Influencing safety conscious behavior
a case study at a large brewery in The Netherlands

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Management summary

The behaviors people perform in their daily lives can have profound effects on their own health and well-being, on the health and well-being of other individuals, groups, and organizations to which they belong, and on society at large. There is a growing awareness that human behavior can both cause social problems in a variety of domains such as health, the environment, safety, work motivation, and productivity. Over the past years, there has been growing interest among organizations on safety aspects. One of the reasons to spend so much time on safety is the deep-rooted belief that safety pays. To some extent by saving the direct costs associated with accidents and incidents, but more by the spin off it has with regard to other aspects of company performance, like quality and the employees’ morale (Berends, 1996). Nevertheless, many organizations fail to exploit the safety benefits by focusing on the individual aspect. This report concerns a research on how to influence safety conscious behavior on an individual level.

An extensive literature study on safety culture and safety climate is conducted to get insight in which factors do influence individual safety conscious behavior. Two research areas are particularly applicable. The first is in the area of psychological literature, in particular the theory of reasoned action (Fishbein & Ajzen, 2010), and the second is in the area of safety literature. The safety literature is divided into a management and academic literature. Based on the psychological and safety literature, studies are reviewed to get insight on how this topic is treated. From these review findings, a research model on safety conscious behavior is developed. The research model shows an underlying causal structure that exists out of psychological and safety frameworks. The research model shows that from a psychological point of view three determinants, attitude toward the behavior, perceived norms, and perceived behavioral control, influence individual safety consciousness and thereby their safety behavior. Combining these three issues results into the behavior that an individual shows. From a safety literature perspective, the research model shows that safety culture stimulates safety knowledge and safety motivation. These can be seen as the attitude toward safety. These two factors leads to two responses namely, safety compliance and safety participation. These can be seen as the perceived norms toward the behavior. However, safety compliance and safety participation are indirectly influenced by perceived behavioral control. An individual can, despite his or her best intentions to act in a certain manner, feel incapable of acting accordingly due to external factors that are beyond their direct control.
This research is guided by the following research question:

“How to influence organizational members to behave more safety conscious”

In order to handle the above stated research question in a structured and controlled manner, a set of three sub-questions were formulated. The first sub-question explores which factors influence safety consciousness and safety behavior. The second sub-question focuses on which factors are most promising in improving and/or optimizing safety conscious behavior and reducing accident, within Pivonymous. The third sub-question describes which steps are required to handle optimizing the promising factors of the second sub-question.

This research took place in cooperation with Pivonymous (a beer and beverage producing company) and the Eindhoven University of Technology (TU/e). The reflective cycle methodology by Van Aken et al. (2007) was used and Yin’s (2009) case study methodology was applied to investigate the research questions. The case study was applied to the packing and distribution section of Pivonymous. Data were collected through four methodologies. Available documentation was collected by using semi-structured interviews with informants on three working levels, through observations, and by benchmarking other sectors. A coding scheme was developed to generate safety related topics to the nine semi-structured questions. Based on these nine semi-structured question statements were made about the elements of the model and the three other methodologies were used to clarify or reject the statements made. Any potential relations were sent for confirmation to the interviewees as verification. Recommendations were formulated and discussions and conclusions were drawn.

The results showed that there is a lack of long-term holistic focus. Audits that are conducted focus mainly on process safety and the focus on personal safety of employees is lacking. Auditors are looking at materialistic aspects and overlook the behavioral side, meaning that their safety knowledge seems to be high on process safety. The safety knowledge in general is not stimulated effectively. Only the employees that are mandatory to know safety aspects, such as fire fighters, etc., increase their safety knowledge through safety trainings. In the design of large and small projects, safety related aspect appear to be lacking. Through the current constructions, a negative effect of behavioral control on safety behavior is created. This was seen in unsafe behavior that was performed to operate the machinery or extra resources that were needed for alterations afterwards. The current focus within Pivonymous lies on responsibility then on learning from unsafe situations. In other words, Pivonymous has a blame culture that leads to fear of disciplinary actions when something went wrong and seems to decrease safety motivation of employees. Due to this fear, employees try to preserve the relation amongst colleagues by not addressing colleagues on unsafe behavior. Another result of this is that reporting’s are mainly written on materialistic aspects, which also seem to be stimulated by only auditing on the materialistic side.

Several suggestions are made to improve the current situation, such that there is an increase in long-term holistic focus. The proposed solutions increase long-term holistic focus, by providing an audit form on personal safety and through including more safety aspects in the design phase of projects. To place the focus more on learning, safety trainings need to be intensified for all employees. In addition, by setting management goals on safety the priority is
intensified. Although, caution is needed not to misuse these goals for disciplinary actions. Having one reporting system, that is accessible for everybody, reduces the lack of behavioral control. This reduces the amount of excuses for not reporting or not behaving safety conscious. Through better reflecting on accidents or incidents, employees increase their safety knowledge and important root causes are found. Pivonymous became aware of the seriousness of the situation it is currently facing and through this report knows which interventions are needed to increase safety and thereby try to reduce the number of accidents. Nevertheless, this is a long time commitment they have to give to make this plan work. This is not a plan for successes in the short run, but much effort is required to alter the current culture into an advanced learning long-term holistic safety culture.

This research showed how to influence safety conscious behavior. Safety conscious behavior comes by engaging in safety activities, since such activities have an impact on the depth of processing of information, which translate into attitudes and knowledge regarding safety (Westaby and Lee, 2003). The model can be used to distinguish whether members in an organization are lacking safety consciousness or safety behavior. Management must be aware of the fact that individuals use lack of behavioral control as an excuse to be passive. Aspects such as unsafe constructions were seen as an obstruction to comply with safety regulations leading to unsafe acts or refusal of behavior. Although behavioral control is needed, caution must be taken that lack of behavioral control is misused as an argument not to perform safety behavior. This research relates to safety culture. However, it contributes less to academic literature due to the fact that the company at which this research was conducted appears to be in the beginning of their journey towards an advanced safety culture. Company-specific characteristics might be related to the statement that safety culture measures do not, by definition, mirror actual safety behavior. When a company is in the beginning of their journey towards an advanced safety culture and employees fear disciplinary actions when results of safety culture measures are published, these results can be taken in question whether they represents the actual safety behavior. This research has shown that true insight into safety behavior of employees seemed to come from qualitative research.
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Introduction

The behaviors people perform in their daily lives can have profound effects on their own health and well-being, on the health and well-being of other individuals, groups, and organizations to which they belong, and on society at large. There is a growing awareness that human behavior can both cause social problems in a variety of domains such as health, the environment, safety, work motivation, and productivity (Fishbein & Ajzen, 2010).

Research has demonstrated a link between safety behaviors and accidents in organizations (Hofmann & Stetzer, 1996). Therefore, organizations are directing efforts towards increasing the ability of organizational members to prevent accidents and to limit the negative effects. Here safety consciousness, defined by Barling et al. (2002 p. 489) as “a general awareness of safety issues as well as a more specific knowledge of the behaviors required to ensure safety”, is a central concept (Enander & Johansson, 1999). Safety consciousness manifests itself in safety behavior such as wearing protective equipment, following protocols, etc. Nevertheless, safety consciousness does not represent a simple, instant solution; it requires continuity on the short and long run. Safety behavior is differentiated into two types of behavior namely: compliance and participation (Neal & Griffin, 2006). For organizational members to behave more safely a climate or culture has to be present that stimulates this. Consequently, there is an increasing interest in the concept of safety culture as a means of reducing the potential for disasters, accidents, incidents or near misses within their everyday tasks (Knegtering & Pasman, 2009). Organizations find safety culture a critical factor that sets the tone for implementation of safety within their workplace (Choudhry et al., 2007). Some elements of safety culture include senior management’s commitment to safety, good communications, organizational learning, a working environment that rewards identifying safety issues, and participative management leadership style (Choudhry et al., 2007).

Research on safety culture is typically conducted on organizational or group level. An individual does not create safety culture; it is formed within a group of individuals. Moreover, safety culture does not exist isolated in an organization, but is influenced by the organizational culture as a whole (Berends, 1996). This creates a conflict since safety behavior is not based on group level, but on an individual level. According to Barling et al. (2002), individual safety consciousness is associated with perceived safety climate. Questions remain how individual safety consciousness and individual safety behavior are influenced by safety culture that is formed by a group and/or organization.

Numerous studies have already discussed how safety culture or safety climate in the healthcare, industry or other high-risk organizations can be measured (Zohar, 1980; Berends, 1996; Guldenmund, 2000; Lawrie et al., 2006). Various authors created a framework for the development and maturation of organization safety culture, which allow them to reflect on the multidimensional, dynamic nature of safety culture by providing descriptions of an organization with respect to a range of key aspects of safety culture (Choudhry et al., 2007). In addition, some authors have used mainstream psychological theory to clarify the mechanisms underlying the links between safety climate and behavior (Fogarty & Shaw, in press). Existing literature, however, mainly used quantitative (surveys) research methods to investigate the state or presence
of a safety culture (Guldenmund, 2000; Choudhry et al., 2007). Due to the limited number of significant changes in safety culture, the use of self-reported safety culture surveys as an evaluation instrument could be questioned. Kessels-Habraken (2009) even calls for future research to use qualitative research, in addition to safety culture surveys, to identify the underlying organizational problems and determine appropriate interventions.

In response to this, the present study will extend existing knowledge about safety culture in that it examines what influence it has on individual safety consciousness and safety behavior. In addition, this study proposes that mainly through qualitative research an elaborated understanding of the individual perspective towards safety consciousness and safety behavior can be formulate. This is in line with Van Aken et al. (2007) who state that qualitative research methods are particular important if one intends to study people, groups, organizations and societies, as is the case here.

The study was conducted at Pivononymous, a Dutch brewing and beverages producing company. Within Pivononymous there are too many accidents taking place. This study defines an accident as an instantaneous, unplanned, and undesired work-related event which results in personal injuries involving loss of working time. From the analyses conducted by the company itself it appeared that many of these accidents can be attributed to human failure and unsafe behavior. The management of Pivononymous wants to reduce the number of accidents and stimulate safety consciousness and safety behavior amongst its employees. Therefore, the central question that is being addressed in this research is how to influence organizational members to behave more safety conscious. For the purposes of this study, safety conscious behavior is defined as behavior that is driven by the realization that safety is of the utmost importance. Through a case study design, this study provides new insights into how Pivononymous is handling and stimulating its safety aspect. Furthermore, the findings of this study provide the basis for recommendation to Pivononymous to improve their safety aspects in order to exploit the benefits of safety consciousness and safety behavior.

This report starts in Chapter 1 with an explanation of the study outline by introducing the reflective cycle, which is used as the overall methodology. This model is used to fill a knowledge gap in the academic literature through the use of a business case and it defines the general objective of the study and the implications for the business case. For this case the regulative cycle is particularly applicable for doing business problem solving since it consists of an analysis to determine the need the design should meet followed by an implementation and reflection of the design. Chapter 2 gives a theoretical background of the current academic literature and where a gap exists in which this study is focused on Chapter 3 describes the problem definition, selection, formulation, and its approach and it tells us about Pivononymous, where the case study was conducted, and its problems with safety consciousness and safety behavior of employees. Chapter 4 focuses on the analysis of the problems encountered at the case study and explained the methodological approach that was used to handle this research. Which type of research methods were used and how they were conducted is explained. Chapter 5 presents the diagnosis of the problems found in the analysis phase and provides interpretations of these findings. In Chapter 6, the results following up the interpretations that are made in previous chapter and a redesign is proposed to improve the current situation. The redesign consists of a solution design on the main problems. In addition, a change plan for the short as the long term is provided. The
last two steps, implementation and evaluation, of the regulative cycle are not addressed due to time constraints. These last two steps need to be performed by the organization itself, in order to reach the full potential of the solution. Ending with the last chapter in which the feedback loop of the regulative cycle is reached and the study will continue on the reflective cycle loop in which the step from specific to general will take place. In addition, concluding remarks are provided of this study and its development. Based on that implications that were encountered during this research are given and recommendations for future research are suggested.
1 Study outline

There are two contexts where knowledge can be developed according to Van Aken et al. (2007). The first context is an academic context in which a contribution is made to the existing body of scientific knowledge by addressing gaps in literature. The second context is the knowledge in a business context that has to yield a solution to a business problem. To fill a knowledge gap in the academic literature through a business problem-solving activity, this study uses the methodology based upon the reflective cycle, visible in Figure 1.1, proposed by Van Aken et al. (2007). This reflective cycle incorporated the regulative cycle proposed by Van Strien (1997) that makes use of the case study methodology. A case study is defined by Yin (2009, p.18) as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident”. One of the benefits is that the methodology allows flexibility for the researcher to move attention to behaviors that seems interesting and/or relevant at that time. Due to time constraints, the ‘Implementation’ and ‘Evaluation’ of the solution are not part of this study. Therefore, the case study only focuses on the first three phases of the regulative cycle: ‘Problem identification, ‘Analysis and Diagnosis’ and ‘Redesign’. However, the reflective cycle suggests that the cycle is not completed after the problem in the regulative cycle has been solved. The analyses and experiences from this project can then be reflected and codified into academic research, and thereby contributing to the general design knowledge. The ultimate goal is, of course, to close the gap between academic knowledge and business problems.

![Figure 1.1: The reflective cycle (Van Aken et al., 2007)](image-url)
2 Theoretical background

The first objective of the reflective cycle is to state the current academic knowledge with regard to influencing organizational members to behave more safety conscious. Hence, this chapter will describe the two research areas that are particularly applicable to this. The first is in the area of psychological literature, in particular the theory of reasoned action, and the second is in the area of safety literature.

2.1 Theory of Reasoned Action

psychological perspectives on learning, motivation, attitudes and beliefs (Cox & Jones, 2006). Learning can be considered as an active process where by behavior is strengthened by reinforcement and feedback. For example, praise from colleagues or immediate managers, promotes behavioral change and learning, while blame or criticism is often counterproductive (Skinner, 1974). Vroom’s (1964) expectancy-valence theory proposed that individuals are motivated to behave in a certain way under certain conditions. Those conditions can be: if they have a strong desire to achieve an outcome (i.e. following procedures), if they have a reasonable expectation that they will achieve the outcome (i.e., they are competent) and finally, if they expect that the achievement of the task outcome will result in a reward (i.e. increased safety performance, quality completion and reduced accident rates). Nevertheless, it is also true that rewarding may hamper the desired behavior. Simple application of rewards may be attached to the wrong behaviors (Hudson, 2007). To secure long-term changes in safety related performance, researchers have suggested that it is necessary to change both individual behaviors and attitudes (Fishbein & Ajzen, 1975). Some researchers state that behavioral safety can be reviewed by the Theory of Reasoned Action (TRA) approach (Cox & Jones, 2006). The TRA (Fishbein & Ajzen, 2010), which is almost identical to Ajzen’s Theory of Planned Behavior (TPB) (Ajzen, 1991), assumes that human social behavior follows reasonably and often spontaneously from the information or beliefs individuals possess about the behavior under consideration. The model argues that individual intention for specific behavior is determined by three determinants: Attitude, Norms, Control. The stronger the intention, the more likely it is that the behavior will be carried out.

