LEARNING FROM INCIDENTS IN FIRE BRIGADE TWENTE

The stimulating and hindering factors in learning from incidents

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BRANDWEER **TWENTE**

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Preface

The extent of this study was much larger than is reflected in this thesis. Being a design study, the researcher had to invest a great deal of time into gaining a deep and grounded insight into the context, culture and daily proceedings of the organisation. In addition, the researcher had to make sure that the to be developed instrument met the requirements of the organisation and, even more important, the frontline workers who needed to make use of the instrument. This made it necessary to involve a great number of stakeholders from different parts of the organisation and to adjust the process manual several times to fit those needs and wishes. In order not to overburden the reader with an enormous dissertation, the main goal of this study was to involve the reader in the most important steps of the process leading up to the final product and to elaborate on the fit between the literature, interviews, focus groups and the process manual.

Acknowledgements

This graduation project was an incredible experience and I am delighted to be starting of my career with the memories and insights gained from this graduation project. Therefore, I would like to express my great appreciation to the people who made this experience possible and the resources that were offered to me during my project. First, I would like to express my appreciation to Tim Hirschler who provided his constructive guidance during the entirety of the project and gave up precious time to provide useful feedback and a relaxing moment to go into dialogue about my project. I would also like to thank Mélisande Boernama for making this study possible at fire brigade Twente and for providing me with constructive feedback when I needed it most. Furthermore, I would like to thank Ymko Attema for facilitating all aspects during this project and pointing out the practical implications and necessities that needed to be part of my final product. In addition, I would also like to thank dr. Maaike Endedijk, my second supervisor, for her contributions in narrowing the scope of my project and providing me with the final insights needed to successfully finish my project. And finally, I would like to express my great appreciation to all the participants that were willing to provide me with their time and insights on the concepts that were explored in this study. I could not have finished my project without the added value of your opinions and experiences. The final product is greatly build upon your input and hopefully provides you with the necessary insights to take learning from incidents to a higher level in fire brigade Twente.

Abstract

Learning from incidents is a vital part of every organisation that has the desire to keep up in a changing environment, especially when that environment involves guaranteeing the safety of people. In addition, not every organisation optimally uses the occurred incidents as learning opportunities to better handle or even prevent incidents in the future. Proper evaluation and learning from incidents, where learning is stimulated instead of hindered, could lead to less severe incidents and could add to the safety of colleagues during similar incidents.

This design study investigated which factors influenced the process of learning from incidents to shed light on how this process could effectively and adequately be implemented. In the context of fire brigade Twente, a process manual was designed based on an extensive literature review and focus groups and interviews conducted in fire brigade Twente to optimize the affiliation between the literature and the context. The focus was on developing a systematic and structured learning from incidents process based on the stimulating and hindering factors present in fire brigade Twente. It was found, both in theory and practice, that the most important factors that influence the process of learning from incidents are the organisational structure that is present, the presence of psychological safety during the process and involving frontline workers in creating a process that meets the needs and wishes of the workforce. The process manual that was developed aims at facilitating the follow-up process of evaluating incidents with a focus on learning from the incidents. The vital factors that were found in theory and practice form an intricate part of the process manual. Frontline workers create the input of the follow-up process and can share knowledge and experience in a safe and blame-free environment. This approach is being supported by the adaptation of the organisational structure that aims at a more facilitating role during the entire process. Although the three factors are vital, the other factors, both stimulating and hindering, form an important part of this study and the successful implementation of the process manual that was designed. The results showed that the process manual designed in this study promised great potential but that the incorporation of the design should carefully be monitored to achieve said potential.

1. Introduction

This chapter provides the broader background of learning from incidents and the focus within this subject. This is followed by the organisational context in which the study was conducted and is concluded by stating the goal and research design of this study.

Background

Learning in organisations, especially in teams, can be instigated by using different strategies. While learning can occur when an individual or team acquires knowledge that was previously not present within the individual or team, a more important source is learning from unexpected and unwanted events (Drupsteen & Guldenmund, 2014; Tjosvold, Yu, & Hui, 2004). These unexpected and unwanted events can be identified as mistakes or errors made by team members, near misses, accidents or even events that cannot be controlled by the team members but need solving in order to protect themselves or the environment. When an organisation uses these events for evaluation, reflection and learning purposes, the organisation uses its capability to convert experiences and incidents into knowledge and activities aimed at avoiding and identifying future incidents (Cannon & Edmondson, 2001; Drupsteen, Groeneweg, & Zwetsloot, 2013; Jacobsson, Ek, & Akselsson, 2011; Tjosvold et al., 2004). When an organisation and her teams achieve this, learning from incidents can contribute to the development of competencies and skills needed to maximise learning experiences (Harteis, Bauer, & Gruber, 2008).

For organisations to effectively implement learning from incidents, the numerous small incidents with little to no consequences should form the starting point for deeper analyses in order to reveal weaknesses which could lead to larger incidents in the future (Drupsteen & Guldenmund, 2014; Jacobsson et al., 2011; Littlejohn, Margaryan, & Lukic, 2010; Tjosvold et al., 2004). These small incidents are the events that the organisations should use and learn from to avoid both minor and major incidents. As long as organisations try to change and improve, incidents are inevitable but also provide valuable knowledge and learning experiences (Tjosvold et al., 2004). It is however necessary to start analysing the smaller incidents to optimally benefit from the learning potential that organisations have and to effectively learn from incidents.

Research has confirmed that learning can contribute substantially to the performance of organisations (Argyris, 1976; Drupsteen et al., 2013; Drupsteen & Guldenmund, 2014; Edmondson, 1999; Edmondson, 2004; Harteis et al., 2008; Tjosvold et al., 2004). In the last two decades there has been a great deal of interest in utilizing incidents for learning purposes in several sectors, such as the process industry (Cooke & Rohleder, 2006; Drupsteen et al., 2013; Drupsteen & Guldenmund, 2014), aviation industry (Jacobsson et al., 2011; Littlejohn et al., 2010) and medical care (Edmondson, 2003; Littlejohn et al., 2010). Every organisation in the aforementioned industries wants this process of learning from incidents to be as effective as possible, thereby preventing future incidents from happening. This effectivity depends greatly on how incidents are evaluated and what the viewpoint on this evaluation is.

Evaluating incidents can be done from two different viewpoints. First of all, evaluation can be used to justify choices that have been made and to make sure the impact of incidents is reduced in the future (Abrahamsson, Hassel, & Tehler, 2010; Beerens, Abraham, & Braakhekke, 2012). This viewpoint of evaluation is presently monitored by the government and municipalities to provide protection against liability issues. This study will focus on the other viewpoint; evaluation of incidents that aims at learning from incidents (LFI). Learning from incidents occurs when there is reflection on the incidents that occurred and putting these lessons learned into practice to prevent and identify future incidents (Drupsteen & Guldenmund, 2014; Littlejohn et al., 2010). By evaluating incidents that have occurred, teams that are part of the evaluation can learn from incidents, their actions and develop new ways of working and their abilities (Abrahamsson et al., 2010; Beerens et al., 2012; Littlejohn et al., 2010; Lukic, Margaryan, & Littlejohn, 2013).

Within the fire brigade, structured and systematic evaluation and learning from incidents is not yet the standard (Inspectie Openbare Orde en Veiligheid, 2005). Therefore, the organisation lacks the opportunities to learn from these evaluations and improve the process of learning from incidents. It is common that different teams have their own way of evaluating incidents, mostly in an informal and unclear manner but this shows the preparedness and commitment to learn from incidents. For those and other teams, it is important to use the appropriate viewpoint on evaluating incidents to actually learn from them and use the evaluations from incidents as knowledge for future incidents.

However, the effectiveness of learning from incidents does not solely depend on the viewpoint that is chosen to evaluate incidents. The effectiveness of learning from incidents can be debatable because the learning often stops after an incident has been reported (Jacobsson et al., 2011; Lukic, Littlejohn, & Margaryan, 2012). This causes the implementation of improvements and appropriate measures to be ineffective and the full potential

of learning from incidents is therefore not achieved. One approach to increase the effectiveness of LFI is to focus on what stimulating and hindering factors can be found to influence this process by asking e.g.

- What are stimulating factors in the process of LFI?
- Wat are hindering factors in the process of LFI?
- How can an intervention be designed to guide the process of LFI based on the stimulating and hindering factors?

In this study the focus will be on the bullets mentioned above and this will be supported by the development of a process manual to increase the effectiveness of LFI in fire brigade Twente. This will be done by using a systematic and structured approach in analysing the organisational context, its needs and the stakeholders involved and connecting this to findings from the literature regarding learning from incidents. If the stimulating and hindering factors that play a role in LFI become clear, the organisation can direct its efforts into supporting the former and minimizing or eliminating the latter. Furthermore, it is valuable to clarify these stimulating factors by designing a process manual that can be instantly applied to incidents to introduce a systematic and structured approach to learning from incidents. The optimal result will lead to using stimulating factors during learning from incidents and minimizing the effect of hindering factors to optimize the learning from incidents process.

Context

The context in which this study was conducted is fire brigade Twente. In this context, a study took place elaborating on the stimulating and hindering factors concerning learning from incidents. Furthermore, a process manual for learning from incidents was developed and offered to fire brigade Twente to assist the process of learning from incidents. Fire brigade Twente is part of the safety region Twente. With 1050 employees, 750 of them being volunteers, fire brigade Twente's catchment area has 626.000 people living in it who count on their 24/7 preparedness all year around. Within the safety region, 31 fire stations are located, four of them being staffed by full-time professional firemen. The rest of the fire stations is staffed by volunteers and a few professional firemen. The organisation is divided in two sections, a 'warm' (rescue and firefighting) section and a 'cold' (prevention and advice) section. This division is not as clear as it seems because many employees from the 'cold' side operate in close cooperation with the 'warm' side whenever an incident has occurred. These employees have a role as fire investigator, on-call officers or fire brigade spokesperson whenever an incident has occurred that needs their field of expertise in order to adequately wrap up an incident. This cooperation provides useful for the process after the incident when cooperation between the two sides is less apparent but still needed to guide the fire brigade in adapting new policies and training opportunities.

The nationwide fire brigade is built on three pillars; expertise when using knowledge and experience to prevent emergencies and provide professional support and aftercare where needed, willpower in taking action and doing what has to be done to control the fire and to prevent it from happening, and helpfulness in order to answer any questions and offer 24/7 preparedness for the citizens in the catchment area. These three pillars are under constant improvement to provide better assistance, advices and solutions in a changing environment and society. In fire brigade Twente, these three pillars are translated into an approach that can be characterized as pragmatic, but compassionate. This is achieved by creating a dynamic, expert and pragmatic organisation containing proud and passionate fire fighters. During the reorganisation in 2013, the fire brigade started to operate as "one fire brigade", meaning that the independent regions in Twente became organised under one safety region (*Veiligheidsregio Twente*).

The specific department this study was conducted in is a combination of the team of the *KnowledgeCentre* (*Team KennisCentrum, TKC*) and the firefighting teams spread out over the safety region of Twente. The *TKC* of fire brigade Twente has been up and running since the reorganisation in 2013 and is fairly unique within the national fire brigade. Fire brigade Twente is the only fire brigade in the Netherlands that has a special department that is focused on the acquisition and spreading of knowledge within the organisation and is actively involved in the evaluation of incidents and the steps that need to be taken following this evaluation process. *TKC* provides fire brigade Twente with new insights in how knowledge about incidents can be spread among the organisation in order for widespread learning to take place. Furthermore, *TKC* provides the employees of fire brigade Twente with learning opportunities to keep informed about incidents and knowledge that could have an impact on the daily proceedings employees face.

Methodology

In order to gain insight in the effective design of a process manual to guide learning from incidents, both from a theoretical as well as practical perspective, this study used a design-based research (DBR) methodology. The DBR method is commonly used to design and implement an intervention – in this case, a process manual – to offer a solution for a complex problem within an organisation – in this case, learning from incidents. Secondly, DBR is typically used to contribute to the existing knowledge regarding the characteristics of the process manual and the processes of designing and developing them (Mckenney & Reeves, 2014; van den Akker, Bannan, Kelly, Nieveen, & Plomp, 2013). This approach gives the research a cyclical character in which three phases, analysis, design and evaluation activities, are iterated until the desired outcome (product) is reached. The analysis activities involve a context and needs analysis coupled with a literature review in order to provide a practical and theoretical foundation for the study. This phase is followed by the design/development phase, in which several prototypes are developed, evaluated and revised in order to develop the best fitting end product. Finally, this end product is then evaluated using pre-defined specifications that could lead to further recommendations (van den Akker et al., 2013). Design-based research is chosen for this study because it builds on a pragmatic, theory-oriented, collaborative and interventionist approach (Mckenney & Reeves, 2014). This approach generates usable knowledge by involving stakeholders in the design process which will improve the development of the process manual. Within this study, an empirical relational approach is chosen to elaborate on the relationship between the needs of the stakeholders and connecting the different viewpoints and the several concepts and to explain and support this relationship.

Structure

The aim of this study was to find out what the stimulating and hindering factors in fire brigade Twente were regarding the systematic and structured way of learning from incidents. Furthermore, a process manual was designed and developed that would instigate and further support the process of learning from incidents in fire brigade Twente. This process manual should promote the learning from incidents by making clear which factors stimulate learning and which factors hinder learning. In addition, this study aimed at evaluating the process manual by using it after an incident has occurred to initiate the learning from incidents in a systematic and structured way. This to make sure the appropriate lessons are learned and all necessary knowledge comes to the surface. Chapter 2 describes the theoretical framework on which this study is based and forms the foundation for the rest of the study. In chapter 3, the method that was used to carry out this study is described, including the participants that took part and the procedure that was performed to gather the data. This is followed by the results that came forward from the analysis of the focus groups and interviews which is described in chapter 4. These results are then used in chapter 5 to elaborate on the justification of the process manual that was developed in this study and the connection it has with the theoretical framework. Finally, chapter 6 provides a discussion of the results, the conclusions that follow from this study, recommendations for fire brigade Twente and further research and the limitations of this study.

2. Theoretical framework

This chapter provides the theoretical basis for the research and focuses on the domain of learning from incidents. Firstly, a succinct view of what is meant by incident evaluation is presented together with an elaboration of how learning from incidents can provide support to professionalize organisations. Secondly, an elaboration is presented regarding the stimulating and hindering factors that influence the successful implementation of learning from incidents. Finally, the main research goals of this study are presented as a conclusion.

Incident evaluation

Up until now there has yet to be found a good and effective recipe for evaluating incidents in order to learn from them and be better prepared to handle future incidents (Drupsteen et al., 2013; Klinke & Renn, 2002). When looking at the definition of evaluation, the Joint Committee on Standards for Educational Evaluation defines it as "the systematic investigation of the worth or merit of an object" (Stufflebeam, 1994, p. 323). In this definition, merit is the intrinsic value, considering the level of quality of the judgement involved in the evaluation. Worth is the extrinsic value, which is dependent on the context of the organisation and provides a clear picture of the effectivity and efficiency of the program in implementing the outcomes of an evaluation.

There are two underlying reasons why evaluation can be carried out. The first reason for evaluating incidents is in order to justify the choices that have been made during an incident and to use this justification to assign guilt and possible criminal proceedings (Abrahamsson et al., 2010; Beerens et al., 2012; Heath, 1998). This is mainly done by creating tedious and onerous reports that try to explain every event that occurred right before, during and after the incident. Hereby satisfying the need from governmental and municipal agencies to explain to the people what happened. In addition, these reports try to give some closure to the victims and the emergency services that were present during the incident (Beerens et al., 2012; Heath, 1998). Most of the times, these evaluations are carried out because the government agencies want it to be done and not because of the needs of the employees, that are aimed at improving their actions and to learn from what has happened (Bruining, 2006; Bruining, 2009). Secondly, incident evaluations can be aimed at searching for correction in terms of reducing incidents and learning from the incidents that did occur (Drupsteen & Guldenmund, 2014; Littlejohn et al., 2010; Lukic et al., 2013). In this approach, the focus lies on using an incident as a means to an end, the end being learning from what happened and implementing this during future incidents or even preventing proceedings during an incident. The difficulty in differentiating these two underlying reasons of evaluating incidents is that their starting point and their initial path are the same (Heath, 1998). Both methods start by identifying the cause of the incident, then look at the response and handling of the incident and both conclude by looking at how the incident could have been prevented. This makes it difficult to pinpoint which rationale is the underlying reason for conducting the evaluation. Heath (1998) points out that blaming a person or group for the occurrence of the incident might foster the illusion that corrective action is taking place when, in reality, this is not happening. Furthermore, when evaluation is aimed at hunting down wrongdoers, two outcomes, that are both negative for the process of learning from incidents, might occur. First, people who feel guilty are unlikely to implicate themselves and will not provide all the information or even edit or distort information in order to protect themselves. Secondly, organisations can protect their image by omitting information that might be perceived as potentially damaging for the image of the organisation (Cannon & Edmondson, 2001; Heath, 1998). To stop this from happening, organisations must clearly communicate that the main goal of the evaluation process is to improve the handling of incidents and that the process of justification is done by another group or belongs to another process done within the organisation (Edmondson, 2004; Heath, 1998). By clearly demonstrating and communicating the non-judgemental aim the organisation has with the incident evaluation, people might become encouraged to share more information in order to stimulate the goals set by the organisation.

In this study the focal point will be the improvement of the actions undertaken and benefits it has for learning from incidents. Therefore, it is important to look at the factors that can positively influence this evaluation aim, thereby increasing the ability to learn from incidents.

Learning from incidents

Organisations put effort into managing safety in order to minimize or even prevent incidents from happening. Nevertheless, incidents keep reoccurring, which can result in injuries and damage to the environment (Drupsteen & Guldenmund, 2014). One of the reasons that incidents keep reoccurring, is a failure to learn from incidents in order to prevent them (Drupsteen & Guldenmund, 2014; Jacobsson et al., 2011). Learning from incidents arises when organisations start evaluating and reflecting on the events that occurred and put these lessons learned into practice to understand these incidents and prevent future incidents (Drupsteen et al., 2013; Drupsteen & Guldenmund, 2014; Littlejohn et al., 2010; Lukic et al., 2013). In order to understand learning from incidents it is important to understand what incidents are and how learning takes place. Drupsteen and Guldenmund (2014) describe incidents as "unwanted and unexpected events within the organization with an effect on safety, including also accidents and near misses" (p. 81). In this definition, near misses and accidents are also considered incidents, coinciding with the definition provided by Schaaf (1992) where the incident could both have severe and less severe outcomes. In this study learning from incidents refers to the capability of an organisation to extract experiences from incidents that happen in organisations and convert those experiences into knowledge and activities which will aid in avoiding future incidents and increase overall safety (Drupsteen et al., 2013; Jacobsson et al., 2011; Tjosvold et al., 2004).

Incidents, being unwanted and unexpected, can also be partly contributed to mistakes and errors made by employees during their everyday activities. Harteis et al. (2008) define mistakes as "an evaluative term attributed towards a non-successful goal-directed process or its result" (p. 6). These unexpected and undesired effects, when recognized and reflected upon, can reduce the probability of occurring in future proceedings (Tjosvold et al., 2004). Therefore, mistakes and errors are also incorporated in the definitions of incidents used in the present study. The effectiveness of learning from incidents can often be questioned because the learning process stops after reporting the incident, hereby making the following implementation of appropriate measures ineffective (Jacobsson et al., 2011). Incident investigations rarely go beyond the material and workforce directly concerned with the incident and offer very few insights in the deeper lying latent conditions and situational factors that might have triggered the event. However, these sorts of insights in the latent conditions are found when evaluation of *focusing events* is carried out.

Focusing events are "events that are sudden, that are known to policy makers and elites simultaneously, that affect a community or a community of interest, and that do actual harm, or that suggest the possibility of greater future harm" (Birkland, 2009, p. 147). The typology of *focusing events* is mainly used to describe incidents that have a distant impact, spreading across different nations or even continents (Birkland, 2009), but can also be applied to local incidents. These *focusing events* in the Netherlands are called GRIP (Gecoördineerde Regionale Incidentbestrijdings Procedure or 'Coordinated Regional Incident Management') incidents. These events are normally dealt with by thoroughly finding the deeper lying causes and often result in far-reaching actions and changes to ensure the incident will not happen again. The firework disaster in Enschede (2000), the Schiphol-East detention centre fire (2006), the large fire on a shipyard in De Punt (2008) and the large, industrial fire at Chemie-pack Moerdijk (2011) are several examples of these focusing events that occurred in the Netherlands and that were thoroughly investigated and evaluated. However, these incidents are rare and offer very limited use of the available learning potential within organisations and their teams. Therefore, the smaller incidents that occur more often have the potential to form the basis for evaluating and critical reflection because of their reoccurring character within fire brigades nationwide (Buul-Besseling, Arciszewski, & Koning, 2012).

Learning from and reflecting on incidents is increasingly done within the team context (Edmondson, 1999; Ellis et al., 2003; Kozlowski & Ilgen, 2006; Tjosvold et al., 2004). Therefore, it is important to describe the learning from incidents from a team's perspective. Edmondson (1999) describes teams as "groups that exist within the context of a larger organization, have clearly defined membership and share responsibility for a team product or service" (p. 351). London & Sessa (2007) take it a step further and define team learning as the process through which "groups progress from fragmented individualistic behaviors, to synergistic, group-as-a-whole interactions that foster continuous learning" (p. 652). The focus of both definitions is on reflection, continuous learning and the role of psychological safety. Team learning is further described as a process of ongoing reflection and action is where learning behaviour is characterized by sharing information, seeking feedback and talking about errors (Edmondson, 1999; Edmondson et al., 2007).

To further elaborate on how teams and organisations can optimally learn from incidents, figure 2.1 provides a framework that proposes a link between five factors that influence learning from incidents and contribute to the breadth and depth of this process (Littlejohn et al., 2010; Lukic et al., 2012).

Figure 2.1 – Revised framework for learning from incidents in the workplace. Taken from *A framework for learning from incidents in the workplace* (p. 954) by Lukic, D., Littlejohn, A., & Margaryan, A. (2012). Safety Science, 50(4), 950–957.

Every team in every organisation learns in a different manner. Learning from incidents that take place in teams depends on several factors that come into play during an incident (Lukic et al., 2012). Littlejohn et al. (2010) state that "the objective of learning from incidents is not simply sharing knowledge about a specific incident, but rather to aim for a safety culture where learning is a process of continuous knowledge flow" (p.429). To achieve this safety culture, it is vital to understand how each factor from the framework can influence the learning process. Therefore, a short explanation of each factor will be given in order to clarify the framework.

