work when climbing inside with their body
weight that sometimes exceeded 100 kg. If the drum itself were not properly blocked, then it would begin to turn slightly with a person inside. And if that person then tried to stabilize himself by catching the device he would badly cut his hand.

The second situation concerns the proper placing of a toe board to a scaffold. The toe board should keep tools, which lie on the plank, from falling when accidentally kicked by the shoe of the worker. As a consequence, they have to be mounted in such a way that there is just a little free space to let water down but not enough to let a tool pass. During September 2009 I did a random survey of toe boards fitted to scaffolds in the area of Zurich, Switzerland. The randomness was the result of looking at scaffolds only if and when I found a parking space nearby whenever I spotted a scaffold. Of the 15 scaffolds surveyed only 1 had all toe boards properly fitted. In all the other cases a tool as big as a hammer could easily have slipped through. Again this shows that the workers erecting the scaffold knew that toe boards had to be fitted but did not understand what this meant.

The third situation concerns a welder in a plant in China. He was sitting on a platform about 3.5 meters above ground in order to weld the cover of a vessel from above. He knew that he had to use fall protection, i.e. a harness, since the guard rail did only cover 270 degrees of his platform, leaving the rest open for him to do his work. He had attached a lanyard about 2.5 m long to the guardrail just behind him. The conclusion again was that this worker knew that he had to use fall protection, but did not understand how to do it properly for his specific activity.

Why did the workers in all three examples not make the step from knowing to understanding? In his book “Leading Change” 85 John Kotter stresses the importance of “Show me”, “See the truth” and “Feel it”. Just telling workers that they need to isolate and lock out, to mount a toe board or to use harness and lanyard is not good enough. They must see it practically, ideally feel it by doing it under realistic circumstances. This second step is similar to the knowledge conversion mode “internalization” (“explicit” to “tacit”) defined by Nonaka and Takeuchi 86 who say that it is closely related to “learning by doing”.

85 Kotter: Leading Change
86 Nonaka and Takeuchi: The Knowledge-Creating Company, chapter 3
4.2.4 Step 3: To accept means to recognize the value

Knowing and Understanding does not automatically lead to acceptance of safety rules and procedures. What can be the barriers?

Let me start with an anecdote. I have a school friend from high school in Switzerland who learned the trade of a roof maker. During a class reunion I asked him what the rules were regarding safe working on a roof. He immediately gave a rundown of Swiss laws and regulations governing this activity. Obviously he knew. So I continued, asking how this translated into practice. His answer was: “This would mean that I would have to . . .” He clearly understood but was not willing to apply all the rules. When challenged he said: “But you do not really think that we use fall protection all the time when working on a roof? This would slow us down so much that we could never finish a roof on time. Furthermore, all of us working on high roofs are never feeling dizzy and can run around like cats”. This conversation shows a first and very important barrier: the nuisance factor. This nuisance factor can be seen in many ways, for example in the use of safety glasses when working with compressed air. Table 4.11 presents the result from 38 observations of employees during 2012. The safety procedures had mandated the use of safety glasses.

| People observed working with compressed air | 38 |
| People using safety glasses               | 16 |

Table 4.11: Use of safety glasses: 38 observations

More interesting than this low compliance are the reasons given for not using them. 18 of the non-users were asked why they did not use their safety glasses. Their answers are given in table 4.12:
The five reasons given can be classified into two categories:
a) “Real” reasons – the first two items - which have their root cause in a gap of the safety management system applied. It is true that safety glasses which have not been properly fitted to the shape of the head of each individual can cause headaches. It is therefore a management task to assure that all glasses issued to employees are properly fitted. Wearing safety glasses over corrective glasses is also not a sustainable solution and should only be used for visitors. Management has to assure that employees who need them are issued corrective safety glasses.
Wearing these safety glasses the whole day gives me a headache | 5
I use corrective glasses. If I put safety glasses over them I cannot see as well as I should | 3
I wear normal corrective glasses which protects me from small chips | 5
For just a few seconds it is not necessary. I just turn my head into the other direction | 3
I have mislaid my glasses / my glasses are broken and I did not have time to replace them | 2

Table 4.12: Reasons for not using safety glasses
(18 interviews)

b) “Excuse” reasons –the remaining three items - which have their roots in the individual behavior, namely in an inadequate HIRA (Hazard Identification and Risk Assessment) with a result of low probability and low impact in the HIRA matrix. The probability of an incident, i.e. of a chip landing in the eye, is considered low, because the number of incidents involving eyes had been zero at all the sites concerned for at least one full year. Table 4.13 shows the allocation of the injuries for the two year period 1.1.2012 to 31.12.2013 in one of the larger plants (on the average 800 FTEs) where some of the non-compliance had been observed. Having not had such an incident leads easily to the conclusion that the probability is low. Three of the four employees questioned in this plant about their non-compliance stated that they had felt a chip landing on their face several times. Their evaluation of low probability did not say that very few chips were flying around; they obviously just thought that these chips were very unlikely to reach and hurt their eyes.

Ranking the potential impact as low is linked to the result of the past. If and when no lost time incidents involving eyes occurred in a plant for more than two years, it is hard for an employee to imagine a severe impact. As mentioned above John Kotter stresses the need for “feel it” and “see it” in the context of change management. Changing the perception of employees regarding probability and impact is exactly such a case of change management.
<table>
<thead>
<tr>
<th>Allocation of Injury</th>
<th>Quantity</th>
<th>Lost days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Hand</td>
<td>23</td>
<td>50</td>
</tr>
<tr>
<td>Left Hand</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Right Foot</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Left Foot</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Haunch (Upper Body)</td>
<td>14</td>
<td>53</td>
</tr>
<tr>
<td>Other (Arms)</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>66</strong></td>
<td><strong>160</strong></td>
</tr>
</tbody>
</table>

Table 4.13: Injury allocation

The mentioned case of non-compliance wearing safety glasses shows that when the value of a safety rule is perceived to be low then the negative value of the nuisance factor can override the safety rule. This finding coincides with findings regarding the use of hearing protection presented by Krause.\(^{87}\)

Conflicting values can be a second major barrier. Conflicting values can compete at the same point in time; conflicting values can also compete along the time axis.

Let us first look at two values existing at the same time which could be in conflict, namely customer satisfaction and employee safety. This can be shown in two questions raised by engineers employed at the corporate headquarters of Holcim. After being informed about a new corporate safety rule that nobody should travel in a car without safety belts some engineers who frequently had to go to the field in India raised the question of what they should do if the car waiting for them at the local airport had no safety belts or belts that were not in working order. It was clear to them that they should comply with the rule. They however mentioned that refusing the vehicle in question could mean losing hours or even a day at the airport, reaching the cement plant with a substantial delay and letting the local team waiting which in turn could result in a drop of customer satisfaction. As the plants in question were not fully owned subsidiary of Holcim customer satisfaction mattered. Going deeper into this issue of “Safely

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\(^{87}\) Krause: The Behavior-based Safety Process, p 20
Working at Client Site” a second even more serious issue came up. Some engineers described their dilemma as follows: “In order to do a check inside a ball mill we have to reach the hole to go in. This hole has to be on the topside of the stopped mill and is somewhere in the middle. We therefore have to walk on the mill up to ten meters at a height of more than 15 meters, which means complying with the rules governing working at height, i.e. using fall protection. What do I do when there is no line to attach my lanyard and all my local colleagues just step across without fall protection as they have always done - and then I stay behind and am perceived as the European who thinks he is too good for such work?”

The second of those cases was easy to decide. Since probability and potential impact are both high, going across the mill without proper fall protection was simply a no go. Safety clearly overrides customer satisfaction. Such situations in which an employee has to demand that he be allowed to follow safety rules point to a gap in the safety management system of a company. Customers should be made aware of the requirements for safe working upfront. The engineers who brought up the issues were on one hand satisfied that they not only had the right to refuse such an activity but rather an obligation to refuse it. On the other hand, they said that their relationship with local colleagues would suffer.

The first case was harder to rule on. There had not been a case of somebody having been hurt in a car accident in the countries in question where the safety belt would have made a difference. The value of the rule was therefore perceived to be low. Furthermore, the practical difficulty of living the rule at all times seemed quite high in the short and medium turn. Again the Safety Management System of a company should solve this question. The Guiding Principle is that “One Worldwide Standard” has precedence over “When in Rome do as the Romans”. A second principle however states that a rule should only be set if it can be enforced. The pragmatic decision reached was sticking to the rule but extend the time frame for implementation, meaning advising travelers that they could use a car without belt provided they were sitting in the back (the rule that belts have also to be worn on the back seats is relatively new in Switzerland).

Conflicting values can also exist along the time axis. Let us look at a case where fitness for work or, more precisely, fatigue was a contributing factor to severe accidents. During the construction of a new plant in India three fatalities involving unskilled labor of a contractor occurred within less than half a year. All three of them fell down from heights when going back up after luncheon. The root causes were not obvious since they had been using a properly fitted staircase on the outside of the scaffold, which meant
that there had been no obligation to use fall protection. What turned up during the investigation was fatigue as a contributing factor. The three of them were just a little over 20 years old, had been married with one child, the family living far away. The contractor paid them the legally required minimum salary. In order to send the family a little more money all of them had worked for weeks seven days a week, and one and a half shift each day. This led even at their age to fatigue, giving the climatic summer conditions at the site. They all knew that their family needed them in the long run (long term value) but they opted for the short-term value of more money at the end of the month. The main issue in this case is that the linkage of the safety rule (recovering soundly after a shift of hard work and thereby evading fatigue) to a potential consequence is not immediate. Krause explains that consequences must follow soon after the behavior to have a strong influence.\footnote{Krause: The Behavior-based Safety Process, p 21}

With this third step employees get nearer to knowledge as defined by Nonaka and Takeuchi\footnote{Nonaka and Takeuchi: The Knowledge-Creating Company} since beliefs and commitment are added. As there are conflicting values management must act as a motivator which will be explored more in chapter 4.2.8.

4.2.5 Step 4: To do means taking the necessary time

Even if we know, understand and accept we sometimes do not apply the rules. There are three main reasons for this:

a) Working safely takes more time, either initially or forever. When a new and safer process or procedure is introduced we initially lack the efficiency that comes with experience. It is important that all employees take the time and are given the time to practice: a beginner learning to drive a car takes a lot more time to fit his car into a parking space! More important however is integrating the additional time needed to work safely in all company processes, starting with the offer process. If a roof maker needs more time, then this additional time has to be considered in the calculation of the offer. It is equally important that this approach forms also part of the “Request for Proposal” process. When a company asks potential contractors for an offer it should request that all competitors offering fulfill the same minimum safety requirements.
b) Working safely means remembering the safe practice. There are, however, tasks in each company that need to be performed at a low frequency only. In the video mentioned earlier “I chose to look the other way” the worker in the initial scene says “I must have forgot”. For such tasks the Safety Management System of a company must require a detailed checklist combined with strict compliance. Since the checklist must be followed step by step, time needed for execution can be an issue again.

c) Working safely finally means weeding out “creeping bad habits”. If and when no incident occurs for a certain activity then shortcuts begin to appear and are incorporated into the “way we do business here”. These shortcuts usually save some time and are taken at the decision of the employee, not ordered by the company. I call these shortcuts “apron shortcuts” in analogy to a typical kitchen situation in the morning. Let us assume you are preparing a grapefruit every morning, slicing each section carefully. Initially you will use a proper fitted apron to protect your clothes. After some time, you start just to hang the apron in front of you without properly fitting the straps. And after a further time lag you might even be tempted to slice without the apron, because that leaves more time for the newspaper.

Having gone through the four steps we now turn to the question of the role of management. How can and should management support employees at each of the steps? The transformational style Krause describes\(^{90}\) has four elements, to be challenging (to know), engaging (to understand), inspiring (to accept) and influencing (to do). Figure 4.8 shows that managers should be teachers, coaches, motivators and mentors, i.e. live a specific function for each of the four steps.

4.2.6 Managers support step 1 as teachers

In all the subsidiaries of Holcim and OC Oerlikon the task of delivering safety courses was always delegated to specialists, sometimes even to outside companies, i.e. not run by line managers. The reason is well known: the specialist knows the theory and often line managers lack the didactic skills necessary to properly deliver course content. But this view of what teaching means is too narrow. Teaching a safety course is one thing, teaching in a safety course a second way, participating in a safety course as a “professor of practice” a third one and inspecting progress of a safety course in the sense of short interval control a forth way of teaching.

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\(^{90}\) Krause: Leading with safety, p 43
Expecting a line manager to teach a full safety course to his direct reports is not realistic. Teaching a short sequence or participating as mentioned above, however, underlines the importance of the topic and improves the learning success as shown in the following case. The participants of a two-day safety course - middle managers from a US-based manufacturing plant - had to do practical exercises, one of them writing a Job Safety Analysis for changing a wheel on a car, the other doing a Safety Observation Tour of 45 minutes in the plant. This course was run a total of three times. Looking at their functions and years of experience the three groups were very similar. In one of the groups however the plant manager himself participated full-time. When ranking the two practical exercises on completeness and effectiveness of the safety actions to be taken (JSA) and the number of observations made and the quality of their description (SOT) the group with the plant manager scored 8 (out of 10) in both exercises, the other two groups a 5 or 6. During the two days the plant manager acted as “professor of practice”, pointing out several times why the theory (“to know”) being taught was important in this specific plant. In this way he not only underlined the importance of the theory but did some groundwork towards step 2 and 3 as well.
4.2.7 Managers support step 2 as coaches

Understanding means being able to apply the theory to a specific workplace and activity. This requires coaching by the direct superior of an employee. Heinrich wrote more than 80 years ago: “There is little need for substantiation of the oft-repeated assertion that the foreman is the ‘key man’ in industry, that he, from an executive point of view, is responsible for accidents . . . . Of even greater significance than the matter of responsibilities is that of simplifying the art of supervision so that it can be expressed as a formula and so taught to practicing and prospective foremen.”91 Manzoni wrote. “Executives are therefore expected to coach, empower, encourage initiative and risk taking, foster loyalty and commitment, and show recognition”92 It is important to remember what John Kotter has written about behavior change93: the employee must see the safe behavior by having it demonstrated by his boss. Managing safety additionally means having the courage to demand safe behavior. As the maintenance manager in the video stated: “some of the newer guys get mad from time to time but I don’t mind”.

There is another often-overlooked aspect to coaching. Line managers also have the obligation to make rules understandable. Let us look at a short statistic (table 4.14) put together during the year 2013. When visiting production sites I noticed from time to time a blue and white sign stating that audio protection was necessary. In each case I asked myself if I would be able to draw a red line on the floor indicating that from here onwards audio protection must be worn, followed by a green line stating that audio protection was no longer necessary. Rules are useless if they cannot be understood.

<table>
<thead>
<tr>
<th>Number of signs observed</th>
<th>61</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of signs allowing red/green</td>
<td>42</td>
</tr>
</tbody>
</table>

Table 4.14. Understandable signs

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91 Heinrich: Industrial Accident Prevention, p 185
92 Manzoni: The Set-Up-to-Fail Syndrome, p 4
93 Kotter: Leading change
4.2.8 Managers support step 3 as motivators

How can acceptance of safety rules be increased? Motivating employees first means that managers at all levels have to give a good example themselves by visibly complying with safety rules. Geller wrote: “Indeed, to make safe behavior the norm – rather than the exception – we must always set an example both in our own work practices and in the verbal consequences we offer co-workers following their safe and at-risk behaviors.” DuPont Safety Resources, a well-known safety consulting company calls it “felt leadership”; in Holcim and OC Oerlikon it is called “visible leadership”. Walking the talk has a double impact: it provides role models and it underlines that safety is a value for everybody, not only for “the company”. Living the good example requires at times more than just compliance.

Let us look at the example of an expat general manager in a plant in China where welding is part of the production process. In the welding area masks must be worn according to the blue and white sign. This manager did not use his paper mask inside the welding area. When challenged he answered that the risk analysis had shown that masks were only necessary with a prolonged stay in this production area, i.e. for people who were actually working there. Scientifically his answer was correct. Giving a good example however requires in this case that a manager spending just a few minutes there also wears the mask in order to increase acceptance.

Increasing acceptance can be achieved by creating a positive image in the mind of the employees concerned. A positive image means adding a virtual extra voice speaking to the employee asking him or her to keep safe. This virtual extra voice should remind the employee of the negative consequence of behaving unsafely. Let us look at the case of a plant in Ecuador. The local general manager had realized that workers on the average visited their locker about four times per day. He then asked those workers with children to provide a photograph of one of the children to which he had the words added: “Dear dad/mom – I love you! Please come home safe in the evening”. Even if an employee was convinced that he or she worked in a safe way and had everything under control his child spoke to him/her every time when opening the locker, basically saying “I know that you are big, strong and have a lot of experience - but if you suffer a bad accident I could not see you again”. A year later the statistics showed a significant lower number of incidents in this plant.

Positive images are created if and when managers send the message in the “frequency” of the worker, i.e. choose elements from the live of the employees to show the value of keeping safe. Naturally managers can do so

94 Geller: Working Safe, p 84
only if they have an insight into the lives and desires of the employees, knowing for example that a specific employee is a sports coach in a junior league and looks forward to those eager faces at the beginning of each training session.