The model describes that individuals are likely to differ in the beliefs they hold, based on individual differences in social background or personal traits. Beliefs serve to guide the decision to perform or not perform a particular behavior, and can be distinguished into three kinds. First, individuals hold beliefs about the positive or negative consequences they might experience if they performed the behavior (behavioral beliefs). Second, individuals form beliefs about the normative expectations of others and motivation to comply with these expectations (normative beliefs). Finally, individuals form beliefs about personal and environmental factors that can enhance or impede their ability to carry out the behavior (control beliefs).

Behavioral beliefs are assumed to determine an individual’s attitude toward personally performing a specific behavior. In general, when performance of the behavior is perceived to result in more positive than negative outcomes, the attitude toward the behavior will be favorable. Normative beliefs produce a perceived norm, that is, perceived social pressure to engage or not engage in the behavior. If more important others and if the majority of important
others perform the behavior, individuals are more likely to perceive social pressure to engage in the behavior. Control beliefs result in a sense of high or low self-efficacy or perceived behavioral control. Perceived self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. Self-efficacy beliefs determine how people feel, think, motivate themselves, and behave (Bandura, 1994). If control beliefs identify more facilitating than inhibiting factors, perceived behavioral control should be high.

Once attitudes, perceived norms, and perceived behavioral control have been formed they are directly accessible and available to guide intentions and behavior. In combination, they lead to the formation of a behavioral intention, or a readiness to perform the behavior (Fishbein & Ajzen, 2010). However, when there is a lack of requisite skills and abilities, or presence of environmental constraints, this can prevent individuals from acting on their intentions, meaning that they lack actual control over performance of the behavior. It is when people have control over behavioral performance that intention is expected to be a good predictor of behavior. A schematic representation of the theory is visible in Figure 2.1.

Applying the theory of reasoned action to safety behavior, one may, for example, address the process involved in an employee’s decision to attend or not to attend safety training. This employee may judge that by attending the training he or she will acquire important information (behavioral beliefs), that most of the colleagues plan to attend, and that senior management very much approves of this behavior (normative beliefs), and that there is sufficient time and financial resources to attend the training (control beliefs). This employee is very likely to actually attend the training. Another employee may also favorably evaluate attending the training and experience similar sources of social pressure. However, if the individual has made prior commitments that cannot be cancelled, or if they lack the financial resources, this individual will perceive that despite a favorable attitude towards the training, he or she cannot attend the training and thus may form an intention not to attend the training.

![Figure 2.1: Reasoned Action Framework (Fishbein & Ajzen, 2010)](image-url)
From a psychological point of view, this framework provides a proper reference for investigating the research question on how to influence organizational members to behave more safety conscious. It provides us with three determinants that increase the likelihood that an individual will behave safely, namely a) the attitude towards behaving safely, b) the perceived (social) norms concerning behaving safely, and c) the belief about ones capabilities to behave safely. Fogarty and Shaw (in press), for example, used the TPB framework to study which of the three individual determinants contributed to safety violations in aviation maintenance. They established that management attitude to errors and violations had an influence on the workers intention to violate aviation maintenance guidelines and violation behavior, while group norms had a strong influence on the attitude, the intention to violate, as well as violation behavior itself. Work pressure was assessed as a measure of behavioral control and proved to influence both group norms and the intention to violate. The authors’ main finding, however, was that these three determinants were all influenced by the management attitude toward safety topics, and that this was the most important factor to prevent safety violations. As such, the TRA proves to be a valuable general psychological framework for understanding, predicting and controlling individual safety behavior. Still, more specific insights regarding safety behavior may come from research done in the area of safety management. Hence, we will now continue to discuss insights from the safety management literature.

2.2 Safety culture management literature

Traditionally, occupational health and safety interventions are centered on controlling the physical work environment and work procedures of employees in an effort to prevent accidents. Examples include the documentation of detailed procedures designed to provide the safest way of completing tasks, procedures for handing over uncompleted tasks to colleagues, strict safety guidelines for the operation of machinery, and the wearing of personal protective equipment. A complementary approach to human error focuses on the human factors in work accidents. This approach takes into account the inevitability of human error and seeks to contextualize behavior so that a greater understanding can be realized. Where strict procedural guidelines attempt to mechanize and standardize behavior, a human factor perspective, conform the TRA, acknowledges individual differences and focuses on psychological pressures and factors that influence behavior. In safety literature, one of the simplest models is that of the iceberg theory of Heinrich (1929) (see Figure 2.2). The basic idea of the iceberg theory is that when one wants to reduce the number of accidents (“melt the iceberg”) the approach should start at the bottom of the iceberg, at the behavioral acts. These bottom acts occur more frequently, however are less visible to management since they create no damage, injuries or worse. A point of notice is that we have to realize that there are two icebergs, the one mentioned above on personal safety and the one that is focused on process safety. Here personal safety focuses on individual behavior as the antecedent of accidents, while process safety focuses mainly on design and engineering of facilities, maintenance of equipment, effective alarms, and ergonomic designs. Heinrich also designed the 88-10-2 rule. This rule states that 88% of the accidents are caused by human interference, 10% is caused by machinery, and 2% was not preventable (Heinrich, 1928).
By focusing on the behavior acts, one can stimulate individuals to become more aware of safety related aspects with the intention to make individuals more safety conscious. Safety consciousness was defined by Westaby & Lee (2003, p. 228) as “A positive attitude and awareness toward acting safely in general”. This definition was put more specifically by Barling et al. as “a general awareness of safety issues as well as a more specific knowledge of the behaviors required to ensure safety” (2002 p. 489).

In 1990, the Loss Prevention of the European Federation of Chemical Engineers (EFCE) already presented several determinants that needed to be formed to modify safety behavior. This group was ahead of the upcoming literature and they described basic elements of human behavior that might contribute to the origin of incidents and accidents. These determinants were:

- **Knowledge** of risk symptoms needs to be instructed or highlighted by inspections and audits. The observation and reporting of incidents and unsafe acts needs to be trained.
- **Experience** or practice needs to profit from demonstrations and efficient information transfer, instead of lecturing. Knowledge needs to be maintained by repetitive training sessions or through process simulation techniques.
- With regard to **learning**, organizations need to realize that safe behavior is often not sufficiently rewarded or reinforced. Very often unsafe behavior is more rewarded (i.e. by taking shortcuts and saving time) than penalized. Taking precautions against unsafe behavior often is regarded as too difficult or not comfortable enough, while unsafe behavior is seen as easier. Hence, actions to stimulate safe behavior include a.o. the removal of inconvenience of protective equipment, the demonstration of the negative effects of unsafe behavior (the long-term disadvantages compared to the short-term advantages) and making unsafe behavior impossible by physical obstruction.
- People need to be encouraged and stimulated to act safely. **Motivating** for safe behavior means to acknowledge people, to act as a good example and to make use of group dynamics. An individual needs to recognize as being responsible for safety, as they are for productivity, quality, and maintenance.
- **Attitudes** can be described as integrated and stored results of repeated opinions, evaluations, and beliefs, signifying a mental position towards people, objects, and objectives. A positive attitude of individuals towards safety is sometimes very difficult to develop. Modifying attitudes is very time-consuming, except when sometimes very impressive negative events (explosion with fatal injuries) bring about sudden changes in attitude.
These elements, or human factors, were studied to uncover their role and significance in the interaction of humans with systems, equipment and devices, to understand why and when things could go wrong, and to develop measures to prevent the occurrence of incidents, near-accidents and accidents or, in case they did occur, to limit their consequences. They appear to have some similarities with the TRA framework mention in paragraph 2.1 since both models emphasize that attitude precedes behavior.

According to Barling et al. (2002), individual safety consciousness is associated with perceived safety climate. These authors state that “a minimum threshold level of safety consciousness is necessary for employees to be concerned with perceptions of safety climate” (p. 490). Continuing on this, some authors see safety climate as a segment that is part of a safety culture (Guldenmund, 2000). Hence, the focus on safety is increasingly shifting toward safety culture, as is visible in Figure 2.3, but as the Baker Panel reported it should be in combination with process safety (Baker et al., 2007).

2.3 Safety culture academic literature

Drawing on the dimensions from the TRA framework mentioned in paragraph 2.1, and the determinants mentioned in paragraph 2.2, the model by Neal, Griffin & Hart (2000) seems to apply the principles of TRA to safety behavior specifically (see Figure 2.4). This model provides a link between organizational environment and specific individual behaviors related to safety as it identifies external influences that affect on individual safety behavior. The model is separated in an organizational and individual section. Starting with the organizational section, two factors are mentioned. Organizational climate is “a multidimensional construct that encompasses a wide range of individual evaluations of the work environment” (Neal et al., 2000, p. 100). These evaluations may refer to general dimensions of the environment such as leadership, roles, and communication or to specific dimensions such as the climate for safety. This safety climate is “a specific form of organizational climate, which describes individual perceptions
of the value of safety in the work environment” (Neal et al., 2000, p. 100). Safety climate reflects the perceptions of safety-related policies, procedures, and rewards (safety knowledge), but also the extent to which employees believe that safety is valued within the organization (safety motivation) (Griffin & Neal, 2000). The second section of the model is based on individual behaviors. Neal and Griffin (2004) states there seems to be three determinate of individual differences of behavior namely: knowledge, skill, and motivation. Safety behaviors are most directly determined by the knowledge and skills necessary to enact the behaviors and by the motivation of individuals to actually perform the behaviors. By looking at the model safety consciousness, seem to be represented by two factors on the individual section. Here safety knowledge is referred to knowledge that is needed, to safely operate equipment and machinery. Safety motivation refers to “an individual’s willingness to exert effort to enact safety behaviors and the valence associated with those behaviors” (Neal & Griffin, 2006, p. 947). Individuals behaving safely should have the knowledge and be motivated to comply with safe working practices and to participate in safety activities if they perceive that there is a positive safety climate in the workplace. Here, safety compliance refers to “the core activities that individuals need to carry out to maintain workplace safety” (Neal & Griffin, 2006, p. 947). These behaviors include obeying safety regulations, following the correct procedures, and using appropriate equipment (Neal & Griffin, 2004). Safety participation referred to safety initiative as used by Zacharatos et al. (2005) and is defined as “behaviors that do not directly contribute to an individual’s personal safety but that do help to develop an environment that supports safety” (Neal & Griffin, 2006, p. 947). These behaviors include activities such as participating in voluntary safety activities, helping coworkers with safety-related issues, and attending safety meetings. To undertake such activities individuals need to have the knowledge but also the motivation to behave safely.

By seeing safety conscious behavior as the four factors of the individual section, this seems to be the area to focus on when addressing the present study’s research question. By stimulating safety consciousness positively the intention then is to reduce the amount of accidents and injuries, report more unsafe behavior and/or unsafe situations, and correct or make others aware of unsafe behavior.

Two out of three determinants from the TRA framework seem to be addressed in this model as well. Attitude towards behavior can be seen as safety motivation. When individuals are motivated they create a positive attitude towards the behavior in a favorable way. Perceived norms can be seen as safety compliance. Social pressure of others influences the individual to engage in the behavior thereby forcing them to follow up and not stimulating one’s own input. Only perceived behavioral control is not represented in this model. Perceived behavioral control suggests there are times when, despite their best intentions to act in a certain manner, individuals feel incapable of acting according to procedures and rules because of external factors that are beyond their direct control (Fogarty & Shaw, in press).

Moreover, the model is focused on safety climate but as Guldenmund (2000, p. 229) states ‘perceptions are more associated with climate whereas attitudes are considered to be a part of culture’. Safety climate is often used to describe employees’ perceptions, attitudes, and beliefs about risk and safety. Safety culture is considered to be of a more complex and enduring phenomenon than safety climate, reflecting fundamental values, norms, assumptions and expectations, which, to some extent, reside in societal culture. The term safety culture is often
understood as a subcomponent or indicator of organizational and societal culture (Guldenmund, 2000). Specifically, safety culture is then to be considered as the collective ability to produce organizational and interorganizational work practices that both protect individual welfare and the environment (Tharaldsen et al., 2006). According to Kessels-Habraken (2009), an advanced or ‘good’ safety culture is characterized by four aspects:

- Employees and managers are notified about actual errors and potential risks. They are informed about relevant quality and safety issues in their organization; they know what is going on.
- People trust one another and are willing to share lessons regarding errors, without the fear of punishment.
- A sophisticated safety culture is adaptable to change through learning and flexibility.
- In an advanced safety culture, people worry about safety. They are aware that their working situation is hazardous and are constantly anticipating problems.

![Proposed Research Model](image)

**Figure 2.5: Proposed research model**

As was mentioned before behavioral safety derives much on learning, motivation, attitudes and beliefs (Cox & Jones, 2006). These four aspects of a ‘good’ safety culture represent similarities with that. By taking the abovementioned perspectives into account, the present study proposes to extend Neal et al.’s (2000) model by suggesting that safety culture stimulates safety knowledge and safety motivation. For the purposes of this study, both symbolize individuals safety consciousness, defined by Barling et al. (2002 p. 489) as “a general awareness of safety issues as well as a more specific knowledge of the behaviors required to ensure safety”. Safety knowledge and safety motivation, subsequently, are expected to influence safety behavior, as reported by safety compliance and safety participation (Neal & Griffin, 2006). Furthermore, it is proposed that these relationships are influenced by behavioral control, that is, whether to participate or comply with safety behavior is also influenced by factors that are beyond the
control of the individual worker. All this results in the proposed research model, visible in Figure 2.5, which represents the elements determining employee’s safety behavior. The elements of this model are used to clarify the question how organizational members can be motivated to behave more safety conscious.

2.4 Concluding remarks

In this chapter, there is a distinction made between psychological and safety literature. It appears that aspects from both scientific fields are comparable. Within the last, an extra distinction was made between managerial and academic literature. The managerial literature focuses more on situations occurring in organizations, as is visible in the iceberg theory. The implementation is low demanding and highly measurable. This is due to targets that are able to measure, while the approach of the academic literature is more from a psychological point of view. By combining both fields this lead to the proposed research model visible in Figure 2.5. In the next chapter, the problem definition at the organization in which the proposed research model was applied to will be explained more in depth.
3 Problem definition at Pivonymous

While explaining the first step of the reflective cycle in previous chapter. This chapter describes the first step of the regulative cycle from Van Strien (1997), which describes the problem and gives a problem definition. First, some background is provided about the organization. Continuing with the problem selection, after which the problem formulation is given. Ending with the problem approach.

3.1 Pivonymous

Pivonymous is part of a large brewing company that has breweries and brands worldwide. At Pivonymous, three types of beer are mainly brewed and packed. Of the total beer production, 30 percent is destined for the domestic market and 70 percent for export. Pivonymous is one of the large breweries in Europe in total amount of beer production. A total amount of 600 employees is working at the brewery in production, of which most in two or three-shifts, and a total amount of 600 employees is working in the office. An organizational structure of Pivonymous is visible in Figure 3.1.

