An Incident Reporting, Investigation and Analysis Procedure for the Saint Croix National Scenic Riverway

by

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A Research Paper
Submitted in Partial Fulfillment of the
Requirements for the
Master of Science Degree
in

Risk Control

Approved: 3 Semester Credits

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March, 2011

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Title: ***An Incident Reporting, Investigation and Analysis Procedure for the Saint Croix National Scenic Riverway***

Graduate Degree/ Major: MS Risk Control

Research Adviser: **Dr. Elbert Sorrell, Ed.D., CSP**

Month/Year: **March, 2011**

Number of Pages: **64**

Style Manual Used: **American Psychological Association, 6th edition**

Abstract

The purpose of this study was to develop a formalized incident reporting, investigation, and analysis procedure for use at the Saint Croix National Scenic Riverway (SACN), and answer the five research questions created for this study. In order to develop these formalized procedures and answer the study's research questions, a review of literature was performed which presented the researcher with industry best practices and guidelines to follow in connection with incident reporting, investigation, and analysis. A questionnaire was then developed and given to SACN employees who are knowledgeable, involved, and have experience with incident reporting, investigation, and analysis and the safety management system employed at SACN. The questions generated for the questionnaire were aimed at answering the five research questions and allowing the participants to express their perspectives of SACN's current incident reporting, investigation, and analysis procedure.

After the reviewed literature and questionnaire responses were analyzed, the study found some concerning issues and deficiencies with the procedures for managing incidents currently employed at SACN. The major findings of the study include a number of issues concerning communication and reporting barriers that were identified at SACN which might inhibit employees to report incidents, and the lack of established, formalized incident investigation and incident analysis procedures. The recommendations made for this study can provide opportunities to address these deficiencies and help in developing these needed formalized procedures.

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Acknowledgments

I would like to acknowledge everyone who has inspired me to complete this accomplishment. I would like to thank the entire Risk Control Department at the University of Wisconsin-Stout for their generosity and providing me with the necessary skills to enter the risk control profession. I would like to specially thank Dr. Elbert Sorrell for his guidance and assisting me with my field problem. I would also like to extend my appreciation to the Saint Croix National Scenic Riverway for providing this opportunity and for their continuous cooperation with this project. Finally, I would like to sincerely thank my family and friends for all their encouragement and everlasting support.

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Chapter I: Introduction

An incident reporting, investigation and analysis procedure is an essential component of an effective safety management system. Organizations that proactively manage safety understand the need to report and carry out thorough investigations when incidents occur. By reporting and systematically investigating incidents, an organization has the ability to identify the corrective measures needed to eliminate or reduce the probability that the given type of incident will reoccur, along with the actions needed to improve the management system.

For both the organization and its employees, incident investigations can serve as a valuable tool; however it is often perceived as a means to place blame on an individual (Manuele, 2003). The overall objective of an incident investigation is to relive the chain of events leading up to the incident in order to eliminate and prevent the reoccurrence of employee injuries and illnesses, motor vehicle accidents, and/or damage to property. When performed correctly, "a thorough accident investigation will often help show concern for employees, prevent repeat accidents, identify root causes, address liability issues, expose errors in processes, identify and eliminate hazards, decrease worker compensation costs, correct unsafe acts and conditions, aid in crisis planning, and provide information to make recommendations" (Hilden, 1996, p. 12).

In an overall safety management system the role of incident reporting is critical. It provides essential information used for proper investigations, evaluations and corrective actions, assist in identifying and analyzing workplace trends, establishes priorities for improving the system, and determines additional training requirements. In order to achieve these desired results, an effective written reporting system needs to be embedded within the organization. This

system requires the dedication and continuous commitment of management to promote and encourage employees to report incidents in a timely manner and without the fear of reprisal.

The Saint Croix National Scenic Riverway's (SACN) incident reporting, investigation and analysis procedure has an opportunity to be improved. Employees are apprehensive to report incidents to management. Investigations are performed, but could be more effective in identifying the incident's root cause and the breakdown in the management system. SACN realizes and understands that there is a disconnect between their current procedure for managing organizational exposures and the desired outcomes which they wish to achieve.

SACN consists of the St. Croix and Namekagon Rivers and is a member of the Department of the Interior's (DOI) National Park Service (NPS). In 1968, The Wild and Scenic Rivers Act were created to offer protection to the nation's most majestic and astonishing rivers, thus distinguishing SACN as part of this act. Together, both the St. Croix and Namekagon Rivers provide 252 miles worth of scenic beauty and recreational enjoyment.

Historically, the NPS experiences very high rates of loss due to the occurrence of workplace accidents and injuries. The NPS has the highest rates within the DOI, and is one of the top three agencies with the overall highest rates in the federal government (NPSafe, 2008). SACN is in a position to move away from the traditional norm and understands the benefits and impacts of proactively managing losses by which accurately reporting, investigating and analyzing incidents can have on an organization.

Statement of the Problem

The absence of an effective procedure for reporting, investigating and analyzing incidents at SACN is limiting the organization's opportunity to manage and prevent the reoccurrence of employee injuries, motor vehicle accidents, and/or damage to property.

Purpose of the Study

The intention of this study was to develop a formalized incident reporting, investigation and analysis procedure to serve SACN as a valuable tool for preventing the reoccurrence of losses. The study established the necessary procedures of performing an effective investigation, determining the root cause of an incident, and addressing the issue with the development of adequate corrective actions. This study also discussed the barriers of reporting incidents and strategized ways to promote and encourage employees to become more involved in the reporting process.

Research Questions

1. What are the communication barriers at SACN, which inhibit employees to report workplace incidents, and how can SACN combat these incident communication/reporting barriers?
2. What is the manner in which incident investigations are conducted at SACN and are they effective in providing sufficient data/information regarding the incident?
3. What methods are considered to be industry best practices with regards to conducting an incident investigation?
4. Are incident analyses performed using the information gathered during the investigation and can the analysis identify the incident's root cause and determine corrective actions?
5. What are the best practices for performing an effective incident analysis?

Significance of the Study

This study was significant in that it provided SACN methods to effectively manage and prevent the reoccurrence of employee injuries, motor vehicle accidents, and/or property damage

by improving the current procedures and methods for reporting, investigating, and analyzing incidents.

Limitations of the Study

This study posed some limitations. The following limitations apply to this study:

- This study is intended solely for use at SACN however; the study could be modified or adapted to fit the needs of other organizations.
- A complete review of the literature for this study was not conducted.
- The data collected for the purpose of this study was gathered over the course of the 2010 summer and fall semester.
- Data from the questionnaire responses was collected from four employees knowledgeable in incident reporting, investigation, and analysis, and the safety management system employed at SACN.
- The collected data was analyzed based on the researcher's knowledge, education, and professional opinion.

Assumptions of the Study

As with almost all different types of research, assumptions can be made. The following assumptions apply to this study:

- All literature reviewed for the purpose of this study contained valid information.
- All questionnaire participants fully understood the questions and gave honest responses based on their knowledge and experience.

Definition of Terms

Incident. Incidents are events that have the potential to cause injury or damage; they are caused by unsafe acts and/or unsafe conditions (Spear, 2002).

Near Miss. A near miss is an unplanned event that could have caused harm if conditions were different or allowed to progress (Wallace, 2000).

Methodology

The research methods selected to conduct this study include a review of literature focusing on incident reporting, employee involvement, organizational communication, reporting barriers, incident investigation, loss causation, and incident analyses, an evaluation of SACN's current procedure for reporting, investigating, and analyzing incidents, and surveying SACN employees. The literature review gathered relevant information on this issue by establishing the procedures to follow when performing investigations and analyzing the results of the data. Evaluating SACN's existing procedures for addressing incidents determined deficiencies and helped in creating solutions for reducing and preventing losses caused by incidents. Lastly, a questionnaire allowed the participants to express their perspectives of SACN's current incident reporting, investigation, and analysis procedure.