Motivation finally has to do with recognition. As Tom Krause has written, both antecedents and consequences influence behavior, the first one indirectly, the second one more powerfully and directly when it follows soon, is consistent and is significant. In the case of a plant in the Midwest of the USA this was achieved by giving managers four tokens per month for the vending machines on the shop floor. The managers were requested to hand out those tokens to employees whenever they saw them behaving very safely.

4.2.9 Managers support step 4 as mentors

Mentoring means first of all that line managers must give their direct reports the time necessary to work safely. This must be conscientiously done because in today’s manufacturing environment continuous efficiency improvement is the prevailing strategy. If a manager “insists that safe procedures be followed even though it delays the availability of the equipment, the priority of safety will be communicated much more powerfully than by saying ‘Safety is number one’ in every safety meeting” It secondly means demanding strict adherence to rules for seldom-performed tasks. These demands must be enforced visibly, which requires managers to be on site for such tasks. And mentoring means detecting “creeping” bad habits. All of this can be done by frequent Safety Observation Tours. The following statistic shows what frequent SOTs can achieve. A total of ten Safety Leadership Courses were run in the same plant in Liechtenstein. Each course contained an SOT exercise, consisting of having four groups of participants going for 45 minutes into the plant, observing and talking to five workers each. Participants in the first course brought back 37 observations to be followed up. 18 months later in the 10th run of the course only 5 observations resulted.

4.2.10 Conclusions

Offering and running safety trainings is but a first necessary step to a safer behavior. Knowing the theory provides the foundation for building up

95 Krause: Leading with Safety, p 90
96 Krause: Leading with Safety, p 131
safety at work. Managers must get involved in those training session, underlining with their presence the value of safety but even more important providing a link to the next steps. Understanding means translating the theory to the specific place and activity. This requires practical exercises as well as coaching by managers, which enables the employees to see and feel what “safe” means. Acceptance means more than having to be safe; acceptance must construct the bridge to wanting to be safe. A conditional acceptance is just not good enough. The nuisance factor must be overcome; conflicting values must be made visible and addressed by management. Motivating employees to accept means creating a positive image of safe behavior in their minds. Motivating also means introducing an additional virtual voice in their minds reminding them continuously of the pleasure of returning home safely. Finally mentoring stands for assuring that all employees are given the necessary time to work in a safe way. All four steps are necessary and have to be passed in the shown order. To make it work managers must visibly support each of the four steps. If and when the four steps have been successfully gone through, knowledge in the sense of Nonaka and Takeuchi has been created. The employees do not only rationally “know” and “understand” rules but have progressed via “accept” to a set of shared tacit beliefs and convictions, directed via “do” to action, i.e. to knowledge for some end.

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97 Nonaka and Takeuchi: The Knowledge-Creating Company
4.3  Leading safety with numbers

4.3.1  Setting the stage

Let us assume that Cemcorp Ltd has established “Zero Harm to People” as its vision for Occupational Health & Safety. And let us furthermore assume that the management of Cemcorp wants to check on the progress towards its vision. As a consequence, Cemcorp has a monthly safety reporting to the Executive Committee and to the Board of Directors that looks as follows:

**LTAFR: Status as of March 2015**

Lost Time Accidents #: number of accidents which caused one or more lost work days  
Rate: number of LTAs per 200’000 hours worked.

<table>
<thead>
<tr>
<th></th>
<th>2014 FY Target Rate</th>
<th>2014 # of LTA's</th>
<th>2014 LTAFR</th>
<th>2015 FY Target Rate</th>
<th>03/2015 LTAFR</th>
<th>03/2015 # of LTA's 12 m roll</th>
<th>03/2015 LTA FR YTD</th>
<th>03/2015 # of LTA's YTD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cemcorp</td>
<td>0.86</td>
<td>96</td>
<td>0.75</td>
<td>0.60</td>
<td>0.80</td>
<td>92</td>
<td>0.72</td>
<td>0.62</td>
</tr>
<tr>
<td>Segment A</td>
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<td>0.84</td>
<td>0.62</td>
<td>0.82</td>
<td>16</td>
<td>0.65</td>
<td>0.80</td>
</tr>
<tr>
<td>Segment B</td>
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<td>49</td>
<td>0.92</td>
<td>0.74</td>
<td>0.97</td>
<td>44</td>
<td>0.85</td>
<td>0.50</td>
</tr>
<tr>
<td>Segment C</td>
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<td>9</td>
<td>0.58</td>
<td>0.55</td>
<td>0.66</td>
<td>9</td>
<td>0.58</td>
<td>0.49</td>
</tr>
<tr>
<td>Segment D</td>
<td>0.67</td>
<td>17</td>
<td>0.51</td>
<td>0.47</td>
<td>0.62</td>
<td>23</td>
<td>0.66</td>
<td>0.72</td>
</tr>
<tr>
<td>Corp/Others</td>
<td>1.95</td>
<td>0</td>
<td>0.00</td>
<td>1.36</td>
<td>1.80</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Figure 4.9: Monthly safety reporting  
(This reporting is a real one with the real numbers. The name of the company and its business units has been anonymized.  
FY: Full Year  
LTA: Lost Time Accident  
LTAFR: Lost Time Accident Frequency Rate  
12 m roll: 12 months rolling  
YTD: Year to Date)

From figure 4.9 the readers would see that “harm” has been translated into Lost Time Accidents (Cemcorp uses the term “accidents”), what the results of the year 2014 had been, what target had been set for 2015, where the company and its different segments should have been at the end of March 2015 and where they actually were in terms of 12 months rolling and year
to date. Let us further assume that the top and senior managers of Cemcorp received a part of their total compensation in variable form and that reaching the safety target played a substantial part when calculating the amount. This kind of reporting - frequently enhanced with numbers on fatalities or total recordable accidents – is quite common. But is it also good practice? The answer of Krause in 1980 was to the point: “the reliance in accident frequency as the sole measure of performance shows up for what it is – misleading and reactive.”

4.3.2 The fallacy of relying on lagging indicators only

LTI and LTIFR, its frequency rate, are lagging indicators collected and calculated after the fact, basically describing history. Krause wrote already in 1980 that these and similar indicators measured the consequences of incidents without giving any indication for incident causes, thereby denying management the opportunity to learn and steer. Many of us have experienced that the difference between a Near Miss Incident and an incident resulting in a severe injury sometimes can be measured in a few seconds or a few centimeters, meaning that the result of the incident depends quite substantially on a chance element as shown in a personal experience. In 2009 I stood in front of a building outside the barricaded area with workmen active at a height of 25 meters when they dropped a metal bar of more than three kilogram weight which fell just a little less than a meter to my left. A little less than a meter distance made it a Near Miss.

Using indicators such as LTIFR to calculate variable compensation can therefore result in serious frustration since the result measured is not linked directly enough to the manager in question and his actions. This was expressed by a statement of the OH&S officer of a large subsidiary in 2009 who stated that he was able to influence the probability of an incident but much less its outcome and concluded that top management simply wanted to limit his compensation.

It can be concluded that lagging indicators alone are not only not sufficient but should not be first priority. The challenge is to define, measure and report a better-suited set of indicators.

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4.3.3 Translating safety restrictions into measurable targets: three issues

Let us assume that the management of Cemcorp wants to enable its organization to deliver value to customers at minimal cost and under full compliance with a given set of rules. It is important to note that “safety” belongs to “rules” in the above definition. Therefore, as a consequence management cannot perform the balancing act between the different factors mentioned, namely value, cost and safety but has to make sure that the restrictions established by the safety definitions are respected. As mentioned before this situation is very similar to Linear Programming in Operations Research: The safety rules are the restrictions that form the allowed space (the safety space) within which the optimum can be found, i.e. the best value/cost combination for the business.

As a consequence, management has to start with defining those restrictions, i.e. to translate its vision into measurable targets and actionable processes and procedures. The starting point for both elements are externally imposed targets and activities, established either by governments and other legally empowered agencies (such as Berufsgenossenschaften in Germany) or by business associations such as the World Business Council for Sustainability. Defining measurable targets raises three issues:

a) Are dual standards acceptable? This is a thorny issue for all companies acting in more than one jurisdiction. Since there is not one world-wide set of laws defining and governing Occupational Safety there will be stronger and weaker externally imposed targets and mandated activities. Typical elements are hours of safety training a new employee has to pass before allowed to work. These hours vary greatly between one country and another. Given that information travels fast in the Internet-age a case can be made for a unique company standard to be reached everywhere the company is active. This unique standard does not have to be the strictest found in any jurisdiction because government set standards are not necessarily always the best ones to reach a “Zero Harm” vision. A company should rather aim for a global standard that can be reached within a reasonable time frame everywhere, declare them as a minimum requirement and then ask subsidiaries in jurisdiction with more stringent standards to be locally fully compliant.

b) How rapidly should the standards be tightened? Every company has to take its particular status regarding safety as a starting point and then set targets that are ambitious and realistic at the same time. What is realistic changes over time. Let us take the indicator “Lost Time Incident Frequency Rate LTIFR” as an example. If a company has an LTIFR over 2.5 to start
with, it is not realistic to set 0.0 as a target for next year. It rather has to chart a journey for the next years and define a target path, e.g. requesting a 30% reduction year over year. This target path must be emotionally touching (ambitious) but also analytically acceptable (doable). As a consequence, most organizations will find themselves at the beginning of a year outside the safety space, defined by this year’s target, with the task to move inside again.

c) Can we ethically accept anything less than zero injuries? This question is very present when looking at fatalities. Let us assume that a global company had 30 fatalities last year. Can management now set 30% less fatalities as a target for next year, thereby saying “we implicitly accept that there will be 21 people dying on our premises at work next year”? If we talk about LTIs the ethical question is somewhat receding but it is still there.

The challenge is now to find good measurements to define and communicate the safety space and to measure progress towards moving inside those boundaries.

4.3.4 Developing Safety Indicators

4.3.4.1 The view from a Controlling perspective

Controlling is the activity in a company that deals with data (measurements) and indicators.99 Weber distinguishes five different functions for indicators (own translation from the German text)100:

- Predictive function (Anregungsfunktion)
- Operationalization function (Operationalisierungsfunktion)
- Targeting function
- Control function
- Steering function

With a view on Safety it is important to note that according to Weber the classical duo - set targets and control progress towards targets - are just two of five functions. Indicators should also help to understand the targets

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99 Controlling in wirtschaftslexikon.gabler.de: Das zeitlich gesehen erste Grundverständnis des Controllings weist diesem die Aufgabe zu, betriebswirtschaftliche Informationen für Zwecke der Führung bereitzustellen.
100 Weber: Einführung in das Controlling, chapter 7.2
and actions of a company, should enable management to steer in a timely fashion (which is consistent with the definition of controlling as the watchdog of future results) and should predict areas to focus on.

### 4.3.4.2 Deductions from Control Loop thinking

The control loop 8 (figure 4.10) starts with the target, consistent with Weber’s targeting function for indicators. Today’s targets, resulting from the translation of “Zero Harm” into something measurable that can be communicated to all employees, indeed to all people on premises of a company, are *lagging indicators*. The outcome will be measured, compared to the targets and decisions will be taken according the gap detected. These decisions aim to give steering impulses (the old “correct” in the military C3 loop of command – control – correct). At this point the shortcomings of the lagging indicators become evident.

![Control Loop Diagram](image)

**Figure 4.10: Control loop**

They show the results of the incidents but not the cause, which means that they offer little guidance for the steering process. As Drucker noted on 1954: “management – almost alone – has to live always in both present and
future” as a consequence and in accordance with Weber a second set of indicators has to be defined which can be called *steering indicators*. These steering indicators can be found by analyzing the effect of different inputs on the results, inputs which were called levers in the Manzoni model in chapter 3.1 and which represent Weber’s operationalization function. Steering indicators are by nature leading indicators showing a gap developing before incidents happen. As steering should be mainly preventive *predictive indicators* must be defined that guide the steering, i.e. focus the attention of management and staff on those areas where incidents are waiting to happen. Finally, the organization must be able to improve continuously which means that *learning indicators* must be integrated into the system.

Let us now look in more detail at those four categories of indicators.

4.3.4.3 The standard lagging indicator

The source for those indicators is the “Bird Pyramid”, already presented in chapter 3.4, reproduced here as figure 4.11

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101 Drucker: The role of Management, p 15
a) Fatalities and Lost Time Incidents (LTIs)
Every company will try hard to operate without fatalities (the absolute number of fatalities being the indicator) and very few LTIs, usually reported in form of a frequency rate, i.e. the number of LTIs per 200'000 (or 1 million) hours worked and a severity rate (LTISR), based on the total number of days lost. Even though those indicators are lagging ones they have to be measured and reported since a vision of “Zero Harm” must translate itself into an objective of “Zero Fatalities” and – eventually – “Zero LTIs”. Whenever management sets an objective it is mandatory to measure achievements.

There are three main difficulties with this kind of indicators:
- Many companies try to use these indicators also to steer, i.e. to motivate managers of different levels to undertake certain actions. They do this by integrating the said indicators into their compensation scheme, making part of the variable compensation dependent on reaching the objectives expressed by “Zero Fatality” and LTIFR < x. But as there is no scientific law linking root causes and resulting incidents to the severity of the outcome, this attempt to convert a lagging indicator into a steering one is doomed to fail. It can lead to frustration, to a view of safety that is not value based or - in the worst of cases – to “creative reporting”. Geller wrote: “combine this slogan ["all injuries are preventable"] with a goal of zero injuries and a reward for not having an injury and human nature will dictate covering up an injury if possible”.102
- The frequency rate is calculated on a large number of hours. Originally 200'000 hours represented 100 workers working one full year. The LTIFR objective therefore works only for large units; smaller units arrive with one single LTI at a rate that surpasses the corporate goal given to them.
- Both LTIFR and LTISR have a limited use for benchmarking. This is most evident in the unequal use of the concept of restricted duty around the world. Whereas in one country an injury leads to the affected worker staying away for a few days, in another country he is given a different duty, “light” in the sense that he will be able to perform it even though his facilities are impaired. In the first case it is counted as an LTI, in the second not. The differences between locations are even more visible regarding the severity: there are jurisdictions where a worker does not have to bring a medical certificate if he is able to return after a maximum of five days to work; in another jurisdiction such a certificate is necessary from day one onwards and can be investigated by a specially nominated medical doctor. The result is that the severity rate in the first of those two jurisdictions is substantially higher than in the second one. The use of those two rates

102 Geller: Working Safe, p 39
should be restricted to comparisons over time within the same jurisdictions.

b) Medical Treatment Incidents (MTI)
MTIs are incidents where the injured person needs the help of a medically qualified person such as a doctor or a nurse. The need for reporting MTIs has two sources. On one hand they represent “harm” and have to be investigated locally with the aim of evading a repetition. On the other hand, they represent a finer comb needed when LTIs become fewer and fewer, so that top and senior management still has a view of how far their company has progressed on the path to “Zero Harm”. What has been said above about the use of LTIs holds also true for MTIs: using them as criteria for variable compensation has to be very carefully analyzed.

The reporting of MTIs presents an additional challenge, this time not from the side of management, but from the side of workers. Going to seek help inside a plant from a nurse means having to be entered in a register. As most such incidents have an unsafe behavior as a root cause, i.e. an activity by which a company rule was violated, there is the question of punishment or at least a negative entry into one’s HR file, to be used in case of downsizing. This is a real dilemma for any company. On one hand a full and comprehensive reporting is needed for learning purposes, followed by a full investigation which then in turn enables preventive actions for the future. On the other hand, rules must be enforced; otherwise they become meaningless even though consistent consequence management can lead to a loss of information.

All the indicators discussed so far are lagging ones. They are needed for another reason: most authorities and insurance companies require their reporting. Going further down the Bird pyramid we now arrive at predictive indicators.

4.3.4.4 Available Predictive Indicators

Further down the Bird pyramid one finds four different indicators that help to predict accidents, thereby focusing the attention of management:
- First Aid Cases
- NearMisses
- Unsafe Conditions
- Unsafe Behaviors
There is a main difference to the incidents explained in section 4.3.4.3 above: these indicators measure events that create little or no harm. While all events still have to be fully investigated as in the harm-creating cases a point can be made that the consequence management should be applied differently since the value gained from full reporting outweighs the potential downside of not fully consistent consequence management.

a) First Aid Cases (FAC)
An incident leading to First Aid treatment - defined as something the injured person can either do himself or ask any other person to do for him - is “harm” in the broadest sense of the word (“physical damage to a person”, according to dictionary). FACs have nevertheless been classified here as a source of predictive indicators because the perception of a FAC as harm can be very different and depends a lot on the surroundings. When I asked one worker in New Zealand about it, he answered “we all played rugby” and did not consider a bruise or a cut as harm. When I spoke to a DuPont manager in Luxemburg he stressed that in his company such an injury definitely would be harm and then investigated with the same procedure as an LTI. An FAC should be treated differently from the more severe layers above it in the Bird pyramid for the following reasons:
- It frequently can be hidden quite easily because it seldom impairs the ability of a person to do the task assigned. If there is a threat of consequence management, FACs will not be reported and the information content is lost.
- Translating “Zero Harm” into an objective of “zero FACs” can be perceived as being far away from reality. Anybody who cooks at home experiences at least once a month an FAC and this life-experience makes the mentioned zero objective look not attainable which then casts a shadow on the company’s safety program.