Learning participants

In order to learn when working in teams, it is important to take into account the organisational and social context (Littlejohn et al., 2010). Learning participants are all the employees who are involved in an incident and the learning process afterwards and who can contribute to the application of learning goals (Littlejohn et al., 2010). Working in teams means that individuals are dependent on the actions and knowledge from others within the team. Therefore, it is important that the participants know how to act during an incident and that the knowledge that arises from an incident is shared among team members (Lukic et al., 2012). Furthermore, it is important to actively involve the participants in order to effectively pursue organisational learning from the occurred incidents.

Learning process

When applying the learning from incidents process within an organisation, an important step should be to understand the underlying processes of learning in order to maximize the impact of learning from incidents (Littlejohn et al., 2010; Lukic et al., 2012). Two processes of learning that are frequently used to develop a deeper understanding in learning from incidents are single-loop learning and double-loop learning (Argyris & Schön, 1996; Littlejohn et al., 2010; Lukic et al., 2012). The main distinction between the two processes is the depth and thoroughness of the analysis needed to solve the problems that have occurred. Single-loop learning focuses on the incidents that have superficial causes that warrant a quick solution to solve the problem (Lukic et al., 2012), while second-loop learning focuses on open and critical reflection of the deeper underlying causes of an incident that might lead to organisational changes to increase the safety culture (Littlejohn et al., 2010; Lukic et al., 2012). When single-loop learning is used, the danger could be that the incident would need a deeper analysis to

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understand the actual underlying causes of the incident and implement changes to the existing working methods. Argyris (1976) mentioned that although second-loop learning is not the direct opposite of single-loop learning, double-loop learning would be able to avoid the negative consequences that would emerge when single-loop learning was used as learning process for an incident that would need a more thorough analysis and alteration to underlying assumptions.

Type of incidents

Almost every incident has different underlying causes and it is therefore difficult to carry out a general learning from incidents process that is qualified to handle every incident that has occurred. However, the process of learning from incidents can be adjusted to fit incidents that are categorised in order to achieve a learning from incidents process that is most effective. Naot, Lipshitz, & Popper (2004) mention that learning from incidents might not be as effective as is needed because of the superficial analysis process and the focus on applying all the lessons learned. This leads to applying lessons that come forward from a learning from incidents process that build on a weak analysis of the incident due to an inappropriate analysis of the type of incident. The *Cynefin* framework could be of aid when categorising incidents in order to optimize the learning from incidents process that follows an incident (Littlejohn et al., 2010; Lukic et al., 2012; Snowden, 2002). In this model, incidents are categorised into four domains of complexity; *simple and complicated* incidents, which represent *orderly domains* and the *complex and chaotic* incidents, which represent *disorderly domains* (Littlejohn et al., 2010; Snowden, 2002). In the orderly domains, the incident has causal relationships, which are more present in simple incidents, and the most effective solution already exists. To effectively carry out learning from incidents in this domain, an in-depth analysis is needed that requires the assistance from organisational parts that have knowledge about the incident (Lukic et al., 2012). In the disorderly domain, the main goal is to move from an unpredictable and dangerous chaotic incident towards a complex incident which, although still in need of immediate action to prevent further harm, can provide a basis for learning from incidents when this is done through comprehensive analysis of the incident (Littlejohn et al., 2010; Snowden, 2002). For learning from incidents to effectively impact the daily proceedings and to implement the appropriate lessons learned, it is vital to categorise the incidents adequately because the "effectiveness of LFI is diminished if solutions designed for orderly situations are applied in complex or chaotic domains" (Lukic et al., 2012, p. 951).

Type of knowledge

Not only the type of incident is important for an effective analysis of an incident, also the type of knowledge that was needed during the incident influences the learning from incidents process (Littlejohn et al., 2010). Most of the incidents that occur are different in nature and are based on the need of a different type of knowledge to achieve a solution in order to prevent similar incidents in the future. When having a better understanding of the type of knowledge involved, it becomes easier to find the gaps of knowledge that need to be addressed by the learning outcomes. There are four main types of knowledge that are important factors in the learning from incidents process (Littlejohn et al., 2010; Lukic et al., 2012), namely conceptual, procedural, dispositional and locative knowledge. Conceptual and procedural knowledge mainly focus on knowing what to do and having the ability and technical knowledge to actually do it (Littlejohn et al., 2010). These two types of knowledge comprise of facts and knowledge about safety procedures in order to adequately handle faulty equipment or adequately evaluate an unfamiliar situation in order to implement knowledge present within the individual or team. The dispositional knowledge level depends on the values , attitudes and beliefs that are present among employees within an organisation and can therefore greatly differ between organisations (Littlejohn et al., 2010). Knowing where to find the needed knowledge within the organisational context is the main element of locative knowledge (Lukic et al., 2012).This type of knowledge tries to connect the aforementioned types of knowledge into a single model that is dependent on the interactions between colleagues to find the proper knowledge needed for an incident (Lukic et al., 2012). Within the process of learning from incidents all four types of knowledge are equally important and the whole is greater than the sum of its parts.

Learning context

The four aforementioned factors have to be taken into account during every learning from incidents process that is started. However, learning does not only take place in formal settings that are often provided and facilitated by the organisation but learning can also take place in informal settings. In these informal settings, learning is not always the key objective but emerges throughout the work tasks that are done by employees (Lukic et al., 2012). For organisations it is important to look at how to achieve the outcomes of learning in informal settings, where employees can speak more freely and perceive a safer environment for discussing incidents, into the structured and systematic formal learning settings (Lukic et al., 2012). By doing this, organisations can gather more information and knowledge from the employees in order to support the effectiveness and successful implementation of learning from incidents.

Breadth and depth of learning

It is important to understand that this model provides insights in both the breadth and depth of learning. The breadth of learning mainly focuses on the diversity of the incidents that have occurred and the comprehensiveness of the factors included in the process of learning from the incident (Lukic et al., 2012). In addition, the depth of learning focuses on the impact of the incident on the organisation and its employees and how the incident attributed to organisational change (Littlejohn et al., 2010; Lukic et al., 2012). The breadth of learning consists of the type of knwoledge used, the learning context and the learning participants that are involved during and after an incident, whereas the depth of learning focuses on everything but the learning context. Both the breadth and depth of learning are needed to effectively implement a learning from incidents process and actually bring about organisational change and create a safety culture. The five key aspects in figure 2.1 that form the basis for this framework will not cover every aspect that is part of an incident (Littlejohn et al., 2010), but can shed light on the analysis of incidents and form the starting point of developing a tool to support and optimize the process of learning from incidents.

In order for teams, and therefore organisations, to optimally learn from incidents it is important to clarify the stimulating factors during learning from incidents and implement these factors during the process of learning from incidents (Drupsteen et al., 2013). Stimulating factors are those factors that aid the process of learning from incidents and provide positive influence to the future learning processes. Furthermore, to increase learning from incidents it is also vital to decrease the factors that hinder the process of learning from incidents (Drupsteen et al., 2013). Hindering factor are those factors that slow down or even undermine the learning from incidents process, thereby hindering possible positive outcomes and future investments in the learning processes. The aim should be to develop and use an effective incident learning system. This incident learning system "includes all activities, from reporting an incident, to implementation and follow-up of measures designed to prevent such incidents in the future" (Jacobsson et al., 2011, p. 334).

Stimulating factors

Although incidents can have a considerable potential for learning, organisational members might take a defensive stance when these incidents involves making and pointing out mistakes (Tjosvold et al., 2004). Several factors can be found that decrease this defensive stance and stimulate learning from incidents. Each of these factors contribute to the implementation of one or several key parts of the aforementioned framework for learning from incidents in the workplace (*Figure 2.1*) and therefore provides added value for the breadth and/or depth of learning within the organisation.

Organisational structure

An important positive influence on learning from incidents is the organisational openness, mediation and support towards sharing knowledge and insights from incidents. Harteis et al. (2008) state that the organisational structure shapes whether reflection on incidents is appropriate and permissible without consequences for the employees involved. When this approach is embraced by the organisation the emphasis is much more on the analysis of causes and the search for alternative methods for improving practice than personally blaming employees, thereby decreasing the likelihood of learning from incidents. Furthermore, when the organisation adopts this tolerant approach towards incidents it is actively supporting an environment where the chances to learn from incidents are increased (Cannon & Edmondson, 2001; Edmondson, 1999; Tjosvold et al., 2004). Improving the analysis of the underlying causes of an incident and creating a tolerant environment where employees feel safe during their critical reflection of an incident corresponds to the type of incident and learning participants mentioned in the framework of learning from incidents in the workplace.

Psychological safety

When working in teams, it is important that team members are comfortable with sharing knowledge with other team members and are comfortable in interpersonally threatening situations (Edmondson, 1999). Interpersonally threatening situations can be defined as situations where team members need to exert themselves outside their comfort zone and perceive a difference in how to handle the social consequences to their actions (Edmondson, 1999). In teams with a sufficiently safe environment these interpersonally threatening situations are minimized because the team members trust each other and ask for help, admit errors and discuss problems. Being comfortable in interpersonally threatening situations and sharing knowledge with team members is part of psychological safety. Edmondson (1999) defines psychological safety as "a team climate characterized by interpersonal trust and mutual respect, in which people are comfortable being themselves" (p. 354). Furthermore, applying psychological safety creates an environment where people develop a shared belief, which is taken for granted and not directly discussed by the team members. This tacit belief among team members increases the ability of a team to use an incident as chance to generate appreciation and meaning for the discussion of the occurred incident and use it as a learning experience. Therefore, psychological safety is positively associated with team learning behaviour (Edmondson, 2003; Edmondson, 1999; Van den Bossche, Gijselaers, Segers, Kirschner, & Bossche, 2006). Tjosvold et al. (2004) and Abrahamsson et al. (2010) focus their attention on a 'no-blame safety culture' where evaluation is successful when the focus is on learning from incidents and using the knowledge to develop new ways to handle incidents. An example to do this is to praise employees who admit their mistakes but still have them focus on learning and performing on a higher level. This culture is achieved by using the theory of psychological safety put forward by Edmondson (1999). Psychological safety is seen as a process in where individuals provide information, seek feedback and talk about errors in a safe work environment (Edmondson, 2003; Edmondson, 1999). In regard to this 'no-blame safety culture' applying an open and constructive reflection of incidents provides organisations with the opportunity to use it as a starting point for learning and creativity (Harteis et al., 2008). Creating a safe environment to share knowledge within teams and the organisation and use incidents as a learning experience relates to the learning participants within the framework for learning from incidents.

Open information system

Teams that have members with specialized skills face intense, unpredictable situations that require coordination and improvisation (Sundstrom, de Meuse, & Futrell, 1990). These teams rely on an open information transfer system because of the coordination during unexpected events. Leaders of teams have more organizational power relative to other team members and they can stimulate this coordination process through coaching, including providing feedback, seeking members' input and being receptive to other ideas and questions (Cooke & Rohleder, 2006; Edmondson, 1999). Transferring knowledge between individuals and teams during unexpected

event depends on the type of incident that has occurred and the type of knowledge that should be transferred. Therefore, an open information system can be linked to those two key aspects from the framework for learning from incidents in the workplace. Furthermore, team leaders can mitigate these power imbalances in the team by providing self-disclosure, indicating their own fallibility and emphasizing the need for teamwork rather than relying on the aforementioned hierarchical structures (Edmondson, 1999). This direct interaction within the team is intended to promote desired outcomes and can lead to improving the handling of incidents (Edmondson, 1999; Janssen et al., 2010). Providing self-disclosure and direct interaction with team members heavily builds on the learning participant aspect from the aforementioned framework.

Negative knowledge

For teams, continuously learning is important to keep up in a continuously changing environment (London & Sessa, 2007). Stagl, Salas, and Day (2007) state that stimulating the effective use of teams is necessary because of their broader perspective and their ability to lean on and learn from one another. This continuous learning will prevent subsequent errors of the same kind through the improvement of existing working methods. This is called negative knowledge (Gartmeier, Bauer, Gruber, & Heid, 2008; Harteis et al., 2008). *Negative knowledge* describes the insight about circumstances and situations in a way that they are *not* shaped or are *not* supposed to happen. This construct complements positive knowledge that is present and aids individuals and teams to understand the complex surroundings and actions that need to be undertaken. The main benefit is that teams both learn from and prevent others repeating errors that might occur in the future. In relation to the learning from incidents framework, negative knowledge can be linked to the type of incident, the learning participants and the type of knowledge involved in the incident. When taking these three key aspects into account, negative knowledge provides contribution to the depth as well as the breadth of learning from incidents.

Minimizing underreporting of incidents

Concealing or avoiding the incidents or mistakes that have occurred can lead to underreporting of incidents (Drupsteen & Guldenmund, 2014; Sanne, 2008). This underreporting of incidents might prevent the organisation from forming a comprehensive representation of the incidents that have occurred. When doing so, useful incidents might not become known to the team members or organisation and possible learning opportunities might remain unclear. More importantly, this could hinder the process of appropriately learning from incidents and using effective measures to minimize of even prevent similar incidents from occurring again. Therefore, it is important that the workplace culture is tolerant and not focused on assigning blame to employees (Harteis et al., 2008). This creates a culture where the focus is not on concealing incidents, but conceives them as opportunities that can be used as learning experiences. When this culture is present, the analysis of causes and the search for alternative approaches to solving mistakes and making sure future incidents are avoided are much more emphasised than pointing fingers and the ambition of attributing blame. This view is supported by Cannon & Edmondson (2001), Edmondson (1999) and Tjosvold et al. (2004), who all outline both a climate of trust and an insightful analysis of the causes that lead to incidents as cornerstones for a positive learning from incidents culture, which aims at enhancing the chance to learn from incidents. Regarding the aforementioned framework, minimizing the underreporting of incident involves the learning context present in an organisation and the learning process that is necessary to adequately learn from an incident. Single-loop learning in an informal context occurs more naturally and therefore is less susceptible for underreporting of incidents than when double-loop learning in a formal setting is needed to adequately learn from an incident.

Involving frontline workers

In public services, like fire brigades, learning of frontline workers plays a vital role (Bruining, 2009). Frontline workers are practitioners who are involved in the primary process of public services and are in direct contact with civilians (Bruining, 2006). These frontline workers are exposed to diversification of their work, the constant change of priorities set by governing agencies and the demand of their services. When introducing innovations, ignoring the views of these frontline workers can have detrimental effects on the feasibility of the developed innovation and often leads to discarding the innovation (Bruining, 2009). Handling difficult issues, requires frontline workers to be aware of their actions and to give attention to possible ways of improving one's actions. Frontline workers are often in the best position to identify operational problems, thereby providing invaluable input in identifying potential faults (Lukic et al., 2013). Therefore, the distributed knowledge that is present in these individuals throughout the organisation can contribute towards an effective implementation of LFI. This involvement is strengthened by the feeling of individual agency that is present among the employees. Individual agency refers to "one's perception of the extent to which one can make decisions and judgements related to

one's job and involves active participation of employees in organizational practices" (Lukic et al., 2013, p. 410). These employees are often in the most adequate position to identify operational problems and are vital for organisational improvement (Lukic et al., 2013). Individual agency builds on employees who are motivated to engage in the process of learning from incidents and lets them take ownership of the learning process by constructing learning goals. A key factor in individual agency is the impact employees should have upon the learning of an organisation as a whole, where the individual insight is communicated in a wider organisational context (Lukic et al., 2013). Therefore, involving frontline workers heavily builds on the key aspect of learning participants presented in the framework for learning from incidents. Individual agency, as part of learning participants, signifies the voice that frontline workers should have and the ability they have to initiate and achieve the improvements and challenge the existing methods in order to develop them through learning from incidents.

This way of thinking can be supported by double loop learning, in where individuals apply newly acquired information and knowledge in order to foster the long-range outcome (Argyris, 1976; Bruining, 2009; Huber, 1991; London & Sessa, 2007). Double loop learning occurs when the problems that arise are corrected by changing the underlying reasons and consequently the actions that are undertaken (Anderson, 2002; Argyris, 1976; Littlejohn et al., 2010; London & Sessa, 2007; Lukic et al., 2012). In addition, double-loop learning involves the in-depth inquiry into an incident, thereby questioning the organizational factors aimed at evoking systemic change across the entire organisation through the usage of LFI (Lukic et al., 2013). It is therefore a key consideration for LFI to find out what motivates individual employees to actively show participation to the in-depth organisational LFI processes and is linked with the learning process present within an organisation as presented in the framework for learning from incidents. Together with the aspect of learning participants, involving frontline workers focuses on the breadth of learning as well as the depth of the learning present within organisations.

Hindering factors

Although it is key to use factors that stimulate learning from incidents, thereby creating the ideal climate to learn from incidents, neglecting factors that might hinder this process could result in decreased effectivity of the stimulating factors. Therefore, considering and elaborating on hindering factors forms an important part of successfully developing an effective learning from incidents approach. Trying to eliminate these hindering factors could increase the influence and impact of the stimulating factors and therefore increase learning from incidents. In the same way as the stimulating factors could be related to the learning from incidents framework, the hindering factors can also be linked to one or more of the key aspects presented in the framework.

Bureaucratic and political factors

Learning is negatively influenced by bureaucratic or political factors that slow down, or even undermine the learning outcomes (Argyris, 1976; Harteis et al., 2008; Tjosvold et al., 2004). Examples are focusing competitive goals rather than cooperative goals and not supporting a problem solving approach. Tjosvold et al. (2004) state that "cooperative goals within groups may be a foundation for team problem solving and learning from mistakes" (p. 1228). This theory of cooperation or competition indicates that the interdependency in terms of how team members believe that their goals are related to each other. The essence is that when teams believe their goals are cooperative, individuals believe their goal achievement is positively correlated with the goal achievement of others, the teams understand that when others are successful, they are successful (Tjosvold et al., 2004). When individuals believe in cooperative goals, they interact in ways that promote resolving issues for the mutual benefit. In contrast, competitive goals focus on the negative correlation between individuals or teams and this can lead to competing for who should deserve the most reward or who should be the most important team or individual (Argyris, 1976; Tjosvold et al., 2004). The use of cooperative goals promotes a problem solving approach because when teams believe that their success is dependent on one and another, team members start to share information, explain their ideas and critically reflect on others in order to achieve the best possible solution (Tjosvold et al., 2004). This leads to fully identifying incidents in order to optimize the learning from these incidents and therefore increases the problem-solving capabilities of the teams and the organisation and aids the learning from incidents process. Insights in the bureaucratic and political factors that play a role within fire brigade Twente provide added value to the understanding of the learning context in the aforementioned learning from incidents framework.

Presence of hierarchy

In addition, learning is negatively influenced by the presence of hierarchy (Edmondson, 1999; Edmondson, 2004). Leaders of teams have more organizational power relative to other team members. These discrepancies in a team can have a detrimental effect on the ease of speaking up from low-power members, which results in inhibiting open discussion (Edmondson, 2004; Edmondson, 1999). This communication of the work team across tacit boundaries that are imposed by rank or group identity can inhibit the transfer of valid data and information, thereby hindering the process of learning from incidents. The insights provided here, give a further elaboration on the learning participants and the learning context mentioned in the framework of learning from incidents.

Scapegoating

When focussing on learning from incidents, pointing out a scapegoat has a negative effect on the entire process (Drupsteen & Guldenmund, 2014; Pidgeon & O'Leary, 2000; Tjosvold et al., 2004). Tjosvold et al. (2004) state that "teams are unlikely to learn effectively from their mistakes if their interaction is focused on blaming others" (p. 1226). This scapegoating is aimed at looking more competent than others and individuals are more interested at gaining an advantage and protecting their reputation than self-reflection and professional development. This kind of approach impedes learning from incidents and avoid being held responsible for mistakes by blaming others (Tjosvold et al., 2004). This is done because individuals fear the embarrassment and punishment that may follow when individuals take responsibility for their actions. Blaming others makes discussions about incidents more threatening and divisive and therefore seem unlikely to result in an adequate level of learning from incidents (Drupsteen Guldenmund, 2014; Tjosvold et al., 2004). Thus, a workplace culture that avoids pointing out a scapegoat does not focus on the concealment of mistakes but sees them as learning opportunities in order to professionalize the working process. Within the learning from incidents framework, scapegoating provides an addition to the insights offered into the learning participants.

Research questions

The goal of this study is to investigate which factors can stimulate or hinder the systematic and structured implementation of learning from incidents in fire brigade Twente. Furthermore, this study is aimed at how these stimulating factors can be implemented within evaluation processes in fire brigade Twente by designing a process manual.

The following research question can be defined:

How can learning from incidents be supported within fire brigade Twente?

and the following sub questions:

1. *Which stimulating and hindering factors are found in the learning from incidents process in fire brigade Twente?*
2. How can an intervention be designed to guide the process of LFI based on the stimulating and hindering factors?

3. Method

This study entailed a design-based research approach that involved the development; a process manual. In this chapter, the method for conducting the interviews and the focus groups will be elaborated on. Firstly, the research design is described. Secondly, the procedure that was employed in this study will be described. This is followed by the characterization of the participants and the instruments used. Finally, the usability test that was performed and the analysis of the data will be described.

Research design

The aim of the study was to find what factors influence learning from incidents and how these factors could be used in an instrument to instigate and further spread systematic and structured learning from incidents in fire brigade Twente. To achieve this, a design-based research building on a pragmatic, theory-oriented and relational approach was carried out. Within the relational approach, it is important to have a dialogue with the stakeholders to increase the fit of the interventions to the setting. Therefore, interviews and focus groups were used in this study to gather data and gain a better insight in the needs and wishes that were present in fire brigade Twente. Furthermore, triangulation was used in this research by using interviews and focus groups to ensure the outcome of useful information that would have beneficial attributions for answering the research questions. In addition, the dialogue that was present in both the interviews and the focus groups will increase the commitment of the management to the proposed interventions (Visscher, Irene, & Visscher-Voerman, 2010). The relational approach therefore overlaps with the dialogical approach that Visscher et al. (2010) mentioned. A critical note might be that not the entire problem and solution space was investigated because of the incompatibility with the stakeholders' interests. In the interviews and focus groups a broad spectrum of improvements and information came to light, but because not every employee of the fire brigade was questioned, it might be possible that not all the solutions were taken into consideration. Visscher et al. (2010) state that to overcome the possible problem of an inconsistent or incomplete solution, the commitment and opinions of the key stakeholders are valued higher than solutions that do not fit within the organizational context. This guarantees that the results from the data collection methods will fit within the organizational context of fire brigade Twente.