At Pivonymous, organizational members have a high age and high average years of services. Both the packaging as the distribution (Distribution & Customer Service) department have an average age of the organizational members of around 46.5 year. These years of service range from one to 47 years with an average of 18 years.

![Figure 3.1: Organizational structure Pivonymous](image-url)
3.2 Pivonymous situations

Pivonymous is chosen as a research case due to the current situation at location. There are too many accidents taking place. In 2008, the total amount was 10 accidents while in 2009 this almost doubled to 19 accidents. This resulted into Pivonymous becoming the second worst brewery of Pivonymous global, in terms of total amount of accidents, in Western Europe. From the analyses conducted by the company itself it appeared that many of these accidents are attributed to human failure, unsafe behavior, not wearing personal protective equipment (PPE), and not obeying the procedures.

Estimates from the European Union in 2000 suggest that averages of 30 days of work are lost for each workplace accident. Moreover, it is estimated that the total cost of each workplace injury in Ontario, Canada, is $6,000, with the cost of each workplace fatality being $492,000 (Barling et al., 2002). Therefore, these 19 accidents may be considered a serious problem that has to be handled thoroughly. For this reason, priority was given by management to handle this situation.

Currently a Total Productive Management (TPM) program is implemented which include a route for the Safety, Health, and Environment (SHE) department, which consists out of multiple steps. One of these steps is ‘understand and analyze behavioral anomalies’ which this research contributes.

3.3 Problem selection

Through seven exploratory interviews, which were conducted in the first weeks and lasted between one half hour and one hour, a better understanding of the situation was obtained. The interviewees were working in functions in which safety was predominant or that were responsible over a high amount of employees. The interviews were held at the office of the interviewee to provide a trusting environment and to get an overview of the current problem. The interviews were unstructured, but basic questions asked during the exploratory interviews were:

- What is your function within Pivonymous?
- Where are you positioned within the organization?
- Where are, in your opinion, high-risk situations / circumstances?
- What behavior is related to this high risk?
- Has this behavior been there before or is this new?

Each of these questions tries to let the interviewee reveal their standpoint towards safety and the problems present at Pivonymous with the particular focus on the safety behavioral aspects. Based upon these interviews a preliminary cause-and-effect diagram was developed, which is shown in Figure 3.2.

From these interviews and some additional documentation gathered at the same time, it became clear that there are too many accidents and incidents taking place due to unsafe behavior. Whether this behavior is caused by unsafe use of equipment because individuals wrongfully handle it or damaged material that is not reported is unclear. Some of the interviewees mentioned that protocols that are written to prevent unsafe behavior are inefficient. This could be caused by the fact that individuals are not obeying them or management is not monitoring them. Some mention that the trainings that individuals receive are not effective in reducing incidents. Once a safety certificate has been obtained, no further steps are taken. Also due to understaffing, training
is cancelled for those wanting to participate, which might decrease motivation. One interviewee also mentioned that the reporting of unsafe behavior is lacking. Individuals blame not having enough time to report unsafe behavior. They do not point others on unsafe behavior because they consider it to be part of the team leader’s job and some individuals even refuse to assist with reporting unsafe behaviors. In addition, there seems to be a safety awareness gap between middle and top management. The higher you talk with the more quiet it became. This could be due to low priority of safety or just the unwillingness to stimulate safety. This all leads to individuals being less safety consciousness and acting unsafe with the result of incidents or accidents taking place.

Based on these interviews and the preliminary cause-and-effect diagram, shown in Figure 3.2, several problems regarding safety issues were identified and one was selected, namely that of individual less safety motivated and unaware of risks. The reason for choosing this safety issue at Pivonymous was based on its commensurability with the proposed research model.

Figure 3.2: Preliminary cause and effect diagram

3.4 Problem formulation

The problem definition is according to Van Aken et al. (2007) a crucial part of the business problem solving project. The problem statement should be related to unsatisfactory business performance or an undesirable state-of-affairs, which leads to lower performance. Given the background of this study, the central question of this study was defined as:

“How to influence organizational members to behave more safety conscious”
It is possible to break down this central question into constituent elements:

*How to influence...* This first element indicate that this is in the first place a problem solving project and not a design project. As Yin (2009) mentions, most case studies start with “How”. Much academic literature is available on this, and in the theoretical background, this is explained in detail.

*...organizational members...* The study should be focused on members working within an organizational context. The study was therefore conducted within the organization of Pivonymous in the form of a case study. The members that contributed to this study should be representative.

*...to behave more safety conscious* Behavior is a manner that is conducted by an individual and this individual must act safely during the actions they perform on the job. The results of this study should be compatible for other organizational members worldwide. At the end of this study, it should be clear how to increase safety conscious behavior.

### 3.5 Problem approach

Overall, the scientific aim of this study is to contribute to the current academic literature in terms of defining which factors are to be influenced to stimulate organizational members to behave more safety conscious. In order to handle the above stated research question in a structured and controlled manner, a set of three sub-questions are formulated. These sub-questions are:

1. *Which factors influence safety consciousness and safety behavior?*

2. *Which factors are most promising in improving and/or optimizing safety conscious behavior and reducing accident, within Pivonymous?*

3. *Which steps are required to handle optimizing these promising factors?*

   Where the problem solving project primary aims at solving business problems and identifying relationships, there is sufficient room to contribute to insights regarding the factors that optimally can be influenced and that contribute most to safety conscious behavior. The focus of this study will be restricted to two segments within the Pivonymous organization namely: (1) packaging and (2) distribution (Distribution & Customer Service) departments, which are visible in Figure 3.1. More specific on the distribution department, export section and on the packaging department, rayon 3’s packaging lines seven and eight. The reason for this is that it is one of the boundaries set by the company. By starting the study on these two segments the plan is then to horizontally expand the results throughout the remaining segments and when evaluated positively perhaps throughout Pivonymous global.

### 3.6 Concluding remarks

Coming to the end of this chapter the situation at Pivonymous appeared to be suitable for this study. Due to the implementation of the TPM program, the research has a high change to
be implemented. In addition, the organization recognizes the need for change and cooperation from different levels was given. This is an important factor as, Fogarty and Shaw (in press) already highlighted management attitude towards safety influences violation behavior. This led to the main research question of this study: How to influence organizational members to behave more safety conscious. By breaking down this question into elements, an explanation is given to what standards this research question must apply to. To handle these standards, three sub-questions are formulated that will assist in answering the main research questions. For sub-question 1: Which factors influence safety consciousness and safety behavior? an answer was already found in previous chapter by introducing the proposed research model. This model mentions the factors that influence an organizational member in their behavior. How this case study at Pivonymous was handled and which steps were used will be explained in the next chapter.
4 Methodology

This chapter describes the second phase of the regulative cycle from Van Strien (1997). First, the methodology is given after which the analysis is performed. The analysis shows how applications are currently managed and what the causes and consequences are.

4.1 Methodology for analysis and diagnosis

This study took an explanatory science approach to answer the research question. Explanatory science mission is to develop valid knowledge to describe, explain, and predict empirical phenomena within the scope of the science in question (Van Aken et al., 2007). This type of approach may be regarded as a quest for understanding like most social sciences. It focuses on the immaterial world of knowledge.

Based on the research question, the case study approach is the most appropriate research method to follow. The main argument for the application of the case study research was that this approach is most appropriate for answering “how and why” questions (Yin, 2009). These types of questions rest heavily on the ability of qualitative data to offer insights in complex social processes. The case study approach allows researchers to study examples and experiences from the practical context and to translate them into generic statements (Yin, 2009). In this study, the organization of Pivonymous was seen as one case study. Although conducting more than one case study results in literal replication and theoretical replication (Yin, 2009) there was within Pivonymous global not a comparable situation for a second case. The reason for this was that Pivonymous is a large brewery in Western Europe. In addition, the problems seem to relate to the high amount of employees at location.

4.2 Data collection

As was mentioned previously, through qualitative research an elaborated understanding of the individual perspective was formulate due to the limited number of significant changes in safety culture surveys (Kessels-Habraken, 2009). Qualitative research methods are particular important if one intends to study people, groups, organizations and societies (Van Aken et al., 2007) as was the case here. This implies the assessment of the case study through documentation, interviews, direct observation, and benchmarking. Clearly, the use of four data sources will increase the construct validity of the research project. Furthermore, the author assessed documents and interviews, to analyze the formal process and the organizational design, in terms of effect on performance and their current situation.

4.2.1 Documentation

Documents are important for confirming evidence from other sources (Yin, 2009). Examples are evaluations, formal studies, annual reports, amount and type near misses, incidents, and accidents. These documents should give insight on occurred important relational events and the sequence of these events over time. The documents used for this research were the following:
1. The accidents, incidents with absence, and incidents without absence were collected over the last five years. The reason for five years was chosen since that is an indication for seeing measurable changes in a safety culture (Guldenmund, 2000).

2. All in 2009 reported near misses are categorized into eight dimensions namely: Wrong safety security; Defect of tools/equipment/design; Placing/construction/design; Lack of order and tidiness; Improper ventilation/lighting; Incorrect or no PPE (Personal Protective Equipment); Organization; Weather condition. These reported cases were appointed to the four different Rayons with the exception of wrongfully reported, such as non-category ones.

3. The amount and types of safety trainings employees are given were collected. In addition, the duration these trainings were valid was looked at.

These data were analyzed and then used to support or decline results collected from the interviews. Some data was integrated within TPM methodologies. One of TPM’s methodology is called 4M which stands for Human (Mens), Machine, Method, and Material. The 4M are the four categories in which the root causes of accidents and incidents are reported in.

4.2.2 Interviews

Qualitative research methods are particularly important if one intends to study people, groups, organizations and societies (Van Aken et al., 2007) as was the case here. This led the focus of this research mainly on interviews.

The interviews were conducted within a semi-structured interview, where certain themes are introduced, or certain concepts are introduced, but where no specific questionnaire was made up. Semi-structured interviews are interviews that start with specific questions and then follow the individual thoughts. Semi-structured interviews are used to extract more and a greater variety of data (Yin, 2009). The semi-structured interview methodology did not pretend to provide uniform outcomes. The focus lied mainly at the underlying concepts and their interpretation. Nevertheless, no strong statements can be formulated regarding the validation of problems. Due to this validity problem and that these types of interviews’ are so broad, certain characteristics of the Critical Incident Technique (CIT) were used to maintain some depth during the semi-structured interviews. By doing so, the intention was to preserve an open structure of the interview thereby only directing the interviewee into safety conscious related areas.

The interviews were prepared by making a standard set of nine open questions, which are:

1- What are you satisfied with concerning safety?
2- What are you dissatisfied with concerning safety?
3- What is your motivation to work safely? (Safety Motivation)
4- Do you feel you possess sufficient knowledge to do your job in a safe manner? Why yes, why no? (Safety Knowledge)
5- How important is it to you that you and others follow up the correct procedures and use the correct tools and equipment? (Safety Compliance)
6- Do you feel you have adequate resources to do your job safely? Why yes, why no? (Behavioral Control).
7- What is your contribution to the way the safety program is improved and promoted? (Safety Participation)
8- What do you think of the way your workmates/team leaders/management deal with safety? (Safety Culture)
9- What form of intervention would you suggest, or what do you miss to make employees behave more safety conscious?

The first, second, third and eighth question are adopted from Berends (1996) research on safety culture. The fourth till seventh question focuses on four factors of the model. Those are adapted but rewritten from Neal et al. (2000). The final question is asked to hear the interviewee’s vision of the research objective. During the interview, there was room to shift to topics that seemed important at that moment.

Seven safety consciousness related questionnaire items are presented to the interviewee. These questions were adapted from Barling et al. (2002) and interviewees are requested to provide answers based on a 5-point scale (1 = strongly disagree, 5 = strongly agree)

Safety Consciousness
1. I always wear the protective equipment or clothing required by my job
2. I am well aware of the safety risks involved in my job
3. I know where the safety materials are located in my workplace
4. I do not use equipment that I feel is unsafe
5. I inform management of any potential hazards I notice on the job
6. I know what procedures to follow if injured on my shift
7. I would know what to do if an emergency occurred on my shift (e.g., fire)

These questions were asked to create a baseline on how safety conscious employees at Pivonymous currently are. These seven questionnaire items were asked at the end of the interview. It was not chosen to ask them at the beginning because they might feel threatened and they will not answer truthfully. Therefore, neutral less threatening open questions such as the first two were asked in the beginning to create a pleasant atmosphere and then the remaining specific questions were asked if they had not been answered yet. CIT techniques were used to requests for examples, how they handled that, how do they noticed that et cetera.

The interviewees for this study were at management level, a departmental managers and a rayon manager. At middle management level from both departments, two team leaders were interviewed. The operators from the job floor level were balanced based on group size. Therefore, three operators from distribution and nine operators from packaging were interviewed. All interviews were done with one individual except one interview that was conducted with two operators. The reason for this was that one of the operators was being transferred to one of the other breweries within short notice and the person was transferring his tasks over to the other operator. The underlying thought for choosing these people was that the factors of the model are based on individual perspectives. Since department managers and team leaders are between senior management and the job floor, these employees are most likely to create an overall picture of the situation, thereby making them suitable interviewees. The operators are chosen since they are the ones that must comply with the safety regulations and receive safety trainings. The operators were selected at random and a balance was tried to find to interview people from each of the shifts. By interviewing these three individual working levels, an attempt was made to create an overall picture to see if there was a (mis)matching safety overview. Everybody who was asked for an interview was enthusiastic or at least willing to participate – nobody refused. When a quotation of the interviewee seemed interesting to mention in the report this was done anonymously. This was done to reduce the possibility to relate certain quotations back to the interviewee.
At the start of the interview an introduction of the project and its background was given. Such as, what the objective of the interview is and why the interview is important to the project. In addition, the issue of confidentiality was mentioned and how the results will be fed back to the interviewee to check them. At the end of the interview the interviewee were thanked and an agreement was made on how feedback was provided, both of the results of the interview and of the results of the project. After every interview, the data was send to the interviewee to check its internal validity and if needed corrections were made. Relations found from the data with interviewees were presenting to them and they will be asking for their response on this. For the reason that these interviews were held in Dutch, the introduction is written down in Dutch too (see Appendix IV. for more detail.). After the interviews a summary with the key findings and causal models were developed. These finding were send to the involved persons in Dutch (see Appendix V. for more detail). A critical remark refers to the researcher’s perspective on relevancy that could impose bias. This bias was decreased to a minimum in the following manner. The nine open questions, were somewhat hidden throughout the course of the interview. When the interviews were written out, issues relating to each of the nine open questions were coded. Of the interview, a short summary of one page was made and send to the interviewee as well for clarification. This short summary was made for all interviewees. In each summary, the coded text from the interview data was combined until each of the open questions had been answered. Once all interviews were completed, all short summaries were combined per open question. This was done to maintain an open and orderly analysis. This resulted in nine collected summaries with issues relating to each of the nine open questions.