The investigation of FACs must be done thoroughly but with a common sense component: when the investigation shows a low probability for a more severe impact resulting from the same type of incident with the same root causes then this does not merit a long search for possible mitigating actions. The management focus should be kept on those FACs where a much more severe outcome could also have happened.

b) Near Misses

Many studies published since 1931 when Heinrich\textsuperscript{103} calculated for the first time the relationship between LTIls and Near Misses have confirmed that for each serious accident at work there are many more Near Misses. This

\textsuperscript{103} Heinrich: Industrial Accident Prevention
signifies that there is a wealth of information available if and when Near Miss reporting in a company works. There are three major hurdles to overcome: the early conditioning of humans not to “wake up sleeping dogs”, the reluctance to write and the efficiency of the process turning data into information.

Let us first look at the psychological conditioning not to report Near Misses. We all remember situations in kindergarten or first year primary school when the teacher - let us call her in analogy to the cartoon Calvin's Miss Wormwood – explained a rule, such as not to spill water, because then the floor could be slippery. Soon afterwards your buddy John with whom you share the table spills water but mops it up before Miss Wormwood sees it. If you then report this Near Miss by raising your hand and shouting “Miss Wormwood, you just told us not to spill water and now John has done it…” then you will learn on the way home a hard lesson by John and his friends that your behavior was fully unacceptable. Not to report a misbehavior if there was no serious consequence is deeply ingrained in our minds as numerous sayings show, beginning with the “sleeping dog” mentioned above to the German “Immer wenn Gras über eine Sache gewachsen ist, kommt ein Kamel unde frisst es wieder ab” (Whenever grass has grown over an issue and hides it, a camel comes along to eat it away). This general rule of conduct that tells us never to be a squealer, i.e. never to betray another person is even stronger when applied to one’s own person. Let us assume that you are driving home at midnight and run a red light at an intersection where you know that a camera is installed. Luckily for you no car was crossing from the other side and the camera did not flash. This is a Near Miss according to Near Miss definitions (Wikipedia: A near miss is an unplanned event that did not result in injury, illness, or damage – but had the potential to do so). Would you now stop at the next safe place, take your cell phone and inform the police that a Near Miss happened because you violated a rule and that their camera was not working? The situation described shows the dilemma for the worker: if he has committed an error but nothing has happened and he could be punished for his infraction then he most certainly will not report it.

What can and should be done to overcome this hurdle to receiving the information? The National Safety Council recommends: The reporting system needs to be non-punitive and, if desired by the person reporting, anonymous.104 This recommendation is fully consistent with many other publications on this topic. It however raises again the issue mentioned at the end of section 4.3.4.3. On one hand a company needs to enforce rules, which in turn include consequence management, i.e. punishment. On the

other hand, the recommendation states the contrary, implicitly saying that the information resulting from Near Miss reporting is so valuable that the company does not enforce rules whenever by “luck” the potential for damage and harm had remained just a potential. As a consequence, companies will punish results and not cause. This dilemma cannot be eliminated and must be explained clearly to the workforce. One approach could be to set a time limit for non-punitive, such as stating that all Near Misses reported within 24 hours will not be subject to sanctioning. The non-punitive approach helps to encourage an employee to report Near Misses that are the result of his own misbehavior. The implicit rule that nobody should betray another person however must be respected in order not to create an informer culture usually associated with totalitarian states. Such a culture would reduce safety to a compliance issue, going back on the Bradley curve to “dependent”. In a good Near Miss reporting environment employees observing a co-employee committing an error should encourage the other employee to report.

The second issue, the reluctance to write, has also to do with early conditioning. In 1984 I did a study for a Swiss oil burner company, trying to find out why their suggestion system received just very few entries from their workforce. Conducting interviews one older worker told me: “I know that I am not able to write proper German. Already in primary school I received my texts back from my teacher full of red ink and I have not improved since. Now I will not give the bosses up there the opportunity to laugh at my incorrect German.” I have since investigated to what degree shop floor level workers in North- and South America are mastering their language by asking managers whether reports filled out by plumbers, painters, electricians or other craftsmen coming to their home to fix something were correct language-wise. The answers showed that this is very rarely the case. It is therefore important to create a reporting system in a company that does not require writing text. Several opportunities exist. The most usual solution is to use a form structured as a checklist that demand only ticking the box. Such forms however require that the safety experts reviewing the forms must go back and do an interview since checklists do not carry the full information. Another solution is to nominate somebody good at writing to serve as the reporter; employees know that they can see him at certain times to tell their story. Depending on the smart phone policy of a company an app can be prepared by which employees can enter whatever they want to report together with a photograph. The reluctance to write is much reduced when using a smart phone since short messages or Twitter messages are seldom expected to use correct language (maybe it would be more appropriate to say that they have a grammar of their own).
The final hurdle is the efficiency in dealing with the reports since in large facilities there can be easily hundreds of report per months (especially if the next two categories, unsafe conditions and unsafe behavior are included). Reports must be analyzed, preventive measures designed, decisions taken and actions implemented. This is the obvious part since the purpose of the Near Miss reporting is to take preventive actions to stop the root causes leading to harm. There is however a second activity resulting from receiving reports, namely giving feedback to the person who reported and communicating to the employees in general. The person reporting wants to be taken serious, wants to receive a feedback regarding his report and wants this in a timely fashion. Krause has shown that consequences that flow soon and are clear to grasp have a big impact, in this case a big positive impact\textsuperscript{105}. Companies looking at their Near Miss Reporting need to analyze whether their feedback process is fast and clear enough. This however does not mean jumping to conclusions. Some reports need time to be fully analyzed; some solutions might need to go through a full investment approval process. Giving feedback can mean that the company informs the person who has reported that a process has been started and that a content oriented feedback will be given at such and such time.

c) Unsafe Behavior

Unsafe behavior is a deviation from safe behavior as defined by the company, either through its HIRA process or by adopting rules formulated externally by government agencies or by safety associations. This definition is narrower than the everyday use of the term “unsafe behavior”. What then can be measured through observation is the percentage of behavior that does not comply with the rules. If this percentage is growing, either a serious accident is waiting to happen or the rules for safe behaviors are not well defined and/or communicated. A growing percentage therefore requires the same kind of analysis as reports of Near Misses. There is a major difference to the reporting of Near Misses. Unsafe Behavior must be captured by periodic formal audits. Formal audit means that observers must be fully familiar with “safe behavior”, i.e. the respective rules, and the methodology of auditing. Only this allows the calculation of percentages. Employees who want to report an unsafe behavior sporadically should nevertheless be encouraged to do this via the Near Miss reporting, but without including those reports in the indicator.

\textsuperscript{105} Krause: The Behavior-based Safety Process
d) Unsafe Conditions

Contrary to unsafe behavior the reporting of unsafe conditions can and should be entrusted to employees. “Hourly employees are often closest to the work, and their untapped knowledge represents a wasted resource.” Employees know their surroundings better than managers, they work with equipment and their surroundings all day and they do not face punishment nor anxiety for “betrayal”. The function of management in this case is to organize the “hazard hunting” because otherwise conditions are not checked in the necessary rigorous way. Organizing can mean dedicating 10 minutes each week or month to a certain topic. One can imagine that on a certain Monday every employee is given 10 minutes to look at all electrical installations in his area or on the way to his workplace with the request to document everything that seems not to be safe.

Efficiency dealing with reports on unsafe conditions is even more important than in the case of Near Misses. Correcting unsafe conditions is very visible and creates confidence; permitting reported unsafe conditions to continue to exist destroys trust. In most cases the items concerned are small and correcting them requires little money and time.

4.3.4.5 Steering Indicators

As Krause noted management cannot directly steer the outcome regarding safety but rather the input helping to reduce probability and impact. In order to find indicators to steer the input let us use again the Manzoni model with its six levers:

a) Technology
The task of technology is to make using it as safe as possible which in turn requires “Design for Safety”. All equipment must be designed so that the probability of an incident is very low and the impact in case of an incident is also very low. Car manufacturers today offer devices that automatically keep a safe distance to the car in front (low probability) and a chassis that uses up most of the energy in the case of a crash by deforming the metal structure before the energy is conveyed on the human body (low impact). “Design for safety” also means that the activity of maintaining the equipment in a safe state must be doable in a safe way. In this sense “Design for Safety” means “Design for Safe Operations” as well as “Design for Safe Maintenance”.

---

How can managers measure “Design for Safety”? In the case of a manufacturing company that buys equipment from a supplier there are three items to be measured:
- Request for Proposals specifying safety requirements
- Evaluation of the offers with safety playing an important part among the criteria
- Feedback to the supplier from safety reports received during the use of the equipment

All three items concern the procurement process where the functions of manufacturing, engineering, procurement and safety have to work together. In many cases this might signify some changes in procedure:
- The company as the potential buyer has to specify its safety requirements already when drawing up the request for proposal instead of waiting for the supplier to describe the safety features of the equipment offered.
- Safety criteria must be included in the evaluation process, as binary (yes/no) as well as weighted ones
- Systematic feedback should be given to the supplier regarding safety issues and improvement potential during the useful life of the equipment

b) Management

As shown in chapter 4.2 managers must be teachers, coaches, motivators and mentors. From these functions four input-oriented indicators can be deducted:
- Participation in training (teacher function)
- HIRA exercises with workers (coaching function)
- Safety Moments given (motivator function)
- Safety Observation Tours done (mentor function)

Participation in training means to count the frequency of managers participating as teachers or inspectors at safety training course given to employees. HIRA exercises are short training sequences run by managers with individual employees or small groups of employees using an activity as a case that they are familiar with, having happened within the company or in their outside life. Safety Moments are looked at in chapter 4.6 and SOTs are visits to the shop floor focusing on behaviors.

All four functions are enabling functions – making employees able to stay safe - and as such are typical input factors.
c) Processes

Rules can only be followed if they exist and are current. What can be measured in this context are four items:

- Number of Safe Working Procedures (SWPs) in existence
- Integration of Safety into Change Management
- Frequency of revision of the existing SWPs
- Application of Hazardous Work Permits (HWPs)

There are three reasons why the amount of SWPs in existence should be measured. First: Safe Working Procedures are a pre-requisite to the predictive indicator “Unsafe Behavior” mentioned above. Second: Without SWPs the step “To Know” in chapter 4.2 is not done. Third: The development of SWPs requires the formal and strict application of the HIRA process.

SWPs must remain up to date. As companies frequently change their working processes based on their Continuous Improvement Programs attention must be paid to the inclusion of safety into the change management process. An approach I call the “Pharmaceutical Concept” must be applied, i.e. the search for and identification of the side effects of the proposed changes on safety. As said before: Safety is not the purpose of the company but a restriction - and for each change it has to be evaluated whether the defined safety restrictions are still the same.

SWPs themselves must also be improved. This is done by formally revising existing SWPs. To make sure these revisions take place the frequency of revisions should be measured.

Finally, there is a special case of SWPs to be mentioned: the Hazardous Working Permits. They are “standard” as a methodology but valid only for one execution. Compliance with this methodology gives a very important input to the steering of safety. As it deals with hazardous activities it is advisable to audit each HWP after closure.

d) Structure

Structure as a lever works indirectly and was therefore valued low in the surveys presented in chapter 4.1. It is however important in setting the tone in a company. This tone of “Safety First” can be set by
- beginning each meeting with an agenda point on safety
- beginning the periodical management communication to employees with a paragraph on safety
- Giving Safety indicators a prominent place on display such as PDCA boards
- Update regularly publically displayed safety information

The challenge for these items is to keep them from becoming routine. Starting a meeting with safety is frequently done by explaining emergency procedures. Sometimes this is important when a substantial group of participants are not familiar with the location. But it carries a large downside risk for the “safety-tone” with it. First of all, it can border on the ridiculous (“we now show you how to close and open seat belts”) for many of the participants who as a consequence will not pay attention. Secondly it reduces safety to an exception instead of promoting “safety always and in everything”. Explaining emergency procedures therefore should not count as the safety item on the agenda. What then can count? The easiest is to move an existing safety agenda point to the beginning of a meeting, be it the discussion of monthly reporting, a proposed project, conclusions from an incident or a Near Miss, or feedback from a safety committee meeting. If no such item exists, then a Safety Moment can be held. In its most simple form participants could look at a clip on Internet (there are dozens of new entrants every week on YouTube) and then be asked: Could it also happen here?

In many companies a top manager - chairman, president, CEO, General Manager etc. – sends a monthly letter to employees. Do those letters start with a safety message consistent with “Safety First”? It can be done: Amrit Kapur, from 2008 to 2011 CEO of Ambuja Cement in India, started and ended every single of his monthly letter with a safety message. The example that follows is taken from June 2008: “Before concluding my letter, I would once again, appeal to all that intensive efforts should continue to be made to spread awareness of ‘5 Cardinal Rules’ of safety with constant interaction with the people more particularly with contractors and their employees on an ongoing basis. We have major task to change their behavior. It is a challenge for all of us”-

Displays can also set the tone but they must be SMART. This acronym usually applies to objectives (Specific, Measurable, Accepted, Realistic, Timely). Here it is used in a slightly different form. The information displayed must be
Specific: linked to the location
Meaningful: understandable for the employees seeing it
Actual: updated
Relevant: concern the activities of the employees
Thought provoking: stimulate the employees to maintain or improve safety

Many PDCA boards fall short of at least one of the five criteria, mostly the last one. A good example is the so-called Green Cross which lists all the weeks of the year with the weeks colored green if it passed without an incident (usually a LTI). For most employees this is nice to know but not more. What conclusions can they draw if and when a “red” week shows up?

e) Performance Management

Performance Management deals with rewards, recognition and consequence management, i.e. punishments. As will be shown in chapter 4.4 monetary rewards do not seem to have a positive influence on safety. If a company decides to offer rewards, then a tracking mechanism must be put in place to enable management to judge the relevance of this steering activity and to change or adapt the reward program as necessary. Recognition programs are somewhat similar to setting the tone in section d) above. Management certainly speaks up if things do not work well, i.e. if they notice safety violations. Necessary as this might be it nevertheless gives safety a sour taste. Recognitions change the sign from negative into positive, show that management actively looks for good behavior, for good practices. The challenge to recognition programs is to not let them become routine as in the case of a manager of a Holiday Inn in the state of Michigan who told me: “I employ 39 people and over the course of the last four years 37 of them have been employees of the month, some more than once. It has now become a “right” to receive this title in a certain frequency.”

All companies have rules regulating punishment for safety violations. It is therefore imperative that management is informed about the types of punishment, the root causes, and the reaction to punishment. This information shows on one hand what types of infractions are happening so that mitigating actions can be put in place. It also serves to assure that the punishment process is consistent and fair (understood as “fully in accordance with the rules of the company”).

f) Skills

Employees must know and understand the skills necessary to keep safe. This is why most companies have rules such as “No person is allowed to work for Oerlikon or to visit an Oerlikon site without having received
adequate safety instruction and training.” (OC Oerlikon Golden Rule #1).
In the quoted rule “training“ is linked to “work“. New employees have to be
given the skills necessary to work safely. Management needs to know
whether this rule has been complied with. Having skills however requires
more than the initial training mentioned. There must be indicators to
measure the upgrade of skills in case of changing activities or changing
equipment. The challenge of changing activities is not so much the shifting
of an employee to a new job but the short-term standing in for a colleague
who is absent for whatever reason. Frequently a worker does this out of
goodwill and his supervisor forgets to check whether this worker has the
necessary skills to stand in.
Finally, skills acquired once can fade and erode. For this reason, refresher
courses must be organized and the participation and outcome recorded.

4.3.4.6 Learning Indicators

The fourth group of indicators deals with the ability of a company to
maintain and improve safety. How can management measure whether the
company learns and implements the learnings?
Most companies operate a knowledge management system where good and
bad practices are stored. This database offers two conventional
measurements:
- number of entries
- number of retrievals
Comparing the number of entries with the number of reported Near Misses
can show whether the company is able to process the inputs it receives.
Measuring the time difference between the date a report is received and its
storage in the knowledge management systems shows the efficiency of the
process.
Measuring information storage and retrieval however does not offer insight
into the ability of the company to implement actions. This can be measured
by comparing the due dates on action plans with the “done” date. It is
important that the “due” date used in this reporting is the first one entered
in an action plan. Many times due dates are changed during
implementation for a variety of reasons. Comparing the final date with the
original due date shows the ability of the company to plan and implement.
If there is a gap the company is either not good at planning or not good at
implementing.
4.3.5 Conclusion

The conventional indicators used by management teams are lagging ones. They are needed because setting objectives without tracking progress is useless. Furthermore, they have to be reported to authorities. For steering, however, they are not helpful. There is an urgent need to develop leading indicators and the corresponding reporting systems, part of them measuring input activities by management, part of them showing predictive characteristics. Ideally those indicators will be complemented by figures that present the ability of an organization to implement safety improvements. The reporting of First Aid Cases and Near Misses must be encouraged even though this results in applying Consequence Management according to results and not according to root causes.
4.4 The role of reward in improving safety at work

4.4.1 Positive and negative consequences of Performance Management regarding Occupational Safety

Performance Management has always two sides to it, the reward and recognition part and the consequence management part (this term substituting “punishment”). We are aware of the two sides when we look at our car insurance schemes with its bonus and malus components. Within companies the positive consequences are usually very obvious; variable compensation, promotions, new interesting tasks, fringe benefits are incentives with a positive value that should induce us to work hard in the direction established by the company. The negative consequences are less visible; they range from no salary increase to admonishment to dismissal. This general situation is somewhat turned on its head when looking at the subject of safety at work. Here generally performance management consists of consequence management as a reaction to not following rules and the positive consequences are somewhat hidden, maybe because managers think that staying safe by itself should already be enough of a positive connotation. Emphasizing compliance however leaves us far from a sustainable safe situation as can be seen by the Bradley curve introduced at the end of chapter 3.4. Compliance with rules as a condition of employment forms part of the dependent stage. In order to be really successful in Occupational Safety it is necessary to progress to safety as personal value and then eventually as a core value of the company. In essence this means that all of us should behave safely because we want to be safe, not because we have to be safe. Reward management should be able to support behavior transitioning into an attitude. Armstrong listed among the aims for reward management\textsuperscript{107} that it should underline the definition of what is important in terms of behavior and outcomes and enhance the motivation of employees to engage themselves. Behavioral science\textsuperscript{108} teaches that positive consequences have more impact than negative ones. It can therefore be assumed that reward and recognition elements in a Performance Management system support Occupational Safety better than elements of consequence management. In order to verify this hypothesis, the reward and recognition system of a cement company in Indonesia, Holcim Indonesia, was looked at in October 2011, since this company had put in place a very elaborate program.