Procedure

Figure 3.1 provides an overview of the development stages in this study[1]. Firstly, an extensive review of literature on learning from incidents and the factors influencing this process was carried out **(1)**. This literature review formed the basis for the interviews that were done with experts in the field of evaluation and knowledge development in nationwide fire brigades and public service agencies **(2)** and the context specific interviews held within fire brigade Twente **(3)**. The experts were approached by mail and were interviewed, in where their prolonged support was asked. This support consisted of providing feedback on the several iterations of findings and the design and content of the process manual. This was done by mail, or by having face-to-face contact. The participants that are part of fire brigade Twente were mostly approached through face-to-face contact or a personal phone call. This was done to ensure participation and to maximize response rates. The first round of focus groups that were conducted with fire fighters and the support staff **(4)** were aimed at gathering context specific data concerning the current process of learning from incidents and how this process could be improved. This congregated in the first version of the process manual **(5)**. This version was elaborated on and discussed with both the experts **(6)** and a second round of focus groups held among fire fighters from fire brigade Twente **(7)**. This elaboration and discussion provided feedback for the refined second version of the process manual **(8)**. In addition, the second version of the process manual was discussed with stakeholders within the 'cold' side of the organisation who would be involved in learning from incidents process when it is implemented **(9)**. This feedback was used to finalise the process manual and create a third version as a working product **(10)**. The outcomes of the study and the final product were presented at the end of the research period and are open for all the participants of this study. This will, together with providing a digital version of the process manual for all the teams that participated in this study, ensure that participants get feedback on their input and can see and discuss the end product or to ask questions about the research design.

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[1] The numbers in between brackets that reoccur within this chapter refer to and correspond with the numbers in figure 3.1.
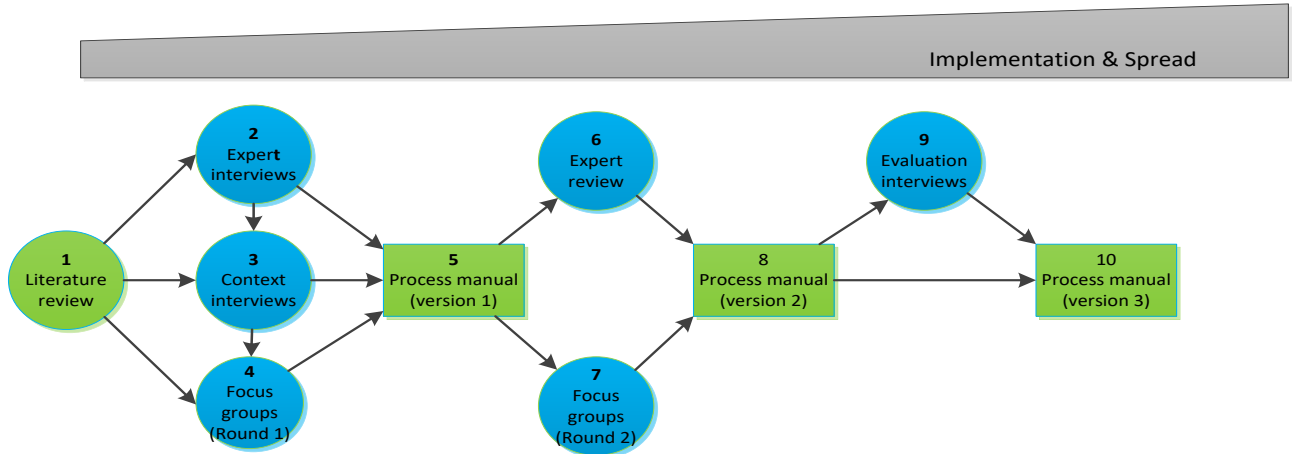
Figure 3.1 - Simplified overview of the development process

Participants

In this study, the respondents comprised of employees from the supporting and management staff, the 'cold' side of the fire brigade **(3&9)**, and teams of firefighters, the 'warm' side, within fire brigade Twente **(4&7)**. Furthermore, two experts participated in this study **(2&6)**. One expert, a Ph. D. candidate and dean of the Master of Crisis and Public Order Management, operates in the field of evaluating and learning from worldwide incidents and crises and one expert, a professor in the fire science department, operates in the field of learning from incidents and knowledge development in fire brigades nationwide.

Interviews

The two experts mainly provided insight on how incidents and crises are evaluated, the importance of a safe environment to share knowledge to learn and a broader focus on discovering stimulating and hindering factors. Both experts are not part of the daily proceedings in fire brigade Twente and can therefore provide an unbiased, objective opinion on the best way to tackle the problem of implementing structured and systematic learning from incidents. In addition, the expert in knowledge development in nationwide fire brigades has a broad knowledge base concerning the learning character in fire brigades across the country.

Furthermore, employees from the 'cold' side of fire brigade Twente **(3&9)** were approached to participate in this study. Eight half an hour to an hour-long interviews were held, four ahead of the development process **(3)** and four after the second design **(9)**, to gain more insight in the various needs and wishes that are present in the organisation as well as the practical issues that surrounded the development of an instrument that could aid in the implementation process of learning from incidents. The topics in these interviews were the discrepancies between the current and desired situation of evaluation and learning from incidents and what factors should be present in the process manual to instigate systematic and structured learning from incidents. The employees from the 'cold' side **(3)** were selected based on their field of work within the organisation to maximize the variation in respondents. The respondents were two fire investigators, three team leaders, a management information advisor, a learning capacity specialist and a training & practice specialist.

Focus groups

In addition, twelve focus groups were held with a total of 40 participants from both the 'cold' side and the 'warm'side of fire brigade Twente. The focus groups were held to define the stimulating and hindering factors concerning learning from incident and to define the boundaries of successfully developing a process manual. These focus groups provided useful insights from different parts of the organisation on the possible triggers and pitfalls when designing a process manual. A total of 15 employees, divided in a group of eight and seven, from the 'cold' side participated in two rounds of one-hour long focus groups **(4&7)**. These focus groups were performed with team *KnowledgeCentre* and the core-group fire (*Kerngroep Brand*). The employees from the 'warm' side were selected by approaching different firefighting teams from the different fire stations in Twente. A total of seventeen employees, divided in one team of seven, one team of six and one team of four, provided their opinions during the first round of one-hour long focus groups **(4)**. During the second round of one-hour long

focus groups **(7)**, the initial group of seventeen employees together with eight new employees divided over two teams of four provided their insight. The participants were chosen in consultation with the barrack coordinators to ensure the participation of employees that could contribute to the goal of this study, providing insight in how an instrument can be developed to support learning from incidents. The participants from the 'warm side' of the fire brigade were recruited by looking at the number of incidents that had occurred in the last five years to make sure the teams have had their share of experiences and could provide their views about the current process of learning from incidents. Furthermore, the participants from the 'warm' side were also selected on the difference in function, professional or voluntary status, their general experience as a firefighter and the attitude of the team/barrack towards learning from incidents. This attitude towards learning from incidents was established during the conversations that were held with the team leaders to establish which teams should participate in the focus groups.

Instruments

Interviews

To find out what factors are considered stimulating and hindering regarding learning from incidents, data was gathered by conducting qualitative interviews with people from the 'cold' side of the fire brigade and two experts outside the organisation **(2&3).** Furthermore, two round of focus groups **(4&7)** were held with employees from fire brigade Twente. The interviews were aimed at gathering insights how incident evaluation influences learning from incidents and what factors plays a role in learning from incidents. The interviews were designed as semi-structured interviews (*SSI*) and lasted for a maximum of one hour. When conducting SSI, four variables need to be structured as little as possible; the content, formulation, sequence and response options of the questions. The less structure the researcher uses, the less the researchers directs the interview (Boeije, 2005; Drever, 1995). This assures that the participants are not guided to certain answers, the formulated questions are understandable for the participants and that participants can give any answer they want instead of fixed answer options. The four variables mentioned are not totally unstructured, but thorough preparation and discussion lead to a list of interview topics that need to be addressed with fitting open-ended questions. In this approach, the researcher converts the research questions into questions for the instrument and the answers given are then converted to provide answers for the research questions. Adams (2010) also mentions the ongoing, meandering dialogue around a predefined topic list with the possibility to delve into unforeseen issues as a positive feature of SSIs. The SSIs provided support for the theoretical framework of learning from incidents and provided input on the stimulating and hindering factors that can influence this process and how this can be achieved in fire brigade Twente. The interviews with employees from the 'cold' side of fire brigade Twente **(3)** were aimed at getting a better insight into how learning from incidents currently takes place and how this process could be better supported. Furthermore, these interviews within the 'cold' side of the fire brigade **(3)** elaborated on the organisational composition of fire brigade Twente and the factors within fire brigade Twente that stimulate and hinder learning from incidents

In addition, the main goals of the interviews with the experts **(2)** was to gain a better understanding in how the field of work the operate in influences incident evaluation and learning from incidents in fire brigades nationwide and worldwide. The main subject of the interview with the evaluation expert was incident evaluation and how this process could differ between teams and organisations and the subtopics were mainly focused on how incident evaluation could be developed for learning from incidents to occur and what factors could influence this process. The main subject of the interview with the expert on knowledge development in fire brigades nationwide was to gain more insight in what practices were currently applied and why there was a need to implement a systematic and structured approach towards learning from incidents. The subtopics concerned the stimulating and hindering factors that were present in fire brigades and what criteria should be met to effectively develop a process manual that would be used within the setting of fire brigades. The topic list and interview guide for both the experts and the employees of fire brigade Twente are placed in appendix A

Focus groups

The focus groups provided a general overview of views of the different stakeholders regarding learning from incidents and were directed at gaining insight in how learning from incidents takes place and what factors could contribute to this process. Folch-Lyon & Trost (1981) describe focus groups as a discussion within a small group of participants where thoughts can flow freely under the guidance of a moderator who leads the process. Packer-Muti (2010) describes the open character of the focus groups and that interaction between the participants is stimulated to create an in-depth discussion of the various topics. Krueger & Casey (2010) finally mention the homogeneity of the participants and their relation to the topic, the nonthreatening environment and the absence

of the need to reach consensus among the participants as important features of a focus group. All these features create a broad flow of information from the participants. Both first rounds **(4)** were aimed at gathering information about the current process of learning from incidents and stimulating and hindering factors that play a role in this process. The goal was to gather as much information possible from employees who would have to use the process manual to give a clear description of the discrepancies between the current situation and the desired situation to guide the design process of the eventual working product. The main topic of the focus group **(4)** was learning from incidents and the four subtopics were the After-Action Review, the current follow-up process, factors influencing this process and the conditions that had to be met to develop a process manual that could aid the process of learning from incidents. The topics for the first round of focus groups **(4)** were distilled from the interviews conducted with the experts **(2)** and the 'cold' side of the fire brigade **(3)** and the literature review **(1).** This input was elaborated on in the formulated questions with the possibility to ask follow up questions. The aim of the second round of focus groups **(7)** was to evaluate the initial design of the process manual and the participants could provide feedback on the design. The second round of focus groups **(7)** consisted of 4 to 6 persons that were put together to discuss the initial design. The researcher provided an on the spot walkthrough of the process manual in the second round of focus groups to provide guidance for the members of the focus group. The focus groups were recorded to gather all the insights provided during the meeting. The topic list and design of the focus groups are presented in appendix B.

Usability test

To assess the accessibility and user friendliness of the process manual, a formative evaluation in the form of a walkthrough was done during the second round of focus groups **(7)**. In this usability test, that had the same format as a focus group, three teams that provided input for the first round of the focus groups as well as two new teams were asked to discuss the process manual during a walkthrough that was guided by the researcher. The focus groups were held with four to eight members from one fire station and the groups were diverse regarding age, function and experience to gain a broad understanding of the functionality of the process manual. Firstly, the participants were asked what their expectations were from the process manual. Then the researcher guided the participants during the walkthrough of the process manual and elaborated on the different parts of the manual. Lastly, the members were asked if there were any improvements to be made to make the manual more effective and further discussion of the design and context took place. The results from this formative evaluation were used to adjust the design.

Data analysis

Within this study, the data from the interviews and focus groups was recorded and then transcribed, without transcribing the office gossip and interpersonal jokes, to provide the opportunity for deeper analysis. In addition, the data form the interviews with the experts and employees from fire brigade Twente was compared with each other to filter out comparisons and discrepancies. This was done by creating a table with the several interviews and compare the differences and similarities between the transcribed data. This created an overview of the data and the outcomes and provided input for the analysis of the data. Moreover, a member check was done to guarantee the validity of the transcriptions. The results of the data analysis can be found in chapter four.

The coding of the data was done using emergent coding. The topic list used in the interviews and focus groups functioned as a rough version of the code book containing priori codes that followed from the research questions and the literature review. The usage of expert interviews and literature review formed the basis for the context interviews and all three formed the main input for the focus groups. This ensured that the content of the focus groups had a high level of content validity. To increase the reliability of the coding scheme, the data gathered from the interviews and focus groups was coded and then recoded by a second coder. The importance of the *interrater reliability* (IRR) "lies in the fact that it represents the extent to which the data collected in the study are correct representations of the variables measured" (Mchugh, 2012, p. 276) This IRR was calculated by using three coded focus groups, two from the 'warm' side and one from the 'cold' side and having these focus groups coded by a second coder. These three focus groups represent around 25% of the entire data collection. The *IRR* is calculated by determining the level of agreement between the two coders (Mchugh, 2012) and this level of agreement is determined by calculating Cohen's Kappa (Cohen, 1960; Mchugh, 2012). Cohen (1960) suggested that values between 0.61-0.80 could be seen as substantial agreement between the two coders. Within this study, the average IRR in the three focus groups is 0.75 with the lowest agreement being 0.71 and the highest agreement being 0.78. Therefore, the data collected does substantially provide a correct representation of the variables measured in this study.

4. Results from interviews and focus groups

This study entailed a design-based research approach that involved interviews and focus groups to gain an insight in the views on and the needs of the employees of fire brigade Twente regarding learning from incidents. In this chapter, the results of the data analysis will be presented to provide a better understanding in the underlying assumptions of the developed process manual. This will be done by combining the outcomes of the interviews and focus groups and grouping the results under every aspect mentioned in the theoretical framework to create uniformity and a clear overview.

In this analysis, the outcomes of the interviews and the focus groups will be discussed and related with each other to provide the functional and pragmatic foundation for the developed process manual. A total of 50 participants provided their insights and opinions in either an interview or a focus group. In addition, all the participants provided over 20 hours of recorded material that was transcribed, analysed and brought back to statements that fitted within the coding scheme. In the following sections these statements are put together to form a better understanding of the opinions from the experts, the 'cold' side of fire brigade Twente and the 'warm' side of fire brigade Twente.

Incident evaluation

For learning from incidents to take place, it is important that a mechanism in in place to evaluate the occurred incidents. This is confirmed in both the interviews and focus groups conducted. Evaluating incidents is being mentioned as an "important first step in reaching the process of learning from incidents" and that it is "important to evaluate incidents to conclude the incident and create a shared image of the incident including the learning goals". This is important because "not everyone has insight in everything that happens during an incident" and this shared image can contribute to that. In fire brigade Twente, the After-Action Review (AAR) is used as the evaluation tool. In several interviews, it is stated that the AAR is "functioning appropriately and is used frequently" and that "the importance of using the AAR is clear among the users". Within the focus groups conducted in the 'warm' side of fire brigade Twente these statements are not supported. In all eight of the focus groups it was stated that "the AAR is not used frequently" and that "the AAR is not known within this team". Furthermore, several focus groups mention that they are using the time after an incident to talk about it but have not heard of the AAR. "Only several colleagues know what the AAR is but it is not used very often" is one of the statements that keeps reoccurring within the focus groups. However, all the focus groups state that there is a kind of debriefing that on the technical area of an incident and whether there are possible improvements but there is no system or structure present in these debriefings. In several focus groups, it became clear that this lack of using the AAR is based on not having the right qualities or competencies to adequately lead the debriefing. "This leads to making a list of improvements that come forward during an incident, transfer the list to the organisation and settling in the notion that nothing gets done with the list" is one of the statements that provides a clear picture of how most of the participants from the 'warm' side feel about the current added value of evaluating an incident. In all twelve focus groups that were conducted in both the 'cold' and 'warm' side it was mentioned that evaluating incidents should be approach from a learning perspective rather than by assigning blame. This is put into word in one of the focus groups conducted in the 'warm' side by stating that "evaluating incidents should be aimed at learning and not justifying the undertaken actions" and that is a problem within fire brigade Twente because "the fire brigade currently does not learn from incidents because the organisation is not a self-directed learning organisation, which it should be to better handle incidents". In one of the focus groups conducted in the 'warm' side, not being a self-directed learning organisation is contributed to "the nature of fire fighters, who are doers who make mistakes, learn from those mistakes for themselves and do not share these insights within their barracks and organisation". This problem is supported by the experts who have been interviewed and mentioned that "adequately evaluating the incidents can provide added value to learning in several levels within the organisation". Furthermore, the experts support the views that are present within fire brigade Twente about the main aim of the evaluation mechanism. "Evaluation has two main goals, justifying one's actions or using one's actions to learn from them and positively develop yourself. The second goal should be the main purpose of evaluation for organisations to learn from incidents" is the main opinion of both the experts that were interviewed and it coincides with a statement from a focus group conducted in the 'warm' side where it was said that "the evolution of humans is to make a mistake and use that experience to prevent it from happening in the future". The experts also offer an interesting point regarding which incidents should be evaluated. Both experts agree that "the smaller, more structural incidents, which occur more often, should form the basis for learning from incidents to take place". One of the experts mentions that "evaluating the smaller incidents forms the starting point for creating a meta-evaluation, evaluating the evaluations, to discover what the organisation should adapt as the standard and appropriate level for learning to take place within the

organisation. This approach where smaller incidents form the beginning of learning from incidents is supported by the focus groups conducted in both the 'cold' and the 'warm' side of fire brigade Twente. In one of the focus groups in the 'cold' side, it was mentioned that "the smaller incidents form the basis of learning in the fire brigade and can support the implementation of knowledge during the larger incidents" and this was supported by a statement from the focus groups in the 'warm' side where they mentioned that "knowledge from smaller incidents can be useful when this knowledge is shared to support the colleagues within fire brigade Twente". This learning from smaller scale incidents to aid the handling of larger incidents is, as stated in one of the focus groups, an example of "a step-by-step implementation of a learning from incidents process in fire brigade Twente". However, one of the issues currently present in fire brigade Twente is "the lack of learning culture" that is perceived by most of the participants from the focus groups conducted in the 'warm' side but does not find support according to the focus groups conducted within the 'cold' side. "The culture to learn is absolutely present but because the firefighters cannot be vulnerable in evaluations it is difficult to share information and opinions and for them to be accepted by colleagues" provides a good picture of the opinions from the focus groups conducted in the 'cold' side. This problem is confirmed in another focus groups, where it was mentioned that "some employees react defensive when incidents are evaluated and cannot accept that the evaluation serves a learning purpose and is not aimed at judging the actions of the employee".

In conclusion, within fire brigade Twente some discrepancies occur as to whether the organisation is equipped to deal with learning outcomes when evaluations are done more systematically and structured but it is clear that any kind of debriefing or AAR that is currently in place contributes to dealing with incidents but that this is not yet used in a structured manner. In one of the focus groups conducted in the 'cold' side it was mentioned that the next step should be "using the AAR as a funnel to gather learning points from the evaluation and make those learning points useful for other parts of the organisation by sharing the knowledge from incidents and learn from those incidents". This will be one of the main goals of the process manual together with offering a solution for incorporating the learning from incidents process within the entirety of the organisation.

Organisational structure

For learning from incidents to be carried out effectively, the organisation needs to adapt and adequate approach to provide guidance during the entire process. Both the experts made in clear in their interviews that implementing a learning from incidents process would only work when the organisation would have a facilitating role in the entire process and it was supported by the frontline workers. One of the experts mentioned that "everybody learns after an incident but for it to be the right kind of learning, a systematic and structured process should be implemented for the organisation to assess the merit of learning". Furthermore, one of the experts mentioned that "the learning potential in the fire brigade is large and the AAR forms a solid starting point but that it needs an addition to make the AAR more efficient considering the aim of learning from incidents and sharing knowledge within the entire organisation". This statement was supported by the other expert who said that "the fire brigade lacks a quality management system or process that facilitates the learning opportunities that come forward from incidents and the evaluations of these incidents". The statements from the experts show that the organisational structure present within the company dictates whether facilitating learning from incidents and critically reflecting all the proceedings within a company is not only accepted but also actively facilitated to increase the added value of evaluating incidents. These statements therefore show a high level of similarity regarding the provided definition of organisational structure and its importance in the process of learning from incidents. In addition, the opinions from the experts regarding learning from incidents were abundantly supported in the focus groups and interviews held within the entirety of fire brigade Twente. In one of the focus groups conducted in the 'warm' side it was said that "*Team KnowledgeCentre* needs to be the central point for knowledge sharing and they need to facilitate the spreading of the adequate knowledge among the proper teams and/or barracks". Another individual in this focus group mentioned that "this kind of process (learning from incidents) is not yet used in fire brigade Twente", thereby again showing a similarity with the statements provided by the experts. These statements are supported from another focus groups from the 'warm' side, where it was said that "something has to happen with the results and debriefings of incidents but at this moment there are no ways of doings this or the right persons with the adequate level of knowledge cannot be found by everybody".

Furthermore, in one of the focus groups conducted in the 'warm' side it was stated that "the process of learning is currently not structured and the organisation only spontaneously hears from incidents that can function as learning opportunity". However, from several focus groups and interviews conducted within the 'cold' side it came forward that "the automatism to share knowledge from incidents is missing even though the organisation offers support for the teams". Furthermore, in one of the focus groups conducted in the 'cold' side,

it was said that "the organisation should practice what it preaches" referring to the admitting mistakes and being vulnerable in these situations to learn from the mistakes. In addition, in the same focus group it was mentioned that "the organisation should make it clear for the frontline workers that he organisation supports learning from incidents and wants to use it as learning opportunities instead of holding employees responsible and punishing them". However, in one of the focus groups conducted in the 'cold' side it was also stated that "even though the focus should be on the learning opportunities from incidents, the accountability issue is often a necessity to start the learning process". This shows that even when the focus should be on learning from incidents, the accountability issue on whether someone was responsible for the incidents is part of the beginning steps in the learning process. This statement was supported by an interview conducted in the 'cold' side, where it was mentioned that "accountability, although not being the focus, should be an accepted necessity to adequately answer the learning problem from incidents". In conclusion, the organisational structure of fire brigade Twente, although partially applying a learning from incidents approach, does not fully show their commitment towards applying an organisation wide learning from incidents approach. Adapting the organisational structure of fire brigade Twente to be more equipped to deal with learning from incidents and actively facilitate and support this process is therefore seen as a stimulating factor regarding the successful implementation of a learning from incidents process. Thus, providing support for adapting the organisational structure to be better equipped to actively support the learning from incidents process is one of the focus points within the process manual.