Chapter II: Literature Review

The intention of this study was to develop a formalized incident reporting, investigation and analysis procedure for use at SACN. This chapter reviews and integrates literature regarding incident communication and reporting, employee involvement, communicating throughout the organization, communication barriers, investigating incidents, loss causation, incident analyses, and the best guidelines to follow when conducting an incident investigation and analysis.

Incident Communication and Reporting

An organization's safety culture depends heavily on its safety communication effectiveness (Williams, 2006), and communication is the foundation for an incident response (Brown, 2008). Incident reporting is the first step towards identifying the root cause of a given type of incident or near miss so its reoccurrence can be prevented. To create a successful reporting environment, an organization must promote and engage as many employees as possible to report incidents through multiple lines of established communication (Levitt & Samelson, 1993).

Reporting the incident. In the instance of any accident, injury, or near miss, it is essential for the incident to be reported. Failure to report incidents will leave an organization uniformed. Without knowing that an incident has occurred, an organization cannot give an appropriate incident response, evaluate the incident's potential, or conduct an investigation (Reese & Eidson, 2006). Reporting incidents is the method by which an organization can begin taking the necessary steps towards abating and preventing a recurrence.

When incidents due occur, it is important for organizations to engage in actions that convey the support of their employees (Hofmann & Morgeson, 1999). It is essential for an organization to have a system in place that allows for an employee to report the incident to

management. This type of system is typically supplemented with an incident report. These reports are beneficial for documenting and gaining information regarding the incident. Incident reports tend to be most effective when filled out by the employee involved in the incident along with the employee's direct line supervisor or safety professional. Therefore, organizations should promote the development of effective communication exchange relationships between supervisors and employees (Hofmann & Morgeson, 1999). By demonstrating personal commitment to employee safety, managers show those involved in an incident that management cares (Boraiko, Beardsley, & Wright, 2008). This interaction between the employee involved and the line supervisor is a critical component for the success of the safety management system.

Employee involvement. Employee involvement is critical for the reporting of incidents and has a substantial impact on the success of a safety management system because employees are afforded the opportunity to develop and express their own commitment to safety (Esposito, 2001). The involvement of employees in suggesting strategies to prevent the reoccurrence of an incident encourages ownership of the solution(s) and a commitment to implement the recommendations (Vecchio-Sadus, 2007). The involvement of employees and their personal input into the safety system can help develop more desirable employee attitudes and behaviors (Michael, 2005). This relates to Welborn and Boraiko (2009, p. 37) who state that, "employee attitudes toward workplace safety are affected by how they perceive the program". For the program to be successful there needs to be a true feeling throughout the organization that safety is a core value. Without it, the implementation of safety systems, gaining employee involvement and the controlling of exposures will be a long and daunting task (Esposito, 2001). When an organization can consistently and proactively demonstrate the value and care for its workers,

employees should perceive that management would be open to the raising of safety concerns (Hofmann & Morgeson, 1999).

Organization communication. The creation of a successful safety program can best be accomplished through a joint commitment on the part of management and its employees (Ariss, 2003). "Management's level of commitment to the safety culture directly affects the results. In addition, the message that safety is a priority must be pervasive" (Perdue, 2008, p. 73-74). It is management's responisblilty to not only create the program and communicate it across the organization, but also provide the nescessary resources to improve on aspects of safety and health throughout the entire organization (Minnesota Department of Labor and Industry Occupational Safety and Health Division [MNOSHA], 2009). Top performing companies understand and express this high level of commitment to safety by developing a process in which the workforce can participate, and which can be implemented and monitored so both management and the workforce can receive feedback (Neihoff, Enz & Grover, 1990). This commitment towards communication throughout the organization and proper attention to workplace safety can result in improved morale, increased job satisfaction, and greater health for the organization as a whole with the power to affect the quality of individuals' lives (Ariss, 2003).

In order to understand organizational communication and its role in fostering a safe and healthful working environment, it's important to understand the various styles in which individuals communicate. Safety communication can become easily complicated due to the fact that people have different styles of communication (Williams & Geller, 2008). These differences in communication styles or patterns occur due to a variety of factors, including but not limited to, cultural variables, personality traits, or environmental conditions (Williams,

2006). The following are four basic types of individual communication styles common to business and industry (Brounstein, 2001, as cited in Williams & Geller, 2008):

- Dominant communicator – An individual with a dominant style of communication is characterized as having inconsiderate verbal behavior. Dominant communicators often believe they're always right, their opinions matter most, and discourage or downgrade those who disagree with them (Williams & Geller, 2008). A dominant style is typically ineffective because of the negative effects it can create and the damage it can cause to an organization's culture and moral.
- Passive communicator – Individuals characterized as passive communicators often avoid confrontation and conflict at all cost (O'Brien, 2006). Passive communicators often believe that the opinions of others are more important than their own. Individuals with this style of communication are typically soft-spoken, indecisive, overly agreeable, and highly self-critical (Williams, 2006). Similar to the dominant style of communication, passive communication is typically ineffective and it can create negative consequences for an organization as well.
- Passive-aggressive communicator – Individuals who communicate passive-aggressively are best characterized as having a deceitful verbal behavior. Passive-aggressive communicators often speak of people behind their backs because they find it too difficult to directly confront an individual (O'Brien, 2006). In addition, these types of communicators tend to give a false impression of agreement, make sarcastic remarks of others, hold personal grudges, and resist offering assistance to those in need (Williams, 2006). This type of communication creates a fair amount of confusion and distrust between individuals within an organization. Again, an

organization can suffer severe consequences if individuals communicate in this fashion.

- Empathic communicator – An empathic communicator is characterized much different than three previous styles of communication. These types of communicators are different in that they have a direct, open, and honest verbal behavior. An empathic communicator is one who is concerned with and considerate of their own opinions, but also the opinions and feelings of others. This type of verbal communication fosters healthier relationships among employees, leads to better decision making, and creates a balanced environment within the organization (Williams, 2006).

Effective communication throughout the organization is a key element to achieving an atmosphere or culture revolved around safety. By encouraging others to communicate empathically, leading by example, and overcoming the communication styles that can have adverse effects, an organization should see an improvement in safety performance, healthier morale, and a more enhanced safety culture (Williams, 2006).

Communication and reporting barriers. As stated earlier, it is crucial for an organization to establish multiple lines of communication that allow employees to pass on their concerns and recommendations (Levitt & Samelson, 1993); however, it is quite common for many incidents to go unreported. If the atmosphere of an organization's safety culture is negative, employees may become defensive and choose not to report anything which may reflect badly upon them (Spear, 2002). There are a number of barriers that affect employee attitudes which inhibit them to report incidents. The following are ten reasons why employees fail to, or avoid, reporting incidents (Reese & Eidson, 2006):

- Fear of discipline – employee's fear of punishment for contributory actions or negligence when property is damaged, people are injured, or problems are encountered.
- Concern about the record – employee's decision to not report an incident so a safety or zero incident record can be maintained.
- Concern for reputation – fear of being called, labeled, or marked as an unsafe, accident prone employee.
- Fear of medical treatment – fear or dislike the thought of having to receive medical care.
- Dislike of medical personnel – in some cases, employees may develop negative attitudes towards medical personnel. As a result, they wish not to be treated by them and injuries never get reported.
- Desire to keep personal record clear – employees may not want accident data on their personal record. Also, organizations sometimes give recognitions or bonuses for employees with accident-free records.
- Avoidance of red tape – excessive forms, interviews, preparing statements and other excessive administrative measures lead workers to avoid getting involved in reporting.
- Desire to prevent work interruptions – employees tend to be concerned with completing their job. Taking the time away from work to report an incident or leave for treatment does not seem practical.
- Concerns about attitudes of others – employees tend to want their fellow co-workers and supervisors to have a favorable attitude towards them. If reporting may reflect badly upon them, they will avoid it.

- Poor understanding of importance – employees may neglect to report because they are not aware of the benefit, or they have not seen the benefit from previous reports.