\textsuperscript{107} Armstrong’s Handbook on Reward Management, p 6
\textsuperscript{108} Krause: The Behavior-based Safety Process
4.4.2 The Program “Anda Yang Memutuskan” (You Decide) of Holcim Indonesia

This program for safety was implemented in 2007, following somewhat the logic of the many frequent flyer programs in existence, meaning that points could be accumulated by employees doing “things” in favor of safety, thereby earning a chance for some rewards. The terms of the program had been developed on the basis of a pilot program tested during 2006 where the organization had learned the following lessons:
- The rewards must be meaningful for most of the employees (the 2006 program handed out motorcycles as the biggest reward)
- The period up to a potential reward must be short (the 2006 program ran for the full year which discouraged many employees already after a few months)
- There must be an individual and a team component
- The program must be easy to administrate
- The program must be offering an opportunity for recognition

The program had the following characteristic:

a) Criteria for earning points:

- Do a Safety Observation Tour or request to be observed: 1 per month
- Attendance at the safety committee meeting: 1 per month
- Conduct a planned inspection: 1 per month
- Submit a valid hazard report: 1 per month
- Report an incident or a Near Miss: 1 per month
- Do a Personal Risk Assessment or a Job Safety Analysis prior to a non-routine activity: 1 point per month
- No personal injury the whole month: 1 per month
- No personal Safety Violation the whole month: 1 per month

Each employee was therefore able to gain a maximum of 8 points per month.

b) Criteria for participation

- The company was divided into 6 areas and then each area into a number of teams
- All employees below the rank of a manager (company-internal definition) were invited to participate
- All teams having suffered a Lost Time Incident were excluded from the program for the relevant quarter of the year.
- All teams of an area having suffered three or more LTIs or a fatality were excluded from the program for the full year.

c) Program process

- Each employee was given a scorecard booklet with one scorecard per quarter
- Employees filled out the scorecard themselves and sent them at the end of the quarter (signed by their immediate superior) to the OH&S department
- Each area selected two winners per quarter: One from the collection of scorecards with the highest number of points and afterwards one from the collection of all valid scorecards.
  . The first winner was awarded a reward (not money) with a value of IDR 1 million (in 2007 the equivalent of about USD 100) and all the members of his work team were receiving the same price as well.
- The second winner received also a reward with a value of IDR 1 million but only as an individual.
- At the end of the year the names of the 24 first winners were put into a drawing box from which the grand yearly price winner was drawn: a scholarship fund in the value of IDR 20 million. In addition, all the members of the team of the winner received the same grand price.

At a first glance this program seemed to show all necessary elements:
- the criteria for earning points were under control of each employee
- the time period was short (3 months) which meant that missing a point in a quarter just was valid that specific quarter
- teams had an interest to help each other gaining points

In other words, it fulfilled characteristics of a good performance management as defined by Armstrong\(^\text{109}\) who said that performance management should be concerned with both what people achieve and how they achieve it, should be rooted in the reality of the individual’s performance that rewards should be attainable and worth attaining and should quickly follow the performance. And it seemed to avoid a pitfall mentioned by Manzoni, namely “trying to reward the behaviors it was hoping to see but doing so imperfectly – typically using incomplete measure(s)”\(^\text{110}\)

\(^{109}\) Armstrong’s Handbook on Reward Management, 
\(^{110}\) Manzoni: On the folly
4.4.3 Effect of the program

The OH&S statistic of Holcim Indonesia showed the following values:

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lost Time Accidents</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Medical Treatment Accidents</td>
<td>9</td>
<td>10</td>
<td>9</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td>First Aid Accidents</td>
<td>NA</td>
<td>24</td>
<td>26</td>
<td>21</td>
<td>37</td>
</tr>
<tr>
<td>Near Misses</td>
<td>NA</td>
<td>18</td>
<td>32</td>
<td>12</td>
<td>17</td>
</tr>
</tbody>
</table>

Table 4.15: Safety results 2006 to 2010

These results show clearly that the safety situation had not changed over the four years of the existence of the program. The program therefore did not trigger a noticeable improvement, especially when knowing that the management of Holcim Indonesia made a big push during the four years to implement so-called Fatality Prevention Elements, i.e. specific rules and procedures for known hazardous activities such as Working at Height or Confined Space Safety.

Since the overall incident rate was quite low the question remained whether the program contributed at least to sustainability. For this purpose, the participation rate of the employees was taken into account:

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTEs</td>
<td>2432</td>
<td>2406</td>
<td>2376</td>
<td>2486</td>
</tr>
<tr>
<td>Program participants</td>
<td>356</td>
<td>337</td>
<td>246</td>
<td>318</td>
</tr>
<tr>
<td>Rate of participation [%]</td>
<td>14,6</td>
<td>14,0</td>
<td>10,4</td>
<td>12,8</td>
</tr>
</tbody>
</table>

Table 4.16: Participation level

Why this low participation? Or: why did the program not work?
4.4.4 Search for reasons: semi-structured interviews with employees

During early October 2011 a total of 18 interviews with employees were conducted, posing them the following 9 questions:

1. Do you know the safety reward program “Anda Yang Memutuskan”? If yes, please describe it.
2. Did you participate in the program? If yes did you win a reward?
3. Why did you/did you not participate?
4. Is your team participating in the program?
5. What do you do differently due to the program?
6. What kind of safety-oriented activities did you carry out last week and for how long?
7. Are you feeling safer at work due to the program? Why?
8. Does management support you in becoming safer? How?
9. Any suggestions?

All the interviews were conducted with the help of a translator, namely the medical doctor in charge of Occupational Health in the company. She was a very much liked and respected person with many years of experience in her field and in the company and was trusted by everybody. This was the reason for choosing an inside person as translator and not a neutral outsider.

The sample was composed as follows:

<table>
<thead>
<tr>
<th>Total persons interviewed:</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age variation:</td>
<td>23 – 49</td>
</tr>
<tr>
<td>Years with company:</td>
<td>2 – 29</td>
</tr>
</tbody>
</table>

Questions 1, 2 and 4 gave the following numerical results:

<table>
<thead>
<tr>
<th></th>
<th>Unskilled</th>
<th>Apprentice</th>
<th>High School</th>
<th>Professional Degree</th>
<th>BA/BSc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interviewed</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Program known</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Program unknown</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 4.17: Answers to questions 1, 2 and 4

Remarks:
- The program was considered “known” when the person interviewed correctly explained the five elements mentioned above under “program process” that related to the quarterly process.
- 7 of the 9 employees that had participated said that their team participated. 2 employees were not member of a team. For the purpose of this study they were considered 1-person teams.

Let us now look at the reasons given for participating in or abstaining from the program.
The ten employees having participated mentioned the following reasons:

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number of mentioning’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety is important for me</td>
<td>8</td>
</tr>
<tr>
<td>The prizes are attractive</td>
<td>6</td>
</tr>
<tr>
<td>My boss told me to participate</td>
<td>5</td>
</tr>
<tr>
<td>My friends participate</td>
<td>4</td>
</tr>
<tr>
<td>I want to be a role model</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.18: Reasons for participating

These answers show that the opportunity to win a prize was a contributing factor but not more. Pressure (from the company or the peers) was at least as important. Looking at the most mentioned reason, namely that safety was important, the question now becomes whether those participants were influenced by the program to do anything differently in regard to safety. To get an insight into this aspect let us look at the answers to question 5 where the employees had to say what they did differently due to the program.
### Table 4.19: Additional safety actions

According to the perception of the employees interviewed the program had mainly an impact on safe conditions. One person said: “Today we not only see a hazard but we report it and then the company acts on it.” This perception is substantiated by the company statistics:

<table>
<thead>
<tr>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazards reported</td>
<td>924</td>
<td>1088</td>
<td>1272</td>
</tr>
</tbody>
</table>

### Table 4.20: Hazard reports 2008 to 2010

That participants in the program focused on conditions can also be seen from the answers to question 6 about their specific safety oriented activities the week before the interview (only participants in the program mentioned anything):

<table>
<thead>
<tr>
<th>Activity</th>
<th>Number of mentioning’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection of conditions</td>
<td>6</td>
</tr>
<tr>
<td>Participation in a safety meeting</td>
<td>2</td>
</tr>
<tr>
<td>Nothing</td>
<td>2</td>
</tr>
</tbody>
</table>

### Table 4.21: Personal safety activities

Now let us go back to the abstentions from the program and the reasons given for it. The answers include also the perceptions of those employees having participated in the program regarding the reasons why others had not participated:
The surprising part of these answers is the reference to clear rules. The five employees who mentioned this confirmed the Bradley curve which states that in the development of a company to a safe company, rules precede values.

The answer to question 7 showed that the majority felt safer:

<table>
<thead>
<tr>
<th>Feeling safer</th>
<th>Number of mentioning’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel safer</td>
<td>8</td>
</tr>
<tr>
<td>I feel somewhat safer</td>
<td>4</td>
</tr>
<tr>
<td>I do not sense any change</td>
<td>6</td>
</tr>
</tbody>
</table>

Those who felt safer gave two reasons for it:

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number of mentionings</th>
</tr>
</thead>
<tbody>
<tr>
<td>The company acts faster on reported hazards</td>
<td>8</td>
</tr>
<tr>
<td>Managers remind us more frequently about safety</td>
<td>4</td>
</tr>
</tbody>
</table>

Again those answers confirmed that the employees interviewed saw the benefit of the program mainly in the elimination of hazards, i.e. in improving conditions. This ties in with the answers to question 8 about
management support. All 10 employees having participated felt that management was supporting them in becoming safer:

<table>
<thead>
<tr>
<th>Type of management support</th>
<th>Number of mentioning’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giving frequent safety messages</td>
<td>7</td>
</tr>
<tr>
<td>Improving conditions</td>
<td>6</td>
</tr>
<tr>
<td>Doing Safety Observation Tours</td>
<td>4</td>
</tr>
<tr>
<td>Offering training</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4.25: Management support

The last question was deliberately a very open one. The few responses obtained centered on the program process:

<table>
<thead>
<tr>
<th>Suggestions</th>
<th>Number of mentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>The communication must be improved to reach more employees</td>
<td>7</td>
</tr>
<tr>
<td>The probability for winning must be higher</td>
<td>4</td>
</tr>
<tr>
<td>There should be a greater variety of prizes</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 4.26: Suggestions by the employees

At the end of the interview all employees were asked whether they would suggest to management to continue with the program. Only 3 said yes.

From the 18 interviews it can be concluded that the program did have some impact on the reporting and correction of hazardous conditions. Given however the 312 participants in the program in the year 2010 and potentially each of them reporting one hazard per month there could have been 3744 hazard reports for the full year while the company received “only” 1272. The program did not create “Passion for Safety” which is the tag line for the safety improvement program of Holcim, the parent company of Holcim Indonesia.

4.4.5 The view of management

In a second round of interviews 8 managers were invited to answer the following questions:

1. What do employees today differently due to the program?
2. Why did employees not participate?
3. Any suggestions for the future?

These eight managers were all above 40 years old, had all a university level degree and between 4 and 21 years of experience with the company. The plant manager was one of these managers.

The answers to question 1 reinforced the conclusions from the employee interviews:

<table>
<thead>
<tr>
<th>Activities</th>
<th>Number of mentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better reporting of hazards</td>
<td>2</td>
</tr>
<tr>
<td>Taking the time to work safely</td>
<td>2</td>
</tr>
<tr>
<td>Nothing</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4.27: Improvements as seen by management

The doubts about the program were summed up clearly in the comment of one manager who said: “Yes, a competition with prizes to win ties in with the local culture. The program however causes awareness without really raising awareness”.

The following reasons were brought forth answering question 2:

- This program is just another of many programs.
- It is voluntary: nothing happens if somebody does not participate
- Prizes are not attractive for everyone
- After winning a first time employees did not continue
- Employees in areas that are already very safe have nothing to report
- Employees do not like to fill out forms

This rather skeptical view of the program was then confirmed in the answers to question 3. With regard to the future the managers said:

- The program should not be necessary at all because safety is in the interest of everybody.
- We merge this program with those on operations excellence and maintenance excellence.
- We should rather use the yearly qualification process.
- If we continue we must build elements into it, which give safety “a good feeling”.
- If we continue we must change the prizes frequently to catch the attention again.
With these answers the managers confirmed that the program did not live up to the expectations created in 2007. They themselves did not believe that the program could add much value to the safety effort of the company. The plant manager summed it up as follows: “Reward is a starting point because it catches the attention of people. To achieve sustainable safety we however must use recognition”. By recognition he referred to the constant daily feedback of superiors to their staff, an approach that had been described decades earlier by Haire: “the superior is bound to be constantly shaping the behavior of his subordinates by the way in which he utilizes the rewards that are at his disposal”\(^\text{111}\)

4.4.6 Conclusions

A reward program for safety is expected to
- raise and maintain short and long term awareness for safety
- incentivize actions to improve conditions and behavior

Looking at the program of Holcim Indonesia some additional awareness was created and some conditions were improved. The low participation rate as well as the skepticism shown by the management leads to the conclusion that it did not give an additional push. Why was it failing even though its consequences were immediate (nobody criticized giving prizes on a quarterly frequency) and positive as mentioned by Krause as preconditions?

Five issues can be identified from the interviews:

a) Procedure: it was considered complicated. To what degree can workers be expected to fill out forms?
b) Fairness: Not all employees have the same opportunity to fulfill the criteria to gain points.
c) Value of the reward: the choice of prizes was not as attractive as needed to incentivize and the probability to win was considered too low.
d) Teams: including the team aspect hindered the program rather than supporting it.
e) Management support: when managers themselves are not convinced of the merits of a program then success will be difficult to achieve.

\(^{111}\) Haire: Psychology, p 14
Would the program work if those deficiencies could be overcome? One single case study certainly cannot prove that a reward system should not be part of a safety program of a company. There are a few questions however that need to be addressed when thinking of implementing a program without the mentioned deficiencies.

a) Personal value: The Bradley curve implies that safety is improved when all employees accept being safe as a personal value, i.e. they want to be safe instead of having to be safe. Can a reward system with its emphasis on monetary value enhance safety as a personal value?
b) Core value: The Bradley curve implies that a very low incident rate requires safety as a core value of the company. Can a reward system foster core values?
c) Excellence: Should a reward system hand out prizes for standard activities which should be part of daily business or should rewards be restricted to “going the extra mile”?
d) Emotion: Does a reward system create emotions for the prizes or emotions for the underlying cause?

Based on the case study and the considerations resulting from it the conclusion is that even a well-structured and easy to use reward system for enhancing safety at work contains many potential pitfalls that make the value/effort comparison not attractive. There is however no way back to pure consequence management with its emphasis on compliance with rules but rather a move towards better recognition. Case studies are needed to show whether recognition systems can do what reward systems cannot achieve.
4.5 Creating a new culture through behavior change

4.5.1 Introduction

According to the Manzoni model a culture of a company changes when enough employees change their behavior long enough. The surveys presented in chapter 4.1 showed that the most important lever to influence employee behavior is visible management behavior. In chapter 4.2 a model was presented whereby the change of behavior is achieved by running through four steps. How does all of this work in practice?

Holcim Apasco, the subsidiary of Holcim Ltd in Mexico, started in 2009 working with the California based safety consulting company BST to work on the behavior of their managers regarding safety. The theory behind the approach of BST stresses the importance of visual leadership by managers. As this coincides with the content of chapters 4.1 and 4.2 we decided in October 2011 to study the impact of the program on Holcim Apasco. Together with their CEO and their OH&S Coordinator we opted to run a series of structured interviews at the biggest plant of their Ready Mix subsidiary in Mexico City. Ready Mix was chosen because it is less technically driven that the cement activity, human behavior therefore being more directly influenced by human interaction.