Psychological safety

When implementing the learning from incidents process it is essential to create an environment where knowledge and information can flow freely without judging the participants and participants feel safe to share this knowledge. One of the experts that was interviewed mentioned that "a precondition for effectively applying an learning from incidents approach is an open learning environment in where an open discussion about the deployment and incident can take place". This statement was supported by the other expert who mentioned that "people learn by discussing incidents and coming to solutions to prevent them from happening again. However, this should be done under the supervision of a person who can pose the adequate, non-judgemental questions". Furthermore, the expert mentioned that "this adequate supervision also ensures the appropriate process management, which is essential in securing the goal and open culture that need to be maintained during the entire process". Both opinions put forward by the experts where supported in the focus groups conducted in the entirety of fore brigade Twente. In one of the focus groups conducted in the 'cold' side it was stated that "improving the open culture starts by being vulnerable, getting a nudge and starting again". This was supported by a statement from the 'warm' side, where it was mentioned that "the process starts by being vulnerable and admitting mistakes because these serve as learning opportunities". This statement was supported by another statement from the 'warm' side, where it was said that "it is vital that people show their vulnerability and admitting mistakes is accepted without providing it with a judgement but rather see it as a positive development and action is undertaken to learn from the vulnerability of people". It was also mentioned in the 'warm' side that "there needs to be a safe environment to be vulnerable and admit mistakes because although fire brigade Twente has come a long way there is still improvements to be made increasing the open culture of sharing knowledge outside barracks". All these statements show opinions that correspond to the previously mentioned definition of psychological safety, where the focus lies on an open and safe environment where mutual trust and respect play a significant role in creating a shared belief among the teams.

Furthermore, in one of the focus groups conducted in the 'warm' side it was stated that "honesty and openness should be an essential part of the process and the process should therefore be focused at the learning character of the incidents that have occurred". This statement provides a good overview of how all the participants of the twelve focus groups thought about openness and honesty being implemented in the process of learning from incidents. However, even though consensus is achieved on being vulnerable, admitting errors and posing judgment free questions, in several focus groups a few possible problems were mentioned. In a focus group conducted in the 'cold' side it was mentioned that "some people might not be open to learning from incidents because of their character and the difficulty they might have accepting the feedback and creating an open learning environment where providing feedback is one of the key aspects". This opinion from the 'cold' side was partially debunked by a statement from a focus group from the 'warm' side where it was stated that "it can be expected that when the focus is on learning from incidents people take their responsibility, both mentally and socially, for their actions and the consequences and show behaviour that is supportive and people can be addressed when they do not show this behaviour". These statements show that even though some employees from the 'cold' side fear that not every frontline worker is able to adapt to the changes, this fear is not shared among the frontline workers who mention that their level of responsibility trumps the possible inability to

change. Another problem that came forward from several focus groups in the 'warm' side was that "the emphasis should not be put on the product that can be developed with the learning points coming forward but on the fire fighters and the process of learning from incidents and helping them handle future incidents". In conclusion, the open learning environment where people can be vulnerable and still feel safe to admit mistakes without being judged is what both the 'cold' side and the 'warm' side desire. Although a few problems might still occur, creating this open environment where psychological safety is one of the key aspects is vital and stimulating for the learning from incidents process to gain results and support and therefore one of the starting points of developing the process manual.

Open information system

When an incident has occurred that provides learning points for the team and possibly the organisation, the information and knowledge about this incident should not be inhibited by a system that makes the process of sharing this knowledge difficult. In one of the expert interviews it was stated that "for teams to learn, it is important that information can spread freely between one and anther without assigning blame". This statement was supported by an interview conducted in the 'cold' side, where it was mentioned that "the knowledge to adequately evaluate and critically reflect on incidents is mostly absent within firefighting teams. Therefore, a climate where information can flow freely provides the commander with the opportunity to share information coming from the team with persons outside the team who can provide support in elaborating on possible solutions to the learning goals". This absence of knowledge about evaluating and critically reflecting incidents was confirmed in nearly all the focus groups conducted in the 'warm' side. One of the statements that showed this was "the *KnowledgeCentre* should take up the role as facilitator because they have the knowledge about posing the right questions to gain adequate insight in the learning goals. After this, they should enable other parties to provide content specific knowledge to discuss the learning points and how to provide support for achieving the learning goals". These statements show resemblance towards the theoretical definition provided earlier, where it was mentioned that providing feedback, seeking input from other members and being receptive for questions and other ideas are key parts in creating an open information system that fosters learning from incidents. This was supported by a statement from the focus groups, where it was mentioned that "the follow-up process should not be aimed at right or wrong but at finding possible learning goals that can contribute to a better handling of future incidents and share this knowledge with every part of the organisation that could use it". In conclusion, using an open information system provides a platform from where learning from incidents can become more effective and is therefore a stimulating factor in the process of implementing a learning from incidents approach. This can only happen when teams receive the proper support from the organisation to make the learning goals of added value for the team and possibly other teams in the organisation.

Negative knowledge

To learn from incidents, the focus should not solely lie on sharing the knowledge from incidents that went according to plan and provide insights about using known techniques in specific situations. "In the follow-up process after an incident, it must be admitted when a deployment did not go according to plan and that a different approach could have worked better" is one of the statements heard in one of the focus groups. This was supported by a statement from another focus group, where it was said that "it is not only about the mistakes, but admitting that something did not go perfect and that there could be better options". In addition, in one of the other focus groups conducted in the 'warm' side it was said that "if learning points come forward, don't be afraid to admit this and don't see it as limitation but as a chance for future improvement". These statements coincide with the definition of negative knowledge, where the focus lies on using incidents to prevent the same errors from reoccurring in future incidents and thereby increasing the possibility to learn from incidents to optimize existing working methods. The previous statements are supported from one of the focus groups in the 'cold' side where it was mentioned that "the emphasis should be on mistakes" and that this is not currently the case because "not everyone has the same view on the professionalism needed to improve the organisation and its safety and this often contributes to not getting all the facts on the table because people do not know when something could have gone wrong". Furthermore, in the focus groups conducted in the 'warm' side, it was mentioned that "it is important to admit your own mistakes, since this is your own responsibility and is aimed on improving yourself. When people have trouble with this, they should be approached in a different manner to provide support". In conclusion, all these statements from the focus groups point towards negative knowledge being a stimulating factor in the learning from incidents process and therefore is a meaningful part in the process manual.

Minimizing underreporting of incidents

For the learning from incidents process to function optimally, it is necessary that incidents are reported and all the required information is provided by the team. One of the experts mentioned that "the organisation can only form an adequate measure of learning when all the needed information is available". This statement was supported by the other expert who stated that "in almost every deployment there are learning points, however small they might be, and the team and the organisation could benefit from these learning points". These statements show that when not all the incidents that can provide learning opportunities are shared, this can hinder the process of learning from incidents. However, when all these incidents are shared with the organisation, it is a stimulating factor regarding the learning from incidents process because it offers opportunities for the organisation to use the knowledge and experiences for incidents within other parts of the organisation. Furthermore, the previous statements correspond with a statement from the focus groups conducted in the 'cold' side, where it was stated that "sharing the knowledge from incidents, whether it went perfect or mistakes were made, can contribute to the professionalism of other teams and therefore the organisation". This statement was supported by the focus groups conducted in the 'warm' side, where it was mentioned that "every deployment might provide insights or learning points and when the focus is on learning from these incidents, these incidents should be reported and not be concealed". In conclusion, minimizing the underreporting of incidents is a stimulating factor in the learning from incidents process and the process manual contributes to making it easier and more approachable to share learning goals from incidents.

Involving learning of frontline workers

In all the interviews and focus groups conducted it became abundantly clear that the learning from incidents process should handle the needs and wishes coming forward from the firefighters instead of a top-down approach. One of the experts also mentioned that "the organisation can only learn when its employees and teams are ready to start learning". This is supported by the second expert who said that "when an individual shows a certain change and shows he/she is learning; the organisation automatically starts becoming a learning organisation". In addition, one of the experts mentioned that "the evaluations that are conducted should match the learning needs and wishes coming from the work floor and that the results from these evaluations are fed back to the work floor". This statement was supported by the other expert who stated that "when the organisation wants to create a measure in what has to be learned, this measure needs to be developed according to the needs from the teams and provide feedback for importance of the learning needs coming from the work floor". These views from the experts also came forward during the interviews and focus groups conducted in the 'cold' side. One statement from the interviews sums up the overall opinion: "the question should come from the work floor and this needs to be connected to the organisational possibilities that are available to solve the learning needs and share this knowledge among other teams". This statement was supported within the focus groups conducted in the 'warm' side where it was stated that "firefighters need to be on top and be the guiding force and the organisation should provide the support needed to achieve the learning needs". This corresponds with the focus groups conducted in the 'cold' side, where it was stated that "*The knowledgeCentre* should function as a facilitator" and "the goals of the organisation should be connected to the needs from the work floor". All these statements provide a similar opinion as stated in the theoretical part of this study. In that part, it became obvious that for an organisation to learn, its employees need to be involved and their perceptions on the degree of their involvement play an intricate part in the successful implementation of the ability to identify problems and move towards organisational improvement. In addition, in all the focus groups conducted in fire brigade Twente it came forward that the firefighting teams need to keep ownership of the knowledge and information coming forward and that the organisation should provide guidance during the learning path. It was stated that "let the team tell their story and *the knowledgeCentre* should pose the right question but ownership should remain in the concerned team". In conclusion, by applying this bottom-up approach, frontline workers keep ownership of the process through the usage of feedback in the entire process. Therefore, involving frontline workers seen as a stimulating factor during the implementation of the learning from incidents process. This feedback, from the frontline workers and the organisational components, is vital for the implementation of proper actions that attend to the learning experiences of the individuals involved.

Minimizing bureaucracy and political factors

One of the important issues that must be considered when applying a learning from incidents approach, is to make the process user-friendly and minimize bureaucracy and political, organisational influences that negatively impact this process. In one of the focus groups it was mentioned that "after an incident several parts of the organisation contact the team to gather information and these questions are often similar and take up a lot of

time. This process should be centralised and the part of the organisation that makes the call should pose the right questions to inform other parts of the organisation about the incident". This statement was supported by a statement from another focus group from the 'warm' side, where it was stated that "the contact between the team and the organisation should be sensible and there needs to be feedback about what will be done with the shared knowledge. It is therefore necessary that the person who contacts the team has gathered and read all the available information to be prepared and pose the proper, in-depth questions". This statement was complemented by a statement from another focus group from the 'warm' side, where it was mentioned that "*The knowledgeCentre* should function as a facilitator by gathering the information about the incident by asking the proper questions and then approach other parts of the organisation who can provide their content specific knowledge to handle the learning points". These statements were both supported within the focus groups conducted in the 'cold' side. In one of the focus groups it was stated that "*The knowledgeCentre* should function as knowledge director and guard the process of learning from incidents by providing structure to this process". These statements partly coincide with the definition provided in the theoretical framework because the statements do provide insight in using a problem-solving approach by making it more simple for teams to initiate a follow-up process. However, the statements provide less insight in the usage of cooperative goals rather than competitive goals. Finally, by minimizing bureaucracy and political factors, fire brigade Twente could provide support and simplicity for using the learning from incidents process, thereby increasing the likelihood the frontline workers will adapt this process. The current presence of bureaucracy is a hindering factor that needs changing to create an adequate learning from incidents process.

Minimizing hierarchy

Within several of focus groups, hierarchy was mentioned as being an important aspect to consider during the process of learning from incidents. In one focus group, several participants emphasized that "hierarchy works very good during the deployment because of the several tasks that have to be done and the experience of the commander. But hierarchy during the evaluation and learning process only hinders the sharing of experiences and creates an environment where the personnel cannot provide input". This was supported by a statement from another focus group, where was said that "hierarchy is one of the most important processes to effectively fight fires but is also very intimidating if you do not feel free to talk about the incident afterwards because of the repercussions that might follow from the commander". This shows that hierarchy, although important and necessary during the initial firefighting process, is detrimental when it is applied during the follow-up process where evaluation and learning are the most important factors. Therefore, within this study, the presence of hierarchy is considered as a hindering factor in the development of a learning from incidents process. In addition, in the focus groups conducted in the 'warm' side it became clear that during the evaluation of incidents not only the commander takes the lead. "Whenever an incident is over and the debriefing starts, I can mention my experiences and we talk about it in the group" is one of the statements heard from personnel in several focus groups. This view is supported by a statement form a focus group conducted in the 'cold' side, where it was mentioned that "the commander is not the only one who initializes the process of learning from incidents and this must be spread among more teams within the fire brigade. Because if not, this could lead to incidents where, according to the commander, everything went well even though his personnel might think otherwise". Minimizing the hierarchy could provide a useful tool for the commander of the team to get an insight in the members of his/her team and their views and adaptability to sharing knowledge and speaking up. All these statements coincide with the theoretical foundation that was presented earlier regarding hierarchy and it influence on learning from incidents. Therefore, minimizing the level of hierarchy present in discussing the occurred incident is an important part of the successful implementation of learning from incidents and is therefore abundantly present in the process manual.

No scapegoating

For learning from incidents to adequately involve the participation of employees, it is important that when incidents are evaluated and mistakes are admitted, the process of pointing out a scapegoat is avoided. In one of the expert interviews it was mentioned that "the goal of the evaluation is establishing an open learning environment in where a no-blame culture prevails to encourage open debate about the incident and the deployment". This statement was supported by the other expert who stated that "a no-blame culture should be introduced to enhance learning. People make mistakes, and that should be open for discussion and that depends on what consequences are in place when these mistakes are admitted". Both statements offered by the experts show that avoiding scapegoating support the process of learning from incidents. In several focus groups avoiding a blaming approach was mentioned. In one focus group, it was stated that "the focus should not be on pointing

out a culprit because this would only have the opposite effect" meaning that people would be even more against sharing information and admitting errors or mistakes in the future. These statements show that scapegoating has a hindering influence of the process of learning from incidents. Therefore, the focus in the process manual lies on eliminating this factor entirely.

Learning from incidents

The analysis of the factors that came forward in the interviews and focus groups provide fire brigade Twente with a better understanding of the importance they have during the learning from incidents process. This understanding can be increased when these factors are integrated with the learning from incidents framework that was mentioned earlier. The analysis showed that the all the mentioned factors should be incorporated in the learning from incidents process but that several factors are more important than others. First, involving frontline workers and applying psychological safety during the learning from incidents process are mentioned as two vital factors. Both factors are part of the learning participants and learning process part of the framework and show the importance of having the support of employees and providing them with a safe environment where they can share their experiences and knowledge without being judged. This non-judgemental environment, where scapegoating is minimized or even eliminated, is an important factor that is also part of the learning participants in the framework. Furthermore, from the analysis it came forward that to create an effective learning from incidents process the organisational structure should offer adequate facilitation and the opportunity to critical reflect the incidents to instigate learning from incidents. The organisational structure offers guidance in how to reflect on the type of incidents part of the framework and influences whether the learning participants can critically reflect on the actions taken during the incident.

Additionally, the analysis showed that bureaucracy and political factors and hierarchy should be minimized during this process to create a process that is mainly focussed on the learning outcomes. Both factors can be related to learning context part of the framework.

Finally, the analysis showed that to develop a learning from incidents process that is supported by the entire organisation the information coming forward from incidents should be shared in an open environment and that this also means that negative knowledge should be shared to minimize incidents from happening. Both the open information system and negative knowledge are part of the type of knowledge and type of incident mentioned in the framework.

In conclusion, the stimulating and hindering factors that were found to be of importance regarding the learning from incidents process can be connected to the learning from incidents framework. Although all factors influence the parts mentioned in the framework, the learning participants and learning process are found to be vital regarding the factors that were mentioned as being most valuable to applying an effective learning from incidents process. The table on the next page presents the stimulating and hindering factors from the theoretical framework and provides a description from the practice to provide the integration between the theoretical foundation and the practical implementation.

Theory	Practice
Organisational structure	Providing support for adapting the organisational structure to be better equipped to actively support and facilitate learning from incidents.
Psychological safety	Creating an open learning environment where employees can be vulnerable and open while still feeling safe to admit mistakes and share knowledge and experience.
Open information system	Creating a platform where information is shared throughout the organisation to spread learning goals that can aid in better handling future incidents
Negative knowledge	Admitting your own mistakes, thereby showing your responsibility aids in improving yourself and others by looking at options that were better suited for handling the incident.
Minimizing underreporting of incidents	Every deployment/incident might have learning points for someone in the organisation. Therefore, sharing these instead of concealing them benefits the learning purpose.
Involving frontline workers	Implementing learning from incidents should be supported by the employees and they should be able to be the guiding force behind the process of learning from incidents. Furthermore, the teams should keep ownership over the knowledge that is shared with the organisation.
Minimizing bureaucracy and political factors	Making it more simple and easy for teams to share knowledge and address the learning needs without all the extra paperwork that is needed can be achieved by having the organisation asking the right questions and preparing the follow-up process.
Minimizing hierarchy	Hierarchy is an intimidating concept and should not be present during the discussion of incidents so that teams can openly share knowledge and experiences without being judged by superiors. This provides insight in the learning goals coming forward from the team members.
No scapegoating	People make mistakes and having a blame-free environment fosters the sharing of these mistakes so that learning from these mistakes can take place.

5. Design

Based on the literature review presented in chapter 2, a list of stimulating and hindering factors regarding the development of a process to successfully implement learning from incidents was composed. Together with the data analysis, this list of factors was integrated in a user-friendly and concrete process manual that can be used by fire teams after incidents. First, the intervention design will be elaborated on to provide insight in choices that have been made in this study regarding the intervention. Finally, the justification for the choices that have been made in the final version of the process manual are given to explain how the several stimulating and hindering factors are incorporated in this final version.

In fire brigade Twente, systematic and structured evaluation of incidents is not yet in place. For the fire fighters, there is a need to implement this to learn from the incidents that have occurred in order to provide information about preventing incidents in the future. Also, the organisation can use this knowledge to be spread among the fire stations that might benefit from this knowledge. The process manual that was designed aims to fulfil these needs by providing a structured method to evaluate incidents based on the stimulating factors and hindering factors that were discussed in chapter 2. This chapter aims to combine the outcomes of the literature regarding stimulating and hindering factors with the needs of fire brigade Twente and subsequently transform these connections to a process manual that effectively guides the process of learning from incidents.

Intervention design

To implement the best possible intervention, focus groups and interviews were held to clarify what the wishes and needs were within fire brigade Twente. The initial idea was to adapt the AAR and make this process more accessible for employees and the organisation to gain more insight in incidents and their learning points. Because the present form of the AAR was gaining increased support from the frontline workers, changing this would not aid in developing an intervention supported by the frontline workers. The main outcome from the interviews and focus groups pointed towards an intervention that should, apart from being supported by the frontline workers, offer guidance in handling the learning points coming forward from an incident. Furthermore, the intervention should provide the organisation with a facilitating rather than leading role during the entire process of learning from incidents. However, this clarified the need for an intervention that supports employees not only during the incident and the AAR but also offers support in dealing with the learning points and its consequences after an incident. Furthermore, the intervention should be aimed at learning from small scale incidents to adjust the handling in these incidents to foster the outcomes of the larger incidents. These outcomes show that the intervention should offer guidance to teams in need of transferring the learning points towards knowledge that can be used to increase the quality of handling future incidents. Moreover, the intervention should provide a framework that can provide aid during any kind of fire related incident that has occurred. Therefore, the process manual that was designed in this study fits the needs that come forward from the interviews and focus groups.

Justification

This section will explain and elaborate the design choices underlying the design of the process manual. This will be done by matching the outcomes of the interviews and focus groups to the stimulating and hindering factors that were presented in the theoretical framework. Thus, the design choices will represent a combination of both the needs and wishes from the organisation and the theoretical foundation that is needed to develop a valid, user-friendly and empirically solid instrument to support learning from incidents. For every chosen guideline that is present in the process manual, an explanation is provided which is supported with empirical evidence of its effectiveness. Finally, an example is given of how these design guidelines are supported by the collected data and how these can be recognized in the design of the process manual.

1. **Organisational structure**

   Explanation

   The organisational structure present within companies greatly influences whether reflection on incidents and the learning of these incidents are appropriate and therefore supported by the organisation (Harteis et al., 2008). This leads to tolerance to mistakes being a contributing and conditional factor to the environment where learning from incidents is actively supported.

   Empirical research

   In research by Harteis et al. (2008) it became clear that for employees to share knowledge about incidents or mistakes the organisational structure present should be focused on mediating the process of learning from

incidents and make admitting mistakes or errors part of the sociocultural context present within the organisation. The results from the study by Harteis et al. (2008) showed that a culture that supports learning from incidents should be present in everyday work and that the importance of individual appraisal of mistakes and the capability of an organisation to handle the learning process involved go together when effectively applying an learning from incidents process. Furthermore, studies by Cannon and Edmondson (2001) and Tjosvold et al. (2004) provided support by stating that the organisational structure and insightful and critical analysis of causes of an incident form the cornerstone of a positive mistake culture that aims to enhance the opportunity to learn from incidents.

Exemplification

It was abundantly clear that the teams alone could not effectively implement learning from incidents. Therefore, a big role is set aside for the organisation, particularly in the form of *Team KnowledgeCentre* (*Team KennisCentrum*), to facilitate the process of learning from incidents. In the process manual, this can be found in all the decision processes and contact moments that are present. In all those, the *KnowledgeCentre* supports the gathering of information, allocating that information to the right parts of the organisation and facilitating the implementation of that information in the solutions that come forward at the end of the process. This facilitating role provides the teams with the essential guidance for them to learn from the incidents.

2. **Psychological safety**

Explanation

Psychological safety is suggested to provide a safe working climate where team members feel safe when sharing knowledge, admit errors and discuss problems (Edmondson, 1999). This shared belief of a safe environment instigates the ability of teams to use the sharing of knowledge to initiate learning from incidents.

Empirical research

In a study by Edmondson (1999), it was shown that psychological safety was an important construct in understanding the learning processes that are present in teams working in an manufacturing company. Furthermore, these teams profited from sharing knowledge among team members and admitting errors in order for the entire team, and even other teams in the organisation, to learn from. These results were used in a study by Edmondson (2003) to relate the findings from the earlier article to interdisciplinary action teams in hospitals. Results showed that psychological safety promoted the opportunity to discuss actions, the ease of speaking up and even promote the admittance of mistakes to be used as learning experiences for the team (Edmondson, 2003).