Strategies to cross communication and reporting barriers. Once an organization identifies and understands the types of communication and reporting barriers affecting their employee's attitudes towards reporting incidents, they can develop the necessary tools for successfully crossing these barriers. Organizational leaders and frontline supervisors can place themselves in a better position to combat these reporting barriers by (Reese & Eidson, 2006):

- Reacting in a more positive way when confronted by an employee reporting an incident.
- Give more attention to incident prevention and control.
- Recognize individuals for good performance.
- Develop the value in reporting incidents.
- Demonstrate belief by personal action.

A reliable incident communication and reporting system enables employees to address management, without fear of reprisal, of loss causing events or conditions and to receive timely and appropriate responses (Kolack, 2007). Spear (2002) suggests that proper training on the importance of incident reporting and ongoing communication between employees at all levels can address communication and reporting barriers.

Incident Investigation

An incident investigation is a technique used to identify the causes of an incident and understand why it occurred. An incident investigation is essentially "a reactive procedure performed after an incident occurs" (Welborn & Boraiko, 2009, p. 37). More effective safety programs utilize both reactive and proactive methods when investigating incidents. The reactive

approach to incident investigations most often focuses on the corrective actions after an incident occurs (Earnest, 1997). Whereas, the proactive approach aims to prevent incidents from happening in the first place (Welborn & Boraiko, 2009).

Organizations conduct incident investigations in order to eliminate the probability that the given type of incident will reoccur. To ensure this, "information obtained during the investigation about the conditions and actions that caused the event must be accurate. Otherwise, a subsequent intervention may not address the real cause(s)" (Boraiko et al., 2008, p. 26). When used properly, an incident investigation will identify the chain of events leading up to the accident, determine the immediate and root causes, develop correctable solutions, provide management oversight, and ensure that reporting requirements are met.

An underlying concern regarding incident investigations is that they are often perceived as a means to place blame on an individual (Manuele, 2003). However, "a thorough investigation will often help: show concern for employees, prevent repeat accidents, address liability issues, expose errors in processes, identify and eliminate hazards, decrease worker compensation costs, correct unsafe acts and conditions, aid in crisis planning, and provide information to make recommendations" (Hilden, 1996, p. 12). Therefore, organizations need to understand that the purpose of conducting an investigation is to gather the facts that cause incidents, and not to find fault (Canadian Centre for Occupational Health and Safety [CCOHS], 2006).

Investigating the incident. A thorough investigation of an incident requires meticulous documentation and sound problem solving skills by those involved in conducting the investigation. This corresponds with the Handbook of OSHA Construction Safety and Health which states that, "a complete investigation includes an objective evaluation of all the facts,

opinions, and statements, and other related information, as well as an action plan or steps to prevent or control a similar recurrence" (Reese & Eidson, 2006, p. 143). As a result, an effective incident investigation requires an individual or team of individuals with a level of experience in the areas of investigative techniques, loss causation, and a clear understanding of the work processes and procedures. Therefore, investigations are typically performed by supervisors with the help and assistance of safety officers, safety committee members, knowledgeable employees, and even outside consultants or government representatives (CCOHS, 2006).

When incidents do occur, it's important for an organization to have an investigation process in place to be able to respond in the most time sensitive fashion. When a predetermined process is initiated the investigator can see and interpret the conditions as they were at the time of the incident, the scene and evidence will be better preserved, and witnesses can be interviewed (CCOHS, 2006). A typical incident investigation process involves the following steps:

1. Receive an incident report or notification that an incident has occurred;
2. Appoint an incident investigator or develop an investigation team;
3. Secure the incident scene. If needed, administer first aid or provide medical care to the injured and prevent further injuries or damage;
4. Conduct the investigation. Gather evidence and facts relating to the incident and interview witnesses;
5. Identify the incident's basic and root causes;
6. Develop an incident report and document the findings of the investigation;
7. Identify solutions and create a plan for corrective action;
8. Implement the corrective actions;
9. Monitor, measure, and evaluate the effectiveness of the corrective actions; and

10. Make necessary changes for continuous improvement.

In addition to having a systematic process as this, or similar, the investigators need to be equipped with the proper tools used to conduct an investigation and gather facts and evidence. Investigation tools are necessary because, "all aspects of the accident scene must be completely documented and studied to determine what transpired prior to and during the accident sequence" (Reese & Eidson, 2006, p. 143). The following is partial list of the tools that should be readily available to an investigator (Reese & Eidson, 2006):

- Photographic camera
- Accident investigation forms
- Rulers and measuring tapes
- Tape recorder
- Video camera
- Sampling devices and instruments
- Interview forms
- Caution or barrier tape
- Special personal protective equipment

Investigating near misses. A near miss incident is a close call where a dangerous situation or behavioral action occurred, but resulting in no significant injury (M. Bauer, personal communication, June 12, 2010). With each near miss incident, there is a potential for an actual loss to occur, as a result, organizations should have a program or system in place to effectively manage the occurrence near miss events (Engineering News-Record [ENR], 2009). Therefore, "making sure that minor injuries and near misses are reported to organizations when they occur provides vital information that enables the organization to improve its safety outcomes" (Lauver,

Lester, & Le, 2009, p. 327). According to ENR (2009), experts suggest that there are 8 elements to an effective system for managing near miss events. These elements include:

1. Identifying a near-miss event;
2. Having a system in place which allows an employee to report the near miss event;
3. Prioritizing near miss events based on their potential severity;
4. Providing information to those analyzing the causes;
5. Investigating the near miss to identify it's basic and root causes;
6. Identifying corrective solutions for each identified cause;
7. Communicate the corrective solutions to those who will implement them; and
8. Tracking the implementation of the solutions and monitoring their effectiveness.

Many organizations lose the opportunity to learn from near miss events because they often struggle to effectively implement this type of system. These struggles may be the result of confusing definitions, misunderstood objectives, inappropriate procedures, the lack of adequate feedback, misuse use of data, and no proper investigation or follow up (Ritwik, 2002). Perhaps the most common reason why organizations lose the opportunity to learn from near miss events is because employees aren't provided with a clear near miss definition or know when and why they should be reported (Britten, 2009). Therefore, the first step in managing near miss events effectively is to develop a clear, concise, well-communicated near miss definition and highly encourage employee reporting (Ritwik, 2002). The following elements are recommendations aimed to assist organizations with the near miss reporting process (Ritwik, 2002).

- Develop an awareness program that is supplemented with a verity of different examples of near miss events.

- Keep the importance of near miss reporting fresh in employee's minds by using daily pre-shift meetings, toolbox talks and other organizational gatherings.
- Stay away from elaborate, complex, and time consuming near miss reporting forms. Employees will be more apt to use the reporting form if it is simple and user friendly.
- Implement a policy of not holding near miss events against the reporter or other personnel.
- Allow individuals the choice to report near misses anonymously.
- Maintain a high level of communication with the near miss reporter and provide them with regular feedback on the status of resolving the near miss event.

Overall, having a system to identify, investigate, and manage near miss events is extremely beneficial for documenting and addressing situations and actions which would otherwise go unreported and investigated. Similar to an accident investigation, a near miss investigation's primary objective is to determine the failure mechanisms and take corrective action (Wallace, 2000), with the majority of corrective actions focusing on the management system and not an individual (Bird & Germain, 1997). For a near miss program to be successful, management must be committed to a positive safety and health culture (Ritwik, 2002) and a understanding that near miss information can offer both valid and reliable insight to potential accidents (Joshi, Senior & Smith, 2001).

Incident Causation and Analysis

In order to prevent incidents from reoccurring, an organization has to have a clear understanding of the incident's causes. This understanding can be achieved through the effective use of incident causation models and analyses. These methods can assist an organization in identifying the sources of incidents and ultimately help in reducing or eliminating them

(Arboleda & Abraham, 2004). There is a number of different incident causation and analysis tools available for use in industry today. These tools are designed to supplement the information gathered from performing an incident investigation in order to identify the incident's contributing factors, distinguish the root cause(s), and assist in the development of corrective actions (Boraiko et al., 2008). Common incident loss causation models and analyses are discussed in this section.