4.5.2 Interview setup

The sample chosen for the interviews was composed as follows:

<table>
<thead>
<tr>
<th>Nr of interviewee</th>
<th>Age</th>
<th>Years with company</th>
<th>Function</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28</td>
<td>3.5</td>
<td>Worker</td>
<td>Operations</td>
</tr>
<tr>
<td>2</td>
<td>39</td>
<td>13</td>
<td>Supervisor</td>
<td>RM plant</td>
</tr>
<tr>
<td>3</td>
<td>28</td>
<td>2</td>
<td>Mechanic</td>
<td>Maintenance</td>
</tr>
<tr>
<td>4</td>
<td>31</td>
<td>1.5</td>
<td>Worker</td>
<td>Operations</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td>0.5</td>
<td>Worker</td>
<td>Operations</td>
</tr>
<tr>
<td>6</td>
<td>37</td>
<td>4</td>
<td>Employee</td>
<td>Office</td>
</tr>
<tr>
<td>7</td>
<td>29</td>
<td>9</td>
<td>Mechanic</td>
<td>Maintenance</td>
</tr>
<tr>
<td>8</td>
<td>37</td>
<td>18</td>
<td>Worker</td>
<td>Warehouse</td>
</tr>
<tr>
<td>9</td>
<td>44</td>
<td>19</td>
<td>Vice President</td>
<td>Operations</td>
</tr>
<tr>
<td>10</td>
<td>36</td>
<td>4</td>
<td>Worker</td>
<td>Operations</td>
</tr>
<tr>
<td>11</td>
<td>25</td>
<td>3</td>
<td>Driver</td>
<td>Logistics</td>
</tr>
</tbody>
</table>

112 Krause: Leading with Safety
Table 4.28. Interview setup

All the interviews took place in Mexico City from October 10 to October 13 2011. They were conducted in one-on-one sessions in Spanish and the notes taken in Spanish.

The questionnaire had five parts:

<table>
<thead>
<tr>
<th>Question</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>How would you describe the safety culture today at Concretos Apasco and what were the main changes over the last two years?</td>
<td>Identify the key terms used to describe the culture in October 2011 and to find specific tangible elements that had changed.</td>
</tr>
<tr>
<td>What is your personal role in safety?</td>
<td>Identify the key terms used to describe the individual behavior regarding safety</td>
</tr>
<tr>
<td>What is the role of a manager in safety?</td>
<td>Identify the visible part of management activities</td>
</tr>
<tr>
<td>How do managers support you going through the four steps “Know – Understand – Accept – Do”</td>
<td>Identify specific management support</td>
</tr>
<tr>
<td>Do you have anything to suggest?</td>
<td>Identify any issue important to the interviewee</td>
</tr>
</tbody>
</table>

Table 4.29: Questionnaire

To this structured procedure two questions were added to find out whether the behavior change extended to activities outside of work:
- Has this program impacted safety at your home and how?
- Let us assume that arriving at your home you see a man working on the roof of the house next to you without any fall protection. What would you do?

4.5.3 Interview results

4.5.3.1 The safety culture of Holcim Apasco

Workers used the following words to describe the actual safety culture:
- Care
- Respecting each individual
- Priority for safety
- Safety starts with me
- Safety has become a habit
- We now keep the rules
- Awareness of safe working conditions

The terms care (cuidar) and respect for individuals (respecto de cada un) were by far the most used ones. From those terms it became clear that for the workers the attitude of the managers had changed: managers now cared not only about the business but equally about the people working in the company and were willing to give safety (i.e. people) a higher priority in case of a conflict of interest.

The specific tangible elements centered on visible improvement of conditions such as
- Much less noise and dust
- Pedestrians have now their own walkways in the plant
- Order in the whole Ready Mix plant from the entry door onwards
- Drivers have been given proper PPE such as safety shoes and reflecting vests

The separation of space for trucks and for pedestrians was stressed very much which shows how impressed the workers were by this management decision (Remark: Truck traffic is indeed on of the most important hazards in a Ready Mix plant as the trucks frequently have to back up. A permanent high noise level from the trucks and the mixer prevent a pedestrian from hearing a truck coming his way). Giving drivers safety shoes and reflecting vests to wear was also an important visible way to show workers that management cared.
The caring attitude of managers was furthermore reflected in the following comments:
- We have the right to demand a safe access to job sites for unloading Ready Mix
- We are permanently looking for hazards
- We learn through meetings
- Results are visualized by management

The access to job sites is the most important hazard perceived by drivers. The interviewee 13 summed it up in the following way: Customers have a much different culture. They tell me: We buy concrete, not safety (te compro concreto, no seguridad). To have the right to refuse the entry to a job site was a new experience for the two drivers interviewed and proved to them that safety as a priority had a real practical influence on their work, including delegated decision power. Being an accepted partner and not just a receiver of orders was another proof of respect for the individual. Interviewee 3 stated that there were no longer any barriers between managers and workers in safety meetings (no hay mas barreras entre jefe y empleado).

When asked to look back and then state the biggest change that had occurred four workers said that before they just worked (hay que hacer el trabajo) and now they worked safely.

The three managers interviewed (♯2, 9 and 13) commented that for them the biggest change had been management commitment towards safety. The culture now was one of preventive safety which meant for them “we now act when we see unsafe situations, i.e. unsafe conditions or unsafe behavior”. Acting visibly as a management behavior coincides very well with the perceptions of workers as described above. Making safety part of the decision process was the most important step for the managers in the move to a preventive safety culture.

4.5.3.2 My personal role in the safety culture

All twelve workers and the one employee stated that safety started with them. This was best expressed in the comment of one of them: “Whenever I look into the mirror in my locker I look at the person responsible for my safety”. Being the responsible person for safety meant:
a) knowing the safety rules applicable to their activities and to live the said rules
b) knowing the hazards in their area and always looking for new or changed hazards  
c) caring for others and act in case of need  
This strong emphasis on rules and compliance was surprising at first. A second reading of the notes however gave an explanation. The workers thought of the rules as being rules they agreed to instead of rules just being imposed. Rules were, they said, reviewed at safety meetings where, as stated above, managers and employees had the same weight. Furthermore, compliance was not the right translation because the workers had underlined “live the rules” which meant they wanted to work according to jointly accepted rules instead of being compliant to externally imposed rules. This coincides with a conclusion by McSween: “Implementing behavioral safety through a team approach is the best way to ensure a consistently high level of attention to safety. It is also the most effective way to involve employees in developing and maintaining safe work practices.”

This view of the individual role of each worker/employee coincided with the answers of the three managers who stated that they had to 
- give a visibly good example, i.e. being responsible for their own safety 
- lead all employees to the “independent stage” on the Bradley curve 
- coach permanently by giving feedback 

The managers estimated that about 80% of the workers and employees had reached the independent stage, among them all interviewed workers and employees.

4.5.3.3 The role of the managers  
The twelve workers and one employee interviewed had five main expectations regarding the role of managers in the quest for safety. Managers should 
- organize and facilitate safety meetings 
- support positively (and not just give orders), creating a climate of confidence 
- coach on the job 
- provide safe equipment 
- report incidents  
The first three expectations tie in with what they mentioned about the present safety culture. They used explicitly the word “facilitate” instead of “run” for the meetings which is aligned with respect for the individual and

113 McSween: The Values-based Safety Process, p 11
his opinions: they asked for support and coaching so that they could carry out their primary responsibility, namely looking out for themselves.

Asked what the managers actually did they unanimously said that their managers did organize and facilitate meetings and that equipment and conditions had become safer. Three times it was mentioned that the General Manager himself explained, i.e. coached, the Cardinal Rules. The expectation “report incidents” – mentioned three times – was not probed with additional questions; the hypothesis that workers by and large do not like to write was not tested.

Again the three managers had very aligned answers. They saw the role of managers in coaching, following up issues that had come up in safety meetings, during Safety Observation Tours or through reporting. Furthermore, they considered it the obligation of all managers to give daily Safety Moments. Interestingly enough the term “Safety Moment” was not mentioned once by the workers, maybe because it was considered a meeting facilitated by a manager.

### 4.5.3.4 Management support for “Know – Understand – Accept – Do”

**a) To know**

The interviewees stated that managers
- gave initial formal safety courses (interviewee 5: “It all took place within my first week with Holcim Apasco”)
- ran specific courses regarding the operation of equipment, such as a trackmobile (an engine that can run on a railway track as well as on the road).

It was however felt that only the initial course followed a clear structure; equipment-oriented courses were set up depending on the initiative of individual managers and were not based on an overall masterplan.

**b) To understand**

The interviewees stated that their managers
- gave them frequent reminders about hazards and about safe behavior, e.g. when they were distracted in any way
- were always willing to show safe ways of working when asked
- observed their work frequently and then came up with suggestions to be safer

(Interviewee 4 said that initially he felt that at HA management exaggerated talking so much about safety)
c) To accept
Acceptance was supported by
- giving a good example
- letting people speak up at meetings
- reacting fast to suggestions by workers

d) To do
Unanimously the interviewees stated that the General Manager himself insisted that everybody should be given the time to work safely and that this message had reached all management levels, so that is was now fully acceptable to miss a deadline if the reason was safety-based. This “take your time” culture was complemented by managers reminding all people very frequently that rules had to be followed.

What the interviewees perceived was a high degree of visibility of managers who coached on the job, were accessible, observed and listened before speaking and gave a good example themselves. They furthermore perceived a fast reaction to suggestions and felt they were protected against undue time pressure but at the same time requested to fully follow rules. In other words: they perceive a management who walks the talk.

4.5.3.5 The view of the OH&S coordinator

So far only the responses of the workers, employees and line managers have been summarized. Interviewee 15 was the OH&S Coordinator of the Ready Mix subsidiary of Holcim Apasco. He basically agreed with the description of the safety culture, saying that for him Holcim Apasco tried to lead with safety instead of just leading. Just leading had meant focusing one hundred percent on business objectives. Safety had mainly consisted of criticizing obvious deviations. In his view the main change managers had undergone was to give feedback in a supportive way. So far he had agreed with workers and line managers. Where he disagreed was the depth of penetration of the new culture. In his view the culture described had reached very few of the first line managers (FLM, i.e. supervisors). He considered the one interviewed as an exception. Middle managers still did too little to coach FLMs to cooperate and care. As a consequence, he felt that FLMs were still caught between a rock and a hard place, meaning that they still did not understand how to deal with performance objectives when asked to give the workers time to work safely. When challenged that the workers themselves perceived managers
as caring and giving priority to the safety of people he stated that workers were still reacting to the surprising (for them at least) fact that senior and middle managers cared about people and were visible in favor of safety, forgetting their daily experience with their direct boss, a FLM. FLMs still lacked methodology and didactic skills, having many times risen from having been a worker without subsequently given these kinds of management skills.

4.5.3.6 Further suggestions

The suggestions for the future included
- Keep the effort up to convince customers that their job sites need to be safe for our drivers
- Make sure we do not forget the occasional contractor on our sites
- Develop and follow a masterplan for formal safety courses
- Maintain focus groups even after the end of the project with BST to continue to jointly develop solutions for he future.

These suggestions are fully aligned with the other answers. Having improved the conditions in the Ready Mix plants the biggest concern for the drivers -and then adopted by the other workers – was having safe access to the job site in order to unload concrete. Contractors always present a challenge (see chapter 4.7) and occasional ones among them even more. The request to continue with focus programs showed that safety should not be a project but part of day to day management of the activities of the company, recognizing what McSween had written: “team approaches to safety typically struggle with several common problems. One is that teams often shift priorities as they begin to feel they have safety under control”.114 Two interviewees however added a word of caution. One insisted that a balance should be kept between efficiency and safety because HA was now risking overvaluing safety. The second one mentioned the same concern but in a more practical way: Don’t make the safe working rules too time-consuming.

4.5.4 Conclusions

The responses from the interviews show that the safety culture has changed, from “work first” to “all work must be done safely”. This new culture is the result of a changed behavior by workers who know the rules and live them, are aware of the existing hazards, constantly look out for

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114 McSween Values-based Safety Process, p 9
new or changed hazards, participate actively in safety meetings and are not afraid to speak up if they see a colleague committing an error. Workers have accepted that they themselves have the primary responsibility for their own safety. The most important lever to help bring about this change has been visible management behavior. Based on an attitude of “care” and “respect for the individual” managers support the “to know” by giving courses themselves, the “to understand” by coaching frequently on the job, the “to accept” by giving a good example themselves, by observing and listening and by acting fast on suggestions as well as on detected gaps and finally the “to do” by insisting that workers take the time to work safely. The second most important lever has been the process to review safe working processes: such rules are not designed by management and then imposed on the workers any more but reviewed in meetings where the main management function is to facilitate. This teamwork approach has helped much to have the rules accepted. The lever “structure” has also been influential at least as drivers are concerned. The decision to enter a job site or not has been delegated to them. As this represented a step change it can be assumed that it also had an indirect positive effect on workers in the Ready Mix plants. The lever “skills” was used mostly to enhance existing skills by coaching, helping to understand the application of safe working rules.

The remaining two levers, “technology” and “performance management” did not seem to have played a significant role. Regarding technology this is not surprising, as the Ready Mix industry is not known for advanced technology. Performance management was explicitly mentioned only twice in all the interviews, namely by saying that today results are visibly displayed for all to see.

When a company has reached this stage, i.e. a safety culture that is based on care, respect for the individual, managers who see their role as giving support and workers who accept their own responsibility: what is the next step? A first clue can be taken from the suggestions given. Workers mentioned that focus groups should be kept alive. This shows that the change achieved was still considered the result of a project and could lose some of its effect when the project was declared closed. Sustainability would mean that all the positive elements would have to become part of the DNA of the company, part of “that’s how we do business here”. One method to achieve this is an early integration into the company’s routines. A second clue is found in the comments by the OH&S coordinator: he mentioned a lack of skills affecting first line managers, namely not enough

\[115\text{ See Füllemann: Controller} \]
methodology and little understanding of didactics. As this management level has the most frequent and closest contact to workers they themselves need the skills to permanently coach and support. Methodology and didactics need to be integrated into the skill set for this management level.

An afterthought: The indicator LTIFR for all of Holcim Apasco went down from 1.9 at the end of 2008 to 1.4 at the end of 2010, compared to the target given by the Holcim Group of being sustainably ≤ 2.0.
4.6 A daily dose of sustainability: the Safety Moment

4.6.1 Introduction

It has been said before: safety is not the main purpose of business but a restriction or condition. This also holds true for each individual. When somebody goes to work in the morning his purpose is to achieve something or at least to execute a given task, under the condition that his safety is not impaired. As a consequence, we leave home mostly without thinking about safety, taking “Zero Harm” for granted. But to stay safe during the working day an employee needs a minimum level of safety attention to be aware of existing or changed hazards, to follow the defined mitigating actions or to design via a HIRA necessary new ones. This situation is shown in figure 4.12

Safety energy must be uploaded every day

For working safely a minimum attention level to safety is required. This level starts low at the beginning and must be increased by an initial Safety Moment. Several times during the day a small increase is again needed.

Figure 4.12: Safety awareness during the day

I have used the term “safety energy” because I like to think that all of us possess an inner safety wheel, much like the wheel made of lead inside small toy cars for children where energy can be loaded by turning the car wheels rapidly. When the car is set down at this moment it will run for a
certain distance. Our inner safety wheel must be loaded with enough safety energy to last through the day or the shift. One method to do that is the daily safety moment.

4.6.2 Definition and description

Let us define the Safety Moment as follows: A Safety Moment is a short safety event at the beginning of a workday or a shift helping people to raise their own as well as the team’s safety awareness.

In order to reach this purpose a Safety Moment has to be developed in five steps:

- Prepare – Recognize the audience (the participants) and what their needs are
- Pinpoint – Keep focused on the main idea or issue you are trying to convey
- Personalize - Bring the subject or issue close to home by using relevant examples
- Pictorial - Create a clear picture for your audience
- Prescribe- make sure you tell the audience precisely what they should or should not do

It should not exceed 5 minutes duration, catch the attention of the participants right at the beginning, use different techniques and most importantly leave a vivid picture in the mind of the participants at the end.

4.6.3 The case study

Given that nearly all Safety Moments have to be run by First Line or Middle Managers one has to ask what kind of skills they need to fulfill the said purpose and to what degree those skills are usually available. To find this out a total of 234 Safety Moments were analyzed, all of them having been developed and given under training conditions, i.e. slightly removed from reality. In all the Safety Leadership Courses I ran since the beginning of 2012 for mostly Middle Managers - some First Line Managers and some Senior Managers sometimes also participating - I integrated a module where the participants had to develop in groups of two a Safety Moment and then run it, using the other participants as their audience
telling them at the beginning who they represented. It was interesting to see that all “others” with very few exceptions immediately played the role of “who” quite realistically. At the end of the day all participants voted to select the best Safety Moment of that training session.

I evaluated the Safety Moments using the following seven criteria, the first three judging the delivery, the further four tied to the steps of the preparation mentioned in 4.6.2:

- Getting attention: Was the opening done in a way as to catch the attention of the participants (contrary to the safety announcements before a flight when nearly everybody is opening the newspaper when this safety moment is announced)?
- Participation: Were the participants activated by taking part or did they just have to listen?
- Keeping attention: was attention of the participants maintained during the full safety moment?
- Relevance: Was the chosen topic of importance for the chosen “who”?
- Focus: Was the Safety Moment focused on one message only?
- Reminder: Was there a “take to work” message at the end?
- Time: Was the time limit kept?

4.6.4. Results

As stated above these Safety Moments were run under training conditions where the participants were also managers and – very importantly – colleagues. The evaluation nevertheless gave a clear result. Each criteria was rated binary, either as fulfilled or not fulfilled.