4.2.3 Observation

In order to complement the interview methodology, ethnographic researcher methods were used. An ethnographic researcher participates in a community and tries to learn something about community by participating and using a range of different research techniques (Atkinson and Hammersly, 1994). Ethnographic methods are commonly used to research social phenomena, because an ethnographic researcher studies a subject from within the group. Ethnographic methods rely on participant observation, which can range from non-participation to complete participation. Atkinson and Hammersly (1994) use a fourfold typology: (1) complete observer; (2) observer as participant; (3) participant as observer; (4) complete participant. The author was an observer-as-participant during this research. This type maintains only superficial contacts with the people being studied (for example, by asking occasional questions). This was done by joining and participation in the safety inspections conducted by team leaders. This was done three times at the distribution department and twice at the packaging department. Also by walking with the production teams when there was a question relating to safety. It was however, impossible to become a complete participant in such a short period, and the author lack education in the profession of the technology used.

The focus during these observations was on whether individuals posses the knowledge (safety knowledge) and if they comply with the safety regulations (safety compliance). This resulted in a clear overview of the actual behavior being noticed by the personnel and leaders. Clearly, results are interpreted in the researcher’s perspective, which could harm the validity. Therefore, it was important that the author tried to remain as objective as possible in order to perform a scientific research and the information will therefore be used mainly to establish insight into the working context and to verify collected data.
4.2.4 Benchmark other sectors

Benchmarking safety situations at companies in other industries was incorporated to the research. Benchmarking is defined by Kumar et al. as “the process of identifying, understanding, and adapting outstanding practices from organizations anywhere in the world to help your organization improve its performance. It is an activity that looks outward to find best practice and high performance and then measures actual business operations against those goals” (2006, p.294). The reason for incorporating this methodology was that Pivonomous is a large brewery in Europe and cannot compare other own breweries or competitors on how they handle safety aspects. Therefore, two other sectors were approached and a visit to two chemical factories and a glass manufactory was made to learn from their experience. The underlying thought for visiting the chemical sector was made due to the high amount of experience they already gained over the years compared to other sectors (Zohar, 1980). The glass sector was chosen due to its similarity in potential injuries. Pivonomous delivers its product mainly in glass bottles, which could lead to injuries such as incision wounds caused by cuts of broken glass.

4.3 Concluding remarks

This research was conducted through the use of four methods. Documents was collected which were relevant for this research. Many data was recorded and by filtering the data for its usefulness, this information became an interesting source for underpinning the interviews. The interviews were the main driving force of this research. It provided individual insights of the current situation and could be linked back to the documentation for grounding. The third method used was that of observation. This was done by becoming an observer-as-participant. By joining safety inspections from both departments, it provided the author with a closer view of the current situation and Pivonomous methods of inspection. The fourth method was that of Benchmarking. This was done to create an understanding of safety approaches within other sectors. This report will continue now on presenting the results found from the methods used in this chapter.
5 Results

This chapter presents the diagnosis of the described analyses, as explained in previous chapter. Each paragraph starts with the description of the methods used. Subsequently the interpretative findings of the diagnosis are presented, by describing what was found with this method and which factors are most promising in improving and/or optimizing safety conscious behavior.

5.1 Documentation

Most of the research was focused on qualitative research, therefore, quantitative research is needed to support the findings. Three types of documents (accidents and incidents, near miss labels, safety trainings), which are recorded within Pivonymous, were used for this support. These documents were collected, analyzed, and filtered for use. This paragraph starts with an overview of what are the definitions of accidents and incidents in this research by using Pivonymous standards when possible. These standards are submitted by Pivonymous in the SHE definitions available on location, which are used in SHE Standards and Procedures.

5.1.1 Accidents and incidents

Accidents and incidents are at the top of the Iceberg model (Heinrich, 1929) which is visible in Figure 2.2. These are the cases that organization wants to prevent as much as possible. The definition of an accident is defined within Pivonymous as “an instantaneous, unplanned, and undesired work-related event which results in death or personal injuries involving loss of working time.” This means that a person cannot continue on that day with his job due to the injury caused by the accident.

An incident is defined as “an instantaneous, unplanned, and undesired work-related event which causes personal harm or other damage and requires only medical treatment.” This means

![Accidents and Incidents over the last five years](image)
that a person can continue on that day with his or her job after the incident has taken place. A distinction is made between incidents with injury that requires medical treatment and incidents without injury and medical treatment.

The accidents and the two types of incidents that occurred at Pivonymous were collected over a period of five years. These five years were chosen since that is an average time span to see how the safety culture evolves (Guldenmund, 2000). In Figure 5.1 a schematic representation is visible of the 159 cases reported over the last five years. In Figure 5.1 there are three figures visible (incidents without injury, incident with injury, accident) and within every figure, five columns represent the number of reported cases per year. For instance, in 2009 there were 15 incidents without injury, eleven incident with injury, and 18 accidents. These reported cases are only those that happened to Pivonymous personnel. The cases that happened to external personnel were excluded, as Pivonymous should first focus on its own personnel. Its own personnel can be influenced by trainings and are evaluated by own personnel.

5.1.2 Near Miss Labels

Near Misses are at the bottom of the Iceberg model (Heinrich, 1929) which is visible in Figure 2.2. These are the cases that organizations want to collect as much as possible so that accidents and incidents can be prevented. A near miss is defined within Pivonymous as “an instantaneous, unplanned, and undesired work-related event that, under slightly different circumstances, could have caused an accident or incident.”

The near miss labels were introduced to the packaging department in 2009 at Pivonymous and all those reported at this department in the year 2009 were collected with the exception of wrongfully reported, such as non-category ones. First the unsafe situation is written down and then the near misses are categorized by the operators and team leaders themselves into one out of eight dimensions. Any actions undertaken to the unsafe situation must be written down and on the back of the near miss label a risk classification score is given. This risk score depends on the probability and the effect it has on the situation. If the risk score was 1, then within the eight-hour shift a solution or temporarily solution must be found. If the risk score was 2, then one week was allowed and at risk score 3, a timeframe of one month was allowed in which a solution must be found. The eight near miss label categories with examples are the following:

1. Wrong safety security, e.g. a electrical unsafe device;
2. Defect of tools/ equipment/ design, e.g. a ladder that is not bolted any more;
3. Placing/ construction/ design, e.g. a slippery floor caused by water that stays there due to an unequal floor;
4. Lack of order and tidiness, e.g. a slippery floor caused by beer foam that was not removed;
5. Improper ventilation/lighting, e.g. a defected light bulb of a fork-lift;
6. Incorrect or no PPE, e.g. a sticker missing on a fork-lift for wearing your seatbelt;
7. Organization, e.g. a to low occupancy rate of company fire fighters during overwork;
8. Weather condition, e.g. a whole in the road created by the weather condition.
The labels were represented for four rayons where the person reported the near miss situation. This was done to give an overall view of where the report came from. In Figure 5.2 a schematic representation is visible of the amount of near misses of each type reported and in which rayon it occurred. There are four rayons visible and within every rayon, a maximum of eight columns is seen. Every column represents the amount of reported near miss labels per category.

In this figure, it is visible that of the total amount of 351 reported near-miss labels, the region of rayon 1 is accountable for 13% of the total amount of reported near misses and they are categorized into four out of eight categories. 21% is accountable for the region of rayon 2 and they are categorized into six out of eight categories, 47% is accountable for the region of rayon 3 and all eight categories has reported labels in. Rayon 4 is accountable for 19% of the near miss labels and they are categorized into five out of eight categories. From this, it becomes apparent that in Rayon 3 a considerable larger proportion of near misses are being reported compared to the other rayons.

The total amount of labels that were written over all the rayons are then categorized into the eight categories. In Figure 5.3 a schematic representation is visible of these eight categories and in Table 5.1 the total percentage of each category is shown.
The percentage of the category ‘Defect of tools/ equipment/ design’, which is visible in Table 5.1, represents almost half of all labels. The remaining seven categories represent the other half. Hence, most reported near misses have to do with defect tools, equipment, or design. By consulting one of the Pivonymous colleagues on the TPM program these eight categories were analyzes and assigned to one of the 4M’s, explained in paragraph 4.2.1, to create an overall view. Only weather conditions were excluded since this was seen as a factor that one could not influence. In Figure 5.4 a schematic representation is visible of these 4M’s. In Table 5.2 the merged categories are visible with the represented percentage of reported near miss labels in that category.

In these data the categories Machine (51%) and Material (30%), which are on the materialistic aspect, together represent 81% of all near miss labels reported, while the categories Human represent 17% and Method represent 2% of all near miss labels reported.

### 5.1.3 Safety training

Employee safety behavior stems from safety consciousness. At the same time, such activities affect the depth of processing of information, which translates into crystallized attitudes and knowledge regarding safety (Westaby & Lee, 2003). Therefore the amount and types of safety training employees within Pivonymous were given was collected and the
duration these trainings were valid for was obtained. The following training was given at location:

- VCA (Veiligheid, gezondheid en milieu Checklist Aannemers) in English the Safety, Health and Environment Checklist Contractors (SCC). This is a certificate that every individual working for Pivonymous must obtain and is valid for ten years. It includes safety regulations and norms to increase safety consciousness during occupational activities;

- Safety movie. This safety movie has recently been implemented at Pivonymous and it shows the safety regulations and guidance of the location Pivonymous before people are allowed to enter the site. It is obligated that everybody that works on the location must have seen this movie and it is valid for three years.

- Around 130 organizational members, which is about 18,5% of the employees, are BHV (BedrijfsHulpVerlening) certified in English first-aid service. These employees become a BHV on voluntary basis and are reworded with a small financial contribution. Since 1994, every organization in The Netherlands is obligated to have a BHV organization. These are organizational members that assist at undesirable events, that can threaten the health and/or well-being of the employees. Within this group of 130 members, company fire fighters are also included. The members that have a BHV are obligated to follow 16 hour per year on safety trainings. This can vary from evacuation trainings to a training of using a fire extinguisher. The company fire fighters are obligated to follow 40 hour per year on safety trainings. The training they receive is more extensive and some are held with the local fire department.

- Ad hoc safety sessions are given. An example is the Near Miss Label training that every organizational member had to follow.

- Since February 2010 there is a new procedure that once, an accident had occurred at Pivonymous an information session is given to all organizational members. The production is stopped in all three shifts for 30 minutes at the end or start of each shift and the conditions in which the accident occur is explained and discussed.

5.1.4 Interpretation of the documentation

These documents provided the author with a wide source of information. First in Figure 5.1 there are some significant shifts visible. Over the last years, the amount of incidents without injury was reasonable stable but in the last year, it doubled. The amount of incidents with injury had a climax in 2007 and started to decrease in the two years following. The most remarkable shift is the one of accidents. The reporting of accidents reached rock bottom in 2007 and then increased slightly until the year 2009. In the year 2009, the amount of reported accident tripled compared to the year before. This was the highest reported amount of accidents in the last eight years and Pivonymous became one of the breweries of Pivonymous global in Western Europe with high reporting accidents. Are these shifts the result of shifts in the number of accidents or are they caused by a shifting safety consciousness of employees? A change in risk acceptance of the employees might have occurred that led to a change in the interpretation of the incident severity instead of accepting that the incident is part of the job (Van der Schaaf and Kanse, 2004). This could have led to the decline in incidents with injury and the increase in accidents thereby creating a change in how employees interpret the definitions. Thus, by referring to the elements of the proposed research model the change in risk acceptance and interpretation of the incident severity can be caused by an increase in safety knowledge.
A second eye-catching item is the reported near miss labels in Figure 5.2. Of the 351 reported near miss labels, Rayon 3 was accountable for 47% of these. This might have been caused by the continuing focus of the rayon manager on this aspect, since the rayon manager is one of the team members in the safety pillar of the TPM program. A second factor that could have contributed to this finding is that the pilot of the near miss labels started at one of the production lines in rayon 3. Thus, when the near miss labels training was carried out employees were instructed to go to their workplace and fill in one near miss label of an unsafe situation. By acting on this instruction, these individuals increased their safety compliance.

A third aspect that is remarkable is visible in Figure 5.4. It appears that most of the near miss labels reported are on the materialistic aspect, while Heinrich’s (1928) 88-10-2 rule, explained in paragraph 2.2, states that 88% should be related to human failure. The categories Machine (51%) and Material (30%) are on the materialistic aspect and together represent 81% of all near miss labels reported, while the categories Human represent 17% and Method represent 2% of all near miss labels reported. This style of reporting might have been caused by fear of disciplinary actions or of other people’s reaction (Van der Schaaf and Kanse, 2004). By mainly reporting materialistic aspect employees avoids confrontation with other colleagues. Materialistic aspects do not argue back when a near miss label is reported. Thus, although the materialistic aspect was mainly reported, employees continued reporting near misses on a voluntarily bases thereby stimulating their safety participation.

What was noticeable about the safety training is that it seemed to be limited to a few employees. 18.5 % of the total employees that work in production receive safety training on a yearly basis, the remaining 81.5% of the employees do not receive safety training in a structured way. Every employee is obligated to obtain its VCA every ten years and see the safety movie every three years. However, apart from these, they do not receive any other safety training. Thus, this influences the element of safety knowledge since the majority of employees do not receive safety training in a structured way.

5.2 Interviews

Information that related to the nine questions asked during the interviews were collected per question and analyzed with the six elements of the proposed research model. Interviewees across three working levels mentioned differences between the two departments in safety related activities. At packaging, a lot of automated machinery is present which require manual assistance, such as filling cardboard boxes or remove jammed glass bottles. Here is a higher chance to get cut wounds from glass and the possibility of getting stuck between moving parts of machinery, while at distribution lots of heavy machinery is present such as forklifts and Automatic Guided Vehicles (AGV). On this location, there is a higher risk to get involved in a collision. The majority of the interviewees from both departments believe that they posses enough safety knowledge to safely operate equipment and machinery. Few interviewees feel that they need to learn more or are aware of knowledge they miss “I believe that I posses enough safety knowledge, but it is possible that there is a blind spot that I am not aware of “. What was mentioned often was that if an interviewee did not posses the knowledge to work safely, they were able to find out where to acquire it. However, while some interviewees wanted to acquire the knowledge themselves and put extensive effort in trying to gain access to this information, others took the shortest route by handing the situation over to those with that specific knowledge “At this moment I do not have the idea that I miss knowledge, but we have here at location
people with that knowledge and they must do their work in that". By handing over the situation to the specialists, they also handed the responsibility over to that person.

There was one prominent difference between the two departments. During the interviews and by analyzing the documentation it seemed that the packaging department was more focused on safety. Answers provided by employees from the packaging department were more related to process safety (materialistic) as well as personal safety (human), while the packaging department was mainly on process safety (materialistic). After further analyses, it appeared that a high amount of BHV’s and fire fighters were stationed at the packaging department. These employees are more aware of safety related topics and since they receive more safety training then other employees this may have boosted the departments safety consciousness. During the selection of interviewees, this was taken into account by selecting a representative number of employees also among BHV’s and/or fire fighters. A second factor for increased safety consciousness might be that the TPM program is further in its implementation phase at the packaging department than the distribution department.