Loss causation models. Loss causation models focus on the theory behind preventing accidents. The models are aimed to identify the multiple causes that allowed an incident to occur and where the management system encountered a breakdown. Dan Peterson acknowledges that accidents rarely occur as a result of a single cause (Peterson, 2003). Therefore, when accidents due occur, one must begin to think multi-causational. This section discusses a distinct and well known loss causation model used in industry, which is the International Loss Control Institute (ILCI) Loss Causation Model.

ILCI loss causation model. The ILCI loss causation model was developed by Frank, E. Bird and represents the sequence of events which allow an actual loss to occur. These events are lack of control, basic causes, immediate causes, the incident and the loss. ILCI's loss causation model "can be used to understand the various causes leading to accidents and as a framework for accident/incident investigations" (Top, 1991, p. 6). This model takes a proactive approach to loss prevention and suggests that accidents are symptoms of lack of control in the management system. This lack of control is generally caused by a lack of standards, inadequate standards, or lack of compliance to standards. In order to gain a better understanding of the ILCI model, the various events will be explained by working backwards from the loss.

The last in the sequence of events is the loss which is the result of an incident. A loss can be referred to as an undesirable consequence and can come in various forms, for instance financial loss, human loss, or property loss (Rowlinson, 2004). In addition, a loss can create both direct and indirect consequences and costs for an organization. A direct cost is the cost of the incident. Direct costs can be in the form of compensation for lost wages, medical treatment, and damage to property, equipment, or materials. Whereas indirect costs, at times, are more significant and can average four times the cost of direct losses (Jhamb & Jhamb, 2003). Indirect costs may include lost time of the injured worker and supervisor, cost of investigating the incident, cost of recruiting and training additional employees, legal expenses, loss in organizational morale, and the potential loss in public image.

The next event in the ILCI model sequence is the incident. An incident can be referred to as an undesirable event that does or has the potential to cause personal injury, damage to property, or loss of assets (Wilson, McCutcheon & Buchanan, 2003). An incident can result in either an actual loss or a near miss. As stated earlier, when incidents due occur, organizations must have systems in place that are designed to effectively and efficiently manage them.

Prior to the incident are the immediate causes. Immediate causes refer to the conditions and circumstances which precede or developed during the incident (Wilson et al., 2003), and tend to derive from either substandard practices or substandard conditions. These causes are typically the easiest to indentify and also where poorly conducted investigations generally stop. For an incident to be prevented from reoccurring, the investigation needs to proceed from this point and address the remaining events in the ILCI model sequence.

Preceding the immediate causes are the basic causes. Identifying the basic or underlying causes provides management with oversight as to why people perform substandard practices or

why substandard conditions exist (Wilson et al., 2003,). The ILCI model suggests that the basic causes exist because of either personal factors or job factors. Personal factors may include inadequate physical or mental capability to perform the job, physical or mental stress, or the lack of knowledge and skill. Job factors generally include the lack of supervision or leadership, inadequate tools and equipment, and the lack of training, direction and communication (Wilson et al., 2003).

The event which precedes all other events in the ILCI model sequence is the lack of control, which can be referred to as a breakdown in the management system. According to the model, there are three primary reasons for a lack of management control. These are: an inadequate program, inadequate program standards, or inadequate compliance with program standards (Wilson et al., 2003). The ILCI model also suggests that all incidents can be traced back to a failure in the management system. Therefore, management should then be held responsible for making the necessary system or process improvements. In other words, management owns the system and employees work within the system. So it's important to not place blame on individuals for committing substandard acts or allowing substandard conditions to exist because it's a management issue.

Incident analyses. Incident analyses serve as effective and valuable tools for solving the problems which create incidents. Spear, states that "using structured problem-solving techniques, safety professionals can define the problem, gather and prioritize related data, analyze solutions, and evaluate the benefits and cost-effectiveness of available prevention options" (2002, p. 29). Two different types of analyses have discussed for the purpose of this study.

Root cause analysis. A root cause analysis (RCA) is essentially a process that is aimed to identify the primary cause(s) that contribute to the occurrence of an incident or problem. It is a systematic approach and calls for analytical thinking about interrelated cause-effect relationships within a system or process which has failed (Okes, 2008). The primary purpose of performing a RCA is to minimize risk by solving problems and eliminating causes that contribute to risk (Hughes, Hall & Rygaard, 2009).

When performing a RCA, it is important to keep in mind that when accidents or incidents do occur, they are typically complex and multi-causational (Williams, 2008). Many organizations fail to address the root cause because they tend to focus on the presenting problem and not the underlying cause (Okes, 2008). According to Williams, "the only way to avoid jumping to a premature conclusion that leads to inadequate corrective actions is by taking time to conduct a proper RCA" (2008, p. 36).

When a RCA is performed properly it will allow an organization to pinpoint the circumstances that increased the risk of an accident or incident from occurring (Williams, 2008); determine who or what was involved in the situation; and prioritize risk management decisions (Hughes et al., 2009). A poorly performed RCA makes it unlikely that the right solutions will be identified and implemented (Okes, 2008).

Many organizations utilize RCAs. However, each RCA used will differ from one organization to the next and each scope of a RCA will be specific to a defined problem. In general, a RCA is a four step systematic process (Hughes et al., 2009). The four general steps include:

1. Defining the problem;
2. Developing a causal understanding as to why the problem occurred;

3. Identifying corrective solutions; and
4. Implement the best solutions and monitor their effectiveness.

The first step, defining the problem, is the most important step in the RCA process. It is important for the problem to be defined in a clear, concise, and complete definition which includes where and when it occurred, its frequency, and severity (Okes, 2008). A clear definition of the problem will reduce the likelihood of focusing on what is non-relevant for mitigating the problem.

The second step of performing a RCA involves identifying and understanding the causes which allowed the problem to occur and the evidence for proving it (Hughes et al., 2009). This step can be supplemented by creating a cause-effect diagram. A cause-effect diagram can assist in brainstorming potential causes, and help determine solutions.

The third step, which is identifying corrective solutions, focuses on challenging each cause by generating ideas that will mitigate the problem. All causes should be considered and it's important to not overlook causes because they could lead to future incidents. Once corrective solutions are identified, evaluate the effectiveness of the solutions relative to the cost of the problem and the solution's likelihood for success (Hughes et al., 2009).

Lastly, the fourth step of the RCA process deals with implementing the best solutions and monitoring their effectiveness. Once the best solutions are found, they need to be implemented into the system. It is equally important that the solutions, once implemented, do not create new or additional problems. And from a process improvement standpoint, the effectiveness of the solutions should be continually monitored and measured.

Cause and effect analysis. The cause and effect analysis was developed in the 1950's by Dr. Kaoru Ishikawa to provide for a more structured form of brainstorming (ReVelle & Margetts,

2010). A cause and effect analysis is also commonly referred to as either an Ishikawa or fishbone diagram. A basic example of a cause and effect or fishbone diagram is provided below in figure 1. This type of analysis serves as a valuable tool because it can help brainstorm, organize, and assess the possible causes of an incident (Spear, 2002). The structured form of brainstorming allows for more efficient and effective analysis and evaluation of the causes (ReVelle & Margetts, 2010). In addition, being able to graphically illustrating the connection between the causes and factors helps influence determining the incidents corrective actions (Boraiko et al., 2008).