<table>
<thead>
<tr>
<th>Criteria</th>
<th># fulfilled</th>
<th>% fulfilled of total</th>
<th>% fulfilled of winner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting attention</td>
<td>73</td>
<td>31</td>
<td>90</td>
</tr>
<tr>
<td>Participation</td>
<td>95</td>
<td>41</td>
<td>92</td>
</tr>
<tr>
<td>Keeping attention</td>
<td>126</td>
<td>54</td>
<td>79</td>
</tr>
<tr>
<td>Relevance</td>
<td>215</td>
<td>92</td>
<td>100</td>
</tr>
<tr>
<td>Focus</td>
<td>152</td>
<td>65</td>
<td>79</td>
</tr>
<tr>
<td>Reminder</td>
<td>140</td>
<td>60</td>
<td>90</td>
</tr>
<tr>
<td>Time</td>
<td>82</td>
<td>35</td>
<td>56</td>
</tr>
</tbody>
</table>

Table 4.30: Quality of the Safety Moments
Apart from the criteria “relevance” this results shows a substantial gap in the skills and abilities of the participating managers to set up and run an effective Safety Moment. It is not that they would use other criteria; their voting showed that those they liked best fulfilled the criteria to a high degree. First Line Managers have hardly ever been trained in the skill of didactics; in many countries they are either good employees promoted after some years or young graduates of mostly technical or engineering schools where the curriculum never had space for didactics. This skills gap is serious since managers have to take the role of teachers and coaches as presented in chapter 4.2. That coaching skills can be acquired has been shown by 12 of the winning teams where one of the two participants had acquired such skills through coaching in his private life, usually of some junior sports team. That the time criteria was not well kept probably had to do with the training setup where there was less time pressure than in the reality of everyday working life.

4.6.5 Conclusions

Sustainability is a topic that needs to be addressed every day. The more successful a company is on its journey to “Zero Harm to People” the more attention tends to switch away from safety. Giving safety energy a daily boost renews attention. The big challenge is to make the Safety Moment interesting every day, fighting habituation. Geller wrote: “Essentially we need to vary the message. When an activator changes it can become more salient and noticeable. . . . When Participants in a group meeting are asked to share something they've done for safety since the last meeting, the examples vary considerably. Similarly, group discussions of near hits and potential corrective actions will also vary dramatically”116. Varying the message and involving the target audience requires didactical skills which were not very well developed at the middle manager level participating in the training. Given that Safety Moments are run or facilitated in practice by managers even one level lower - the First Line Managers - then the lack of didactic skills is even more widespread, calling for corrective training and coaching from senior levels.

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116 Geller: Working Safe, p 108
4.7 Contractor Safety – the additional challenge

4.7.1 Introduction

The OH&S vision of both Holcim Ltd and OC Oerlikon Ltd - in this chapter called “The Company” - reads “Zero Harm to People“. Whom “People” mean is not further specified in the text of the vision. That the employees of The Company are included is clear, and that employees of a company for temporary work, such as Adecco, being delegated to The Company, fall under “people” has equally been standard practice in both cases since such employees report for their work to managers of The Company and must comply fully with the OH&S rules of The Company. It is furthermore standard practice to also include all visitors to sites of The Company in “People”. The open question is to what extent employees of contractors are covered by “People”.

Before trying to answer this question a definition is necessary: what is a contractor? The American Society of Safety Engineers asked in 2008 an attorney to tell them the legal definition. Todd B. Logsdon, attorney at the law firm of Greenebaum Doll & McDonald PLLC stated that there were varying definitions of an independent contractor in use and then cited the ten criteria the Supreme Court of the state of Kentucky had laid down the same year117:

1. The extent of control which, by the agreement, the master (employer) may exercise over the details of the work;
2. Whether or not the one employed is engaged in a distinct occupation or business;
3. The kind of occupation, with reference to whether, in the locality, the work is usually done under the direction of the employer or by a specialist without supervision;
4. The skill required in the particular occupation;
5. Whether the employer or the workman supplies the instrumentalities, tools, and the place of work for the person doing the work;
6. The length of time for which the person is employed;
7. The method of payment, whether by the time, or by the job;
8. Whether or not the work is part of the regular business of the employer;
9. Whether or not the parties believe they are creating the relation of master and servant (employer and employee); and
10. Whether the principal is or is not in business. “

117 Logdson: Temporary Employees
The approach of this specific court, however, does not help companies set a standard for themselves since it states that each case has to be judged on its own merits using the mentioned criteria. Let us therefore look at another definition, the one used by the Cement Sustainability Initiative CSI (Cement Companies who are members of the World Business Council on Sustainable Development WBCSD). This association published in 2009 a document called “Recommended Good Practice for Contractor Safety” with the following definitions:\(^{118}\)

**Contractor** - a company or an individual who is not a CSI member company or employee but has been engaged by a CSI member company to carry out specified work. This definition includes all levels of subsequent subcontractors.

**Subcontractor** - a company or an individual who is not a CSI member company or employee but has been engaged by a Contractor to carry out specified work as part of the contract for the CSI member company. There can be more than one level of Subcontractor, all deemed to be Contractors for the purposes of this Good Practice.

**Contract** - a formal agreement between a CSI member company and a Contractor to carry out an agreed scope of specified work or jobs, regardless of payment type (such as lump sum, turnkey, unit price, time and materials or cost plus). Excluded from this definition are independent external services where there is no CSI member management control exercisable in the safety aspects of that service provision.

For the following the CSI definition is used. Before approaching the question about the extent of inclusion of contractor employees into “People” we have to ask why The Company should be involved keeping employees of contractors from harm. There are four main reasons:

a) **One-business view:** Towards its own customers The Company is fully responsible for the quality and integrity of its products. Quality defects cannot be justified by declaring that a certain part was not manufactured by The Company but by one of its suppliers. Integrity means that The Company has to assure its customers that the products it sells were produced in a true and fair way, i.e. in full compliance with applicable rules. Since on the same site there can be only one set of rules, employees of contractors have also to be covered.

b) **Territorial view:** When applying one set of rules The Company acts like a state, imposing its site rules - rules that can be stricter than the legal rules in force in that particular country - on everybody on the site, not only on its employees.

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\(^{118}\)CSI: Recommended Good Practice
employees. A typical example is the rule not to smoke anywhere. The other side of the coin of enforcing rules is caring for everybody.

c) Reputation: Fatalities and severe injuries can impact the reputation of The Company seriously because in the media the site of the company is mentioned and most readers will not be aware that the harmed people were not employees of The Company.

d) Contractor employees are more at risk. Helen Lingard stated in 2005 “The construction industry continues to kill and maim more of its workers each year than almost any other industry”\footnote{Lingard: Occupational Health, p 1} construction being the typical contractor business. She cites a number of studies from different countries to prove her statement. The CSI group stated in 2009: “over the last 5 years, the Task Force has built up a database of fatalities in all eighteen CSI member company activities. This analysis has shown that some 60% of all those fatalities are related to contractor activities.”\footnote{CSI: Recommended Good Practice}

Legally The Company can more and more be held responsible as a recent court decision in the US shows: “On December 14, 2011, the United States Court of Appeals for the District of Columbia (D.C. Circuit Court) upheld a citation issued against a general contractor on the basis of the multi-employer worksite liability doctrine, joining a growing majority of jurisdictions that have considered and enforced the doctrine. The multi-employer worksite liability doctrine provides that an employer, including a general contractor, who creates or controls a worksite safety hazard, may be liable for violations of the Occupational Safety and Health Act (OSH Act) even if the employees exposed to the hazard are solely employees of a different employer. Under this doctrine, general contractors on a construction site may be held responsible for ensuring their subcontractors' compliance with safety standards if it can be shown that the general contractor could reasonably be expected to prevent or detect and abate the violative condition by reason of its supervisory capacity and control over the worksite.”\footnote{Fonte: OSHA's Multi-Employer Worksite Liability}

Following these lines of thought CSI defined a mission for contractor safety when issuing the recommendation:

“CSI member companies are committed to giving contractor safety equal priority as employee safety. \textit{While our contractors are always responsible for their own safety}, we now commit to setting an example for their safety management through our own activities and contract management. We believe that this can be achieved by implementing this Good Practice, which has proven effective in reducing contractor incidents within our and other
industries. In turn we require our contractors to achieve good safety performance in carrying out their contracts. “

Holcim followed this mission by defining in its policy on OH&S “people” as Directly Employed, Indirectly Employed and Third Party. Indirectly Employed means employees of contractors and of all their subcontractors. OC Oerlikon uses the same definition.

Having said that employees of contractors are included the next question is what The Company can do to advance its vision regarding contractor employees. For this the challenges have to be analyzed.

4.7.2 The seven main challenges

4.7.2.1 The contractor is a different entity

First of all, the contractor is a different legal entity. Employees of a contractor report to managers of the contractor, not to managers of The Company. Then, if a manager of The Company observes an unsafe behavior on the part of an employee of the contractor, he cannot give an order to this employee but has to go up his own hierarchy as shown in figure 4.13.

Figure 4.13: Going up and down the hierarchy

122 CSI: Recommended Good Practice
This process is neither effective nor efficient for two reasons:
- it takes too much time: until the employee who had shown an unsafe behavior receives an order (or at least a feedback) he most probably does not remember the situation
- the content of the information is apt to change when going through that many intermediaries.
Lingard comments: “The inevitable consequence of subcontracting is an expanded chain of command, and the probability that issues will be neglected or forgotten during the process of production.”

To solve this situation it is not possible to give managers of The Company the right to give orders directly to employees of the contractor. An employee can only have one superior; anything other than a clear subordination is a direct road to disaster as any military leadership manual states: “To accomplish a task there has to be unity of action under one responsible superior and a clear designation of the areas of responsibility”

Besides creating confusion giving orders to an employee of another company raises the question of legal implications if this employee would come to harm due to this order.

A third implication of the contractor being a different company can be seen in the reporting of incidents. Contracts can specify that the contractor has to report any incident on site to The Company according to the reporting guidelines of The Company. What is not realistic is requiring the reporting of the hours worked necessary to calculate incident rates. If the contractor discloses the hours then The Company could use that information to determine the profitability of the contract for the contractor, which is not desirable at all from the viewpoint of the contractor and can be bypassed easily by “creative reporting”. It does not make sense to request data, which will be of doubtful quality.

4.7.2.2 The language issue

Speaking and understanding the same technical language is essential for communication. This can be a substantial problem in three different ways:

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123 Lingard: Health and Safety, p 120
124 Taktische Führung XXI, Swiss Army, section 4.6.1.6, 2004 (my own translation from: “Für die Erfüllung einer Aufgabe muss die Einheitlichkeit des Handelns unter einem einzigen verantwortlichen Chef und durch klare Abgrenzung der Verantwortungsbereiche hergestellt werden.”
a) Different languages
Let us look at the construction of a cement plant in Morocco. The managers of the local subsidiary spoke English, French and Arabic; the additional managers participating in the project from corporate headquarter of the Company spoke English with very little French. The main contractor was a Chinese company and its managers spoke Mandarin and very little English. Some subcontractors were from France, speaking French and little English; some were local, its workers speaking Arabic or Berber.

b) Different interpretations
Admittedly the above-mentioned project was a rather extreme case. But even if most or all of the participants spoke English this does not mean that they understand each other, i.e. have the same interpretation of words. There is no “one English” anymore and the same applies to Spanish where “ahorita” for a Mexican means “now”, for somebody from Santo Domingo however “in a little while”. Being clear about timing is essential to keeping safe!

c) Different background
Finally technical expressions are not necessarily understood by managers and employees of companies with very different activities. Each industry has developed its specific language where the interpretation of terms might differ from so-called everyday use of the same word. This also applies to safety language; here the difference does not come so much from different industries but rather from different legislations. A typical example is the reporting of Lost Time Incidents. In some countries the legal rule is to report them if the harmed worker has lost one day of work, in other countries it is considered a LTI only after three days.

4.7.2.3 Different activities

Contractors mostly perform activities, which their clients do not do themselves or do not want to do themselves but could. Let us look at both in turn.

In the first case The Company would not have specific experience with that activity and as a consequence would not have developed an insight into the common hazards inherent to this activity. Developing an insight leads to developing a kind of 6th sense for those hazards. Let us consider the case of an unskilled construction worker in India who came to harm in a plant extension project because he did not have an intuitive feeling for the amount of truck traffic around him. He had come to this job from a quite
remote hill area. It is easy in this case to jump to the conclusion that this worker was just not intelligent enough. But an older Indian colleague of mine who had originated from the same area told me: Image you go hiking in this hilly area. After some 200 meters you pass a dense bush from where a snake will bite you. This unskilled young man would shake its head and remark that anybody knows that this type of bushes always harbors snakes and consider yourself as just not intelligent enough. “Understanding” has a lot to do with experience.

A specific example of a construction related hazard is a two-meter-deep trench in the ground which is confined space requiring a special work permit, the reason being that the walls could crumble and bury a worker executing a task down in the trench on his knees. This probably looks strange to an industrial worker, who considers a trench to be quite open.

In the second case where The Company would know the hazards associated with the activity well enough it becomes more of a cost issue since The Company would expect the contractor to have a lower cost base.

4.7.2.4 Cost issues

Medium and large sized projects have to go through a competitive bidding process. If the company sending out requests for proposals does not explicitly specify its minimum requirements for safety, then a contractor could “save” money by applying lower safety standards. Lingard states that “the financier should be prepared to consider issues of OHS, and ensure that adequate provision is made”125 Specifying minimum requirements however requires a substantial understanding of the activity to be performed by the contractor which is frequently not the case as explained in section 4.7.2.3. If the activity is known - e.g. the logistics of bagged cement – then the challenge is to tell the contractor to eventually go beyond his usual safety precautions. Can this realistically always be done and afterwards compliance verified? If an owner-driver of a multi-purpose truck shows up at the gate of a cement plant in Belo Horizonte, Brazil and offers a really low price for transporting bags to Sao Paulo, justifying it by saying that it is “back-freight”: how can anybody be sure that this driver will be fully compliant not only with legal Brazilian requirements but also with the internal driving rules of this cement company, respecting for example driving hours?

Cost is also an issue with short time contractors such as technicians coming in to service some equipment. How much time can The Company take to sit down with somebody servicing four or five copying machines to be sure

125 Lingard: Health and Safety, p 124
that this person has done HIRA for this particular job? Time is money, for The Company as well as for the technician who has to bill his hours.

4.7.2.5 Overlapping processes

Overlapping processes can have two root causes. If the project is an expansion project of an existing plant, then the processes of the contractor are executed while the existing production processes keep working. The overlap is mostly visible in the logistics on the site, but also regarding electrical and gas installations, fire-fighting systems, not to forget the flow of people. Within the project itself there are frequently different contractors at work with again overlapping processes. When the equipment installation starts then usually the building activities have not yet finished. Again the overlaps already mention will take place. Overlaps need coordination. A general contractor can render this coordination if the project is run as a turnkey project. Frequently the customer company decides to act itself as the general contractor, thereby assuming the responsibility for coordination.

4.7.2.6 Changing personnel

Personnel changes are a basic challenge for occupational safety because new people do not yet have a subconscious sense for the hazards in their new activity. It is even more so when contractors change personnel because these changes tend to happen more frequently, one of the reasons being that contractors usually handle several projects in parallel and need to balance labor requirements. For the customer company this means to set up effective induction and training facilities as well as a tracking system of all personnel on a project site.

4.7.2.7 Purpose

Throughout this entire thesis management attention to safety has been a constant topic. In a project carried out by contractors, the management of the customer company focuses on the upcoming operation, asking how production and logistics will function in a safe way once the operations started. Their focus is on the future and on their personnel, part of which will have to be hired. The management of the contractor focuses on
finishing the project and handing it over. This can create lack of management attention in the final phases of a project.

4.7.3 The case: Building a new plant in Sanand/India for OC Oerlikon

The Drive Systems Segment of OC Oerlikon (ODS) started its project to build a new, third plant in India mid-September 2013. It stated that it would build up this plant in steps on an area of 35 acres with an investment of 400 cr Indian rupees (“Business Standard” on 15.9.2013), of which 1/8 would be invested for the first phase, ending in January 2015. The further steps would follow with the full project finished by 2018. According to the press release by Oerlikon Graziano on 22.4.2015 on the occasion of the inauguration of the first phase Oerlikon stated: “At the Sanand plant, the range of products will be from transmission synchronizers, for which India is already recognized as an international competence center, to assemblies for full and final transmissions as CVT transmission for Agricultural tractors, transaxles for leisure vehicles, and axles for wheeled loader and other on/off-road applications. “

The case to be looked at is the mentioned first phase of the project that ended as planned in January 2015.