Concerning safety culture, interviewees indicated that it is hard for them to address colleagues on their safety behavior. Employees are aloof to approach others when they act unsafe. Although they seem to know that it is needed, several interviewees said that they do not see this as their task. In many cases they explain that they try to preserve the relation amongst colleagues “On every level in the organization there is a barrier to address each other. A few colleagues have to start and they have to realize that they must do this in a normal, verbal, neutral manner”. External personnel, contractors, and colleagues from other shifts or production lines that fill in are addressed more easily. Also an interviewee that was BHV certified, that received extensive safety trainings, believed that preventing all accidents was not possible.

Concerning safety motivation an interesting aspect came forward. This appears to be bidirectional in the safety motivation of interviewees. Several interviewees are motivated to act safely and secure their safety of others as well as their own “What motivates me is mainly my own health and that of others”. They are looking at the well-being of themselves and that of their colleagues, and not just for the short term but also for the long-term effect, while others are focusing mainly on their own safety. They are concerned about their own safety first and do not mention that of their colleagues “My motivation to work safely is not to get injured”.

For the element safety compliance, most interviewees mention they are aware of the regulations and the risks in the working environment. They know that they have to comply with safety regulations. However, sometimes they accept the fact that by not complying with the safety regulation they might work unsafe. This can be situations in which they do not wear safety glasses or safety gloves. Some interviewees mention that they break safety regulations for the importance to keep production going. This acceptance of working unsafe might come from employees being proud of the product, thereby accepting more risk. In addition, some interviewees mention that they work unsafe to keep production going. Interviewees do state that the focus has increased now on safety, previous years safety regulations were more often denied or disobeyed “for years safety has been carried out in a soft manner and now suddenly the regulations are tighten up”.

"I think it’s important that people are addressed on their behavior. I consider this to be a task of management and team leaders."
Safety participation was an element to which variable answers were given. Not many interviewees mentioned that they did not contribute to develop an environment that supports safety in any way. They accepted the fact that the environment was full of risks and that they had to be cautious at all times. Several interviewees mention that they contribute by voluntarily reporting near misses and by wearing PPE’s on locations where this was not restricted. Stimulating others by wearing their own safety equipment is the underlying thought. Several interviewees stimulate dialogues with others colleagues about safety-related aspect. By talking with others about safety they have to think about their actions whether these are conducted safely enough “I spend lots of time in talking with colleagues about safety. You have to spend time in this if you want colleagues to work safely”.

One of the interesting elements of the proposed research model is that of behavioral control. All interviewees mention that this is not seen as an obstruction for acting unsafe when it concerns personal safety equipments. Safety gloves, safety shoes, earplugs and clothing are available and within reach. Aspects that require investments were seen, however, as an obstruction. “Safety equipments such as PPE’s are well available, only when it comes to the construction problems arise”. Situations such as not asphalting certain roads that were now covered by stelcon slabs. One interviewee mentioned that when employees drove with their forklift over stelcon slabs they receive backache because of the bumps. By not asphalting this road, employees took routes in which forklift were not allowed, to prevent having backache. The interviewee used this limitation as an excuse not to perform the behavior or to act in an unsafe manner. Aspects over which interviewees did not have the control were seen by some as an excuse not to act safely.

From the six elements explained above relations were found during the interviews. When interviewees were less safety motivated, their focus was mainly on themselves. By only focusing on themselves and not on others as well, they were less motivated to address others’ unsafe behavior. People have to create safety and safety is not created by one individual. This reduces the stimulants of a good safety culture since their value of safety is not high. Half of the interviewees mention that for years safety regulations were denied or disobeyed, thereby undermining individuals’ safety compliance “For years safety has been carried out in a soft manner and now suddenly the regulations are tightened”. This in combination with employees having many years of services could lead to a negative attitude towards safety and safety compliance. Tightening the safety regulations through the use of disciplinary actions seems to have a negative effect on safety motivation of the interviewees “It makes no sense to punish me by means of official letters or warnings. You must persuade people to wear personal protective equipment and make them conscious that it is in their own best interest to use it”.

Employees that were motivated to report near misses were doing this on a voluntarily bases. This behavior can be seen as safety participation, since it helps to develop an environment that supports safety. Employees have the control of reporting a near miss label, but for some near misses, they depend on others to provide a solution. When the solution is not provided within the required time span, this reduces the motivation for reporting. The behavioral control element of the proposed research model should not be underestimated. Especially when it concerns safety compliance, due to the fact that not having behavioral control over the situation can be used as an excuse not to comply with safety regulations. For safety participation, this lack of behavioral control is less influenced then for safety compliance, since this is behavior that does not contribute directly to an individual’s personal safety.
To create a baseline on how safety conscious employees at Pivonymous currently are at the end of every interview the interviewee was asked to fill in a small questionnaire. This consisted out of seven questions that focused on safety consciousness of an individual. All interviewees filled in the questionnaire and the results are visible in Table 5.3. On a 5-point scale (1 = strongly disagree, 5 = strongly agree) the lowest score was that of I do not use equipment that I feel is unsafe, which had a score of 4.2. The highest score was that of I know where the safety materials are located in my workplace, which had a score of 4.9. Overall, the scores were extremely high and can be seen as dubious. During the interviews, it came forward that they break safety regulation, such as not wearing protective equipment for the sake of continued production, but their answers to the questionnaire provides no indication of such behavior.

<table>
<thead>
<tr>
<th>Questionnaire Safety Consciousness</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>I always wear the protective equipment or clothing required by my job</td>
<td>4.7</td>
</tr>
<tr>
<td>I am well aware of the safety risks involved in my job</td>
<td>4.7</td>
</tr>
<tr>
<td>I know where the safety materials are located in my workplace</td>
<td>4.9</td>
</tr>
<tr>
<td>I do not use equipment that I feel is unsafe</td>
<td>4.2</td>
</tr>
<tr>
<td>I inform management of any potential hazards I notice on the job</td>
<td>4.4</td>
</tr>
<tr>
<td>I know what procedures to follow if injured on my shift</td>
<td>4.7</td>
</tr>
<tr>
<td>I would know what to do if an emergency occurred on my shift (e.g., fire)</td>
<td>4.6</td>
</tr>
</tbody>
</table>

Table 5.3: Questionnaire with results

5.2.1 Interpretation of the interviews

By analyzing the data from the interviews, it becomes clear that, currently, safety culture at Pivonymous is still in its early phase. People are not very safety conscious and trust in management when reporting safety issues is low due to fear of disciplinary actions. This could be one of the reasons why the information that is reported is mainly on materialistic aspects. Interviewees believe that they have sufficient safety knowledge, but this seems to contradict with the fact that only 18.5% of the employees receive safety training. An effect of this is that safety-related aspects are handed over to those employees (BHV, safety officer, etc.) that are seen as experts. The findings concerning Safety motivation show a mixed picture. Some interviewees are motivated to secure their own safety and that of others, while others focus mainly on their own safety. Interviewees’ statements concerning safety compliance are contradicting. In the questionnaire, they score high on complying to safety regulations, while interviewees state that they do not comply to safety regulations in order to keep production going. Safety participation is growing according to most interviewees. By reporting near misses, some individual employees try to create a safer environment and through safety dialogues with colleagues, they try to stimulate others. Behavioral control is an aspect that requires attention. Design issues in particular are seem by employees as an obstruction to safety behavior.

Not reporting unsafe actions could be caused by a fear of disciplinary actions. This might not stimulate safety behavior and might also be the reason why interviewees rated
themselves so high on the questionnaire. The majority of the interviewees indicated they thought that giving sanctions should only be used as a last resort. The focus should be more on why someone is performing an unsafe act. The root causes of the unsafe behavior should be retrieved by going onto dialogue with that person. This might be related with focusing on personal safety and not just on the process safety. Due to years of denying safety regulations, the safety behavior of employees declined as well. Short after an accident occur safety was put high on the agenda, through safety meetings of the accident. Solutions were suggested but not implemented, which lead to a decreased safety focus, which would rise every now and then when an accident happened. By continuously focusing on safety, this impulsive motion on safety is not needed any more. All interviewees appear to interpret that safety behavior is the responsibility of safety management.

A second aspect that might have stimulated high questionnaire ratings of safety might be that employees are safety conscious but are not aware they are lacking safety knowledge. Also the design of installations appears to stimulate unsafe behavior. Decisions concerning designs may have been made at a time when safety was not high on the agenda or by someone who was unaware of safety issues. Since employees do not have the control over the design, they may use this as an excuse not to act safely.

The effect of having lots of BHV’s and fire fighters might have increased the safety conscious focus of individuals at the specific location. At the packaging department, some interviewees were BHV certified. Since these people receive lots of safety training, they seem to be more aware of unsafe situations. This could have affected the near miss reporting of rayon 3 explained in paragraph 5.1.2. By reviewing this data, Pivonymous has to think hard about this current situation. When so many employees are BHV’s and fire fighters at the section where this research was conducted and they express this level of safety conscious behavior Pivonymous must questions itself on what the current status is at other production lines that do not have so many safety-related employees.

5.3 Observation

The observation period within the company shed light on what was revealed by the interviewees. By becoming an observer-as-participant (Atkinson and Hammersly, 1994) during the research, employees opened up to me and started to share their thought on safety-related situations. By joining and participation in the safety inspections twice at the packaging department and three times at the distribution department insight was provided on how safety conscious team leaders and operators currently are. The audit form that the packaging department uses can be found in Appendix VI., while the audit form that the distribution department uses can be found in Appendix VII. Since these audits were conducted in Dutch, the transcripts are written down in Dutch too. Both audit lists included aspects such as: Are the PPE’s visible present and available; is the workplace clean; are the machines covered; are previous audit actions completed. The focus of the auditors was also concentrated on these points, which mainly resemble materialistic aspects. By only placing the center of attention on the materialistic aspects during the audits, the focus on how employees handle and if they comply with safety regulations was observed incidentally.

An immediate action during the audit was that when any unsafe situation was encountered a near miss label was written on the spot and a photo was taken. The person would report the unsafe situation and categorize it into one of the eight categories. Since the team leader participated in the safety inspection, he or she could also register the label into the system
afterwards. This fast registration and the time restriction on solving a near miss label once it is recorded stimulated faster actions to be taken.

During the observations, some unsafe behaviors were noticed. An unsafe behavior was at an installation within the packaging department that was cleaned by two employees. One was not wearing his safety glasses because they were steamed up. The colleague standing next to this person accepted this and only when the safety officer passed by this person put his safety glasses on immediately. Thus, not complying with safety regulations. A second unsafe behavior was at the distribution department where it is obligated to wear reflective vests. This was sometime neglected by employees that occasionally had to pass through both departments. Also, not complying with safety regulations. A third unsafe act was related to design. The latest production line seems to have safety flaws that were not thought of during construction (e.g. elevators that do not fully reach the floor). In addition, an assisting machinery that has the purpose to reduce heavy burdens on employees was not constructed well (could not reach the required height). This resulted into employees not using this machinery and lifting the heavy burden, thereby overloading themselves. Thus, performing an unsafe act due to lack of behavioral control.

5.3.1 Interpretation of the observations
It seemed during the safety inspections that most of the safety aspects the auditors were looking at and most of the aspects on the forms were focused on process safety. That is, referring back to the 4M method of TPM explained in paragraph 4.2.1, the focus of these forms were on Method, Machine and Material, while the factor Human was largely left unattended in these audits. This could explain why so much reporting is on materialistic aspects and so few on human behavior. In terms of the proposed research model, this means that the element safety knowledge might be high on process safety but low on personal safety and that safety compliance receive minimum attention during the current audits.

5.4 Benchmark
Throughout the research it became clear that Pivonymous is struggling with the way it is handling safety compared to others. Since Pivonymous is a large brewery in Western Europe, it has limited possibilities to compare safety aspects with other breweries. Therefore, within a short time-span a visit to safety officer of three other factories was organized. A point of notice is that the statements below are based on the perspective of the author and the Pivonymous employees that participated, therefore this information will be used more as supporting data.

5.4.1 Chemie 1
The first visit was made to Chemie 1, which is the maintenance and safety group on an industrial-site in the southeastern part of The Netherlands. This industrial-site is one of the biggest chemical sites in The Netherlands and safety is high on the agenda due to its location close to urban areas. From this visit, certain positive safety aspects came to our attention that could be useful for Pivonymous. Some interesting aspects were:

- A safety reporting and registration system was accessible for all employees and contractors. In this system all accidents, incidents and near miss labels were reported and they were made visible to all employees and contractors accessing the system. In reported labels names were
made anonymous, to prevent pointing out the culprit, and only a few people were able to alter information.

- Each factory has about one safety per 100 to 150 employees. This safety officer performed audits and assisted in improvements made to the factory.
- The “trainings compass”. This was a yearly schedule in which every employee was listed and where the individual was able to see which (safety) trainings it was required to do and which it already completed. In this system, there was also the possibility to enroll in training for personal interest.

It could be said that Chemie 1 has a professional safety management system. The audits were planned for one year in advance and these lists were also monitored when they were not complied. The results of this system were visible in the visited factory, which did not have any accidents in the past five years.

5.4.2 Glassy

The second visit was made to Glassy, which is a supplier and manufacturer of glass bottles in the southwestern part of The Netherlands. Glassy was chosen due to it similarities with injuries (incision wounds) but also due to the safety program it is currently implementing. Some of the most interesting aspects were:

- The “safety declaration”. This was a declaration with five statements, such as We shall give priority to safety and We will give our commitment to our aim: 0 accidents. This safety declaration were signed by all members of senior management with their personal photo and put on the wall at the entrance. This was done to express management commitment, which is known to be one of the main driving factors of a safety culture (Fogarty and Shaw, in press).
- The safety officer was an independent expert who could be approached for safety bottlenecks. The managers and team leaders are responsible for safety and must communicate this to personnel.
- The safety officer of Glassy had developed a program that assisted the audits focused on behavior. This program was successfully implemented at his former employer and was now being implemented at location. The focus of this program was on how to approach personnel in a way that they themselves participate to think about the way they could work safe and the hazards they might encounter.

The visit to Glassy was very insightful. The safety officer had experience with similar situations and installations from his former employer. Therefore, his knowledge relating to the accidents occurring at Pivonymous was similar to what the safety officer had encountered. The safety program he was implementing at location was based on his experience at his former employer and provided useful ways and methods to handle the situation at Pivonymous.

5.4.3 Chemie 2

The third visit was made to Chemie 2, which is a chemical production sites in the southwestern part of The Netherlands. Chemie 2 has implemented a Hearts and Minds program (Hudson, 2007) which is a successful program for implementing a safety culture in a major multinational. Some of the most interesting aspects were:

- Safety audits were not only focused on process safety but also on conscious behavior of personnel. This audit, known as Observing Unsafe Behavior or in Dutch as “Observatie Onveilig Gedrag” (OOG), was conducted by employees at all levels in the organization. The
main point of this audit was to check whether personnel were aware of the dangers of the job and its surrounding by means of dialogue. When problems were encountered during these audits, the aim was that 99% of these problems had to be solved within that day.