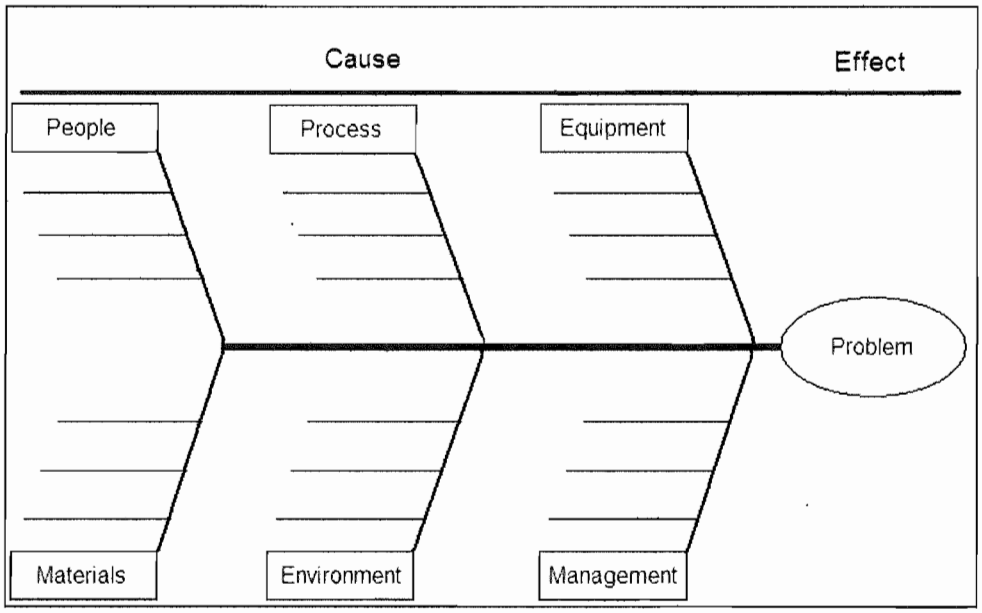

Figure 1. Cause & Effect or Fishbone Diagram. This figure illustrates basic elements of a cause and effect or fishbone diagram.

The first step in using this type of analysis begins with identifying a problem to be investigated. The problem should be written in the form of a problem statement and placed on the far right side of the diagram to represent the head of the fish or the problem under consideration (Wilheir, 2009). To the left of the identified problem is a horizontal line or arrow

which splits the diagram in half. This line represents the spine of the fishbone diagram and leads to the diagram's head or the problem.

The following step of this analysis involves brainstorming the primary categories which might lead to the basic or potential causes. Once decided upon, there categories are placed on the bottom and top of the diagram, with arrows pointing to the backbone as well as towards the head, thus creating a fish skeleton (Wilheir, 2009). In the example shown in figure 1, the primary categories include: people, process, equipment, materials, environment, and management. It's important to note that additional or completely different sets of categories can be used when performing this type of analysis. However, they need to be appropriate and align with the problem at hand (City Process Management [CPM], 2008).

Once the problem and primary categories are identified and the diagram is properly constructed, one can begin brainstorming the potential and basic causes. As causes are brainstormed, they are added to the diagram under the appropriate category (CPM, 2008). This should continue until no other useful items can be added to the diagram. When the analysis reaches this point, the results should be studied to identify causes that appear more than once (CPM, 2008) and to determine the most likely root causes (Wilheir, 2009). If the same causes appear in two or more different categories, it's a good indicator of a root problem within the system. Additionally, categories that generate a considerable amount of potential causes are also areas of significance (Wilheir, 2009). Once analyzing the results is complete and management information is gained, and organization can then take the necessary steps to develop a plan of action to eliminate the identified root causes (CPM, 2008) and prevent the problem from reoccurring.

Summary

The purpose of the literature review was to gather and link relevant information from sources which relate to incident reporting, investigations and analyses. This review provided the researcher with the fundamental concepts and best guidelines to follow in managing these interrelated incident management issues. In turn, the information was used to develop a formalized, effective procedure that addresses incidents that occur at SACN. The following chapter discusses the detailed methodology used to conduct this study.

Chapter III: Methodology

The intention of this study was to provide SACN an opportunity to improve the current procedures and methods of reporting, investigating and analyzing incidents. This opportunity could then assist SACN to effectively manage and prevent the reoccurrence of employee injuries, motor vehicle accidents, and/or property damage. This chapter discusses the primary methods employed to conduct this study and how the methods were used to answer the following research questions:

1. What are the communication barriers at SACN which inhibit employees to report workplace incidents and how can SACN combat these incident communication/reporting barriers?
2. What is the manner in which incident investigations are conducted at SACN and are they effective in providing sufficient data/information regarding the incident?
3. What methods are considered to be industry best practices with regards to conducting an incident investigation?
4. Are incident analyses performed using the information gathered during the investigation and can the analysis identify the incident's root cause and determine corrective actions?
5. What are the best practices for performing an effective incident analysis?

The research methods selected to best answer the research questions included:

- An evaluation of SACN's current procedure for reporting, investigating, and analyzing incidents.
- A review of literature focusing on incident reporting, employee involvement, organizational communication, reporting barriers, incident investigation, loss causation, and incident analyses.

- Surveying SACN employees.

The literature review gathered relevant information on this issue by establishing the procedures to follow when performing investigations and analyzing the results of the data. Evaluating SACN's existing procedures for addressing incidents determined deficiencies and helped in creating solutions for reducing and preventing losses caused by incidents. Lastly, a questionnaire allowed the participants to express their perspectives of SACN's current incident reporting, investigation, and analysis procedure. Questions for the questionnaire (see Appendix – A) were developed after evaluating SACN existing procedure and by reviewing industry practices and techniques gathered from literature.

Subject Selection and Description

The individuals selected for the purpose of this study were chosen because of their involvement, knowledge, and experience with incident reporting, investigation, and analysis and the safety management system employed at SACN. A total of 9 candidates were selected, briefed on the purpose of the study, and asked for their willingness to voluntarily participate in the survey process. The sample population consisted of all 8 members of SACN's safety committee and the Collateral Duty Safety Officer.

Along with the distribution of the questionnaires, the candidates were provided with an informed consent agreement (see Appendix – B). This agreement verified the candidate's willingness to voluntarily participate in the study under strict protection of the individual's confidentiality. Corresponding with the consent agreement, no identifiable information was released through public dissemination. All identifiers or means to which a participant's identity could be revealed were removed. Lastly, the collected data was restricted to only the researcher for the intended use of this study.

Data Collection Procedures

The study's data was obtained by evaluating SACN's current incident reporting, investigation, and analysis procedure, researching related literature, and surveying SACN employees with the use of a questionnaire. SACN's existing procedure for addressing incidents was evaluated by the researcher in order to determine deficiencies and identify areas of improvement. The review of related literature presented the researcher with industry best practices and guidelines to follow in connection to incident reporting, investigation, and analysis. A questionnaire (see Appendix – A) was then developed based on the information provided by the review of literature. The following is a list of the topics covered by the questionnaire:

- Incident Reporting
- Employee Involvement
- Organizational Communication
- Communication and Reporting Barriers
- Incident Investigation
- Incident Analysis

The results of the questionnaire were collected by providing the same series of questions to the participants. The questions focused on gathering useable knowledge about SACN's current incident reporting, investigation, and analysis procedure by allowing the participants to express their personal perspectives and opinions. Also, the questions were designed to validate the deficiencies and effectiveness of the current procedure.

Data Analysis

The information gathered from the evaluation of current procedures for addressing incidents, review of literature, and questionnaire responses were analyzed using qualitative

methods. The data was qualitatively compared and contrasted in order to assist in the development of an effective incident reporting, investigation, and analysis procedure that best fit the needs of SACN. Questionnaire responses were summarized and grouped under their respective questions. Collected data showing signs of similarities or patterns were identified and placed respectively. The data was considered to be useable and reported in the results of the research if it was of significance to SACN. Significance to SACN was defined as the ability to assist in the development of a formalized incident reporting, investigation and analysis procedure to serve SACN as a valuable tool for preventing the reoccurrence of losses.

Limitations

The methodology used for this study posed the following limitations:

- Error caused by misinterpretation of the question by the participant.
- Error caused by misinterpretation of the questionnaire responses by the researcher.
- A limited amount of individuals participating in the study.
- The collected data was qualitatively compared and contrasted based on the researcher's best knowledge, education, and professional opinion.