Exemplification

In the process manual, psychological safety is used in every step. In every step of the process manual, the focus is on creating a climate where team members can share their story, thereby possibly admitting their errors. The process manual allows fire fighters to be vulnerable and makes admitting errors accessible by supporting them in learning from these errors. This is done by facilitating the learning needs from the firefighters to minimize the opportunity for those incidents to occur again. This non-judgemental facilitating process is supported from within the organisation to provide firefighters with the assistance needed to open up for them to learn from the incident. This is done to create a safe environment to learn from incidents. This shared belief of a safe environment is strengthened by elaborating on the culture of trust that is already present in teams during the undertaken actions Thereby transferring the presence of that culture of trust to the process of learning from incidents. In the process manual, this culture of trust creates the opportunity to share the knowledge and information with other teams to increase the learning opportunities for fire brigade Twente in its entirety. This starts from the first informative phone call between the *KnowledgeCentre* where the information provided by the team is the leading factor in designing the precise steps that need to follow and carries on during the subsequent contact moments. In the subsequent contact moments, the culture of trust ensures that the information and knowledge that is shared contributes to learning from the incidents and providing the team members with the opportunity to admit their shortcomings and learn from them. Furthermore, the sharing of knowledge among the members of the team is of vital importance because during the action team members work together on different places of the site were the incident occurs. Sharing knowledge therefore aims at gathering information on all the aspects of the incident.

3. *Open information system*

Explanation

Firefighters are part of a highly skilled specialist team that encompasses professionals with different skill sets. Within this environment and during the unpredictable circumstances that are encountered, improvisation and communication are a vital part (Sundstrom et al., 1990). These teams rely on an open information system during these circumstances in order for them to optimally deal with their profession and to inform their co-workers about the changing circumstances and possible dangers that they might encounter (Janssen et al., 2010). Within these teams the leader can stimulate this coordination process by instigating the process of providing feedback and being receptive for ideas and questions from co-workers (Cooke & Rohleder, 2006; Edmondson, 1999).

Empirical research

An open information system provides teams with the opportunity to provide feedback, increase communication among team members and increases organizational effectiveness (Edmondson, 1999). In research conducted by Tjosvold et al. (2004) it was found that when team members analyse mistakes, communicate about those mistakes in an open way and provide feedback on the findings, it provided an antecedent for effectively learning from mistakes. This finding is supported by research done by Cannon & Edmondson (2001). Their research found that when teams have shared beliefs about mistakes made within the team, it creates the opportunity to effectively discuss the mistakes and provide a clear direction towards solving the underlying reasons for the mistake. When employees experience they are part of the information system, they could feel empowered within the safety context and that reinforces the individual factors that contribute to the organisational process of learning from incidents (Lukic et al., 2013).

Exemplification

In the process manual, the open information system is present during every step that is undertaken. During the After Action Review the input from every team member is critical in gaining insight in the possible learning goals that are present in the team. This sharing of insights is supported by providing feedback and being receptive for questions and ideas from other team members. Therefore, the open information system provides the opportunity for the commander of the team to share information coming from the team with colleagues outside the team who can provide support in elaborating on possible solutions to the learning goals that came forward from the incident. This discrepancy between the need of firefighting teams to evaluate and reflect on incidents to learn from them and the lack of knowledge those teams have to adequately do so forms the key aspect in creating an open information system. Therefore, the open information system provides the organisation with the opportunity to get all the necessary insights in the incident for them to adequately provide support and create a problem-solving approach that could have beneficial effects for the team and other parts of the organisation.

4. *Negative knowledge*

Explanation

In order for professionals to learn, often the positive outcomes are used. However, the negative experiences are frequently not used as learning material although they can offer several new insights in learning (Gartmeier et al., 2008). *Negative knowledge* is using the to be avoided actions as learning potential in order to learn from the mistakes or errors that occurred in previous practice (Gartmeier et al., 2008; Harteis et al., 2008). *Negative knowledge* focuses on what to avoid during experts' effective actions and how this can increase certainty, increase efficiency and, more importantly, enhance the quality and depth of the reflection processes on action (Gartmeier et al., 2008; Harteis et al., 2008).

Empirical research

The research of Harteis et al. (2008) elaborated on the differences in mistake orientation between managers and working staff in middle-sized and big enterprises and the organisational factors influencing the learning from mistakes. The results of the studies indicated that *negative knowledge* offered a good opportunity to increase learning opportunities as opposed to only using positive knowledge (Harteis et al., 2008). Furthermore, Gartmeier et al. (2008) performed a literature review and tried to expand the knowledge about the added value of *negative knowledge*. The results showed that negativity is a central element of learning processes in general and provides an added value to the existing models of learning from mistakes and errors.

Exemplification

The theory of *negative knowledge* is one of the focus points of the process manual. Whenever a team feels an incident has occurred that offers the potential for learning from errors or mistakes, the follow-up process should be started. This is especially difficult when a team or a team member has made a mistake or an error because admitting this and discussing it with colleagues within the organisation can be a confronting project. Every time the process manual is used to learn from incidents, an evaluation document is made. This document serves two purposes. First, it is used to optimize the process of learning from incidents and give the participating parties the opportunity to give their opinion on the process. Secondly, and an important part of the implementation of negative knowledge in the handbook, the evaluation document provides the basis for the knowledge to be transferrable to other teams for them to gain insight on the learning goals from the incident and how these can be handled. This is mainly important when knowledge about an incident is difficult to share because it concerns an error or mistake made during the incident. This gives other teams the opportunity to learn from the occurred incident and its errors and gives them insights to solve future incidents. The successful implementation of the process manual adds to the knowledge level of the team and can be used to avoid several actions during future incidents that resemble the original learning experience. Furthermore, this *negative knowledge* can be shared among other teams in the fire brigade, thereby adding to the general knowledge level of actions to be avoided.

5. *Minimizing underreporting of incidents*

Explanation

For organisations to effectively learn from the incidents that have occurred, it is critical to report all the incidents that have occurred. Underreporting of incidents is common in many organisations because of the difficulty in pointing out what is and what is not an incident (Sanne, 2008). Underreporting of incidents gives rise to problems when incidents are not shared with the right people or units of the organisation, thereby decreasing the amount of appropriate actions an organisation can undertake to successfully learn from incidents. When sharing incidents with the right people or units within the organisation it might lead to adequately prevent similar incidents from happening in the future (Drupsteen & Guldenmund, 2014; Sanne, 2008).

Empirical research

Sanne (2008) researched the underreporting of incidents among railway technicians in Sweden. The results of this study propose the integration of an incident-reporting scheme to learn from incidents and prevent them from happening. This scheme assists users admitting an incident has occurred and thereby minimizes the underreporting of incidents. Sanne (2008) supported the findings of the study by using storytelling. This supported the learning from incidents by increasing the organisational communication, creating ownership of the knowledge that was learned from the incident and creating the possibility to transfer the knowledge among other parts of the organisation.

Exemplification

In the process manual, underreporting of incidents is minimized through the addition of an extra question in between the evaluation process and the follow-up process. This question emphasizes the role of the evaluation process and creates an accessible approach for teams to report incidents. Furthermore, the process manual allows for an in-depth inquiry on the actual proceedings of the incidents to filter out the suitable learning goals that can be attributed to the occurred incident. Finally, the process manual is in place so that all the teams can access the knowledge that came forward from incidents within the entire fire brigade. When other teams share knowledge about incidents that are useful for teams within another fire barrack, this will add to the benevolence of other teams to start sharing their incidents which contain learning goals for themselves and possibly for other teams as well.

6. *Involving the learning of frontline workers*

Explanation

In developing the proceedings of public services, frontline workers play a vital part (Bruining, 2006; Bruining, 2009). However, this is frequently not addressed in the organisations and might therefore lead to alienation when the process of learning is more important than the person that is involved in the learning process. This alienation manifests itself when frontline workers have no influence on the work surroundings, the development of new processes that influence their work and the inflow of resources and manpower needed handle the daily proceedings (Bruining, 2006; Bruining, 2009). Creating higher levels of involvement from frontline workers helps

to increase the feeling of ownership that is present in the process, thereby increasing the connection of the achieved developments to the needs of the frontline workers.

Empirical research

In the research of Bruining (2006) the focus lies on developing a better understanding of how frontline workers in the public service learn. The goal of this research is to improve daily practice of frontline workers by enhancing their learning ability. Bruining (2006) developed an alternative approach based on the ideas that learning is imperative to every organisation, team and individual, thereby providing an in-depth inquiry into learning practices available for public service organisations. The research of Bruining (2006) was focused on the implementation of a police project and how the frontline workers were involved during the process. The results showed that offering the frontline workers opportunities to be involved from the start of the project and offer them the chance to provide feedback on the decisions made, increased the involvement and dispersion of the project goals among the frontline workers. Lukic et al. (2013) describe this involvement of frontline workers as individual agency. This individual agency, as mentioned before, can be enlarged by organisational (increasing participation and feedback) and individual factors (experiences and proactivity) and plays a role in the transition from individual to organisational LFI (Lukic et al., 2013).

Exemplification

Within the process manual, frontline workers are the pivotal point from start to end. Their input leads to actually starting the follow-up process and during this process their input is leading. The several organisational components that offer guidance during the follow-up process support the learning needs that occur during incidents and offer the qualified input needed to implement the learning experiences where needed. Therefore, sharing incidents and learning goals through a bottom-up approach fosters the process of learning from incidents. Finally, through this bottom-up approach frontline workers keep ownership of the process through the usage of feedback in the entire process. This feedback, from the frontline workers and the organisational components, is vital for the achievement of proper actions that attend to the learning experiences of the individuals involved. The feedback is written down in the evaluation document that is updated during the entire process to ensure the proper implementation of the process manual and to provide the organisation with input to increase the effectivity of the process manual in the future.

7. *Minimizing bureaucracy and political factors*

Explanation

In a competitive environment, it can be alluring to focus on personal rather than shared goals in order to achieve personal satisfaction. In an environment where learning from incidents is implemented, focussing on personal rather than shared goals does not achieve the learning potential that an organisation is searching for (Harteis et al., 2008; Tjosvold et al., 2004). In order for teams to achieve a high level of learning from incidents, it is essential for organisations and teams to create shared goals and operate from a problem solving approach in order to minimize the political factors that make learning from incidents an intricate affair (Harteis et al., 2008; Tjosvold et al., 2004). In addition, Argyris (1976) provides several other political factors that can hinder learning such as unresolved conflicts, biasing reports and the lack of open debate within teams.

Empirical research

Tjosvold et al. (2004) found that when personal goals were pursued rather than shared goals, this had a negative effect on the level of team learning present. Furthermore, the results showed that setting cooperative goals, where interdependence and interaction within the team play a considerable role, could provide the foundation for the problem-solving interaction required to help teams learn from incidents. These findings are supported by research from Cannon & Edmondson (2001), in where the findings suggested that when teams have shared beliefs and a clear direction concerning how to learn from failures, this approach could be beneficial to the level of learning that was achieved.

Exemplification

The simplicity and active attitude within the team that is necessary regarding the implementation of learning from incidents, should be simple and driven by the team that shares the learning goals. Within the process manual, political factors that could complicate the process of learning from incidents are minimized by creating several moments where interaction between team members is necessary to create a shared belief about the

learning goals, thereby creating shared goals instead of personal goals. Furthermore, this shared belief is further supported by creating a clear direction for the team to proceed to regarding the to be undertaken action to effectively implement learning from incidents. Finally, the focus is on enacting a problem-solving approach where the admittance of mistakes and taking responsibility to learn and develop the undertaken actions are the main priority of implementing the process manual. This problem-solving approach is initiated by discussing the occurred incident in a blame fee environment where frontline workers can talk about their experiences and learning points. This approach can be seen in the all three of the initial moments of contact where the firefighting team is the leading factor and the facilitating role that is filled in by several parts from the organisation to support learning from incidents for the team.

8. *Minimizing hierarchy*
    ### Explanation
    Hierarchy plays a double role in learning from incidents. During the incidents hierarchy is important, can support the coordination process and can be used to minimize the negative effects of the incident. During the evaluation and learning process that occurs after the incidents has occurred, hierarchy should be minimized in order to encourage the systematic analysis that would better allow people to design systems or processes to prevent incidents from happening (Edmondson, 2004).

    ### Empirical research
    In the study of Edmondson (2004) the focus was on exploring the influence of group- and organizational-level factors that affect errors in administering medicines in hospital settings. One of the results showed that the likelihood of reporting errors was influence by the behaviour shown by nurse managers during the admitting and discussion of mistakes. Edmondson (2004) found that in the process of discussing errors and learning from them, hierarchy had a negative impact on admitting mistakes and even led to a climate of fear. This climate further influenced the ability and willingness to identify future mistakes and problems.

    ### Exemplification
    The importance of hierarchy during an incident and that the same advantageous hierarchy should be minimized in the evaluation process and subsequently the follow-up process. Minimizing the hierarchy could provide a useful tool for the commander of the team to get an insight in the members of his/her team and their views and adaptability to sharing knowledge and speaking up. Therefore, minimizing the level of hierarchy present in discussing the occurred incident is an important part of the process manual and greatly contributes to the successful achievemnet of learning from incidents. This is achieved by giving every member of the team the opportunity to provide his/her opinion during the on the course of the incident. This ensures that the evaluation process obtains as much information and knowledge from the team members and does not let the hierarchy that is present within a team interfere with the desired outcome of the learning from incidents process. Furthermore, the evaluation process could also be initiated by members of the team and not only the commander of the team. This possibility eliminates hierarchy in the learning from incidents process by providing members of the team with chances to handle their learning goals from an incident instead of learning goals that come forward by the commander and might not be supported by other team members. When entering the follow-up process of the evaluation, all members are being treated as equals by the participating parties and can contribute in the same way to the learning process. This is made clear in the process manual by involving the entire team when actions are being undertaken to achieve the to be followed course of action and involving the team in sharing the knowledge within the entire fire brigade.

9. *No scapegoating*
    ### Explanation
    When dealing with incidents, there are several ways to cope with the persons involved in the incident. One way of coping that should be avoided is appointing a scapegoat who is blamed and punished for the occurrence of the incident. Dealing with incidents by creating a scapegoat proves unlikely to create a culture of learning from incidents (Dweck, 1986; Tjosvold et al., 2004). This scapegoating might lead to a closed-mindedness towards learning from incidents and a rigid commitment to current practice. It is important to mention that scapegoating is different from the approach of holding individuals accountable for their actions. Scapegoating is mostly done covertly and is non-discussable whereas holding individuals accountable is done openly and increases eagerness to learn (Tjosvold et al., 2004)

Empirical research

A scapegoat is someone that is blamed and punished for the incident that has occurred in order to make others look good and avoid emotional discussions about the incident (Tjosvold et al., 2004). Fearing punishment, employees might try to hide future errors or cover up mistakes (Harteis et al., 2008). Scapegoating might eventually even lead to attributing mistakes to others to avoid embarrassment when admitting a mistake. In a research conducted by Tjosvold et al. (2004) it was found that a blaming approach did not lead to learning from mistakes when done covertly and non-discussable. These results concerning the negative impact of a blaming culture were supported by Pidgeon & O'Leary (2000) and Edmondson (1999).

Exemplification

The focus of the process manual lies on openly admitting what went wrong and create learning goals from the incident. Because this is done in a non-blaming manner and the aim is to point out points for improvements and not errors, several contact moments where all the information and actions from the incidents can be openly shared for learning purposes, there is no embarrassment in admitting this. Taking responsibility for your own actions should be respected and seen as promoting the process of learning from incidents. Furthermore, because the aim of the process manual is on learning and taking responsibility of your actions, admitting that there are possible improvements leads to a better understanding of handling certain incidents. In the process manual, this can be seen in the possibility to share the learning goals with other teams and making the learning goals, thereby providing insights in the actions of the team, visible for other teams This provides other teams with knowledge which can be used during future incidents to decrease the severity of the incident or even lead to less incidents in the future and creates a safer work environment that fosters the development of firefighters.

6. Discussion

The last chapter answers the research questions and discusses the obtained results from the previous chapter. Then, a reflection on the procedures and methods used in this study is provided. This is followed by a paragraph that provides suggestions for future research and practice. The study is concluded by providing several final remarks.

The aim of the study was to elaborate on the implementation of systematic and structured learning from incidents in fire brigade Twente. Furthermore, this study provided insight in several stimulating and hindering factors that are present fire brigade Twente regarding the process of learning from incidents. To support these findings, a process manual was designed that could support the implementation of the learning from incidents process. For this purpose, multiple instruments for data collection were used. Although the viewpoints between the 'cold' and 'warm' side within fire brigade differed regarding the culture of learning currently present, the results from the interviews and focus groups and the subsequent development and implementation of the process manual showed a great level of agreement between both sides regarding the key factors needed for successful and effective learning from incidents.

First, although there are some discrepancies about how to handle the incident evaluation and the lack of a structured and systematic way of evaluating incidents, agreement was reached in most focus groups about the necessity of evaluation directly after an incident. Moreover, using the right kind of incident evaluation not only supports the organisation in professionalizing the fire brigade but also aids in helping the frontline workers become more involved in the process of learning from incidents which in turn stimulates others to do the same (Bruining, 2006; Bruining, 2009; Lukic et al., 2013).

Moreover, the analysis of the data showed that both the 'cold' side and 'warm' side agreed that the process of learning from incidents needs to be changed for the process to effectively work and have the support from the frontline workers. One of the most important findings was that the organisational structure of fire brigade Twente regarding learning from incidents needs to change to adequately meet the needs of the frontline workers. This organisational change needs to focus on increasing the openness and support that is given to sharing knowledge and experience from incidents thereby emphasizing on analysing the cause and solution of an incident to increase the ability to learn from incidents (Cannon & Edmondson, 2001; Harteis et al., 2008; Tjosvold et al., 2004). The process of learning from incidents is currently filled with bureaucratic and political factors that have a detrimental effect on the main purpose of this process, the learning and development of frontline workers to decrease the future incidents from occurring. Decreasing these factors by focusing more on the shared goals and centralizing the follow-up process helps the implementation of the learning from incidents process (Argyris, 1976; Tjosvold et al., 2004). Furthermore, the evaluation process that is currently in place suffers from the amount of hierarchy that is present and the subsequent environment that is less safe to share knowledge and experience as input for the learning process. Creating a culture where hierarchy stays behind at the incident and a safe environment is created where frontline workers can share their knowledge and experiences and a climate of mutual trust is created is a necessary adaptation to ensure the success of applying a learning from incidents process (Edmondson, 1999; Edmondson, 2004). These adaptations create the space for an open information system where colleagues can share their experiences and outcomes from incident evaluation processes are spread throughout the entire organisation to support the organisation wide learning process (Cooke & Rohleder, 2006; Sundstrom et al., 1990). Finally, in several focus groups and the interviews with the experts, creating this safe environment to share knowledge and experience from incidents was positively connected to supporting the minimizing of underreporting incidents.

Last of all, the learning from incidents framework designed by Lukic et al. (2012) used in this study, seamlessly fits with the stimulating and hindering factors that were found in the literature and those that came forward during the interviews and focus groups held inside and outside of fire brigade Twente. The learning from incidents framework adequately measures the several concepts that are listed in the framework and provides a solid platform to analyse the level of learning that is present in fire brigade Twente, both in the breadth and depth of learning. Although some factors are more important during the learning from incidents process, it can be said that all factors provide a good representation of the different parts mentioned in the learning from incidents framework. Furthermore, the model provides several options for fire brigade Twente to deepen the analysis of incidents and create a meta-analysis of the incidents that have occurred. In this way, fire brigade Twente can use this analysis to gain more insight in which incidents occur more frequently and could, when adequately dealt with, offer bigger gains for a larger part of the organisation.

Concluding, to provide an answer to the first research question, which stimulating and hindering factors are found in the learning from incidents process in fire brigade Twente, there are some key variables this study offers. First, a key factor in implementing an effective process of learning from incidents is the organisational structure.

Fire brigade Twente should support and facilitate the needs of the employees regarding learning from incidents and the organisation needs to involve employees in every step of the learning process to spread the process throughout the organisation. To do this, the firefighting teams, as well as the organisation, need an open information system to provide feedback to one and another and increase the communication between individuals, teams and the organisation. Critically reflecting an incident and transferring the knowledge and information not only depends on an open information system, but also heavily relies on a blame-free environment where members feel safe when sharing knowledge and discussing errors. Psychological safety is a key factor in such an environment and helps to maintain and enlarge such a climate within an organisation. This climate increases the admittance of errors because of the possibility to discuss the negative knowledge that came forward after an incident and promotes learning behaviour to prevent the negative experiences to occur again in the future. This knowledge can then be transferred within the several teams in fire brigade Twente to prevent the negative experiences on a larger scale. This discussion of negative experiences compared with the blame-free culture and psychological safety increase the focus on learning from incidents instead of pointing fingers and creating a scapegoat who is to blame for an incident that has occurred. This could positively influence the number of incidents that will reported because of the focus on learning and the open character in taking responsibility for an incident to learn and share those learning goals among other parts of the organisation. All these factors lean heavily on the involvement of frontline workers who are keeping ownership of the knowledge emerging from an incident and the ease of sharing that knowledge without facing consequences. Minimizing the hierarchy, bureaucracy and political factors surrounding the process of learning from incidents influences the number of incidents shared (Cannon & Edmondson, 2001; Drupsteen & Guldenmund, 2014; Sanne, 2008) and thereby the learning that occurs within fire brigade Twente. This is further increased by the responsibility and ownership that is given to the frontline workers because to the bottom-up approach towards learning from incidents (Bruining, 2009; Lukic et al., 2013).

The second research question in this research was aimed at finding the best intervention to implement learning from incidents in fire brigade Twente. Before the decision to design the process manual was made, several other options were thought of that could instigate a learning from incidents approach and help implement systematic and structured learning from incidents. The choice to design a process manual and not focus on adapting the AAR was a valid decision. Not only does the AAR receive growing support from the frontline workers, but the AAR is a new tool used in fire brigades across the nation. This study, and therefore the process manual, are only aimed at learning from incidents which are fire related in fire brigade Twente. Therefore, adapting the process manual to learning from incidents in other fire brigades is easier than changing a nationwide evaluation tool. Moreover, because fire brigade Twente did not have a systematic and structured follow up process in place, developing this would be a greater contribution than to alter an existing evaluation tool which did not have the chance to be thoroughly used.