- A comparable situation as the one encountered at Chemie 1 was observed at Chemie 2. Eleven safety officers were responsible for over 1500 personnel working on location. Three of these eleven safety officers were former operators and spend around 80% of their time on site to assist with audits and answer safety related questions.

Chemie 2 has a professional safety management system. Due to years of focus on safety and the implementation of the Heart and Mind safety management systems (Hudson, 2007) Chemie 2 is able to safely produce highly flammable and dangerous products.

5.4.4 Interpretation of the benchmark

By benchmarking three other factories, a large amount of information came available to the author and to the participating employees of Pivonymous. Both Chemie 1 and Chemie 2 conducted audits on process as well as personal safety and in both companies, safety was high on the agenda. This was visible in the amount of safety officers on location. A safety reporting and registration system was accessible at both locations in which everybody could report and review unsafe situations. Glassy was currently implementing a safety management system. The focus of the audits at Glassy was on how to approach personnel and confront them by means of dialogue. The first results of this program were positive since the accident rates at location decreased dramatically to currently over 100 days without any accidents. The information that became available during the benchmark provided a brief insight of the three companies safety culture. This information can be used to stimulate the element safety culture of the proposed research model by adapting the outstanding practices.

5.5 Diagnosis summary

From the information provided above a cause-and-effect diagram is made to determine how safety culture and safety consciousness stimulate safety behavior at Pivonymous (Figure 5.5). Only the factors relating to the problem definition of this report are mentioned in this diagram.

One major aspect that impedes safety behavior at Pivonymous is that there seems to be a lack of a long-term holistic focus. Audits are key requirements in any effective safety management system (Parker et al., 2006) especially when it concerns safety compliance. The current audits at Pivonymous focus auditors with the items on these audit lists purely on process safety. Referring back to the 4M’s from TPM these are the Method, Machine and Material categories. The category Human is not included in the current picture of auditing and so, audits on personal safety are not conducted. This certainly needs improvement. Several interviewees even indicated that they miss the dialogue when they are ‘incidentally’ addressed during current audits. Auditing should be extended with safety audits on personal safety in combination with those currently done on process safety to increase safety behavior.
Many reported near misses were, as was explained before, on the materialistic aspect. One potential cause is that in the design of large and small projects, safety related aspect appear to be not high on the agenda. Unsafe designs influence safety on the short and long term when it is not properly thought of. This can be seen in unsafe behavior that is needed to operate the machinery or extra resources being needed for alterations afterwards. During the interviews and observations, some unsafe behaviors were noticed due to wrong construction. The latest production line has safety flaws that were not thought of during construction (e.g. elevators that do not fully reach the floor). The current constructions stimulate unsafe behavior of individuals. Even assisting machinery that has the purpose to reduce heavy burdens on employees is not constructed well, which results in employees not using this machinery and overloading themselves. Through the design of current constructions, a negative effect of behavioral control on safety behavior is created.

A second major factor that appears to hinder safety behavior is a lack of learning focus. Currently, the focus lies more on responsibility then on learning. When employees perform an unsafe act and are approached for this act the focus lies on disciplinary actions. This is the easiest method and the fastest one, but the window to find out the root causes of the unsafe act is closed. Approaching employees in a way that they analyze their safety behavior and the hazards that might have occurred due to their unsafe behavior is neglected. This indicates that the culture at Pivonymous is one of blame rather than one in which unsafe acts are used to learn from.

A factor that seems to be improving is that employees are becoming more aware of the severity of unsafe situations and accidents. This was made visible in Figure 5.1 by the increase of reported accidents and the decrease of incidents with injury. This interpretation change of the incident severity can be caused by an increase of safety knowledge, in the interviews this was partly confirmed, although there is some inequality. Some employees are willing and stimulating others to report unsafe situations, while others refuse to do so or find it too time-consuming. Fear
of disciplinary actions when something went wrong also seems to decrease safety motivation of employees. Thereby, the reported near misses were focused mostly on materialistic aspects, as was shown in the larger proportion of near misses being reported in rayon 3. Secondly, as was mentioned before the audits are on materialistic aspects, this means that their safety knowledge seems to be high on process safety. This indicates that employees focus increases on the materialistic side, which could lead to more materialistic near miss reporting.

From the interviews, it also became clear that approaching colleagues that behave unsafe and addressing them on that behavior is not accepted. Employees try to preserve the relation amongst colleagues. This is mainly seen as a task of management, not something a good and loyal colleague would do.

At all levels of the organization, employees themselves believe they are safety conscious. This was visible in the high scores of the questionnaire and was mentioned often during the interviews. An interesting question remains: Why are, in the analyses conducted by the company, many incidents and accidents allocated to unsafe behavior? The idea is that safety is predominantly secured by the specialists such as safety officers and the employees that are BHV certified. They are the ones that have the required safety knowledge and they are the ones that will be approached for safety related aspects. The idea of a collective contribution in safety issues is currently lacking. What individuals can do on safety instead of directing the problem or situation to one of the safety professionals is not considered. What he or she can do to improve safety as much as possible, whether by reporting near misses or behaving safely, is underestimated. This might be due to the high employees tenure. Many employees have worked at Pivonymous for most of their lives. Their only reference is Pivonymous where previously unsafe actions were tolerated, accepted, sometimes even stimulated. Thus, indicating that safety participation is low.

5.6 Concluding remarks

The collected information led to an enormous amount of information. The documentation provided insight in the safety behavior of the individuals through the amount of accident, incidents and near miss reporting. The interviews created an overall view of the interviewees’ safety consciousness. The interviewee shared his/her own thoughts about the current safety during the interviews. Both methodologies were supported by the observations made during safety inspection audits. Benchmarking other sectors provided outstanding information that contributed to the other methodologies. This chapter found answers found for sub-question 2: Which factors are most promising in improving and/or optimizing safety conscious behavior and reducing accident, within Pivonymous? These factors can be categorized into two main issues:

1. Lack of long-term holistic focus
2. Lack of learning focus

From this point further, this report will focus on these two findings that lead to multiple sub-categories of safety behavior and safety consciousness. The redesign will be developed such, that these two findings are addressed to improve or optimize safety conscious behavior. Next chapter continue on the redesign for Pivonymous.
6 Redesign

This chapter describes the redesign from the regulative cycle (Van Strien, 1997). The redesign consists of a solution design and a change plan. First, a start is made with the redesign requirements. These requirements form the basis of the redesign. In the second paragraph the solution design is explained which describes the current problem and the solutions that are suggested. In the third paragraph, the change plan is described, which explains the changes and resources required. Combined this general redesign provides insight on how Pivonymous could use the findings from this research on the factors that are most promising in improving and/or optimizing safety conscious behavior and which steps are required.

6.1 Design requirements

The analysis and definition of the problem serves as input for the design requirements. With respect to these requirements, Van Aken et al. (2007) distinguish four requirements, functional requirements, user requirements, boundary conditions, and design restrictions. Based on these four categories several specifications have been formulated for this design below. The requirements guide the design through providing boundaries and directions for the solution.

Of these four requirements, visible in Figure 6.1, the functional requirement is the most promising. The functional requirement is to solve the business problem. All the other requirements are more straightforward. The business problem was to influence safety conscious behavior. Therefore the functional requirement is:

To influence organizational members within the organization of Pivonymous to behave more safety conscious through focusing on the main findings of the analysis.

As formulated before, safety consciousness manifests itself in safety behavior. It becomes evident from the analysis and theory that the solution design should be bidirectional. First, there is need to increase long term holistic focus that assist in design but also monitoring tools on the process and personal safety. It is crucial to focus with your design on the long term to prevent unsafe situations or actions. Auditing tools assist in stimulating one another in their safety behavior. In addition, such a tool ensures that members of the organization have a
common understanding of the purpose and added value of safety conscious behavior. Secondly, there is a need for learning focus then responsibility focus. All members in the organization should support and encourage colleagues to engage in safety conscious behavior. Thereby creating a more collective contribution on safety then only that from safety specialists. By learning from mistakes then blaming the ones that make the mistake safety behavior is more stimulated. A long-term holistic focus may be available, but without the right focus, employees may place priorities on different aspect then on safety. Therefore, both topics should go hand in hand.

6.2 Solution design

Based on the two topics explained above, a solution is designed in this paragraph. These solutions, visible in Figure 6.2, are an important starting point for the subsequent change process and the process of learning for performance. Through focusing on these two topics, the underlying categories are dealt with to stimulate safety conscious behavior.

6.2.1 Towards a long-term holistic focus

6.2.1.1 Personal safety audit

The emphases of safety conscious behavior audits are placed upon encouraging employees to behave safely, facilitating learning, exploring the motives underpinning behavior, and understanding what supports safe and unsafe behavior in the workplace so as to gain improvements (Cox & Jones, 2006). Behavioral approaches to safety management are typically designed to improve workplace safety by encouraging those behaviors deemed critical to safety and risk management (Cox et al., 2006). An approach to improve safety conscious behavior that is currently lacking at Pivonymous is thru the use of observations of behavior audits and feedback on the results of those observations. An example of this is the Observing Unsafe Behavior form or in Dutch “Observatie Onveilig Gedrag” (OOG). Examples of this type of auditing forms are visible in Appendix VIII. and in Appendix IX. These are forms that can be used as a support for personal safety audits. One of the most important factors of this audit is the method of how to approach an individual who acts unsafely. There seems to be a fear of disciplinary action among the employees as explained previously. Therefore, when an individual is confronted with his unsafe act the individual believes that he or she will be punished for this behavior. This should not be the focus of the behavioral audit. The focus is to reduce barrier of confrontation by first introducing and explaining what the auditor is doing. By asking the individual what the risks and potential solutions might be of an unsafe act that the auditor established, individuals must think of potential hazards and solutions of their act, thereby increasing their safety consciousness. When any potential hazards came forward during this audit, they have to be reported in a near miss label on the spot. The window of opportunities for this reporting is when employees are confronted during a personal safety audit. They are then asked for potential solution to the unsafe situation and when these solutions are grounded, they
must be solved during the audit. This could be seen as a statement that is needed to stimulate individuals to participate in safe behavior and reporting near misses.

This method appears to improve and promote both the level and quality of communication amongst individuals as well as within and between work groups, encourage sharing of knowledge, learning from mistakes and best practices, and make everyone responsible for safety. However, caution is needed since effective leadership is needed, feedback from observations must be timely in order for learning to take place and to keep employees motivated, and managers could use observations, performed as part of the approach, negatively as a weapon against individuals (Cox & Jones, 2006).

6.2.1.2 Unsafe design

The author believes that an increase in safety-related aspects in the design of projects is needed. When design includes safety minimally, it seems to stimulate unsafe behavior and/or create unsafe situations. Employees perform unsafe acts to keep production going when new machinery is currently installed. On the short term, this could be solved through providing employees with the necessary PPE’s. However, to solve the root cause on the long term, might require additional resources. Solving this situation could be done by suggesting a safety checklist specifically for the design phase of project designers. When a project is in the design phase, aspects relating to safety can be reviewed through the use of this checklist. The safety items on this list should be of a general construct so it can be used as a standard in multiple projects. An example question could be the likelihood this construction can come into contact with a forklift and which preventive actions can be taken to reduce or prevent this. In addition, by involving contractors more into the safety-related aspects of projects unsafe design can be minimized. Contractors that carry out the project can be asked which safety measurements are implemented in the design, what type of safety aspect are thought of, and if the contractor has any suggestions for the design relating to safety. Thus, by focusing more on safety in the design phase excuses for unsafe behavior due to lack of behavioral control could reduce to a minimum.

6.2.2 Towards a learning focus

6.2.2.1 Reflection

Accident analyses that are conducted could be used more for learning purposes. The author proposes that the TPM methods called “Five times why”, that is used on site, will be used to find more insight in the causal process leading to the accident. This method can help trace further back than the immediate precursor of an accident, which is often explained as inattentiveness, or stupidity of the victim. This phenomenon resembles hindsight bias (Henriksen & Kaplan, 2003) or the “knew-it-all-along effect”. When an analysis is currently conducted it mainly leads back to unsafe human behavior, while Van der Schaaf (1992) mentions that there are three factors that lead to unsafe situations, technical factors, organizational factors, human behavioral, and this happens within a combination of these three factors. The author propose that to increase safety consciousness on this aspect and to prevent tunnel visioning this method should not be conducted by a few people, since root causes are hard to find. Instead, it could be performed with multiple witnesses and an expert on the methodology of “Five times why”.

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6.2.2.2 Collective responsibility and contribution

Building a safe work environment is a collective responsibility that should be shared across all levels of the organization and requires the contribution of everyone involved. To stimulate individual contribution to this collective responsibility, multiple solutions are proposed such as setting goals, training, and reporting.

**Goal setting**

The safety officer that is the expert on this topic could be implemented more as an independent expert. The safety officer should be approached for large bottlenecks with conflicting rules or procedures. The middle and senior management are the ones that are responsible for the safety of their department. For these managers goal must be set to stimulate safety equal to production. When individuals face specific difficult safety-related goals, they perform better than individuals who simply adopt a “do your best” goal or no goal at all (Locke and Latham, 1996). The goal setting theory regards a goal as a motivational force for performance. What is essential by allowing people to set their own targets within the context of safety conscious behavior is that, once they have defined their targets, they will be held to them. Setting stretch targets, is seen as commendable, if set on oneself, but those targets should again meet the requirements of being credible, feasible, achievable, and not misused.

**Training**

One way to increase individual contribution is to intensify the amount of safety training. Westaby and Lee (2003) suggested that safety consciousness is positively associated with participating in safety activities. By allowing employees to participate in safety trainings, their safety knowledge is stimulated, since individuals have to think about their acts during trainings and receive feedback on their actions from instructors. At Pivonymous employees have high years of services at the company making their reference and safety knowledge that of the company itself. By providing safety trainings, and not just the 18.5% of the employees that voluntarily joined the BHV organization, but to all employees their safety consciousness is positively stimulated.