Chapter IV: Results and Discussion

The intention of this study was to develop a formalized incident reporting, investigation, and analysis procedure for use at SACN and to answer the following five research questions. These research questions include:

1. What are the communication barriers at SACN which inhibit employees to report workplace incidents, and how can SACN combat these incident communication/reporting barriers?
2. What is the manner in which incident investigations are conducted at SACN and are they effective in providing sufficient data/information regarding the incident?
3. What methods are considered to be industry best practices with regards to conducting an incident investigation?
4. Are incident analyses performed using the information gathered during the investigation and can the analysis identify the incident's root cause and determine corrective actions?
5. What are the best practices for performing an effective incident analysis?

In order to answer these research questions and develop a suitable incident reporting, investigation, and analysis procedure for use at SACN, the following research methods were utilized:

- An evaluation of SACN's current procedure for reporting, investigating, and analyzing incidents.
- A review of literature focusing on incident reporting, employee involvement, organizational communication, reporting barriers, incident investigation, loss causation, and incident analyses.

- Surveying SACN employees.

For the purpose of this study, a review of literature was performed which presented the researcher with industry best practices and guidelines to follow in connection with incident reporting, investigation, and analysis. A questionnaire was then developed and given to SACN employees who are knowledgeable, involved, and have experience with incident reporting, investigation, and analysis and the safety management system employed at SACN. The questions generated for the questionnaire were aimed at answering the five research questions and allowing the participants to express their perspectives of SACN's current incident reporting, investigation, and analysis procedure.

Results

The results of this study utilized the data gathered from the questionnaire respondents and reviewed literature to answer the study's five research questions.

Research question – 1. What are the communication barriers at SACN which inhibit employees to report workplace incidents and how can SACN combat these incident communication/reporting barriers?

The study identified the following communication barriers found at SACN which might inhibit employees to report workplace incidents:

- Fear of reprisal – employee's fear of punishment for contributory actions or negligence when property is damaged, people are injured, or problems are encountered.
- Supervisory negligence – supervisor neglects to listen or act upon incidents reported employees.

- Intimidation by supervisors – supervisor intimidates employees to not report incidents to save face or to avoid having to accept responsibility.
- Embarrassment – fear of being called, labeled, or marked as an unsafe, accident-prone employee.
- Low morale – employees tend to want their fellow co-workers and supervisors to have a favorable attitude towards them. If reporting may reflect badly upon the employee, they will avoid it.
- Ignorance of the incident reporting process – employees may neglect to report because they are not aware of the benefit, or they have not seen the benefit from previous reports.
- Lack of training on the incident reporting process – employees may not know how or when to report incidents.
- The idea that the incident is not a big deal or it's unimportant – employees tend to be concerned with completing their job. Taking the time away from work to report an incident or leave for treatment does not seem practical.
- Maintaining personal pride – employees may dislike the thought of having to receive medical care or may not want accident data on their personal record.
- Not wanting to accept the responsibility – employees may not want to admit they were involved in an incident.
- Not worth the time to bother with the reporting forms and paperwork – excessive forms, interviews, preparing statements and other excessive administrative measures lead workers to avoid getting involved in reporting.

Research question – 2. What is the manner in which incident investigations are conducted at SACN and are they effective in providing sufficient data/information regarding the incident?

The study found that incident investigations at SACN are not currently conducted as an official process. However, questionnaire respondents indicated that incident investigations are typically performed by a supervisor or LE Ranger. Questions such as who was involved, what happened, where, when, and why did the incident occur are needed to be answered. Depending upon severity of the incident, it was found that a board may need to convene and otherwise conduct the investigation.

The results of the study were inconclusive for describing the effectiveness of SACN's incident investigation procedure for providing sufficient data/information regarding the incident. One questionnaire respondent indicated that there is not an official procedure in place. However, another respondent stated that when the process is utilized it can be very effective and can help prevent future incidents from occurring. Lastly, one respondent failed to recall ever hearing the results of an incident investigation and therefore could not determine the effectiveness of the procedure.

Research question – 3. What methods are considered to be industry best practices with regards to conducting an incident investigation?

The study found the following characteristics and methods to be industry best practices with regards to conducting an incident investigation:

- Investigating an incident consists of an objective evaluation of all the facts, opinions, statements, and other related information regarding to the incident.

- The evaluation of the incident is used to formulate a plan to prevent or control a similar reoccurrence.
- An incident investigation entails detailed documentation and requires those conducting the investigation to possess strong problem solving skills.
- An incident investigation requires an individual or team of individuals that have a clear understanding of the work procedures and are familiar with loss causation and investigative techniques.
- Incident investigations are best performed by supervisors assisted by safety professionals, knowledgeable employees, or even outside resources.
- Information gathered during the investigation needs to be accurate in order to reveal the root cause.
- The information gathered from an incident investigation should be used to:
    - Identify the events preceding the incident,
    - Determine the failure mechanisms that have occurred,
    - Determine the immediate and root causes,
    - Identify solutions aimed at preventing the incident from repeating,
    - Aid in the development of correctable solutions,
    - Provide management oversight, and
    - Verify if reporting requirements are met.

Lastly, the study found that a typical incident investigation is a systematic process that involves the following steps:

1. Receive an incident report or notification that an incident has occurred;
2. Appoint an incident investigator or develop an investigation team;

3. Secure the incident scene. If needed, administer first aid or provide medical care to the injured and prevent further injuries or damage;
4. Conduct the investigation. Gather evidence and facts relating to the incident and interview witnesses;
5. Identify the incident's basic and root causes;
6. Develop an incident report and document the findings of the investigation;
7. Identify solutions and create a plan for corrective action;
8. Implement the corrective actions;
9. Monitor, measure, and evaluate the effectiveness of the corrective actions; and
10. Make necessary changes for continuous improvement.

Research question – 4. Are incident analyses performed using the information gathered during the investigation and can the analysis identify the incident's root cause and determine corrective actions?

The study also found that incident analyses are not currently conducted as an official process at SACN. Unofficially, the study found that when an incident does occur, the individuals involved are typically questioned, the site is studied, and documentation is completed.

Again, the results of the study were inconclusive for describing the effectiveness of SACN's incident analysis procedure. One questionnaire response stated that there is not an official procedure in place. Conversely, another response indicated that when the process is utilized it can be very effective in determining solutions. Lastly, one participant could not comment on the effectiveness of the procedure because they have never been involved with an incident analysis.

Research question – 5. What are the best practices for performing an effective incident analysis?

The study found the following characteristics and methods to be industry best practices with regards to performing an effective incident analysis:

- Incidents are analyzed not only to distinguish the root cause but also to help brainstorm, organize, identify, and assess contributing factors which increased the risk of an incident to occur.
- An incident analysis serves as a structured problem-solving technique used to define the problem, gather and prioritize related data, analyze solutions, and evaluate the benefits and cost-effectiveness of corrective actions.
- When performing an incident analysis, its best to focus on the underlying causes and not the presenting problem.
- When analyzing an incident, its best to think in terms of multi-casual. The study found that when accidents or incidents do occur, they are rarely the result of a single cause.
- When performing an incident analysis, the problem needs to be clearly defined. A clear definition of the problem was found to reduce the likelihood of focusing on what is irrelevant for solving the problem.
- An effective incident analysis involves identifying and understanding the causes which allowed the incident to occur and providing evidence to prove it.
- All identified causes should be considered and it's important to not overlook causes because they could lead to future incidents.

- An incident analysis should be supplemented by conducting a root cause analysis (RCA) or by creating a cause-effect diagram.
- An effective incident analysis includes identifying corrective solutions.
- Once the corrective solutions are identified, the effectiveness of the solutions should be evaluated relative to their cost and the solution's likelihood for success.
- Once the best solutions are determined, they need to be implemented into the system.
- The solutions, once implemented, should not create new or additional problems.
- From a process improvement standpoint, the effectiveness of the solutions should be continually monitored and measured.