In conclusion, the developed intervention, a process manual, supports frontline workers and gives them opportunities to instigate learning from incidents and receive support during the entire process. In the future, this could lead to less involvement of the organisation in the learning process when the frontline workers become acquainted with the entire process of learning from incidents and can provide effective evaluation and guidance to the involved colleagues and the learning goals coming forward from the incidents (Berlo et al., 2007).

The main research question; how can learning from incidents be supported within fire brigade Twente, can be answered by looking at the framework and design of the process manual and the stakeholders involved in the development. From the framework of Lukic et al. (2012) and the focus groups and interviews conducted in this study it becomes clear that all factors mentioned in the framework play a vital role in instigating and expanding the learning from incidents process within an organisation. Furthermore, this study makes clear that learning from incidents should be facilitated from within the organisation to create a process that can be effective, but the main support is needed from the frontline workers. These frontline workers need to instigate the process, keep ownership during its entirety and need to be involved in the spreading of the knowledge among colleagues to maintain the bottom-up approach needed to make learning from incidents a successful process in fire brigade Twente.

Limitations

Within this study, several interesting and viable solutions came forward regarding the implementation of structured and systematic learning from incidents within fire brigade Twente. However, several limitations were present within this study. Initially, because of feasibility issues the sample size consisted of a small portion of the total workforce present in fire brigade Twente. Although the sample was made up of employees who were selected based on their experience, function and full-time or voluntary appointment, a larger sample would have positively supported the development of the process manual and thereby make the results more externally valid

(Ritchie & Lewis, 2014; van den Akker et al., 2013). Moreover, the context of the study imposes a limitation to the generalizability of the results and developed process manual. Although the process manual, with several small alterations, might be implemented in other fire brigades, it is far more difficult to implement the process manual in other public service agencies. Not only would the key characteristics of the organisation, like hierarchy and organisational structure, be different in other organisations, but also the main goal and daily proceedings of fire brigade Twente play a role in applying a process manual to learn from incidents in a wider context than is considered in this study. The generalizability of this study could be further supported by conducting research about learning from incidents in other fire brigades and even other public service agencies. This study should then also focus on involving the frontline workers and increasing the psychological safety during the entire process.

Moreover, the results of the study are based on the perceptions of learning from incidents from the participants rather than actual outcomes from a learning from incidents process. This could have been avoided by including findings from an actual usage of the process manual when an incident occurred. Regrettably, after the process manual was spread among the commanders in fire brigade Twente, there were no incidents that warranted the use of the process manual and therefore no results on the usage of the process manual are present in this study. An additional study is needed to investigate the effectivity of the process manual and to see how using the process manual fosters the learning from incidents process. This can be done by looking at several incidents where the process manual was used to investigate the learning needs from the teams. The outcomes of using the process manual should than be evaluated by talking to the people involved and asking their opinion about the process manual and the outcomes. Furthermore, the spreading of the learning outcomes from using the process manual should be investigated to find out if the outcomes have benefitted other teams within the organisation.

Finally, the question remains if the added structure and accessibility in learning from incidents helps develop the spontaneous and open character of informal learning to support the organisational implementation of a learning culture. Research has shown that even when the organisation and its employees are willing to adapt a new practice to foster the professional development, the existing structure and habits might inhibit the actual implementation and outcomes of implemented practice (Edmondson, 2004; Harteis et al., 2008; Lukic et al., 2013; Tjosvold et al., 2004).

Practical implications

This study proposes several practical implications that can aid fire brigade Twente in implementing an effective learning from incidents process. First, this study presented fire brigade Twente with a good understanding of the stimulating and hindering factors present within their organisation. These insights provide the fire brigade with support regarding the adaptations that can be made while further spreading the learning from incidents process within their organisation. Furthermore, these stimulating and hindering factors are incorporated in the process manual which supports the organisation during the learning from incidents process. This process manual, which relies heavily on the input from the frontline workers and the facilitating role of the organisation, helps the fire brigade to achieve the desired learning from incidents process. This will support the fire brigade in transferring knowledge from the organisation to the teams so that future incidents will be minimized. Moreover, the process manual that is designed can also be used during incidents that are not fire related. A few alterations in the process manual would suffice to make the process manual available for other incidents and the learning points that might come forward from those incidents. Finally, the results from this study could be shared with other fire brigades nationwide to implement the process manual and improve the learning from incidents process nationwide. This could have a positive effect on the amount and diversity of incidents that are used in the learning from incidents process. When the outcomes of these learning processes are not only shared within the fire brigade but across the whole country this could support the minimizing of incidents even further. However, the priority for fire brigade Twente should be to incorporate the process manual in their daily proceedings so that learning from incidents becomes a vital part of the organisation.

Recommendations for future research

An interesting direction for future research is to focus on an organisational structure and the culture change that might be needed to increase the effectivity of implementing systematic and structured learning from incidents (Edmondson, 1999). Harteis et al. (2008) state that to maximize the effectivity of learning from incidents the culture of workplace learning should be adapted to fit the desired outcome. Looking at the culture of a company partly coincides with looking at the level of psychological safety present within a company (Edmondson, 1999). By first looking at how an organisation can initiate a culture change, the subsequent development and implementation of a process manual might lead to more acceptance from the employees and the organisation

(Harteis et al., 2008) and therefore increase the usage of the developed instrument. This could increase the effectivity of the developed process manual and provide added value to the process of learning from incidents.

In this study the focus lay on developing an instrument to improve systematic and structured learning from incidents. Therefore, the focus was not on the actual AAR that provides the basis for the learning from incidents process and can therefore be an intricate part to the entire process of learning from incidents (Jacobsson et al., 2011). Future research might be directed more at taking a closer look at the evaluation methods currently in place within a company and might provide an adaptation that can better facilitate the process of learning from incidents.

In relation to findings from Jacobsson et al. (2011), Littlejohn et al. (2010) and Lukic et al. (2012), it is interesting to find out what happens to the process of learning from incidents when the number of incidents is decreased while using a more systematic and structured approach. Within this study, the process manual and adopted approach are aimed at decreasing the amounts of incidents that occur by sharing knowledge and experience about incidents. Therefore, the learning from incidents approach ideally leads to less incidents and that means less learning opportunities. The possibility might exist that the decreasing number of incidents leads to less learning and even a forgetting organisation when the necessity for learning decreases and is not monitored adequately (Cooke & Rohleder, 2006). Within this study there was no opportunity to look at the long-term results from implementing the systematic and structured learning from incidents approach to investigate how these influences future learning possibilities within fire brigade Twente. This is mainly interesting when looking at the future involvement of frontline workers and the open information system when the need to share information among frontline workers decreases. Therefore, a future study could provide insight in how to overcome this problem and keep the knowledge that came forward during incidents in the past relevant and maintain the involvement of frontline workers in this process. This future study could evaluate the learning from incidents process when it is implemented and investigate the level of usage during the next few years at recurring intervals. The outcomes of the investigation could then be further examined when it becomes clear that the usage of the learning from incidents process has decreased but that knowledge of similar incidents has been present within parts of the organisation.

Finally, while this study does provide insight in the different factors that influence learning from incidents, it does not explore the interrelationships of the mentioned factors and the contribution, or detraction, these interrelationships might have on implementing an effective learning from incidents process (Lukic et al., 2013). Although learning from incidents is an abstract subject, it is always present in organisations and organisations need learning from incidents to find valuable information to prevent similar incidents from happening in the future (Koornneef, 2000; Littlejohn et al., 2010). Research has already shown that organisational factors influence individual factors and vice versa (Lukic et al., 2013) and that even when learning is at an individual level, the social context of co-workers and the company play an influential role in the learning outcomes (Littlejohn et al., 2010). Moreover, Tjosvold et al. (2004) confirmed that the interaction between employees and their openness and mutuality are vital components for learning from incidents. A further study using quantitative or mixed methods could provide insight in these interrelationships. The most interesting factors to look at should then be the organisational structure, psychological safety, involving frontline workers and the open information system. These factors have an influence on both the organisational level as well as the individual level. Investigating the interrelationships between these four factors might provide an even better understanding of the influence of several factors proposed in this study on the learning from incidents process.

Concluding remarks

In this study, the focus lay on developing an instrument to improve systematic and structured learning from incidents in fire brigade Twente. In addition, this was supported by providing a deeper understanding in the stimulating and hindering factors present during the process of learning from incidents. The focus groups provided convincing evidence that supporting the process after the AAR was done, would greatly improve learning from incidents. Furthermore, when this process is implemented, the firefighters will be able to influence the decisions made during the learning from incidents process and this provides them with the feeling of being responsible for their own and their teams professional learning and development.

In conclusion, the future should show the actual implementation of the process manual and the added value it can provide to learning from incidents and spreading the knowledge among the learning population that could benefit from this knowledge. The stimulating and hindering factors that were found in the literature can provide a deeper understanding to what is necessary to create an effective process of learning from incidents in public service agencies. Moreover, this deeper understanding in creating an effective learning from incidents process is strengthened by the provided insights given during the focus groups and the affiliation with the findings from the literature review.

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Appendices

Appendix A: Interview design employees fire brigade Twente

Incident evaluatie

1. Hoe is incident evaluatie op dit moment toegepast binnen Brandweer Twente?
2. Zou incident evaluatie verbeterd kunnen worden en hoe kan dit de ontwikkeling van individuen en teams ondersteunen?
3. Als jij verantwoordelijk zou zijn voor het implementeren van incident evaluatie, hoe zou jij dit doen en wat zijn de belangrijkste facetten waar je op zou letten?
4. Wat zijn je verwachtingen van incident evaluatie
   a. Wat kan deze verwachtingen verbeteren?
5. Gebruikt elk team de AAR om eventuele incidenten na te bespreken als dit nodig is?
   a. Waarom denk je dat AAR niet is aangeslagen binnen Brandweer Twente?
   b. Waar ligt dit aan?
   c. Heb je hier alternatieven voor?

Leren op individueel niveau

6. Hoe belangrijk is ontwikkeling/leren voor het goed uitvoeren van taak specifieke acties?
7. Hoe kunnen individuen betrokken worden bij het ontwikkelproces van een incident evaluatie-instrument?
8. Sta jij open voor nieuwe ideeën?
   a. Is dit bij de meeste in de organisatie zo? Waarom wel/niet denk je?
9. Sta jij wel is stil om na te denken over hoe jij gehandeld hebt gedurende acties?
   a. Bespreek je dit wel is met anderen om zo gezamenlijk te reflecteren op hoe jij/een team gehandeld heeft?
   b. Zou het nuttig zijn voor de ontwikkeling van jezelf/teams om dit vaker te doen?
10. Hoe sluiten de training- en opleidingsmogelijkheden aan op jouw wensen?
11. Zijn er wel is wensen die niet gehonoreerd kunnen worden?
    a. Hoe zou dit anders aangepakt kunnen worden?
12. Wordt er door bevelvoerders geluisterd naar manschappen?
    a. Staan bevelvoerders zelf open om te leren en zich te ontwikkelen?
    b. Stellen ze actief vragen gericht om kennis vanuit de manschappen naar boven te halen?
    c. Wordt er vanuit het management een actieve houding aangenomen om kennis deling te bevorderen?
    d. Hoe zou dit proces verbeterd kunnen worden?

Leren op teamniveau

13. Kan incident evaluatie bijdragen aan het kennisniveau binnen teams? Zo ja, zou je bereid zijn actief mee te willen denken met de organisatie om de kennis te verspreiden over de andere teams binnen de organisatie?
14. Hoe zou het team profijt hebben van het evalueren van incidenten?
15. Voel jij je vrij om ideeën/meningen te delen in de groep?
    a. Heeft iedereen dit? Zo nee, waar kan dit aan liggen?
16. Wordt er besproken hoe individuen binnen een team van elkaar verschillen en hoe er van elkaar geleerd kan worden?
17. Hoe verloopt het delen van kennis tussen individuen/teams?
    a. Zou hier nog verbetering in kunnen plaatsvinden en hoe?
    b. Vindt er kennisdeling plaats gedurende momenten waar meerdere repressieve teams bij elkaar zijn of blijft dit vaak binnen de teams?
    c. Hoe zou dit proces versimpeld kunnen worden?

Het borgen van kennis binnen de organisatie

18. Wat versta jij onder het begrip "kennisborging"?
19. Hoe zou ervoor gezorgd worden dat de kennis vanuit verschillende delen binnen de organisatie geborgen wordt in de organisatie zo dat andere individuen/teams deze kennis ok kunnen gebruiken om zich te ontwikkelen?
    a. Hoe kan de organisatie dit proces van kennisverspreiding ondersteunen?

Appendix B: Interview design experts

Incident evaluatie

1. Op welke manier kan incident evaluatie bijdragen aan het ontwikkelen van de organisatie?
    a. Hoe draagt dit bij aan het leren van individuen/teams?
2. Hoe kan incident evaluatie optimaal geïmplementeerd worden?
    a. In welke vorm?
    b. Zou er nog verschil per incident in moeten zitten?
3. Welke rol speelt de cultuur binnen de brandweer bij het implementeren van incident evaluatie?
    a. Hoe zou de brandweer hierop in kunnen spelen?
    b. Hoe kan deze cultuur benut worden om het effect van incident evaluatie te verhogen?
4. Artikelen bespreken over leren van incidenten:
    i. Boek Koornneef (2000): learning from small-scale incidents.
    ii. Drupsteen (2014): Review of safety literature to define learning from incidents
    iii. Jacobsson, Ek & Akelsson (2011): Method for evaluating learning from incidents

Leren op individueel niveau

5. Hoe kunnen individuen een bijdrage leveren aan de ontwikkeling van een evaluatie-instrument?
6. In welke mate kan de organisatie het proces van het omvormen van tacit knowledge naar explicit knowledge ondersteunen zodat kennis verspreiding mogelijk gemaakt wordt?
7. Welke kenmerken van individuen bevorderen het delen van kennis?
    a. Kan dit worden gestimuleerd binnen een hiërarchische organisatie als de brandweer?

Leren op teamniveau

8. In welke mate kan incident evaluatie bijdrage aan de kennisuitbreiding in teams?
    a. Hoe kan verzekerd worden dat deze kennis ook geïmplementeerd wordt tijdens toekomstige incidenten?
9. Wat is de invloed van incident evaluatie op verschillende teams (langdurige samenwerking, beroeps of vrijwilliger)?

      a.   Zal dit bij bepaalde teams beter werken? Welke en hoe?

      b.   Hoe kunnen deze verschillen op een positieve manier bijdragen aan de implementatie van gestructureerde en systematische evaluaties?

10. Hoe kan incident evaluatie geïmplementeerd worden zodat teams een actieve bijdrage leveren aan het verbeteren van het proces en de toekomstige evaluaties?

Het borgen van kennis binnen de organisatie

1. Wat betekent kennisborging voor u?
2. Wat ziet u als kritieke punten als het gaat om het borgen van kennis binnen organisaties?
   a. Kan de organisatie hierop inspelen?
   b. Hoe ziet u dit binnen de brandweerorganisatie?
3. Op welke manier kan kennis van incident evaluaties geborgen worden in organisaties?
   a. Wat is de meest haalbare en toch werkzame optie?
   b. Hoe kan de organisatie dit proces zo goed mogelijk ondersteunen?

Overig

1. Vragen vanaf jouw kant?
2. Hoe nu verder → proces toelichten
3. Eventuele aanvullingen?

Appendix C: Focus group design 'cold' side

Algemeen

1. Hoe beschouwen jullie het huidige niveau van evalueren aan de hand van de AAR (aantallen, diepgang & kennisoverdracht)
2. Wat zou er momenteel kunnen verbeterd worden aan de AAR?
3. Wie zou de evaluatie moeten uitvoeren? Waarom juiste deze persoon?

Voorbereiding

4. Wie zou moeten deelnemen aan het voorbereiden van een evaluatie?
5. Wat zou de rol van KC's kunnen zijn bij het evalueren van incidenten?

Randvoorwaarden

6. Welke randvoorwaarden zou een evaluatie aan moeten voldoen?
7. Hoe zouden jullie het lerende karakter van brandweer Twente meer kunnen aanspreken zodat mensen vaker

Uitvoering

8. Hoe zou TKC als facilitator kunnen optreden in het vervolgproces?
9. Hoe ziet volgens jullie het vervolgproces eruit?
10. Wat is jullie rol hierin?

Afsluiting

11. Wat willen jullie dat er gebeurt met de uitkomsten van de evaluatie?
12. Wat zou jullie rol zijn naar aanleiding van de uitkomsten van een evaluatie, of meerdere evaluaties?
13. Wat hebben jullie nodig vanuit andere sectoren binnen de organisatie om jullie rol goed uit te kunnen voeren?

Terugkoppeling

14. Hoe zou voor jullie de terugkoppeling moeten verlopen?
15. Hoe zou volgens TKC de terugkoppeling moeten verlopen?

Appendix D: Focus group design 'warm' side

After Action Review

1. Wat is jullie mening over de huidige werking van de AAR
   a. Hoe vaak hebben jullie de AAR gebruikt?
   b. Bij wat voor een incidenten?
   c. Wat waren de uitkomsten (snel afgehandeld, vervolgstappen)?
2. Wat zou er verbeterd kunnen worden aan de AAR?
3. Hoe wordt een AAR ingestart? (Wie, wanneer)
4. Wat is jullie visie op wat er moet gebeuren met de uitkomsten van de evaluatie?
5. Wat zou jullie rol zijn (in het vervolgproces) naar aanleiding van de uitkomsten van een evaluatie, of meerdere evaluaties?

Vervolgproces

6. Als er leerpunten naar voren komen uit een evaluatie, hoe ziet het proces eruit nadat de evaluatie is uitgevoerd?
   a. Hoe zouden jullie dit proces willen veranderen?
7. Weten jullie wie ondersteuning kunnen bieden bij het helder krijgen/verspreiden van de leerpunten?
8. Wat zijn stimulerende factoren om te leren van incidenten?
   a. Zouden deze verbeterd kunnen worden? Hoe?
9. Wat zijn hinderende factoren om te leren van incidenten?
   a. Hoe kunnen deze worden geminimaliseerd?
10. Wie zouden kunnen helpen tijdens het vervolgproces/ wie zouden er allemaal betrokken moeten worden in het vervolgproces?
    a. Vakbekwaamheid, TKC, O&O, kerngroep brand?
    b. Wat gebeurt er als deze groepen benaderd worden?
11. Hoe zou volgens jullie de terugkoppeling moeten verlopen?
12. Aan welke randvoorwaarden moet het vervolgproces voldoen?

Randvoorwaarden/ontwerpeisen

13. Aan welke randvoorwaarden zou een evaluatie/vervolgproces moeten voldoen?
14. Zijn die nu aanwezig? Hoe kunnen die geïmplementeerd worden?
15. Missen jullie hier op dit moment de benodigde kennis voor?

Appendix E: Coding scheme

In this code book the a-priori codes and emergent codes that were used in this study are elaborated on and provided with an example in order to give the reader more insight in the statements that can be expected to coincide with the different codes. The creation of a-priori codes can be seen as theory-driven codes and the emergent coding scheme can be seen as incorporating data-drive codes in order to expand the theory-driven codes.

A-priori codes

Code	Description	Example
Incident evaluation	The systematic investigation of the worth and merit of an object. In this case, the incident that has happened.	"The incident can be used as a key moment, what went good and what needs improvement. When these moments are adequately evaluated it can add to the learning of an organisation".
After Action Review	The evaluation tool that is used in fire brigade Twente.	"The 'after action' part is evaluating the incident and the 'review' part is the actions that will be undertaken following the conclusions from the evaluation of the incident".
Learning from incidents	The evaluation and reflection that takes place after an incident and is aimed at learning in order to put the lessons learned into practice to prevent future incidents from happening.	"People learn by talking about incidents. However, this process needs to be guided by a person that poses the right, judgement free questions".
Learning on individual level	The learning that takes place within the several individuals after an incident has occurred. This influences the level of team learning that is present after an incident.	"Every individual learns after an incident, but to establish if it is the right kind of learning the organisational context is needed".
Learning on team level	The learning that takes place within the entire team after an incident has occurred. This is dependent on the level of individual learning.	"When an individual shows a certain change and proves he/she is learning, then a team can start to learn".
Stimulating factors	The factors that can have a positive influence on the learning process after an incident.	"The involved team should keep ownership of the knowledge that is shared during an incident evaluation".
Hindering factors	The factors that have a negative influence on the learning process after an incident.	"A hindering factor could be that not everybody has the same view on the level of

			professionalism that is needed".
Follow-up process		What needs to happen with the information that comes forward from an incident and how the learning purposes are supported when the incident contains learning points.	"The follow-up process needs to have people involved that have the proper content specific knowledge in order to pose the right questions".
Boundary conditions		Several important conditions that need to be incorporated in the learning process in order to guarantee that the individuals actually learn from the occurred incidents.	"Be vulnerable and admit the errors you have made because this leads to learning from incidents".

Emergent codes

Main code	Sub code	Description	Example
Incident evaluation	*Justification purpose*	Justifying the choices that have been made in order to assign guilt and to take further actions.	"Justification needs to be an accepted necessity in order to start the learning process".
	Learning purpose	Searching for corrections in terms of reducing incidents and initiate learning from the incidents.	"Evaluation should be aimed at the learning and development of participants of the evaluation".
Stimulating factors	*Organisational structure*	Organisation structure shapes the appropriateness of implementing critical reflection of incidents and whether this can be done without consequences.	"The organisation can provide a measurement of the learning goals for the coming period from the needs and wishes that occur at the work floor".
	Psychological safety	The level of comfortableness that employees have when sharing knowledge about interpersonally threatening situations.	"Being vulnerable and admitting errors offers learning opportunities".
	Open information system	Teams with specialized skills rely on open information transfer in order to coordinate unexpected events.	"Time has to be freed up to share knowledge and information"
		Continuously learning from incidents that happen leads to avoiding the same mistakes or errors to minimize future incidents from happening.	"It is not about the mistake or the error but about not handling the incident

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	Negative knowledge	Implementing a tolerant culture that allows employees to make mistakes minimizes the chance of missing out on incidents that can provide valuable learning opportunities.	perfectly and admitting there are better ways". "Providing the right guidance during the process is a necessity to reach the goal of an evaluation process".
	Minimizing underreporting of incidents	The learning of frontline workers is vital for an organisation and are in the best position to find learning opportunities that can benefit the entire organisation.	"The work floor employees should be at the top and leading in the learning process and should receive the proper support".
	Involving frontline workers		
Hindering factors	*Bureaucratic or political factors*	Misuse of power and personal goals instead of shared goals slow down or even undermine the learning outcomes and hinder the learning from incidents process.	"after an incident several parts of the organisation contact the team to gather information and these questions are often similar and take up a lot of time. This process should be centralised and the part of the organisation that makes the call should pose the right questions in order to inform other parts of the organisation about the incident"
	Presence of hierarchy	Although hierarchy can aid the handling of an incident, it negatively influences the critical reflection process needed to find out the learning goals from an incident.	"hierarchy is one of the most important processes to effectively fight fires but is also very intimidating if you do not feel free to talk about the incident afterwards because of the repercussions that might follow from the commander".
	Scapegoating	Blaming an individual or a team might lead to concealing mistakes instead of admitting them which can aid to the learning outcomes within an organisation.	"Implementing a no-blame culture to promote the learning that occurs".