**One reporting system**

Another proposed solution lies in the creation of a single reporting system that is available to all employees. Apparently, a sophisticated reporting and analyses system can improve reporting behavior of individuals because of limited time needed to fill out the reporting form, faster feedback, and clear visible improvements efforts (Kessels-Habraken, 2009). The focus of this system should be set on preventive reporting then on reactive reporting. Each time members of the organization decide to report an incident and receive feedback, it might positively change their perceptions, their attitude towards safety, and ultimately their behavior as well (Kessels-Habraken, 2009). Van der Schaaf and Kanse (2004) mentioned four categories that influenced incident reporting from an individual perspective. These four are:

- **fear** of disciplinary action (as a result of a ‘blame culture’ where those who commit an error are punished) or of other people’s reactions (embarrassment);
- **risk acceptance** (incidents are part of the job, cannot be prevented; the ‘macho’ perspective);
- **useless** (perceived attitudes of management taking no notice, not likely to do anything about it);
- **practical reasons** (too time-consuming; too difficult).
All four categories were mentioned during interviews or employees mentioned them during observations. However, fear of disciplinary actions seems to be the factors on which the focus is mainly set when it comes to reporting, so that mostly materialistic aspects are reported and responsibility is handed over to the safety specialists. This indicates that it is important that the safety reporting system protects the privacy of the employees involved. If a report is related to an unsafe act of an individual then that act should be anonymously registered to prevent any blaming. The focus should be on how often these situations occur, not on who is to blame, so corrective measurements can be taken and safety behavior can be stimulated. In addition, the eight categories of the near miss labels that employees must fill in could be replaced by the 4M’s of the TPM program. Hereby the near miss labels become more accessible and less time-consuming. Finally, individuals should no longer automatically be blamed, but they should be stimulated to carry responsibility for their actions (Hudson, 2007) thereby increasing their safety behavior.

6.3 Justification

The ending step of the solution design is justification of the proposed solutions. This justification is done based on three elements (Van Aken et al., 2007), namely:

- Through a description of the process of analysis and design that lead to the solution
- Through an explanation why the realization of the solution will solve the problem
- Through, as far as possible, a cost/benefit analysis

To the first element an answer has been provided in previous paragraph, the question remains whether the proposed solution will actually solve the problem. Answering this question is difficult since fully testing the redesign requires an extensive time period. However, the proposed design in itself is justified through presenting and discussing them with responsible stakeholders. To increase long-term holistic focus through auditing and design this has been discussed in meetings with safety experts and presented to management. In addition, the solutions for focusing more on improvement then on responsibility were presented within the organization and to management. Any feedback received, could then be used to form the correct synthesis of the redesign. An added value of this method for justification is that the solutions are discussed with the responsible stakeholders, and thereby addressing the importance of management support, since it is management themselves that have to take responsibility.

The last element that is required for the justification is the cost/benefit analyses. This analysis is difficult to define, since it is hard to define numbers for justifying the redesign. However, for the implementation input from member of the IT, TPM, and safety department is required. Management will have to devote time and resources for the trainings and realization of the personal safety audits. Managers are the first to conduct these audits and continue on expanding the trainings to the working levels below them. An external specialist should be brought in to provide management and team leaders with the necessary trainings.

The benefits on the other hand, could be much larger. For instance, by increasing safety conscious behavior the amount of accidents could decrease. In 2009, a total amount of 19 accidents occurred and as Barling et al. (2002) mentioned, for each workplace accident an average of 30 days of work are lost. These days lost represent loss of production, insurance, time other employees spend in analyzing the accidents, and the time the victim is not able to work.
These accidents combined let to 570 days of work that is lost. These days of work can be gained by reducing the amount of accidents. A second benefit could be the reputational damage that is being caused by the high amount of accidents. In 2009, Pivonymous became the second worst brewery of Pivonymous global, in terms of total amount of accidents, in Western Europe. Although this can hardly be described in monetary numbers, this does damages the reputation of the brewery.

Unfortunately, there are limitations to the justification of the solution design. As Guldenmund (2000) mentioned, five year is needed to see measurable results. Since managers are shifted throughout the organizations within that time span, the trainings for the personal safety audits must be given to new managers as well. Therefore, an internal safeguard is suggested once the audit trainings are performed by the external specialist.

6.4 Change plan
According to Van Aken et al. (2007), a change plan describes how the proposed solution is to be implemented. The content of the change plan consists out of the following:

- The objective of the change process
- The actions to be taken to realize the planned changes
- The people who have to get involved in the change process
- A temporary structure in which the change organization people will work
- A communication plan

These changes are an important guide for the subsequent change process and the process of learning for performance. These five aspects will be explained more in depth in the following paragraphs. Since some aspects are related to each other, they will be elaborated within a consolidated structure. In addition, there is no need for a change organization since this research is part of the TPM program. Therefore, the members of the TPM safety pillar will prepare the change.

6.4.1 Objectives
The main objective of the change plan is to implement the solution design discussed earlier and thereby stimulate safety conscious behavior. Since the redesign consists of two major elements, increase long-term holistic focus and focus on learning, the objectives can be divided into two segments. First is the introduction on how to increase long-term holistic focus on safety. The second is to increase the lack of learning focus instead of focusing on responsibility.

6.4.2 Actions to be taken with the people involved
To improve individuals safety conscious behavior there are actions to be taken that can be executed on a short and long term. A summary of these actions and the people involved can be found in Table 6.1 and these actions will be explained more in depth further on.

6.4.2.1 Long-term holistic focus
To increase long-term holistic focus audits are needed. In the early stages of implementing a safety conscious behavior audit, trust relations can be fragile and consultation, communication, and training can be used to enhance such relations (Cox et al., 2006). Therefore, the implementation of a personal safety audit requires most attention. A personal safety audit is
<table>
<thead>
<tr>
<th></th>
<th>Actions</th>
<th>People involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Implement personal safety audit</td>
<td>TPM facilitator &amp; safety officer</td>
</tr>
<tr>
<td>2</td>
<td>Involve contractor in safety aspects of project designs</td>
<td>Engineering staff &amp; contractor</td>
</tr>
<tr>
<td>3</td>
<td>Create safety checklist for project design</td>
<td>Engineering staff &amp; safety officer or TPM facilitator</td>
</tr>
<tr>
<td>4</td>
<td>Perform “Five times why” in group with witnesses and expert</td>
<td>Team, witnesses &amp; safety officer or TPM facilitator</td>
</tr>
<tr>
<td>5</td>
<td>Change the 8 categories of the near miss label into 4M</td>
<td>IT department &amp; Safety officer</td>
</tr>
<tr>
<td>6</td>
<td>Set goals on safety</td>
<td>Management</td>
</tr>
<tr>
<td>7</td>
<td>Increase safety trainings for all members in the organization</td>
<td>Safety officer Pivonymous global &amp; Human Resources</td>
</tr>
<tr>
<td>8</td>
<td>Create 1 safety data system</td>
<td>IT department</td>
</tr>
</tbody>
</table>

Table 6.1: Plan of action

Based on the program of the safety officer at Glassy and the four-phase approach by Cox and Jones (2006) the plan of action, visible in Table 6.2, could be used. This plan of action must be taken as flexible and does not stand on its own. It is supported by the safety documentations already available at Pivonymous. Such as the documents needed for the analyses after an accident, the near miss labels, TPM’s safety board, safety training schedules, forms used for auditing, etc. The author proposes to use the OOG form for this type of auditing which is visible in Appendix IX. As far as the author knows there are no suitable, instructors at Pivonymous that are able to provide the trainings needed for management. Therefore, the advice is to attract a specialist from outside Pivonymous or from another company that provide these trainings. This advice has currently been executed by inviting the safety officer of Glassy that provided management a workshop on personal safety auditing at Pivonymous.

A short-term action for increasing holistic focus is to reduce the excuse of not having behavioral control by increasing safety aspects in the design phase of projects. The focus should not be to increase workload on own engineers but by involving contractors more in the safety aspects of the project design. The workload of this question is placed at the contractor and when they are interested in the order, they have to spend time on this aspect. What does require time is to create a safety related checklist for the design phase. This is a one time action and can be conducted by the engineering staff in combination with preferable the TPM safety facilitator and/or the safety officer.

6.4.2.2 Learning focus

To improve the focus on learning then on finding responsibilities actions are needed that could be executed on a short term and long term. On a short term, the method of analyzing accident or incident could be changed. When any accident or incident takes place, the current situation is to form a small team to analyze the occurrence. This result of this analysis mainly
leads back to unsafe human behavior. To increase safety participation and knowledge of these team members, witnesses and an expert could be included in future teams to stimulate discussions, prevent hindsight bias (Henriksen & Kaplan, 2003), and prevent tunnel visioning during this “Five times why” analyses.

For managers goal must be set to stimulate safety equal to production. By creating safety-related goals that weigh equal to production, managers will be motivated to achieve this goal and thereby focus more on safety behavior (Locke and Latham, 1996). What is essential is that, once these goals have been defined, managers must be held to them. Caution must be taken with these goals to prevent misuse and blame.

<table>
<thead>
<tr>
<th>Actions</th>
<th>People involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a Since this report is based on a limited amount of employees an overall safety culture questionnaire should first be carried out to create an baseline on how employees see management and visa versa. An example could be the questionnaire of Lawrie et al. (2006) in combination with the framework of Parker et al. (2006)</td>
<td>Team members TPM safety pillar</td>
</tr>
<tr>
<td>1b Concurrently register the current accident, incidents, near misses, sickness absence and productions as a baseline</td>
<td>Human Resources</td>
</tr>
<tr>
<td>2 Analyze the safety culture questionnaire and present this to management</td>
<td>Team members TPM safety pillar</td>
</tr>
<tr>
<td>3 Provide trainings on the personal safety audit to management. This is the moment when management decide if they really want to participate, for it means that other aspects like costs and time-schedules have to decrease in weight</td>
<td>Management &amp; External specialist</td>
</tr>
<tr>
<td>4 Create a safety declaration and place that at visible locations. When management show that safety is always number one priority, the chance increases that this will be taken over by job floor employees. These are situations in which actions speak much louder than words</td>
<td>Management &amp; Team members TPM safety pillar</td>
</tr>
<tr>
<td>5a Managers starts with the personal safety audit at the production lines</td>
<td>Management &amp; Safety Officer</td>
</tr>
<tr>
<td>5b Simultaneously start with personal safety audit trainings to the team leaders</td>
<td>Manager, Team Leaders &amp; External specialist</td>
</tr>
<tr>
<td>6 Reflect on the current situation and when needed adjust</td>
<td>Management &amp; Team members TPM safety pillar</td>
</tr>
<tr>
<td>7 Both team leaders and managers start with the personal safety audit at the production lines</td>
<td>Management, Team Leaders &amp; Safety Officer</td>
</tr>
<tr>
<td>8 Reflect on the current situation and when needed adjust</td>
<td>Management, Team Leaders &amp; Safety Officer</td>
</tr>
<tr>
<td>9 Expand the personal safety audit amongst the job floor workers</td>
<td>Manager, Job floor employees &amp; External specialist</td>
</tr>
<tr>
<td>10 Perform personal safety audit amongst different production lines</td>
<td>Management, Team Leaders, Job floor employees &amp; Safety Officer</td>
</tr>
</tbody>
</table>

Table 6.2: Plan of action for implementing personal safety audit
To increase safety consciousness for the long-term intensive safety training is needed. By allowing all employees to participate in safety trainings, their safety knowledge is stimulated, since individuals have to think about their acts during trainings and receive feedback on their actions from instructors. To increase safety trainings, not just for the 18.5% of the employees that voluntarily joined the BHV organization, a safety-training program with extensive resources and time is required.

The following steps could be undertaken to implement such a program:
1. Define how often safety trainings must be planned per year;
2. A selection of safety trainings types and topics;
3. A selection of employees that are required to perform which types of training. This can be related, for instance, to the individuals’ working function within the organization;
4. The time span in which the program must be completed;
5. Starting a pilot at one rayon.

The implementation of a safety trainings program to intensive safety trainings is currently being undertaken. This program is constructed by Pivononymous global with Pivononymous safety officers as feedback partners with the intention to enroll this safety program globally.

For the short term to increase collective contribution, the following action could be executed. By integrating the near miss cockpit with the accidents and incidents database an overall view is created combined into one system. By making the system accessible for everybody to report and to view in, individuals have the opportunity to review accidents, incident and reported and/or solved near misses, thereby stimulating individuals safety knowledge. However, to alter information only a few people are allowed access to the system to prevent misuse. The IT department could be approached to integrate the multiple databases into one. A second action is to alter the eight categories of the near miss labels with the 4M’s of the TPM program. This can be done by the safety officer with the reason that the 4M method is well known amongst the employees. Both actions are needed to create a sophisticated reporting and analyses system since this can improve reporting behavior of individuals due to reducing time needed to fill out the reporting form, faster feedback, and clear visible improvements efforts (Kessels-Habraken, 2009).

### 6.4.3 The communication plan

In order to ensure the implementation of the redesign, communication is of utmost importance. Therefore, this research was not conducted from an ivory tower, but under guidance of the safety officer and the TPM safety pillar facilitator. This made the transfer of the change plan easier since they were kept up-to-date during the entire research. Halfway the research, the problem analysis and theoretical background have been presented to members of the TPM safety pillar and Pivononymous management. In addition, during the redesign phase all interviewees were informed of some of the propositions made to stimulate some discussion.

Management are first to start with the personal safety audit, therefore they were kept informed at all times and invited first for the workshop conducted by the external specialist. Since management commitment is crucial in stimulating safety conscious behavior, a safety declaration could be made and hung up. At the end of this research, the final results and redesign have been presented to members of the TPM safety pillar and Pivononymous management.
During the period of this research a special link in the company’s database network was created on which all relevant information of this research was stored. This link was accessible for all members of the organization. At the end of this research, the members of the organization that came into contact with this research were informed of this link on which the final report and presentations were placed. At the time of writing, the personal safety audit trainings and safety-training program are undertaken.

6.5 Concluding remarks.

The redesign consists of a solution design and a change plan. The solution design explained the main problems of Pivonymous is facing and mentions the solutions that are suggested through the two main elements (increase of long-term holistic focus and focus more on learning). These two elements were divided into sub-categories to provide a more detailed solution. The change plan describes the plan of actions that are required to implement the solutions suggested to the two main problems. From this all, an answer was found in this chapter for sub-question 3: Which steps are required to handle optimizing these promising factors?. On these steps, short as well as long-term suggestions are made on how to implement these actions visible in Table 6.1 and Table 6.2. As was mentioned before, the implementation and evaluation of the regulative cycle (Van Strien, 1997) should be implemented by the company itself due to time constraints. This report will now continue the journey of the reflective cycle (Van Aken et al., 2007) and leaves the regulative cycle behind.
7 Discussion

This chapter explains the final steps of the reflective cycle (Van Aken et al., 2007) to what extent this research helped to fill the gap in the academic literature on influencing individual safety conscious behavior. In addition, this report reflects what other contributions that have been made to the academic literature. Ending this report with future research directions and the limitations of this research.

7.1 Academic reflection

Safety culture does not exist isolated in an organization, but is influenced by the organizational culture as a whole (Berends, 1996). Moreover, research on safety culture is typically conducted on organizational or group level. An individual does not create safety culture; it is formed within a group of individuals. Little attention has given in academic literature at the effect of how to stimulate safety consciousness and safety behavior within a safety culture. This research has studied how safety culture aspects influence individual behavior and has suggested company-specific intervention. By stimulating individual safety consciousness, e.g. through training and audits, an individual creates a positive attitude towards safety behavior. When an individual is positioned high in an organization and performs an attitude towards safety behavior it will form the basis for the safety behaviors of others and hence the safety performance of the organization (Parker et al., 2006). Positive attitude towards safety can stimulate, while negative attitude can erode employees’ safe behavior.