Discussion

After the reviewed literature and questionnaire responses were analyzed, the study found some concerning issues and deficiencies with the procedures for managing incidents currently employed at SACN. The major findings of the study include a number of issues concerning communication and reporting barriers that were identified at SACN which might inhibit employees to report incidents, and the lack of established, formalized incident investigation and incident analysis procedures. The results of the study also found certain characteristics, key elements, and methods to follow which are considered to be industry best practices with regards to both conducting an incident investigation and performing an incident analysis. The results and recommendations of this study can provide opportunities to address the issues and deficiencies that were found and help in developing these formalized procedures. The summary, conclusions, and recommendations of this study are provided in the next chapter.

Chapter V: Conclusions and Recommendations

The intention of this study was to develop a formalized incident reporting, investigation, and analysis procedure for use at SACN and to answer the following five research questions. These research questions include:

6. What are the communication barriers at SACN which inhibit employees to report workplace incidents and how can SACN combat these incident communication/reporting barriers?
7. What is the manner in which incident investigations are conducted at SACN and are they effective in providing sufficient data/information regarding the incident?
8. What methods are considered to be industry best practices with regards to conducting an incident investigation?
9. Are incident analyses performed using the information gathered during the investigation and can the analysis identify the incident's root cause and determine corrective actions?
10. What are the best practices for performing an effective incident analysis?

Restatement of the Problem

The absence of an effective procedure for reporting, investigating and analyzing incidents at SACN is limiting the organization's opportunity to manage and prevent the reoccurrence of employee injuries, motor vehicle accidents, and/or damage to property.

Methods and Procedures

In order to develop a suitable incident reporting, investigation, and analysis procedure for use at SACN and answer these research questions, the following research methods were utilized:

- An evaluation of SACN's current procedure for reporting, investigating, and analyzing incidents.
- A review of literature focusing on incident reporting, employee involvement, organizational communication, reporting barriers, incident investigation, loss causation, and incident analyses.
- Surveying SACN employees.

The study's data was obtained by evaluating SACN's current incident reporting, investigation, and analysis procedure, researching related literature, and surveying SACN employees with the use of a questionnaire. SACN's existing procedure for addressing incidents was evaluated by the researcher in order to determine deficiencies and identify areas of improvement. The review of related literature presented the researcher with industry best practices and guidelines to follow in connection to incident reporting, investigation, and analysis. A questionnaire was then developed and given to SACN employees who are knowledgeable, involved, and have experience with incident reporting, investigation, and analysis and the safety management system employed at SACN. The questions generated for the questionnaire were aimed at answering the five research questions and allowing the participants to express their perspectives of SACN's current incident reporting, investigation, and analysis procedure. Also, the questions were designed to validate the deficiencies and effectiveness of the current procedure.

The results for this study were based on responses received from the questionnaire and data gathered from the literature review. The data was considered to be useable and reported in the results of the research if it was of significance to SACN. Significance to SACN was defined

as the ability to assist in the development of a formalized incident reporting, investigation and analysis procedure to serve SACN as a valuable tool for preventing the reoccurrence of losses.

Findings

The analysis of the reviewed literature and questionnaire responses revealed a number of concerning issues and deficiencies with SACN's current procedures for managing incidents. The major findings of the study include a variety of issues that were identified concerning communication and reporting barriers which might inhibit employees to report incidents, and that there is a lack of established, formalized incident investigation and incident analysis procedures at SACN. The results of the study were also able to identify industry best practices relating to both conducting an incident investigation and performing an incident analysis. Industry best practices including certain characteristics, key elements, and methods to follow with regards to both incident investigations and incident analyses were found with this study. The recommendations of this study can provide opportunities to address the issues and deficiencies that were found and help in developing these formalized procedures. The conclusions and recommendations of this study are provided in the following sections of this chapter.

Conclusions

Based on the findings of this study, the following conclusions have been made:

- It was concluded that SACN's incident reporting procedure was adequate. The procedure was established and found that it offered multiple ways for employees to report workplace incidents to upper management.
- The study found that SACN's incident reporting procedure was established and offered multiple ways for employees to report workplace incidents. However, it was

concluded that a number of incident communication and reporting barriers which inhibit employees to report workplace incidents currently exist and there is a lack of reporting occurring at SACN.

- The findings suggest that incidents need to be reported in order to gain valuable information so that an appropriate incident response can be made and an investigation be conducted. The reporting of incidents is the method which enables an organization to begin taking the necessary steps towards abating and preventing an incident's reoccurrence. Failure to report an incident prevents these steps from being made and leaves an organization uniformed.
- From the lack of reporting occurring at SACN, it can be concluded that employee involvement is deficient with regards to reporting workplace incidents. The incident reporting process is dependent on employee involvement. Without the involvement of employees and their contribution to the incident reporting process, the organization will not know that an issue is present and the incident will have the potential to reoccur. An opportunity to understand why the incident occurred and the chance to develop solutions to prevent or mitigate the incident will be missed.
- It can be concluded that SACN lacks in having established, formalized incident investigation and incident analysis procedures.
- The findings suggest that an incident investigation is a technique used to identify the causes of an incident and understand why it occurred. This information is then used to help eliminate the probability that a given type of incident will reoccur.
- It was concluded that an effective incident investigation procedure consists of an objective evaluation of all the facts, opinions, statements, and other related

information regarding the incident. This evaluation of the incident is then used to formulate a plan to prevent or control a similar recurrence.

- The findings suggest that an investigation entails detailed documentation and requires those conducting the investigation to possess strong problem solving skills. As a result, the incident investigation process requires an individual or team of individuals that have a clear understanding of the work procedures and are familiar with loss causation and investigative techniques. Therefore, it can be concluded that investigations are best performed by supervisors assisted by safety professionals, knowledgeable employees, or even outside resources.
- It was concluded that an effective incident analysis procedure will allow an organization to identify the conditions which increased the risk of an incident to occur, thoroughly assess the situation, prioritize decisions, and implement corrective actions. Furthermore, it can be concluded that the result of an ineffective incident analysis makes it unlikely that the right solutions will be identified and implemented.

It can be concluded that the current procedures employed at SACN for managing the occurrence of incidents are deficient. These deficiencies and absence of effective procedures for managing incidents at SACN is limiting the organization's opportunity to control and prevent the reoccurrence of employee injuries, motor vehicle accidents, and/or damage to property. If SACN follows and incorporates the identified industry best practices, guidelines, and methods with regards to conducting an incident investigation and performing an incident analysis and the recommendations of this study, it will provide SACN the opportunity to address and alleviate the issues found and help develop these needed formalized procedures.

Recommendations Related to This Study

This study provided the researcher with information to determine recommendations that address and alleviate the issues found with this study and to improve the current procedures employed at SACN for managing incidents. The following are recommendations related to this study:

- Consider identifying the type of communication and reporting barriers affecting employee's attitudes towards reporting incidents. When an organization can identify the type of communication and reporting barriers affecting employee's attitudes, they can then identify solutions for crossing these barriers, making it more likely for employees to report incidents.
- Consider stressing the need for continuous communication between employees at all levels. As well as for upper management and supervisors to continuously communicate the importance of both a positive safety attitude and the reporting of incidents. Continuous communication between employees at all levels and ongoing communication on the importance of reporting incidents can help address communication and reporting barriers.
- Consider providing timely and appropriate incident responses from the top management and supervisory level. Receiving a timely and appropriate incident response from the top management and supervisory level is a characteristic of a sound incident communication and reporting system. This type of response from the upper management and supervisory level also demonstrates to the affected employee(s) that management cares.