Intervention design	Follow-up process	Gaining more insight in what is needed after the evaluation has taken place sheds a light on what is needed to effectively implement a learning from incidents process.	"Important in the follow-up process is the availability of content specific knowledge"
	Boundary conditions	Providing clear boundary conditions leads to implementing an intervention that fits the needs and more important leaves out the elements that have a negative influence on learning from incidents.	"Honesty should provide the overtone and the process needs to be designed to support that".
	Feedback	Providing feedback during the learning process on what the next step is and how the individual/team is involved.	"There needs to be feedback on what is done by the organisation with the provided knowledge".
	Design requirements	Getting a better insight on what the needs and wishes are regarding what the design of the intervention should be guarantees the best fit in order to gain the most advantageous results from the learning from incidents process.	"Developing a manageable design that can be used by everybody"

Appendix F: Process manual learning from incidents

LEARNING FROM INCIDENTS IN FIRE BRIGADE TWENTE

Het vervolgproces

Enschede, 12 juni 2017
Versie 3.0

BRANDWEER TWENTE

Samenvatting

In het document dat voor u ligt wordt beschreven hoe het vervolgproces dat plaatsvindt na het nabespreken van incidenten is vormgegeven. De inhoud is volledig in samenspraak met repressieve teams ingericht en dit draagt bij aan de bruikbaarheid van het handboek.

In dit document wordt toegelicht hoe het vervolgproces van het nabespreken van incidenten is ingericht en welke betrokken partijen meegenomen kunnen worden in dit proces. Daarnaast zullen ook enkele aanbevelingen gedaan worden om het proces verder te ontwikkelen in de toekomst. Hierdoor kan dit document niet alleen ingezet worden voor brandincidenten maar ook voor incidenten met betrekking tot dienstverlening, ongevallen en leefmilieu

Lijst met afkortingen

- After Action Review (AAR)
- Tem KennisCentrum (TKC)
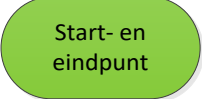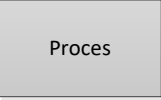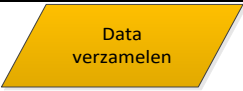- AlarmCentrale (AC)
- VeiligheidsPaspoort (VP)

Inleiding

In dit handboek zal worden toegelicht hoe het vervolgproces van het nabespreken van incidenten eruitziet en hoe dit in de toekomst gebruikt kan worden om het leren van incidenten op regelmatige basis toe te passen binnen Brandweer Twente.

Allereerst zal er begonnen worden met het toelichten van de After Action Review (AAR) en hoe dit het proces van nabespreken kan ondersteunen en vormgeven. Verder zal de uitkomst van de vragen die onderdeel zijn van de AAR ertoe kunnen leiden dat er verdere stappen ondernomen worden in het proces van leren van incidenten. Vervolgens zal er worden toegelicht hoe dit vervolgproces en al haar onderdelen eruitziet. Hier zal de nadruk liggen op de acties die ondernomen worden nadat er leerpunten uit een incident naar voren zijn gekomen en hoe Brandweer Twente ondersteuning kan bieden aan het verspreiden van deze leerpunten binnen het team, de kazerne of de gehele organisatie. In dit vervolgproces zullen enkele stappen worden uitgelegd en de betrokken partijen en keuzemogelijkheden zullen worden beschreven. De acties die ondernomen dienen te worden in het vervolgproces zijn gebaseerd op resultaten uit een onderzoek naar leren van incidenten en hoe dit geïmplementeerd kan worden binnen Brandweer Twente. Deze resultaten zijn daarna gekoppeld aan verschillende ideeën vanuit de literatuur. Als laatste zal er aandacht worden besteed aan enkele aanbevelingen die in de toekomst gebruikt kunnen worden om het vervolgproces van nabespreken verder te ontwikkelen. Hierdoor kan het lerende karakter van Brandweer Twente geoptimaliseerd worden waardoor er nog meer diepgang komt in het leren van incidenten.

Het evalueren van incidenten kan op twee verschillende manieren gedaan worden. Ten eerste kan het gedaan worden om te beoordelen of de goede keuzes gemaakt zijn, het verantwoordelijkheidsvraagstuk te beantwoorden en om te garanderen dat zulke incidenten verminderd kunnen worden in de toekomst. Ten tweede kan een evaluatie gedaan worden om leerpunten die voortkomen uit het incident te behandelen en te leren van de incidenten. Door deze leerpunten duidelijk te krijgen en teams te ondersteunen in hun ontwikkeling kan de organisatie een bijdrage leveren aan het voorkomen van toekomstige incidenten en het in praktijk brengen van de geleerde lessen. Deze manier van evalueren draagt bij aan het lerende karakter binnen brandweer Twente en is leidend in het vervolgproces dat behandeld wordt in dit handboek. Het is echter ook van belang om naast het hebben van het juiste evaluatiedoel te letten op hoe dit proces van evalueren om te leren van incidenten ingericht dient te worden. De leerpunten die naar boven komen na een incident moeten behandeld worden om in de toekomst de inzet te veranderen met kennis uit het verleden. Deze leerpunten dienen, met ondersteuning vanuit de organisatie, uitgewerkt te worden waarbij het team/individu centraal staat en er terugkoppeling is. Binnen een organisatie zijn er enkele factoren die een rol spelen in hoeverre het leren van incidenten efficiënt is en gebruikt wordt door de werknemers. Om het leren van incidenten te ondersteunen is het van belang dat dit in een veilige omgeving gebeurt waarin informatie en gebeurtenissen gedeeld kunnen worden zonder dat er oordelen geveld worden. Daarnaast dienen de vragen gericht te zijn op het ontwikkelen en professionaliseren van de medewerkers en speelt hiërarchie in dit proces een ondergeschikte rol om kennis en ervaringen van alle medewerkers boven tafel te krijgen. De structuur en het klimaat dat bestaat binnen een organisatie kunnen deze veilige omgeving stimuleren waardoor het voor medewerkers gemakkelijker wordt om ervaringen te delen. Binnen dit vervolgproces spelen zowel de incidenten die goed verliepen als de incidenten die niet goed verliepen een belangrijke rol. Naast dat het belangrijk is om alle incidenten die leerpunten hebben te bespreken en eventueel te delen, hebben incidenten waar het verloop niet ideaal was ook leerpunten die, als ze besproken worden, kunnen leiden tot een betere inzet bij toekomstige incidenten waardoor deze incidenten beter zullen verlopen. Als laatste is het gedurende het gehele vervolgproces belangrijk dat de nadruk ligt op het lerende karakter en dat dit proces de focus legt op de gezamenlijke doelen en leerpunten die uit het incident naar voren komen. Dankzij deze probleemoplossende aanpak kunnen leerpunten goed behandeld worden en wordt de bureaucratische gang van zaken zoveel mogelijk vermeden.

Op de volgende pagina is een schematische weergave gemaakt van de stappen die plaatsvinden tijdens het vervolgproces en die volgen op enkele beslissingsmomenten die onderdeel zijn van het vervolgproces. In dit vervolgproces zijn naast enkele beslissingsmomenten ook andere belangrijke onderdelen weergegeven. Deze zullen hieronder worden toegelicht met een korte uitleg.
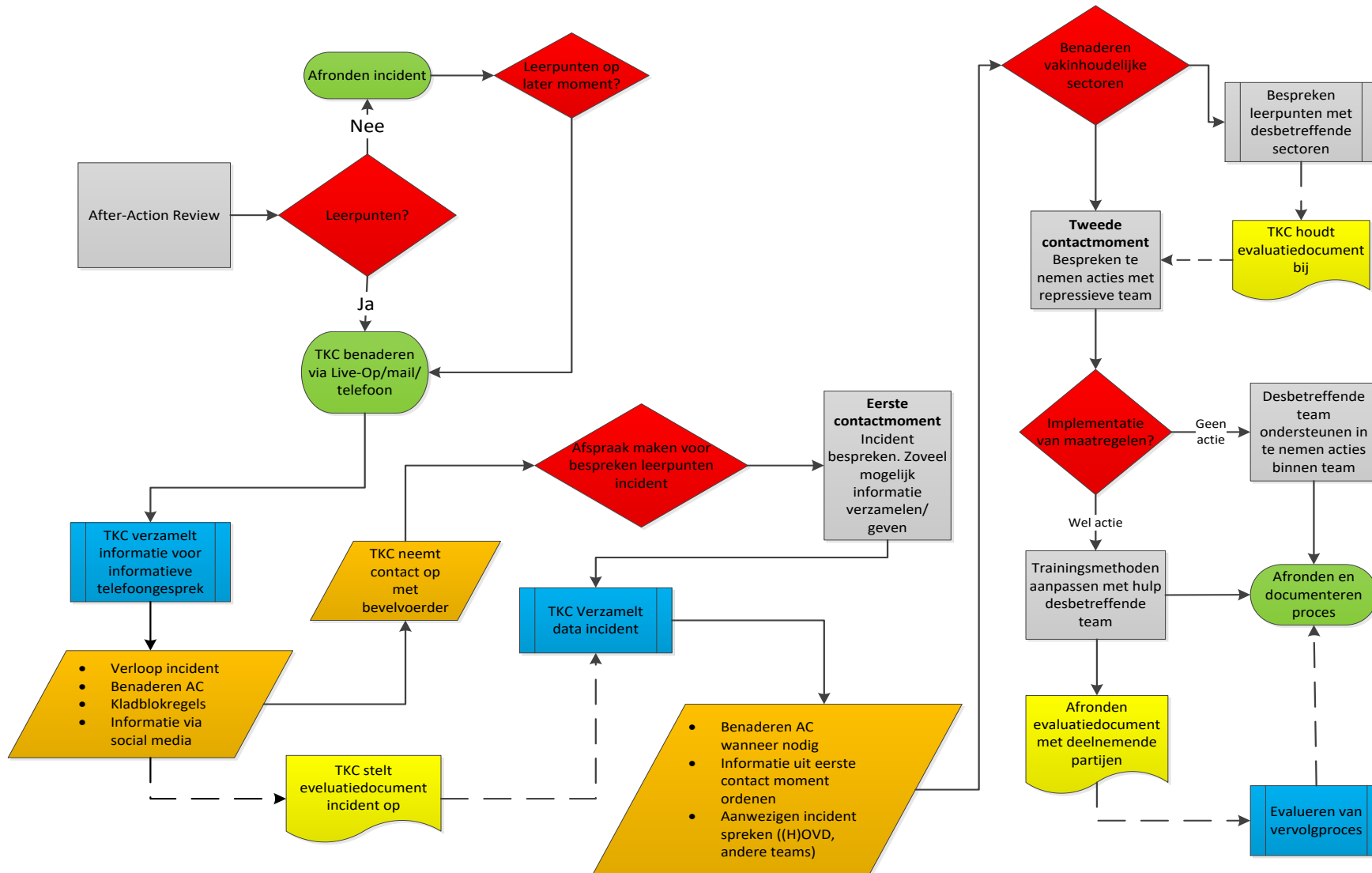
Start- en eindpunt	*Deze figuren geven aan dat er een start- of eindpunt is van een proces of deelproces*
Proces	*Deze figuren geven aan dat er aan een proces begonnen is en dat er in dit proces verschillende stappen ondernomen worden*
Beslissing	*Deze figuren geven aan dat er een beslissing genomen moet worden die het vervolgproces beïnvloeden.*
Deelproces	*Deze figuren geven aan dat er een onderdeel van een lopend proces plaatsvindt waarin ondersteuning geboden worden aan het overkoepelende proces*
Data verzamelen	*Dit figuur geeft aan dat er door TKC of een andere partij data verzameld wordt ter ondersteuning van een lopend proces of deelproces*
Document opstellen	*Dit figuur geeft aan dat er een document wordt opgesteld of een document wordt aangepast met nieuwe informatie/data die verzameld is*

Tabel 1. Legenda schematische weergave vervolgproces.

In het gehele vervolgproces is het van belang dat zowel het team dat met de leerpunten naar voren komt als de verscheidene mensen die betrokken worden vanuit de organisatie en onderdeel zijn van dit vervolgproces zich richten op een zo goed mogelijk verloop van dit proces. Hiervoor is het van belang dat gedurende dit gehele proces gelet wordt op:

- Het bieden van adequate ondersteuning vanuit de organisatie waardoor het lerende karakter van de brandweer wordt vergroot;
- Het creëren van een veilig klimaat waarin kennis en ervaringen gedeeld kunnen worden en waarin dit op een waardeoordeelvrije manier gedaan kan worden;
- Het instellen van een open informatiesysteem waardoor informatie, kennis en ervaringen goed kunnen worden overgebracht en dat de terugkoppeling hierop ook weer terugkomt bij het team;
- Het focussen op zowel incidenten met een goede afloop als incidenten met een mindere/slechte afloop waardoor deze kennis ook gebruikt kan worden om van te leren;
- Het betrekken van repressieve teams in het gehele vervolgproces aangezien zij diegene zijn die met leerpunten komen en deze leerpunten willen gebruiken om toekomstige incidenten te verminderen;
- Het minimaliseren van hiërarchie gedurende dit vervolgproces aangezien dit een negatieve werking heeft op het delen van informatie, kennis en ervaringen en niet leidt tot de gewenste resultaten.

Als bovenstaande punten meegenomen worden in het vervolgproces en aandachtig wordt gekeken naar de juiste implementatie van deze punten zal het vervolgproces leiden tot een toename in het lerende karakter van brandweer Twente en zal er vanuit de teams een grotere welwillendheid ontstaan tegenover het delen van incidenten om hiervan te leren.

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Figuur 1. Schematische weergave vervolgproces

After action review

In dit hoofdstuk zal kort worden toegelicht wat de After Action Review is en welke vragen hierin zijn opgenomen. Vervolgens zal er worden toegelicht wat het doel van de After Action Review is. Het hoofdstuk zal worden afgesloten met een checklist zodat er geen stappen vergeten worden.

Een After Action Review (AAR) is een handige manier om, na de inzet met je team, ervaringen en inzichten te delen om jezelf te *ontwikkelen* en *te leren* om de inzet bij toekomstige incidenten te verbeteren. Deze nabespreking zal aan de hand van vijf slimme, waardeoordeelvrije vragen uitgevoerd worden. Een AAR zorgt voor het systematisch en gestructureerd verzamelen van nieuwe kennis en ervaringen, zodat kennis en ervaringen binnen het team beter (her)gebruikt kunnen worden. Het doel van een AAR is om het lerende karakter van de brandweer te ondersteunen en te bevorderen. Dit betekent dat de AAR dient als *leermiddel* en niet als verantwoording. Hierdoor kunnen *persoonlijke inzichten en ervaringen* vertaald worden naar het teamverband zodat het gehele team zich kan *ontwikkelen* op de basis van verschillende individuele ervaringen. Een AAR dient na elk incident, hoe kleinschalig ook, uitgevoerd te worden. Echter, de duur en impact van de AAR kunnen verschillen aangezien elk incident anders is en er geen blauwdruk is voor incidenten en dus ook niet voor de precieze uitvoering van de AAR. De AAR is dus het beginpunt van het proces leren van incidenten en zorgt ervoor dat dit proces naar goed gaat verlopen.

Onderstaande vragen vormen de basis voor het nabespreken:
1. **Wat was het plan?**
    Reconstrueer met elkaar de kernpunten van het plan, strategie, tactiek, met welke risico's hielden we rekening, geldende protocollen, alsmede de tijdlijn.

2. **Wat is er werkelijk gebeurd?**
    Reconstrueer met elkaar wat er daadwerkelijk gebeurd is tijdens de inzet of de activiteit. Inventariseer, cluster en plaats ze in volgorde van belangrijkheid en probeer hierbij ook de tijdlijn in de gaten te houden. Hierbij kunnen de onderstaande vragen helpen:
    a. Wat hebben jullie gedaan/opgeleverd waar jullie trots op zijn?
    b. Wat waren de grootste teleurstellingen, tegenvallers en problemen?

3. **Waarom gebeurde het?**
    Analyseer de "belangrijkste" overeenkomsten en de verschillen tussen het plan en de werkelijke gebeurtenissen en zoek naar het waarom daarvan. Hierbij kunnen de onderstaande vragen helpen:
    a. Wat werkte en waarom?
    b. Wat ging moeizaam en waarom?
    c. Wat werkte niet en waarom?

4. **Wat kunnen wij als team van deze ervaring leren?**
    Stel als team de vraag wat je op basis van deze ervaring leert en een volgende keer kunt gebruiken. Richt je hierbij zowel op wat wel werkte als wat niet werkte. Het is pas een les als de waaromvraag beantwoord is! Waaromvragen die in het team niet opgelost kunnen worden, zijn ook een geleerde les

5. **Zijn er eventueel leerpunten die we met anderen willen delen?**
    Bedenk welke leerpunten of ervaringen je als team zou willen meegeven aan andere (vergelijkbare) teams of aan de rest van de organisatie.

Deze nabespreking is niet gericht op het maken van fouten en het beoordelen van mensen. In deze nabespreking ligt de aandacht vooral op acties die niet perfect uitgevoerd zijn en waar eventueel nog andere, betere opties voor waren. Het gaat hier dus om toegeven dat een incident/inzet niet perfect is verlopen en dat er verbetering mogelijk is. Daarnaast zijn inzetten/incidenten die helemaal volgens plan verlopen en waarin alles goed gegaan is ook belangrijk om te delen met anderen. Hierdoor kan worden gedeeld wat er tijdens een incident/inzet gebeurd is en kan er nuttige informatie naar voren komen die ook van pas kan komen binnen andere teams/kazernes.

Aan de hand van vraag vijf kan er door de bevelvoerder in de live-op aangegeven worden of er ondersteuning nodig is bij het uitwerken van leerpunten voor het team zelf, dan wel andere teams of de gehele organisatie. Dit zal gebeuren door een pop-up vraag in de live-op:

Zitten er in dit incident leerpunten voor jou collega's bij brandweer Twente?
(Ja/Nee)

Aan de hand van het antwoord op deze vraag zal het vervolgproces worden gestart. Gedurende dit proces zal duidelijk worden hoe de leerpunten geïmplementeerd kunnen worden en op welk niveau dat zal zijn (team, kazerne(s) of regio).

Checklist
- Is er een nabespreking geweest?
- Heeft iedereen hier zijn/haar mening kunnen geven zonder dat de bevelvoerder alleen aan het woord was?
- Zijn hier leerpunten naar voren gekomen die opgelost dienen te worden?
- Is voor het oplossen van deze leerpunten ondersteuning nodig?

Vervolgproces

In dit hoofdstuk zal worden toegelicht hoe het vervolgproces vorm gegeven is en wat verwacht wordt van de verschillende partijen die onderdeel zijn van dit vervolgproces. Verder zal de nadruk liggen op gebeurtenissen die plaatsvinden gedurende het vervolgproces waarin een of meerdere partijen een keuze moeten maken die van invloed is op het vervolgproces en deze keuze ook bespreken met de betrokken partijen. Verschillende paragrafen zullen worden afgesloten met een checklist zodat er geen stappen vergeten worden.

Na afloop van het uitvoeren van de AAR en het aangeven dat er leerpunten naar voren zijn gekomen tijdens een incident, komt dit terecht bij Team Kenniscentrum (TKC). Zij zullen in het proces van leren van incidenten fungeren als coördinator van het lerend vermogen en faciliteren het vervolgproces. Dit betekent dat:

- TKC zorg draagt voor het verzamelen van alle nodige informatie voor het **eerste contact met de bevelvoerder van het desbetreffende team**;
- TKC tijd gaat besteden aan het beantwoorden van alle vragen die naar voren komen uit de incidenten;
- Het initiatief om het vervolgproces van leren van incidenten in te gaan, ligt bij repressie en TKC fungeert als **facilitator** in het proces van leren van incidenten.
- TKC een **coördinator lerend vermogen/leeragentschap** aanstelt die verantwoordelijk is voor het proces van leren van incidenten binnen brandweer Twente;
- TKC bijdraagt aan het lerende klimaat tijdens het vervolgproces door de hiërarchie te minimaliseren en

Gedurende het verdere verloop van het vervolgproces zal TKC zorg dragen dat zoveel mogelijk informatie boven tafel komt en dat de juiste onderdelen/personen binnen de brandweerorganisatie worden benaderd en betrokken in het proces. Dit betekent dat er mensen worden betrokken in het vervolgproces die de juiste vakinhoudelijke kennis hebben en dat deze personen ook daadwerkelijk de leerpunten ter uitvoering kunnen brengen. TKC dient ervoor te zorgen dat er gedurende het gehele vervolgproces terugkoppeling wordt verzorgd aan de betrokken teams en dat er een goede stroom van informatie ontstaat. Door TKC deze faciliterende rol te geven dragen zij zorg voor een toegankelijke manier van leren van incidenten die vanuit de organisatie ondersteunt wordt en hierdoor bijdraagt aan het creëren van een lerende cultuur in brandweer Twente. Deze manier van ondersteuning zal ertoe leiden dat incidenten waaruit leerpunten naar voren komen eerder gedeeld worden met de organisatie aangezien dit proces zich volledig richt op leren en ontwikkelen waarin de teams leidend zullen zijn. Dit zal er mede voor zorgen dat teams en personen eerder bereid zijn om hun ervaringen en kennis te delen om hiermee zichzelf en eventueel de organisatie verder te ondersteunen.

Informatief telefoongesprek

Gedurende het informatieve telefoongesprek vanuit TKC naar de bevelvoerder van het desbetreffende team, zal duidelijk worden hoe het vervolgproces eruit zal gaan zien. Dit contactmoment zal plaatsvinden binnen twee werkdagen nadat het incident is binnengekomen bij TKC. Om dit contactmoment als waardevolle basis te kunnen gebruiken, dient TKC informatie te verzamelen om de juiste vragen te kunnen stellen en vast te stellen hoe grootschalig het vervolgproces ingericht dient te worden. Hiervoor zal TKC enkele stappen moeten uitvoeren:

- Het verloop van het incident vaststellen door het VP te raadplegen;
- Kladblokregels gebruiken voor informatie;
- Raadplegen AC voor verdere informatie;
- Eventueel informatie verzamelen die op sociale media is gepost.