4.7.4 Approach to Safety at the Sanand project

When the Board of Directors of Oerlikon had approved the Sanand project the segment management team nominated a project manager for the project. He was taken from the management ranks of the already existing plant at Greater Noida. He then set up a minimal project team. In a telephone conference between myself (at this time head of Health, Safety and Environment of the OC Oerlikon Group), the Managing Director of the Indian Business Unit of ODS and the Technical Director of ODS it was decided to immediately add a full time HSE expert to this project team. The approach to achieve a “Zero Harm Project” was based on the following elements:

a) Use of the Recommended Good Practice for Contractor Safety of CSI
b) Hold a full day workshop before the start of each phase of the project:
   (1) Planning stage
   (2) Civil construction
   (3) Equipment Installation
   (4) Testing and startup
Workshops 2, 3 and 4 would be held together with managers and safety experts of the contractors.

c) Use the PDCA cycle to ask the relevant question in each workshop:
   - Plan: Policy, HIRA methodology, organization structure (lines of authority as well as process flow)
   - Do: Implement the measure
   - Check: Safety Observation Tours, Safety Inspections, Reporting
   - Act: Learn & Share

As a starting point the BU India of ODS adopted the following mission:

Figure 4.14: Mission for Contractor Safety

Workshop 1 concentrated on the planning and consisted of two parts:
Running the standard Visual Safety Leadership course with the project team, slightly changed by replacing the practical shop floor exercise by an explanation of the recommended Good Practice for Contractor Safety document. Participants were the members of the project team.

Workshop 2 included the chosen contractors for civil construction who participated very actively the whole day. The objectives and the content of the day were the following:
Objectives

Upon completion of this meeting

- a clear understanding of the risk elements specific to construction has been established;
- the roles and responsibilities of the different entities have been defined;
- standard operating procedures for the safety coordinators have been agreed on;
- the PDCA cycle regarding safety issues has been understood.

Figure 4.15: Objectives for the safety workshop with contractors

Table of Content

- The HIRAM methodology
- Phases of a new plant and the safety implications
- Main Issues for the construction phase
- The three step approach
- Step 1: Safety policy
- Step 2: PDCA
- Step 3: Keep the spirit alive

Figure 4.16: Content of the safety workshop with contractors

Workshop 3 kept the structure of workshop 2 but invited suppliers of equipment with their installation team leaders.

Workshop 4 focused very much on overlapping activities and the resulting hazards:
Building contains several overlapping activities

Figure 4.17: Overlapping activities

Overlapping means that people with different backgrounds work in the same place

Figure 4.18: Different background – same location

The RAIDERS procedure was introduced:
Figure 4.19: RAIDERS procedure

4.7.5 Results

When the first phase of the project closed down as planned in January 2015 the Safety scorecard stood at 7 First Aid Cases. What were the reasons for this excellent result? On February 11, 2015 a one-day workshop was held with the project management team and representatives of the larger contractors. For each of the project’s 13 substeps (see table 4.31) the same four questions were asked:

<table>
<thead>
<tr>
<th>Step</th>
<th>Substep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning for a Project</td>
<td>Design</td>
</tr>
<tr>
<td></td>
<td>Request for Proposals</td>
</tr>
<tr>
<td></td>
<td>Selection of Provider/Supplier</td>
</tr>
<tr>
<td></td>
<td>Building the Oerlikon Team</td>
</tr>
<tr>
<td>Civil Construction</td>
<td>Upfront Preparation</td>
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<tr>
<td></td>
<td>Execution</td>
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<tr>
<td></td>
<td>Closure and Handover</td>
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<tr>
<td>Equipment Installation</td>
<td>Upfront Preparation</td>
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<td></td>
<td>Execution</td>
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<tr>
<td></td>
<td>Closure and Handover</td>
</tr>
<tr>
<td>Testing and Startup</td>
<td>Upfront Preparation</td>
</tr>
<tr>
<td></td>
<td>Execution</td>
</tr>
<tr>
<td></td>
<td>Closure and Handover</td>
</tr>
</tbody>
</table>

Table 4.31: Substeps
a) What did we do to promote health and safety?
b) What worked well?
c) What would we do differently?
d) What did we not do and would now integrate it?

Let us look first at what worked well according to the participants. The table shows the steps and substeps, the items that worked well and in the last column the respective challenge (see section 4.7.2). When some of the positive items did not relate to any of the challenges the term “other” was used in this column. A few items that had nothing to do with Contractor Safety are left out.

<table>
<thead>
<tr>
<th>Step</th>
<th>Substep</th>
<th>Positive Item</th>
<th>Challenge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>Design</td>
<td>- Master Layout for the whole area, not only for phase I, allowing a separation of traffic flows with two doors to the public road</td>
<td>Overlapping processes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Separation of pedestrians from vehicle traffic</td>
<td>Overlapping processes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Location of the project office allowing control of all entries of people</td>
<td>Changing personnel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Central location of the training space</td>
<td>Other</td>
</tr>
<tr>
<td>Request</td>
<td></td>
<td>- Construction Safety Handbook issued by Oerlikon, integrating all requirements</td>
<td>Different Activities</td>
</tr>
<tr>
<td>Selection</td>
<td></td>
<td>- High weight for Safety criteria</td>
<td>Cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Proposal supplemented by interviews</td>
<td>Language: Background</td>
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<tr>
<td></td>
<td></td>
<td>- Partnership between Safety Officers written into the contract</td>
<td>Different Company</td>
</tr>
<tr>
<td>Building</td>
<td></td>
<td>- Input from existing plants in India</td>
<td>Other</td>
</tr>
<tr>
<td>Civil</td>
<td>Upfront</td>
<td>- Medical fitness tests for all workers</td>
<td>Other</td>
</tr>
<tr>
<td>Step</td>
<td>Substep</td>
<td>Positive Item</td>
<td>Challenge</td>
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<tr>
<td></td>
<td></td>
<td>- Practical training for all workers with an emphasis on what could happen to a worker</td>
<td>Language</td>
</tr>
</tbody>
</table>
|      |         | - No overnight stay allowed on site  
|      |         | - Outside worker village controlled by surprise visits | Other |
|      | Execution | - Inspections always by joint teams | Different company |
|      |          | - Every morning 20 to 30 minutes safety refresher for everybody | Language |
|      |          | - Every Monday afternoon one hour safety meeting for all managers | Different Activities |
|      |          | - Rest shelters for drivers on site | Overlapping Activities |
|      | Closure  | - Contractor supervisor must stay on some time | Purpose |
|      | Equipment | Upfront | - Upfront Safety Workshop for alignment | Different activities |
|      |          | - Weekly coordination meeting | Overlapping activities |
|      |          | - Planning always one month ahead of execution | |
|      | Execution | - Prepare jointly extensive HIRA for each workstep | Different Activities |
|      | Handover | - | |
|      | Testing  | Upfront | - Use joint teams for testing, integrating specialists from the Segment | Purpose |
|      |          | Execution | - Continue with daily safety meetings | Overlapping activities |
|      |          | Handover | - Integrate the managers/staff who will run the equipment | Purpose |

Table 4.32: Feedback on the substeps
The participants thought that only few items had not been considered, the main two ones having to do with traffic:
- If there are many visitors to the project, a separate visitor path should be marked
- A checklist for the guard at the entry should be developed stating what “roadworthiness” means, so that he can decide whether a truck is allowed to enter.

At the end the participants had the chance to add any item not mentioned so far. Three positive items came up:
- Detailed monitoring from the beginning with a clearly defined and communicated reporting system that guaranteed quality
- Fast reaction to reports of Near Misses and Unsafe Situations, followed by full communication to all on site
- Morning safety sessions run in a participative way where at times workers were running the session.

On the reward system via a Safety Quiz the AAR participants had diverse opinions to what degree this helped. Their doubts coincide with the findings in chapter 4.4.

4.7.6 Conclusion

In terms of responding to the seven major challenges to Contractor Safety Management the following activities had the decisive impact:

a) Different Entity: From the beginning the Oerlikon Safety Officer was “married” to the safety responsible of each contractor. Safety Inspections and especially Safety Observation Tours were always done in pairs that allowed the Oerlikon Safety Officer to get agreement from his colleague from the contractor side whereupon this one then issued the order or engaged in a constructive feedback session with the contractor worker.

b) Language: All three elements of the language challenge were present on this site, partially due to the fact that India knows 26 official languages. To overcome this “Tower of Babel” situation every worker had to undergo safety training, ending with a test, before issued an entry pass. Furthermore, the daily safety event was mandatory for everybody which ensured that awareness could each day be raised and eventual doubts or misunderstandings eliminated.
c) Different Activities: The key word is again “joint”, in this case joint elaboration of HIRA.

d) Cost: Indirectly taken into consideration by valuing the safety criteria high when selecting providers.

e) Overlapping activities: The detailed planning was always a few weeks ahead of execution which allowed recognizing potential hazards from overlap. Such hazards were then discussed at the Monday Safety Meeting.

f) Changing Personnel: The entry control system was handled very strictly.

g) Purpose: All handover were prepared and executed by joint teams.
4.8 Legitimacy and the expectation of positive spillovers

4.8.1 Introduction

Studying international business can serve a variety of purposes, among them looking for success factors of MNEs (Multi National Enterprises), measuring effects on host countries, determining economic policies of host countries. Management literature has consistently stated since the earliest publications of Peter Drucker\textsuperscript{126} that the most important research question is what makes a company successful, meaning producing more or better than all the resources that comprise it. This view of the most important question is also being shared by writers in the International Business (IB) field, among them Peng\textsuperscript{127}. As a practitioner of global management has written this paper it sides with the view of Drucker and Peng. MNEs consist of a number of subsidiaries, generating profits by selling and producing. Therefore, those subsidiaries have to be looked at first which means asking what makes a subsidiary successful within the restriction space of its particular surrounding but never forgetting the whole, i.e. the influence of the parent corporation.

Within the discussion of success factors for a company, scholars of international business focus strongly on two elements: legitimacy and spillovers. The argument is made that not only success but even organizational survival depends on the organization’s perceived legitimacy\textsuperscript{128} and that therefore building and maintaining legitimacy is of critical nature\textsuperscript{129}. Furthermore, it is stated that positive spillovers help to build a company’s reputation and although reputation is a more narrow term than legitimacy it can be assumed that they go hand in hand.

The train of thoughts described so far sounds logical. But does it stand the empirical test? Meyer stated in 2004 that spillovers are difficult to observe, especially those resulting from forward and backward linkages, due to methodological problems. “Our understanding how they occur on a micro level is limited”\textsuperscript{130} he wrote and concluded that future research ought to prioritize the study of vertical relationships by analyzing how spillovers arise in individual interactions of a multinational firm and a local agent or firm. This chapter attempts to do so by presenting a specific case study where those elements can clearly be seen at work and the outcome measured. This will be done in section 10.3. The next section however

\textsuperscript{126} Drucker: The Practice of Management
\textsuperscript{127} Peng: Identifying the big question
\textsuperscript{128} Dowling: Organizational legitimacy
\textsuperscript{129} Kostova: Organizational legitimacy
\textsuperscript{130} Meyer: Perspectives on multinational enterprises, p. 264
takes a closer look at the notions of legitimacy and spillover to prepare the understanding of the case study.

4.8.2 Legitimacy and Spillover

Legitimacy has been defined as “generalized perception or assumption that the action of an entity as desirable, proper or appropriate within a social complex”\(^{131}\) or as congruence between the values pursued by the organization and wider societal values\(^ {132}\). This definition first and foremost looks at the acceptance of a single company in its market by the participants and the wider environment influencing these participants. It does however only look at the external world. Legitimacy must also be gained within the company itself. Companies are composed of persons; their individuality must be harnessed in order to produce more than the sum of the parts. Drucker spoke in 1955 about the citizenship of managers and workers within a company, advocating that management must shape a high level of alignment in this citizenship. Different stakeholders within the company must therefore attach legitimacy to the actions of the company. There are strong political forces at work within a company\(^ {133}\), which influence the perceived internal legitimacy.

So far we have looked at legitimacy from a local point of view, distinguishing between external and internal legitimacy. MNEs add more complexity by introducing the issue of global legitimacy, again with an external and an internal aspect. Subsidiaries of MNEs are always part of their parent corporation and the legitimacy of the two is interlinked. Legitimacy at the global level is more and more influenced and shaped by the NGO’s, the “new actors in global business”\(^ {134}\). A clear point in case is the issue of “Dual Standards”, e.g. the question whether a global corporation can live with different standards of say occupational safety or environment in different countries if those different standards represent differing legal requirements and the respective subsidiaries fully comply with the local legislation. NGOs clearly do not support a dual strategy approach, law firms have held a similar view while advising global clients with regard to occupational health and safety and IB scholars have stipulated that on some issues international consensus supports certain common standards, known as hypernorms\(^ {135}\). As a conclusion a MNE must also possess its own legitimacy at global level.

\(^{131}\) Suchman: Managing legitimacy

\(^{132}\) Kostova: Organizational Legitimacy

\(^{133}\) Mintzberg: Mintzberg on Management

\(^{134}\) Doh: Ahoy There

\(^{135}\) Meyer: Perspectives on multinational enterprises
Internally the same principle applies: the subsidiary must gain legitimacy in the eyes of the parent corporation. This means that it has to act as a good family member, not only following the corporate rules and standards but acting as an active ambassador for the legitimacy of the MNE as a whole while never letting the profit targets out of sight.

From the viewpoint of a local subsidiary this leads to the following legitimacy matrix:

<table>
<thead>
<tr>
<th>Global</th>
<th>Local</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follow the corporate rules and make profits</td>
<td>Fulfill the ambassador function</td>
</tr>
<tr>
<td>Fully align management and staff</td>
<td>Gain acceptance from local environment</td>
</tr>
</tbody>
</table>

The full positive influence of legitimacy is only reached when all four matrix elements have been positively occupied.

Now let us look at the concept of spillover. The interest of many International Business writers has centered on the effects FDI (Foreign Direct Investment) has on host economies via spillover effects which can be the result of a demonstration effect or of labor movement or take place through a competitive effect. These ways of looking at spillovers however do not offer insights for the management of the local subsidiary of the MNE which must “build a legitimacy reservoir through frequent and intense communication with the organization’s social surrounding.”

“Building” means creating expectations and as a consequence the enhancing effect of spillovers on legitimacy do not happen finally when the spillover has occurred but already when some actors have a perception that a positive spillover might happen. Managers wanting to shape legitimacy

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136 Driffield: Linking FDO motivation
137 Meyer: Perspectives
138 Tian: Managing FDO
139 Suchman: Managing legitimacy
must therefore use the concept of the full value chain\textsuperscript{140}, look for the influencers downstream and create the expectation of a positive spillover which then in turn will confer legitimacy backwards.

4.8.3 The Case Study: Ready-Mix Concrete in Columbia

The case concerns the MNE (or rather global corporation) Holcim, one of the world’s largest building materials companies, active in cement, ready-mix concrete and aggregates in markets of over 75 countries and its subsidiary Holcim Colombia.

At the starting point of the case study in 2007 Holcim Colombia had been a subsidiary of Holcim for more than two decades, having acted until 2005 under its local name, Cementos Boyaca, and then changing to the global Holcim brand only in 2005. As the local name said its main business and the one controlled fully by Holcim was cement for which it had gained legitimacy with its local stakeholders as a quality conscious and reliable cement supplier. Internal local legitimacy had also been established due to a focused effort by the then CEO Saverio A. Banchini who managed to establish ten shared values. The other two businesses, ready-mix concrete and aggregates however had been run as joint ventures with local entrepreneurs very much according to local business habits and under their own name. When the global brand was introduced those two businesses were folded into the newly named Holcim Colombia and also fully controlled. Market shares were not affected by those events in 2005 and it can therefore be assumed that legitimacy was extended to the two additional businesses.

In 2007 the Holcim Group decided to strengthen its approach to Occupational Health & Safety (OH&S) by applying world-wide strict minimum standards for a number of areas, a move that was shared by other members of the Cement Sustainability Initiative, the cement part of the World Business Council for Sustainable Development. Good OH&S results were clearly perceived at the global level as being a prerequisite for legitimacy of the Corporation. One of the first directives emitted in this context was the one on “Vehicle and Traffic”, covering among other things the delivery of ready-mix concrete and specifying that each building site had to be inspected and accepted before the first delivery by a Holcim safety inspector and that furthermore each driver of a ready-mix truck had the right to refuse a discharge if conditions had been changed from the last delivery.

\textsuperscript{140} Porter: Competitive Strategy
Let us pause at this point and reflect what this meant for Holcim Colombia regarding the four elements in the legitimacy matrix. The global internal element specified that for maintaining its legitimacy towards the parent corporation a swift application of the said directive was needed which led the local management to apply it straightaway. The local management furthermore was aware that many studies showed that statistically safer workplaces were also more profitable ones, a conclusion that is reaffirmed in later publications in the US and the EU. For the local management team the application of the global directive therefore supported internal local legitimacy. And for the most affected people, the drivers of the ready-mix trucks, it was consistent with the values that the local subsidiary had introduced in the early nineties. Once the first driver had refused to deliver a load and had been recognized for it, internal legitimacy was clearly strengthened also at the worker level.

Local management did expect also a positive impact on external legitimacy in its local environment since safety was thought to always have a positive connotation in the society at large. But when inspections of sites were introduced and customers already informed in the offering process the reality turned out to be different. The site foremen resented what they perceived to be an interference with their sphere of authority. The new safety rules were considered at best a nuisance but frequently a “know-better” attitude of a foreigner. Site foremen thought that accidents happened because of unsafe behavior of the drivers not because of conditions of the job site. In other words: The ready-mix arm of Holcim Colombia was perceived by the said foremen to have no legitimacy regarding conditions of “their” job sites. Enough of them convinced the managers of their respective construction companies that with the new rules there would be substantial delays of the sites causing Holcim Colombia to lose volume: the market share in ready-mix concrete dropped by six percentage points within two months. This drop was so substantial – considering also the negative channel effect on the main cement business – that internal legitimacy at local level came under pressure. Middle managers in sales and finance began to ask whether the new rules had been introduced too fast. Top Management at local level however stayed strict and no loosening of the rules was allowed. In this they were supported by the top management at global level who did not want its effort at global level to be compromised from the start.