The core objective of this research is to contribute to the academic literature when it comes to understanding safety conscious behavior. Behavioral safety has much of their theoretical underpinnings from psychological perspectives on learning, motivation, attitudes and beliefs (Cox & Jones, 2006) only a gap existed on how this behavioral safety related in practice to individual safety conscious behavior. Some academic literature argues that initiatives to stimulate safety conscious behavior should come by engaging in safety activities, since such activities have an impact on the depth of processing of information, which translate into attitudes and knowledge regarding safety (Westaby and Lee, 2003). Hence, employees should be stimulated to actively contribute to or think about safety-related topics at their workplace. When no actions to improve safety are taken, individuals safety commitment will reduce and taking risks will be accepted (Stave & Törner, 2007). The model in this form is useful for the academic literature that it can be used to distinguish whether members in an organization are lacking safety consciousness or safety behavior.

Kessels-Habraken (2009) mention that in an advanced safety culture, employees and managers are informed about quality, safety, and risks, trust each other; that is, they speak openly about errors without being blamed or punished, are adaptable to change through learning, and worry about safety, that is, they are preoccupied with risks. Although this research relates to safety culture, it contributes less to academic literature due to the fact that the company at which this research was conducted appears to be in the beginning of their journey towards an advanced safety culture.

Many safety culture assessments are often conducted by means of questionnaire-based surveys, for which many instruments are available (Flin et al., 2006). However, the use of safety culture questionnaires as an outcome measure could be questioned. Company-specific
characteristics might be related to the statement that safety culture measures do not, by definition, mirror actual safety behavior. When a company is in the beginning of their journey towards an advanced safety culture and employees fear disciplinary actions when results of safety culture measures are published, these results can be taken in question whether they represents the actual safety behavior. This thought was also suggested by Kessels-Habraken (2009) and this research has shown that true insight into safety behavior of employees seemed to come from qualitative research.

This research has shown that behavioral control must not be underestimated. Specifically, when an individual has the intention to perform a safety compliance behavior. However, in contrast to what was found in literature, a lack of behavioral control might act as an excuse not to perform that behavior. Individuals may use lack of behavioral control as an excuse to be passive. Aspects such as unsafe constructions were seen as an obstruction to comply with safety regulations leading to unsafe acts or refusal of behavior. The same counts for safety participation only the acts are not as severe as that of safety compliance. By seeing the near miss labels reporting as time consuming, unsafe situations are not reported. This might not directly contribute to an individual’s personal safety but does not help develop an environment that supports safety. This finding adds to the literature in the sense that behavioral control is needed, however caution must be taken that lack of behavioral control is used as an argument not to perform safety behavior. In contrast with the present study, in which behavioral control was assessed by means of a small population, we encourage other researchers to use multiple measurements and a longer study span.

7.2 Conclusion

A model has been developed, visible in Figure 7.1, which can be used to stimulate safety conscious behavior. This model is based on the findings found in the diagnoses of this
research and is an extended version of the proposed research model in Figure 2.5. The model separates two levels: organizational section and an individual section. The organizational level consists of the characteristics of a good safety culture, while the individual level consists of the knowledge, motivation, and its safety actions it is willing to take. Trust, being adaptable to change, worrying about safety, and keeping informed on safety characterize the needed safety culture (Kessels-Habraken, 2009). To achieve this there is a powerful view that a safety culture should be an informed culture, one based on free and open reporting (Hudson, 2007). Safety motivation is stimulated then through free and open reporting without the fear of disciplinary actions. Safety knowledge is stimulated through safety trainings as was suggested by Westaby and Lee (2003). By focusing on these two elements one increases individual safety consciousness. Both elements of safety behavior are then stimulated when safety consciousness is increased. The element of behavioral control has to be taken with caution. When this element is not secured, individual safety behavior will decline by using this as an excuse.

7.3 Limitations

Obviously, this study suffers from limitations. The first issue concerns the fact that case study results might be idiosyncratic. Often, case study results are hard to generalize. External validity remains limited, because the research was conducted within one section of one company. At other sections or locations, this research can be conducted to increase the external validity. A second limitation is that this research is mainly focused on qualitative research. The main data is collected through interviews and observations. However, this might have an influence on the reliability of the report due to the fact that interviewees provide their opinion on this subject. This reliability has been increased by using documentation to support these opinions. Third limitation is the fact that the outcome of this research is still uncertain, as the solutions were not implemented and evaluated during this research. Once implementing a safety culture, it takes time for results to become visible.

7.4 Future research

The author encourages other researchers to use multiple waves of measurements in a longitudinal study. By first using a questionnaire to establish a better baseline, and then continuing on interviews improves the overall picture of the current safety culture and safety conscious behavior. This method is also suggested by other authors (Kessels-Habraken, 2009; Tharaldsen et al., 2006). Secondly, management should determine whether the model can be expanded and used in other locations of Pivonymous global. Other types of organizations need to be included as well to determine what type of industry can use the model. Third, since this topic is highly sensitive and interviewees were promised full confidentiality, the research can be conducted next time by becoming a complete observer as was explained by Atkinson and Hammersly (1994). By becoming a complete observer the observer can conceal any attention to observe the setting through becoming accepted as one of the colleagues. This might lead to a more open information source.
References


Appendix I.
Abbreviation

4M  Human (Mens), Machine, Method, and Material
APV  Automatic Guided Vehicles
BHV  Bedrijfs Hulp Verlening
CIT  Critical Incident Technique
EFCE  European Federation of Chemical Engineers
HPM  Human Performance Management
ITEM  Innovation, Technology Entrepreneurship and Marketing
NM  Near Miss
OOG  Observatie Onveilig Gedrag
PPE  Personal Protective Equipment
SCC  Safety, Health and Environment Checklist Contractors
SHE  Safety, Health and Environment
TPB  Theory of Planned Behavior
TPM  Total Productive Management
TRA  Theory of Reasoned Action
TU/e  Eindhoven University of Technology
VCA  Veiligheid, gezondheid en milieu Checklist Aannemers

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Appendix IV.
Outline of the interviews

Interview Nederlands versie

Dit interview is onderdeel van mijn afstudeerproject voor mijn studie aan de Technische Universiteit Eindhoven. Het onderwerp waarmee ik bezig ben is gericht op hoe men medewerkers kan beïnvloeden om veilig bewuster te gedragen. Veilig bewuster kan je verstaan als een algemeen bewustzijn van veiligheidsaspecten maar ook een specifieke kennis van het gedrag nodig om veiligheid te garanderen. Het is de kennis, motivatie, naleving, participatie aan veiligheid van de mensen werkzaam hier en de manier waarop die veiligheid behandelen. De nadruk van het onderzoek ligt op meerdere niveaus binnen de organisatie: de werkvloer, de teamleiders, en het management. Van al deze niveaus heb ik, waar mogelijk was, willekeurig mensen geselecteerd voor deze interviews. Dit is ook de reden waarom ik jou hiervoor heb benaderd.

Het doel van dit onderzoek heeft twee kanten. In de eerste plaats probeer ik erachter te komen hoe de mensen hier over veiligheid denken. In de tweede plaats probeer ik erachter te komen hoe de mensen gedragen naar bepaalde veiligheidsaspecten. Dit is ook de reden dat iedereen die ik interview zal dezelfde vragen ontvangen. Maar het onderwerp waarover we zullen praten, zal voornamelijk bepaald worden door jou.


Heb jij nog eventuele vragen voordat we beginnen?

1. Waarover ben jij tevreden wat betreft veiligheid binnen Pivonymous?
2. Waarover ben jij ontevreden wat betreft veiligheid binnen Pivonymous?
3. Wat is jouw motivatie om veilig te werken? (Veiligheids Motivatie)
4. In hoeverre heb je het idee dat je voldoende kennis hebt om het werk op een veilige manier uit te voeren? (Veiligheids Kennis)
5. Hoe belangrijk is het voor jou dat jij en je collega’s gebruik maken van de juiste procedures, gereedschap en materiaal? (Veiligheids Naleving)
6. In hoeverre heb je het idee dat je beschikt over alle middelen die je nodig hebt om een taak veilig uit te voeren? (Gedrags Controle)
7. Wat doe jij aan het verbeteren en het bekend maken van het veiligheidsprogramma? (Veiligheids Participatie)
8. Wat vind jij van de manier waarop jouw collega’s / team leiders / management omgaan met veiligheid? (Veiligheids Culture)
9. Wat is er volgens jou nodig om ervoor te zorgen dat medewerkers veilig bewuster worden, of wat mis jij momenteel?

Heb jij nog vragen / opmerkingen / aanvullingen?

Om een ijkpunt te creëren wil ik jou vragen om 7 meervoudigevragen in te vullen:

Veiligheids Bewustzijn vragen
1. Ik draag altijd de beschermende middelen en kleding nodig voor mijn baan. □ □ □ □ □
2. Ik ben bewust van de veiligheidsrisico’s tijdens mijn baan. □ □ □ □ □
3. Ik weet waar de veiligheidsmiddelen in mijn werkplek staan. □ □ □ □ □
4. Ik gebruik geen gereedschap dat ik onveilig vind. □ □ □ □ □
5. Ik informeer het management over potentiële gevaren die tijdens mijn werk opvallen. □ □ □ □ □
6. Ik weet welke procedures ik moet volgen als ik gewond raak tijdens mijn dienst. □ □ □ □ □
7. Ik weet wat ik moet doen als een noodsituatie gebeurt tijdens mijn dienst (b.v., brand). □ □ □ □ □

Als ik klaar ben met mijn analyse van de gegevens, maar voordat ik het inlever aan school, zal ik mijn bevindingen aan de deelnemers presenteren en ook vragen naar jullie mening hierover.

Heel erg bedankt voor jouw deelname aan dit interview. Zoals ik in het begin al zei zal ik een uitgetypte versie van dit interview naar jou opsturen ter controle. Hoe zou jou dit willen ontvangen?

Appendix V.
Follow-up message of the interviews

Opvolgend bericht Nederlands

Geachte...

Bij deze stuur ik jou een verslag van het interview dat ik een tijdje geleden met jou heb gehad. De gesproken tekst is zo letterlijk mogelijk verwerkt, om het gesprek zo waarheidsgetrouw weer te geven. Ook heb ik een korte samenvatting gemaakt van dit gesprek. Ik zal misschien delen uit het gesprek willen opnemen in mijn eindverslag, maar dit zal altijd anoniem gebeuren. Als jij hier bezwaar tegen hebt laat het mij dan even weten. Eventuele vragen, opmerkingen of commentaar zijn altijd welkom.

Nogmaals bedankt en tot ziens,

Dirk Mulder
Appendix VI.
Safety Audit form used at packaging
Appendix VII.
Safety Audit form used at distribution
Appendix VIII.
Personal Safety Audit form used by Chemie 1
Appendix IX.
Observing Unsafe Behavior form (Tienhoven, 1995)

### Observatie Onveilig Gedrag

<table>
<thead>
<tr>
<th>Area/Gebied:</th>
<th>Naam:</th>
<th>Handtekening:</th>
</tr>
</thead>
<tbody>
<tr>
<td>dag, / / (Datum)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

De bedoeling van deze ronde is dat U 'een redelijk aantal' mensen observeert bij hun werk, dat U daarbij let op alle veiligheidsaspecten volgens onderstaande lijst en direct corrigeert waar nodig. Noteer Uw bevindingen in de vakjes.

#### Sectie 1: Persoonlijke Beschermingsmiddelen

- a. helm
- b. oog- en gelaatsbescherming
- c. gehoorbescherming
- d. schouderbescherming
- e. handschoenen
- f. kleding/loffaamsbescherming
- g. veiligheidschoenen
- h. valbveiliging
- i. H²B monitor

#### Sectie 2: Positie, Handelingen en Werkplek

houdt onvoldoende rekening met:
- k. stoten, getroffen worden, klemmen, etc.
- l. vallen, struikelen, uitlijden, etc.
- m. aanspraken extrem heat/koude delen
- n. aanspraken elektrische spanning
- p. onademend/vastzitten schadelijke stoffen
- q. spanbureaus door overbelasting
- r. ongeval door gebrek derf en netheid

#### Sectie 3: Gereedschap

gebruikt gereedschap:
- s. dat ongeschikt is voor het werk
- t. dat in onveilige staat is
- u. op een verkeerde manier

#### Sectie 4: Procedures & Werkvergunningen

- v. er is geen procedure/procedure ondoelend
- w. is niet bekend met - v begrijpt procedure niet

- x. gestelde in procedure/werkvergunning wordt niet opgevolgd

#### Opmerkingen:

- a) Indien niet direct gecorrigeerd is of is, dan hieronder toelichten.
- b) Indien verdere actie nodig is, dan PVV maken en deze hieronder toelichten.
### Potentieel Verlies Incident

#### LOSS CONTROL

<table>
<thead>
<tr>
<th>Betreft</th>
<th>Ongeluk</th>
<th>Ongeval situatie/verwihp</th>
<th>Milieu</th>
<th>Productie</th>
<th>Datadit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Datum:</td>
<td>Tijd:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Actie:** Proe(P) + CM(P) + CDU(E) + FCCU - CM(E) - ALGEMEEN (ontv/mel)

**III. KORTE BESCHRIJVING VAN HET VOORVAL / DE ONVEILIGE SITUATIE:**

**IV. DIREKT GENOMEN / TE NEMEN AKTIES OP DE AREA:**

**V. DIRECTE OORZAKEN (aard/visie):**

<table>
<thead>
<tr>
<th>Oorzaken</th>
<th>Aard/Visie</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onbeschikbare toestand</td>
<td>Onveilige omstandigheden</td>
</tr>
<tr>
<td>Onveilige omstandigheden</td>
<td>Onveilige omstandigheden</td>
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<td>Onveilige omstandigheden</td>
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</tr>
<tr>
<td>Onveilige omstandigheden</td>
<td>Onveilige omstandigheden</td>
</tr>
</tbody>
</table>

**VI. ACHTERLIGGENDE OORZAKEN (aankleuren):**

<table>
<thead>
<tr>
<th>Oorzaken</th>
<th>Aankleuren</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leidingstoestand</td>
<td>Slijtage / defect (ongewoon)</td>
</tr>
<tr>
<td>Leidingstoestand</td>
<td>Materiaal / gevaarlijke stoffen</td>
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<td>Leidingstoestand</td>
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</tr>
<tr>
<td>Leidingstoestand</td>
<td>Materiaal / gevaarlijke stoffen</td>
</tr>
</tbody>
</table>

**VII. VOORSTEL TER VERBETERING:**

*evt. vervolg op ommezijde*

---

**VIII. Opgemaakt door:**

(Niet verplicht)

Parraaf:

*evt. vervolg op ommezijde*

**IX. Voorstel WEUnet bijvoegen**

Stap/datum:

Aanhouding:

**Naam Afd./Sup:**

Datum:

Parraaf:

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