Aan de hand van deze informatie kan TKC al enkele vragen opstellen met wat achtergrondinformatie zodat er sneller tot vervolgactie kan worden over gegaan, mocht dat nodig zijn. Met enkele gerichte vragen en de input van de bevelvoerder en zijn/haar uitkomsten van de AAR kan er gedurende het telefoongesprek gezamenlijk tot een passende oplossing gekomen worden. Aan de hand van dit contactmoment wordt er een afspraak gemaakt om samen met het team alle informatie betreffende de leerpunten die voort zijn gekomen uit het incident te bespreken. Gedurende dit moment, dat zal plaatsvinden op een trainingsavond of eerder vastgesteld moment wanneer het team al bij elkaar is, kan zoveel mogelijk informatie boven tafel komen om het vervolgproces, ook wanneer het kleinschalig is en voornamelijk voor het team, zo passend mogelijk te maken. Voor dit eerste

contactmoment en het verzamelen van alle informatie met het team daaropvolgend is het belangrijk dat er aan enkele voorwaarden wordt voldaan:

- Binnen twee werkdagen contact opnemen met bevelvoerder van desbetreffende incident
- Informatie verzamelen met betrekking tot incident;
    - o Incident rapport in VP;
    - o Kladblokregels AC & eventuele navraag bij AC/centralist over het incident;
    - o Beeldmateriaal, mediaberichten, berichten op sociale media
- Informatie ordenen en vragen opstellen voordat contact wordt opgenomen met desbetreffende bevelvoerder;
- Telefoongesprek bevelvoerder en plannen eventuele nieuwe afspraak voor het verkrijgen van informatie van bevelvoerder en waar nodig leden van zijn/haar team. In dit gesprek en het eventuele vervolg daarop worden de feiten boven tafel gehaald en gekoppeld/vergeleken met de verzamelde informatie;
- Laagdrempelige vragen, weten bij welke persoon je moet zijn en z.s.m. reactie als er vraag is naar het vervolgproces;
- Focus op leren met verantwoordingsproces als bijproduct.

Actielijst

Om het eerste contactmoment tussen de bevelvoerder en TKC goed en soepel te laten verlopen zijn er enkele acties vereist die dit mogelijk maken. Deze worden hieronder genoemd.

Voor de bevelvoerder
- AAR uitvoeren met gehele team en diepgang creëren in gegeven informatie;
    - o Focussen op **open informatiesysteem** door zoveel mogelijk informatie boven tafel te krijgen en elk lid van het team zijn/haar verhaal te laten doen met betrekking tot het incident/de inzet;
    - o Geen **hiërarchie** in nabespreking om zoveel mogelijk informatie van alle teamleden te ontvangen;
    - o Niet focussen op **fouten** of het aanwijzen van een **schuldige** maar op momenten die **verbeterd zouden kunnen worden;**
    - o Stimuleren van teamleden door geven van **feedback & coaching;**
    - o Ook aangeven wat er vanuit **eigen perspectief** goed ging en wat beter kan.
- Liever te veel incidenten met leerpunten dan het missen van incidenten die belangrijk kunnen zijn voor de organisatie.

Voor TKC
- Benodigde informatie verzamelen met betrekking tot het incident
    - o **Kladblokregels**, informatie AC, **sociale media** & informatie VP
    - o Gevonden informatie delen met bevelvoerder in het gesprek om zo meer duidelijkheid te verschaffen
- Vragen opstellen die kunnen leiden tot verdere contactmomenten
    - o Juist inschatten impact incident door stellen van **waardeoordeelvrije vragen;**
    - o Hierdoor zullen bevelvoerders zich openstellen en zal er ruimte ontstaan om **problemen te bespreken**;
    - o Koppelen informatie incident aan andere **vergelijkbare incidenten**

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Checklist

- Is alle informatie geraadpleegd voor uitvoering eerste contactmoment?
- Is de informatie gekoppeld aan vergelijkbare incidenten uit het verleden?
- Contact opgenomen binnen twee werkdagen na het incident?
- Is er een vervolgafspraak gemaakt of zijn de leerpunten al behandeld/weggezet in de organisatie?

Eerste contactmoment

Het eerste contactmoment zal plaatsvinden naar aanleiding van de uitkomsten van het telefoongesprek (dat als eerste (informatieve) contactmoment diende). Hierin is een datum afgesproken waarop de verantwoordelijke persoon vanuit TKC langsgaat bij het desbetreffende repressieve team of de bevelvoerder om het verloop van het incident en de inzet in meer detail te horen. Dit moment dient bij voorkeur binnen twee weken na afloop van het eerste contactmoment plaats te vinden. Hierdoor is er voldoende tijd voor TKC om informatie te verzamelen maar is het toch nog kort na het incident zodat het repressieve team de kennis omtrent het incident nog paraat heeft. Daarnaast zal de verantwoordelijke persoon vanuit TKC waardeoordeelvrije vragen stellen die tot meer diepgang omtrent het incident kunnen leiden. Hierdoor wordt het duidelijk waar de leerpunten zich precies bevinden en hoe deze, door ondersteuning vanuit andere onderdelen binnen Brandweer Twente, zo effectief mogelijk kunnen worden opgelost. Aan de hand van de uitkomsten van dit contactmoment gaat TKC aan de slag met het ordenen van alle informatie, eventueel het koppelen van de informatie aan andere vergelijkbare incidenten en het benaderen van personen met vakinhoudelijke kennis die ondersteuning kunnen bieden bij het plaatsen van de leerpunten in de contextuele setting. Hierin is het van belang dat er terugkoppeling is naar het desbetreffende team om zo een open informatiesysteem te creëren waardoor het team op de hoogte is van de ontwikkelingen. Daarnaast kunnen deze personen met vakinhoudelijke kennis deelnemen aan het vervolgproces om zo meer duidelijkheid te verschaffen en om het incident/de inzet de aandacht te geven die nodig is. In samenspraak met het desbetreffende repressieve team zal de contactpersoon vanuit TKC de verzamelde informatie bespreken en aangeven welke personen volgens hem/haar waarde toevoegen aan het uitvoeren van de leerpunten. Als het repressieve team bepaalde personen graag als onderdeel wil van het vervolgproces kan dat besproken worden met TKC en wordt hierin een keuze gemaakt. Hierna zal het proces zich verder richten op het creëren van veilig leerklimaat waar inhoudelijk kan gesproken worden over oplossingen die zich richten op het incident/de inzet van het team en hoe breed deze oplossing binnen Brandweer Twente verspreid kan worden.

Actielijst

Om het eerste contactmoment tussen TKC en het repressieve team en/of de bevelvoerder soepel te laten verlopen, is hieronder een korte actielijst gemaakt die weergeeft wat de verwachtingen zijn.

Voor de bevelvoerder/het repressieve team
- Eventueel nieuwe informatie is gedeeld met TKC;
  - Focussen op **open informatiesysteem**;
  - Geen **hiërarchie** in contactmoment met TKC en repressieve team;
- Proces is gericht op **leren en ontwikkelen**;
- **Goed verlopen incidenten** delen vereist ook tijd die de organisatie kan ondersteunen in het proces van professionalisering.

Voor contactpersoon TKC
- Benodigde informatie ordenen zodat er een duidelijk verhaal ontstaat;
  - Leerpunten kunnen zo beter behandeld/weggezet worden door/in de organisatie;
- Vragen opstellen die kunnen leiden tot verdere contactmomenten;
  - Juist inschatten impact incident door stellen van **waardeoordeelvrije vragen;**
  - Koppelen informatie incident aan andere **vergelijkbare incidenten;**
- **Terugkoppeling** is essentieel om leren van incidenten te bespoedigen;
- **Waardering** laten blijken voor goede uitvoering AAR en het vervolgproces vanuit repressieve teams;
- **Eigenaarschap** dient te blijven bij repressieve teams;
  - Neem ze mee bij alle belangrijke beslissingen gedurende het proces;
  - Laat voorkeuren vanuit repressieve teams met betrekking tot vakinhoudelijke personen niet links liggen;
  - Afspraken maken die vallen binnen al bestaande bijeenkomsten van teams zullen verloop vervolgproces **ondersteunen en stimuleren.**

Checklist
- Zijn de uitkomsten naar aanleiding van het eerste contactmoment besproken/teruggekoppeld aan het repressieve team?
- Heeft het repressieve team inspraak gehad in het aanstellen van vakinhoudelijke personen voor het borgen van de leerpunten?
- Is de informatie gekoppeld aan vergelijkbare incidenten uit het verleden?
- Is er duidelijk gemaakt hoe het verdere verloop er uit gaat zien?
- Is er een vervolgafspraak gemaakt of zijn de leerpunten al behandeld/weggezet in de organisatie?

Tweede contactmoment

Naar aanleiding van het informatieve telefoongesprek en het eerste contactmoment gaat de contactpersoon van TKC aan de slag met het ordenen van de verzamelde informatie en het inschakelen van de benodigde expertise om het repressieve team zo goed mogelijk te ondersteunen. Door de informatie die verzameld is in het informatieve telefoongesprek en het eerste contactmoment heeft de contactpersoon van TKC een duidelijk beeld van de potentiële leerdoelen en welke ondersteunende vakinhoudelijke sectoren een toegevoegde waarde kunnen zijn in het vervolgproces voor leren van incidenten. Vervolgens gaat de contactpersoon van TKC aan de slag met het bespreken van de leerdoelen binnen de desbetreffende vakinhoudelijke sectoren zodat er een plan kan worden opgesteld om de leerdoelen van het repressieve team te behandelen en te implementeren in de trainingsmogelijkheden. Daarnaast kan er met de kennis vanuit de vakinhoudelijke sectoren gekeken worden naar hoe breed de implementatie van de leerdoelen moet zijn (team-, kazerne-, regio- of organisatieniveau).

Tegen het einde van het proces waarin de contactpersoon van TKC in overleg gaat met de vakinhoudelijke sectoren over implementatie van de leerdoelen, wordt een tweede contactmoment ingepland met de bevelvoerder van het repressieve team/het gehele repressieve team. Hierin zal besproken worden welke vakinhoudelijke sectoren/personen benaderd zijn die gaan meedenken over de implementatie van de leerdoelen. Dit dien uitvoerig besproken te worden met het repressieve team aangezien zij zich prettig moeten voelen over de kennis en informatie die gedeeld gaat worden om de leerdoelen te implementeren. Waar nodig kan het repressieve team de behoefte uitspreken om bepaalde personen te betrekken of juist niet te betrekken in het vervolgproces om zo een veilig leerklimaat te garanderen. Aan de hand van deze stappen zal de implementatie van de leerdoelen vorm krijgen en dit zal mede bepalen hoe het vervolgproces er verder uit komt te zien met betrekking tot de tijdsduur van het vervolgproces en de breedte van implementatie.

Actielijst

Om het tweede contactmoment tussen TKC en het repressieve team en/of de bevelvoerder soepel te laten verlopen, is hieronder een korte actielijst gemaakt die weergeeft wat de verwachtingen zijn.

Voor de bevelvoerder/het repressieve team
- Extra informatie doorgeven aan de contactpersoon van TKC mocht dit bijdragen aan het vervolgproces;
- Open staan voor inzichten vanuit vakinhoudelijke sectoren/personen;
  o Vertrouwenspersonen krijgen veel kennis boven tafel maar stellen niet altijd de juiste vragen vanwege de vertrouwensband;
- Ruimte en tijd geven aan contactpersoon TKC om vakinhoudelijke sectoren/personen te benaderen om implementatie van de leerdoelen zo effectief mogelijk te laten zijn.

Voor contactpersoon TKC
- Benaderen van relevante vakinhoudelijke sectoren/personen;
  o Informatie vragen binnen organisatie voor benadering juiste personen;
  o Tijdig beginnen met benaderen personen;
- Repressieve team voorzien van terugkoppeling over verloop proces en wat de planning is met betrekking tot volgende stappen in proces;
- Schetsen van een tijdspad voor het repressieve team met betrekking tot implementatie leerdoelen.

> ***Checklist***
> - Heeft de contactpersoon van TKC alle benodigde informatie voor het benaderen van de ondersteunende vakinhoudelijke sectoren?
> - Heeft het repressieve team nog extra informatie voor de contactpersoon van TKC?
> - Hebben de leden van het repressieve team nog verzoeken met betrekking tot het benaderen van personen binnen de vakinhoudelijke sectoren?
> - Zijn alle benodigde vakinhoudelijke sectoren/personen benaderd en is er tijd voor het implementeren van de leerdoelen?
> - Voldoende terugkoppeling geven aan repressieve team over verloop proces.

Einde vervolgproces

Het vervolgproces omvat alle acties die genomen dienen te worden om de leerpunten die voortkomen uit de AAR te verwerken en terug te koppelen aan het desbetreffende team en eventueel daarbuiten. Het vervolgproces zal ten einde komen wanneer een of meerdere van de volgende uitkomsten zijn bereikt:

- De desbetreffende leerpunten zijn opgelost door het team zelf tijdens het vervolgproces en er geen verdere aanpassingen nodig zijn in trainingsmethoden;
- De leerpunten besproken zijn met het desbetreffende team en hiervoor een bestaande trainingsmethode is gebruikt om de leerpunten te behandelen;
- De leerpunten uit de AAR zijn verwerkt in traingingsmethoden voor het team, de kazerne(s) of de gehele brandweer in de regio Twente;
- De desbetreffende leerpunten vaker zijn geconstateerd en hierdoor worde nieuwe trainingsmethodes ontwikkeld die gaan dienen als training voor het voorkomen van desbetreffende gebeurtenissen.

Om tot een goed en waardevol eind van het vervolgproces te komen, is terugkoppeling van de te ondernemen acties cruciaal. Zelfs als er geen actie wordt ondernomen voor toekomstige implementatie van de uitkomsten, dient dit teruggekoppeld te worden naar het team waar deze leerpunten vandaan kwamen. Echter, dient er voor dit team altijd een trainingsmoment te zijn waarin de leerpunten worden besproken en er een oplossing voor gevonden wordt. Dit zal vaak de vorm hebben van een kleinschalig trainings- en/of informatiemoment waarin het incident behandeld wordt en toekomstige acties besproken worden. Eventueel in samenwerking met vakspecialisten voor het betreffende incident.

Na afloop van het vervolgproces kan er nog de mogelijkheid zijn om aan te geven hoe het vervolgproces verlopen is volgens het desbetreffende team en alle partijen die deelgenomen hebben in het hele proces. Zo kan het vervolgproces verbeterd worden zodat het toekomstige gebruik wordt versoepeld en het leren van incidenten efficiënter kan verlopen. Deze procesevaluatie zal vanuit TKC geïnitieerd worden en alle deelnemende partijen zal gevraagd worden om hun mening te geven. Dit is vrijblijvend en geen verplichting. Echter, meningen vanuit repressie zullen worden meegenomen om het proces te verbeteren. Dit kan bijdragen aan toekomstige uitvoeringen van het vervolgproces voor het team zelf of andere repressieve teams van Brandweer Twente.

Conclusie

In de conclusie zal kort worden toegelicht wat de toegevoegde waarde is van het vervolgproces en waarom dit de repressieve teams kan ondersteunen in het leren van incidenten en deze geleerde kennis ook kunnen gebruiken tijdens toekomstige inzetten.

In dit handboek is op een concrete en overzichtelijke manier weergegeven het vervolgproces na het nabespreken van een incident eruitziet. Daarnaast is in dit handboek de nadruk gelegd op het bieden van ondersteuning aan de repressieve teams met betrekking tot het zo adequaat mogelijk uitvoeren van de dagelijkse werkzaamheden die zij verrichten. Een belangrijk onderdeel hierin is dat de repressieve teams eigenaar blijven van de kennis die naar voren komt tijdens nabesprekingen en het vervolgproces en dat zij ook inspraak hebben in hoe de uitkomsten van het vervolgproces gedeeld worden binnen de organisatie. Dit richt zich vooral op het feit dat de aanwezigheid tijdens een incident cruciaal is voor het leren van incidenten en daarmee ook een belangrijke vereiste is als het gaat om de uitkomsten van het incident.

Dit handboek vormt een beginpunt in het erkennen, overzichtelijk maken en structuren van leerpunten die naar voren komen bij incidenten. Daarnaast gaat het in dit handboek vooral over de kleinere incidenten die zich voordoen aangezien deze vaker voorkomen en daarmee het potentieel bieden om leerpunten te gebruiken in toekomstige, vergelijkbare inzetten. Hierdoor is het mogelijk om deze leerpunten te gebruiken om trainingen/oefeningen in te richten op de specifieke wensen van teams, kazernes of de gehele repressieve organisatie binnen Brandweer Twente. Dit kan bijdragen aan de professionele groei van de organisatie en ontwikkeling van een lerende organisatie. Dit betekent dat het vervolgproces zich niet richt op de goede/foute afhandeling van inzetten of gebeurtenissen maar om het erkennen van een niet ideale situatie die gebruikt kan worden om toekomstige inzetten optimaler te laten verlopen.

In conclusie kan dit handboek de opmaat zijn voor het ontwikkelen van passendere trainingen die zijn ingericht op verschillende regio specifieke wensen die voortkomen uit inzetten/incidenten die zich voorgedaan hebben in de desbetreffende regio. Hierdoor ontstaat er leren van incidenten dat op maat is gemaakt voor de desbetreffende teams/kazernes. Dit zal uiteindelijk leiden tot een algehele groei van het potentieel van Brandweer Twente en voor een vermindering van het aantal incidenten, slachtoffers en gevaarlijke situaties.

Aanbevelingen

In deze laatste paragraaf zal de nadruk liggen op enkele aanbevelingen die het vervolgproces in de toekomst kunnen verbeteren en kunnen bijdragen aan een efficiënter verloop van het vervolgproces. Daarnaast zullen deze aanbevelingen bijdragen aan de benodigde verbetering die essentieel is om mee te gaan met het constant veranderende klimaat en omstandigheden binnen Brandweer Twente en haar verzorgingsgebied.

Het vervolgproces laat duidelijk zien dat het belangrijk is om het repressieve team eigenaar te laten zijn van het proces en de uitkomsten hiervan op regelmatige termijn met hen te bespreken. Dit dient in de toekomst niet anders te zijn en wellicht zou er, naarmate het vervolgproces meer onderdeel wordt van de dagelijkse werkzaamheden, meer verantwoordelijkheid gegeven kunnen worden aan de repressieve teams. Hierbij kan gelet worden op het vergroten van de capaciteiten die bevelvoerders hebben waardeoordeelvrije vragen te stellen die al meer informatie over de leerdoelen naar boven haalt. Dit zal bijdragen aan het bespoedigen van het vervolgproces waardoor de incidenten sneller kunnen leiden tot eventuele aanpassingen die voor komen uit de leerdoelen die boven tafel komen na incidenten.

Het repressieve team eigenaar laten blijven van de kennis die naar voren komt en de uitkomsten van het vervolgproces draagt bij aan het efficiënter maken van het vervolgproces maar er zijn meer opties om dit proces te bespoedigen. Allereerst kunnen de brandonderzoekers binnen Brandweer Twente een belangrijke rol spelen tijdens het incident zelf maar ook na afloop. Zij kunnen tijdens het incident brandgedrag observeren en hiermee een toevoeging zijn voor het nabespreken en het eventuele vervolgproces dat hierna ingegaan wordt. Dankzij de expertise van brandonderzoekers zal er de mogelijkheid zijn om dieper in te gaan op de gebeurtenissen tijdens een incident en kan er eerder vastgesteld worden wat de leerdoelen zijn die na afloop van een incident naar voren komen. Hierdoor leveren brandonderzoekers tijdens het incident en tijdens het vervolgproces een bijdrage aan het verhogen van de kenniscapaciteit van Brandweer Twente. Verder kan dit bijdragen aan het inzichtelijk maken van eventuele vervolgstappen die genomen dienen te worden in het vervolgproces zoals het benaderen van kerngroep brand en de expertise die in deze groep zit kan dan eerder worden ingezet.

De toekomstige toegevoegde waarde van leren van incidenten ligt in de leerpunten van incidenten die bijdragen aan het verbeteren van de inzet tijdens incidenten en het. Dit kan door te kijken naar de urgentie, het handelingsperspectief en de sociale norm die gehanteerd wordt. Het beoordelen van de urgentie van een incident aan de hand van eerdere, soortgelijke incidenten of de impact van het huidige incident kan van invloed zijn op de te nemen acties en de te benaderen personen in het vervolgproces. Daarnaast is het belangrijk om het handelingsperspectief in kaart brengen door te kijken naar wat de mogelijke uitkomsten van een vervolgproces kunnen zijn en hierop inspelen tijdens inrichting en uitvoering van vervolgproces. Hierdoor wordt het vervolgproces concreter en kan dit in een sneller en effectiever tempo worden uitgevoerd. Dit draagt bij aan de welwillendheid van repressieve mensen, beroeps of vrijwilliger, aangezien er sneller kan worden teruggekeerd naar het praktisch inzetten van de geleerde punten. Als laatste is de sociale norm van belang. De sociale norm richt zich op de mate van kennisdelen en de cultuur leren van incidenten en hoe de organisatie deze ontwikkeling in de gaten kan houden en veranderingen kan bijhouden. Dit kan worden gebruikt om te kijken hoe de organisatie zich ontwikkeld en kan ondersteuning bieden aan werknemers binnen de organisatie die zijn/haar twijfels hebben bij de gekozen richting.

Naast de inbreng van brandonderzoekers kan er ook per kazerne/regio een lijst worden opgesteld met mensen die kennis van zaken hebben en die door het team/kazerne als vertrouwenspersoon gezien worden. Deze persoon kan tijdens het incident al belangrijke informatie verzamelen die ervoor zorgt dat het vervolgproces efficiënter en daadkrachtiger zal verlopen. Deze persoon kan een belangrijke schakel vormen tussen de contactpersoon van TKC en het repressieve team tijdens het vervolgproces.

Als laatste is het belangrijk dat er door gebruik van het vervolgproces structuur en systematiek wordt toegevoegd aan het bestaande proces van nabespreken en leren van incidenten. Hierdoor zal het proces van leren van incidenten, dankzij de laagdrempelige, open en veilige manier van implementatie, meer ingebed worden in de dagelijkse gang van zaken en kan het volledige potentieel benut worden. Hierdoor zal Brandweer Twente zich ontwikkelen en vormt de repressieve kern de basis voor deze ontwikkeling.