It became clear that the legitimacy matrix did not look very promising any more. The field “local/external” had suffered which meant that Holcim Colombia could not exercise its ambassador role in the field.

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141 Lissner: benOSH  
142 OSHA: Making the Business Case
“global/external” fully any more. The field “local/internal” experienced some doubts, which were growing stronger with the risk that even the “global/internal” legitimacy might suffer. Something had to be done. The CEO of Holcim Colombia of that time, Moises Perez remembered: “We realized that we had neglected important elements of change management, especially by not communicating enough”. He and his team decided to identify potentially positive spillovers further down the value chain and to concentrate on the relationship between safe working procedures and quality. An intensive active dialogue was started not only with the owners or top managers of the construction companies (instead of the foremen) but first and foremost with the final clients, the future owners of the buildings, stressing with them that safe working procedures on job sites would have a positive effect on the quality of the outcome, meaning structurally sound concrete buildings erected within the budgeted time and the budgeted cost. In this dialog they were helped by the growing concern in Colombia regarding durability of concrete which had led the national norming agency ICONTEC to issue a new norm at the end of 2007\textsuperscript{143} Holcim Colombia aimed to create a pull for safe working conditions from the far end of the market backwards. In other words: the expectation of a positive spillover should stimulate the final client to demand safe working conditions from their supplier, i.e. the construction companies, which then in turn would confer legitimacy upon Holcim Colombia. These expectations of positive spillovers began to work rather rapidly. Moises Perez remembered: “Less than four months after we lost volume some of the construction companies that had ceased to be customers came back with requests for proposals. When asked what had brought them back they answered that they were able to use safe deliveries by Holcim as a sales argument towards their own customers, somewhat along the line of: A construction company that is considered safe enough to be served by a high quality organization such as Holcim Colombia will also deliver on its other promises such as building quality, time and cost.” The wheel had turned and four months later the six percentage points had not only been recovered but an additional two had been gained.

4.8.4 Conclusion
The case study has shown an example where an existing legitimacy can be threatened by a change in structure (full ownership) and an application of a global standard. Legitimacy must be shaped and maintained at global and local level, each time externally and internally. Local external legitimacy can be enhanced by the expectations of positive spillovers; it is however essential to think through the full value chain and to involve more

\textsuperscript{143} ICONTEC: Norma 5551
arguments that the product itself. Occupational Safety is an element that can help to create positive spillovers and notions of legitimacy but it is by no means automatic.
5. Conclusions

5.1 Relevance of the Manzoni model

To be safe at work means to minimize the risk of getting in contact with a technical condition – mostly an amount of energy - that could harm the body or parts of it upon contact. Literature states that a majority of incidents that lead to harm (injuries) are due to unsafe behavior of employees and the managers surveyed in the case studies agreed with this statement. Since the start of the Safety-First movement in the US early last century144 companies have accepted that one of the obligations of management of every company is to act in a way that the probability for all employees – and everybody else while on company sites - to come to harm is minimized. Both literature and the managers surveyed however are short on guidance on how management should act to successfully influence the behavior of employees. The research question for this thesis asked consequently: What kind of daily management behavior is needed to improve safety at work?

To answer this question, the Manzoni model was introduced in chapter 3.1, here presented again as figure 5.1, to analyze the levers influencing and shaping the behavior of people.

Figure 5.1: The Manzoni model

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144 See Aldrich: Safety First. Aldrich argues that the single most important factor in improving workplace safety during the twentieth century was the Safety First movement, begun by U.S. Steel and pursued by firms, such as DuPont.
Looking at the case studies presented in chapter 4 (4.1 to 4.5, 4.7) it can be concluded that the use of the Manzoni model to conduct surveys, interviews and observations helped substantially to understand the impact of the different levers on employee behavior. It also supported the search for hurdles that kept managers from using the levers effectually. Regarding the levers four results can be summarized:

a) The managers surveyed agreed that “management behavior” is the most important lever, especially the directly visible behavior. Many managers however are reluctant to get involved in this direct way with employees on issues of safety.

b) “Processes” (mostly called Safe Working Procedures SWP) and “Skills” must be identified and then communicated. In a business setting where a high degree of standardization can be reached SWPs are highly important; in a situation where a lot of special cases turn up (usually repair work) skills will be critical. Current hurdles are
- the completeness of the SWP catalogue in a company
- the effective communication of the SWPs
- the lack of safety change management in continuous improvement programs whereby companies make frequent small changes to their production procedures, forgetting the potential side effects of those changes on safety

c) “Performance Management” shows two gaps:
- The key performance indicators in use today are lagging ones which register history but do not allow future-oriented steering.
- Reward schemes to incentivize managers and workers to become safer do not seem to work

d) “Structure” works indirectly and is more important in a negative sense, i.e. to evade mistakes. When looking beyond employees however at Contractor Safety Management this lever assumes a much higher importance.

A fifth result concerns sustainability, which is represented by the term “long enough” in the Manzoni model. This element requires even more visible daily management behavior as shown in chapter 4.6, comparable to a piano player having to practice every day.

These five results are further analyzed in chapter 5.3, using the four-step-model to arrive at recommendation for practice.

The remaining lever, “technology” did not lead to a recommendation for practice but rather to a recommendation for future research, presented in chapter 5.2.
5.2 Three recommendations for research

5.2.1 Technology

“Technology” can have two effects. It can influence the behavior of people, which is its use in the Manzoni model and it can protect people from the effects of unsafe behavior. Current literature holds that people can achieve high degree of safe behavior and consequently the research – equally in this thesis - has concentrated on how to influence and shape the said behavior. But is it really realistic to expect people to follow Safe Working Procedures all the time, to rapidly execute HIRA always before doing anything, never to be distracted? Laws and regulations clearly do not have this confidence. They prescribe many Personal Protective Equipment that will limit the impact of an incident on the human body, such as requiring harnesses and lanyards for Working at Height, mandating observers for Work in Confined Space, making seat belt in cars mandatory, just to mention a few items. Routine can let people lose focus on safety as mentioned in the case of the worker in Torino (see chapter 4.1.5) doing the same movements 40000 times a year. Regarding complex tasks an American Air Force instructor told his class already in the 1950ies: “In view of his coming flying tasks the human being is a faulty construction”\textsuperscript{145}.

\textit{A first recommendation for future research therefore suggests looking not only at ways to promote safe behavior, but also at the most likely unsafe behaviors.} If and when clarity exists which unsafe behavior is to be expected, then specific design can step in to design fail-safe mechanisms into equipment. Some of it is in use today, an example being light barriers that stop equipment when part of the human body gets into the way, another one the prevention-based Poka-Yoke concepts\textsuperscript{146}. Sustainable safety in the sense of “Zero Harm to People” probably can be achieved only with technological developments that compensate human behavior.

Going back to technology influencing behavior chapter 4.1.5 reported that three out of 45 management teams had ranked the lever “technology” first. All the three teams came from countries, i.e. cultural environments that rated technology high to solve problems.

\textsuperscript{145} Jungk; Die Zukunft hat schon begonnen, p 72. The German text reads: Ein Instruktor der „Air Force“, dessen Vorlesung in der berühmten Akademie für Flugkadetten in Randolph Field ich besuchte, formulierte dies in folgendem kategorischen Satz: „Gemessen an seinen bevorstehenden Flugaufgaben ist der Mensch eine Fehlkonstruktion“

\textsuperscript{146} For an overview see: Poka Yoke or Mistake Proofing, 2009, thequalityportal.com
A second recommendation for future research proposes looking at the link between the use and promotion of technology in a country and the resulting behavior at work.

5.2.2 Local culture

Local subsidiaries of global groups are immersed in local culture. This means that there will be negative spillovers if and when the local safety culture is much below the expectations held for the subsidiary by the mother company. This aspect has not been part of the thesis but offers some interesting research opportunities for the future.

The third recommendation is to find answers to the following questions:
- What management behaviors must be different if the local safety culture is low?
- What kind of additional lever can management use?

To elaborate on the first question let us recall a specific situation in Bangla Desh in 2009. Driving through the capital city of Dhaka towards the cement grinding station in the north of it I observed very unsafe situations every 20 meters, related to traffic or to construction going on left and right. While staying at the grinding station however I did not observe one single violation of the rules on PPE, an astonishing situation in an environment where many people have never used closed shoes before and now have to wear safety shoes inside the grinding station. The General Manager explained that he probably spent ten times as much of his time on safety than colleagues in Western Europe and remarked “if a manager wants safety he can create safety”. What was meant by that was explained later by a maintenance manager: “There was this new General Manager coming in, an ex Army Officer from India. The first thing he noticed is that most of our employees were using flip-flops. He demanded immediate purchasing of safety shoes. When some older supervisors informed him, that many employees had never worn shoes before and that their feet would hurt, he ordered cotton socks as well and predicted a difficult time of only a few weeks. He was right”.

Possible answers to the second question were suggested by the COO of Nestlé Vietnam in an interview in March 2012. He had previously worked in Egypt and in Thailand and mentioned first the influence of religion on behavior. One of the beliefs that influences safety strongly is “kismet” or fate. He nevertheless agreed with the manager in Bangla Desh that this was a hurdle to be overcome and not a barrier to safety and that it mainly
increased the demand on the time of managers. He also mentioned other cultural elements like a high value placed on discipline in Vietnam which he judged to be the result of military events in the past. His conclusion was that management behavior must be adapted to the prevailing cultural elements found in the local surroundings.

5.3 Ten recommendations for practice

Improving safety means to rise the percentage of safe behavior across all activities of a company. A change of behavior takes place when an individual goes through the four steps of behavior change, here presented again as figure 5.2.

![Figure 5.2: The four steps](image)

The conclusion reached in chapter 5.1 stated that the managers knew their visible behavior was decisive but had not very much progressed towards understanding, accepting and doing themselves. Understanding would mean having a clear idea what to do “Monday morning at Seven”. The lack of this clear idea is one of the reasons why managers who are not involved in production or logistics invest little time into safety in their company. This reluctance is enhanced by the feeling that they would trespass into the field of their colleagues and would run the risk of doing or saying something wrong, thereby destroying instead of adding safety value. As a result safety is not on the top of the list of priorities for the daily agenda of most managers (McSween: “While almost everybody agrees that safety is important, it is often not urgent.”147); safety can then compete badly against other time requests.

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147 McSween: Values-based Safety Process, p 149
This leads to the first recommendation:

1) **It is the task of a CEO to encourage all managers to visibly demonstrate their interest in safety, to make them understand how to do it (mostly by doing Safety Observation Tours) and to accept this as an important part of their daily agenda - and then check whether they actually do it.**

Let us now look in more detail at the “four steps” results in table 5.1.

<table>
<thead>
<tr>
<th>Step</th>
<th>Employee requirement</th>
<th>Management requirement</th>
<th>Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>To Know the specific safe behavior</td>
<td>• Participated in a training</td>
<td>• Define the behaviors</td>
<td>• Behavior list not adapted after process changes</td>
</tr>
<tr>
<td></td>
<td>• Has access to a copy of the mandatory behaviors</td>
<td>• Communicate the behaviors</td>
<td>• Managers delegate training fully to experts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Train the behaviors</td>
<td></td>
</tr>
<tr>
<td>To understand the specific safe behavior</td>
<td>• Receives on-the-job coaching by his superior</td>
<td>• Knowledge and Understanding of the required behaviors</td>
<td>• First line managers not trained in coaching skills</td>
</tr>
<tr>
<td></td>
<td>• Gets corrective input in case of deviations</td>
<td>• Coaching skills</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>To accept the specific safe behaviors as</td>
<td>• To be aware of the positive consequences of applying</td>
<td>• To show the consequences in a way that employees can feel</td>
<td>• Too “dry” and analytical in the approach</td>
</tr>
<tr>
<td>a personal value</td>
<td>the specific safe behaviors</td>
<td>them(^{148})</td>
<td>• Late feedback</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To respond fast to observed safe and unsafe behavior(^{149})</td>
<td>• Not living the specific safe behaviors</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To consistently apply rules</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To be an ambassador</td>
<td></td>
</tr>
<tr>
<td>To do</td>
<td>• To consistently live the specific safe behaviors</td>
<td>• To give the time to work according to the rules</td>
<td>• Treating safety as an objective rather than a value (employee view) and a restriction (business view)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To load “safety energy” every day</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To continuously observe behaviors</td>
<td></td>
</tr>
</tbody>
</table>

**Table 5.1: Gaps in management behavior**

\(^{148}\) Kotter: Leading change. To make a person **feel** the necessity of change is central to Kotter’s thinking. DuPont uses for that reason the term „felt safety leadership“

\(^{149}\) Krause: Leading with Safety. Consequences work best when they are not only positive but immediate.
The next five recommendations are linked to those gaps:

2) Managers must take an active part in the safety training of their subordinates
3) Manager must assure that the behavior list is adapted after process changes took place in a CIP program
4) First Line Managers must be trained regarding didactic skills
5) Consequences have to be presented by “show and tell”
6) Feedback has to be given fast

Most of management activities are driven by data, i.e. by numbers. Objectives must be defined according to SMART-principles\(^{150}\) where M stands for measurable. The discussion in chapter 4.3 has shown that the safety numbers are too much fixed on lagging data, partially because this is measurable, partially because governments and other bodies ask for such data. In analogy to a saying by Warren Buffet there is a strong need to progress to other type of indicators, meaningful ones, which leads to the next recommendation:

7) The focus should switch from lagging to leading indicators, data that give a good clue where preventive action is necessary. Management should not (or not only) be measured against outcome, since the difference between a Near Miss and a Fatality can be 10 seconds or one meter; management should rather be judged on what they do in favor of safety (input measurements). And it would be helpful to use indicators that present the ability of an organization to be and stay safe, such as projects completed on time.

In a narrower sense Performance Management deals with rewards, recognition and consequence management. The interviews have shown monetary incentives for good safety performance have little significant impact; the employees preferred clear and understandable rules which coincides with what has been said above about the steps “to know” and “to understand”. As long as it is not clear what safe working means the eventual motivational factor of rewards does not kick in. Furthermore, employees seem to have a fine feeling for what a human value is and are reluctant to have a human value contaminated by monetary values. Recognition works better but the interviews in Mexico showed that the best recognition is the timely reaction of management to proposals or reports brought forth by employees. This results in recommendation 8:

\(^{150}\) Specific, Measurable, Attainable, Realistic and Timely
8) **Before implementing reward and recognition systems do extensive piloting.**

Understanding that “People” means everybody on a site, not just employees, that the contractor is a separate company and that the activity of a contractor is usually less well known means paying special attention:

9) **Contractor Safety Management requires intensive working together, by planning early, preparing jointly and consistently observing the execution in joint teams.**

A final consideration concerns the time axis as shown in figure 5.3.

![Figure 5.3: Time axis](image)

On the time axis the proactive part should be taken into consideration earlier than today. Management must be actively involved into “Design for Safety” which asks for active contribution from the research, development and procurement departments. Everybody active in the design of plants, equipment or products must be fully familiar with the concept of “Hierarchy of Control” because it is at early stages where “Eliminate”, “Substitute” or “Reengineering” can be done at reasonable cost. This is also the case for changes done within Continuous Improvement or Operational Excellence programs.

10) **Safety needs to be part at the very start of business thinking in form of “Design and Plan for Safety”**
If “enough of us” show safe behaviors “long enough” then a company has reached a safety culture that can lead close to “Zero Harm”. The “long enough” can only be achieved by making people wanting to be safe, not having to be safe. Since we all seek positive emotions safety must become a positive emotion. Positive emotions can make us excited: “The closest thing to magic in organizational change is getting the employees excited about what is going on”\textsuperscript{151}. This is the last - and lasting - step of Safety Management: We must help Safety to become something everybody is passionate about.

Does it work? Let us look at a lagging indicator. Holcim started to emphasize management behavior in 2007, the OC Oerlikon Group in 2012:

- LTIFR Holcim Group 2007: 3.9 (base: 1 million manhours)
- LTIFR Holcim Group 2010: 1.9
- LTIFR OC Oerlikon Group 2012: 1.76 (base: 200’000 hours)
- LTIFR OC Oerlikon Group 2014: 0.75

Safety is a topic where many effects come together, making it impossible to strictly compare along ceteris paribus conditions. How much the progress was due to emphasis on management behavior therefore cannot be said. But it can be assumed that it helped to direct the journey towards “Zero Harm”.

A way of presenting the recommended management behavior is the safety wheel in figure 5.4.

\textsuperscript{151} Krause: Leading with Safety, p 21
Figure 5.4: The Safety Wheel

When this wheel turns every day, then the company is well on the way to “Zero Harm to People”. For a final statement let us turn again to Peter Drucker who wrote: “Indeed, the new tasks demand that the manager of tomorrow root every action and decision in the bedrock of principles, that he lead not only through knowledge, competence and skill but through vision, courage, responsibility and integrity.”152

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152 Drucker: The Practice of Management, p 270
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2002 – 2006 SVP Holcim Information Platform
1995 - 2001 SVP Global Projects
1986 - 1994 Head of Business Planning

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1979 – 83 Consultant

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