- Consider maintaining a positive demeanor when confronted by an employee whom is reporting an incident. Staying positive when confronted by an employee whom is reporting an incident promotes an effective communication exchange relationship. Furthermore, by remaining calm and collected, it is more likely that the employee will continue to report future incidents.
- Consider positively reinforcing employees who do report incidents, and refrain from reprimanding or intimidating them. A reliable incident reporting system enables employees to address management, without fear of reprisal, and to receive an appropriate response. If the atmosphere is negative or if employees do not see the value in reporting, they may become apprehensive and choose not to become involved in the incident reporting process.
- Consider paying more attention to incident prevention then control. Proper attention should be given to incident prevention. It is best to prevent incidents from occurring in the first place, rather than trying to manage or control them after the fact.
- Consider training all employees and supervisors on the process of reporting incidents. Proper training on the incident reporting process provides employees with the knowledge and ability to effectively report incidents to management. By informing and training employees on the process, they will be more likely report incidents.
- Consider ongoing training on the importance of reporting incidents. Ongoing training is needed to help ensure that incidents are continually reported.
- Consider implementing a formalized, systematic incident investigation procedure. Such procedure may involve the following steps:

    1. Receive an incident report or notification that an incident has occurred;

2. Appoint an incident investigator or develop an investigation team;
3. Secure the incident scene. If needed, administer first aid or provide medical care to the injured and prevent further injuries or damage;
4. Conduct the investigation. Gather evidence and facts relating to the incident and interview witnesses;
5. Identify the incident's basic and root causes;
6. Develop an incident report and document the findings of the investigation;
7. Identify solutions and create a plan for corrective action;
8. Implement the corrective actions;
9. Monitor, measure, and evaluate the effectiveness of the corrective actions; and
10. Make necessary changes for continuous improvement.

- When performing an investigation, consider objectively evaluating all of the facts, opinions, statements, and other related information regarding the incident. This objective evaluation can assist in determining the causes that led to the incident and provide evidence for proving it.
- Consider using the evaluation of the incident to formulate a plan to prevent or control a similar recurrence. The primary objective of using the information gathered by an incident investigation is to determine the failure mechanisms that have occurred and to then take corrective action.
- When an incident occurs, consider appointing the injured employee's supervisor to conduct the investigation. It might also be appropriate to appoint a team of individuals to assist the supervisor if the incident is more complex. For those conducting the investigation, it is important that they have a clear understanding of

the work procedures and are familiar with loss causation and investigative techniques. This will help ensure that an effective and thorough investigation of the incident is conducted.

- If the incident is complex, consider using safety professionals, knowledgeable employees, or even outside resources to assist in the investigation. These individuals can positively contribute to the investigation by assisting the investigator with their unique knowledge, skills, and abilities.
- Consider validating the accuracy of the information gathered during the investigation to ensure the root cause is revealed. It is essential for the information gathered during an investigation to be accurate. This is to ensure that the right solutions are determined and implemented. When the information is misleading or unreliable, subsequent solutions may not address the actual cause of the incident.
- Consider using the information gathered from the incident investigation to:
    - Identify the events preceding the incident,
    - Determine the failure mechanisms that have occurred,
    - Determine the immediate and root causes,
    - Identify solutions aimed at preventing the incident from repeating,
    - Aid in the development of correctable solutions,
    - Provide management oversight, and
    - Verify if reporting requirements are met.
- Consider implementing a formalized incident analysis procedure. In order to prevent incidents from reoccurring, it is essential to have a clear understanding of the incident's causes. This understanding can be achieved by conducting an effective

incident analysis. An incident analysis is designed to supplement the information gathered an incident investigation and helps in identifying the incident's contributing factors, distinguish the root cause, and assist in the development of corrective solutions.

- Consider using an incident analysis procedure to not only distinguish the root cause but also to help brainstorm, organize, identify, and assess contributing factors which increased the risk of an incident to occur. An incident analysis can serve as an effective and valuable tool for solving the problems that create incidents. When utilized, it can help an organization define the problem, gather and prioritize related data, analyze solutions, and evaluate the benefits and cost-effectiveness of corrective actions.
- When analyzing an incident, consider focusing on the underlying causes, not the presenting problem, and begin to think in terms of multi-casual. The study found that when incidents do occur, they are rarely the result of a single cause. Instead, they are typically complex and multi-causational. Taking the time to conduct a proper incident analysis can help ensure premature conclusions that lead to inadequate corrective actions are avoided.
- When performing an incident analysis, consider developing a clear definition of the problem. A clear definition of the problem will reduce the likelihood of focusing on what is irrelevant for solving the problem.
- When performing an incident analysis, consider evaluating all the identified causes. It is important to evaluate and consider all identified causes and to not overlook causes because they could lead to future incidents.

- Consider supplementing the incident analysis process by conducting a root cause analysis (RCA) or by creating a cause-effect diagram. Both offer structured forms of brainstorming which enable one to graphically illustrate the connection between the causes and factors. This allows for a more efficient and effective evaluation of the potential causes and helps influence determining the incidents corrective solutions.
- Consider evaluating the effectiveness of corrective solutions relative to their cost and the solution's likelihood for success. This evaluation is needed to ensure that the best solutions, based on the organization's financial resources and technical ability, are determined. Once determined, the solutions should be implemented into the system.
- Consider monitoring and measuring the effectiveness of the solutions once they are implemented into the system on a continuous basis. Solutions, over time, may become obsolete, inadequate, or may even create new or additional problems that have the potential to cause incidents. From a process improvement standpoint, solutions should then be continually monitored and measured to determine their effectiveness.

Recommendations for Further Study

Further studies may include researching the effectiveness of the solutions identified to help combat the communication and reporting barriers found at SACN, as well as the effectiveness of both the incident investigation and incident analysis procedures once they are implemented. It would be interesting to know if the implementation of these formalized procedures proved to be successful for identifying, controlling, and preventing the reoccurrence of incidents at SACN.

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Appendix A: SACN Incident Reporting, Investigation, and Analysis Questionnaire

This research has been approved by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46.

Saint Croix National Scenic Riverway Incident Reporting, Investigation, and Analysis Questionnaire

The purpose of this questionnaire is to help the Saint Croix National Scenic Riverway assess and improve its incident reporting, investigation, and analysis procedure; your insight and prompt reply will be greatly appreciated. Please complete the questionnaire and return it to one of the following email addresses: meyertho@my.uwstout.edu or thomas_meyer@nps.gov

All responses will be strictly confidential. Thank you in advance for your support.

Incident Reporting

1.) Please explain why an incident would need to be reported.

2.) Please list and describe methods that are available to employees for reporting incidents.

3.) Please describe how employee involvement, or lack thereof, can positively or negatively contribute to the incident reporting process.

4.) Please describe the role of individual responsibility to report incidents.

5.) If employee involvement is lacking, please describe how SACN can gain more involvement from employees.

6.) Please describe the effectiveness of SACN's employee incident report form.

Organizational Communication

7.) Please describe how park-wide communication, or lack thereof, can positively or negatively contribute to the incident reporting process.

8.) Please describe the role of top management and supervisor responsibility to investigate incidents reported by employees.

Communication and Reporting Barriers

9.) Please list and describe barriers that might inhibit employees to report incidents.

10.) If communication and reporting barriers exist, please explain how SACN can combat or overcome them.

Incident Investigation

11.) Please explain why an incident would need to be investigated.

12.) Please describe how an incident at SACN gets investigated.

13.) Please describe how the information gathered from an incident investigation is used.

14.) Please describe the effectiveness of SACN's incident investigation procedure in determining the incident's causes.

15.) If SACN's incident investigation procedure is lacking or deficient, please describe how it can be improved.

Incident Analysis

16.) Please explain why an incident would need to be analyzed.

17.) Please describe how incidents at SACN are analyzed.

18.) Please describe the effectiveness of SACN's incident analysis procedure in determining the incident's root cause and identifying corrective solutions.

19.) If SACN's incident analysis procedure is lacking or deficient, please describe how it can be improved.

Many thanks for your response!

Appendix B: Consent to Participate in UW-Stout Approved Research

Consent to Participate In UW-Stout Approved Research

Title: *An Incident Reporting, Investigation, and Analysis Procedure for the Saint Croix National Scenic Riverway*

Investigator:

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Description:
The objective of this study is to develop a formalized incident reporting, investigation, and analysis procedure for use at the Saint Croix National Scenic Riverway (SACN) and to answer the following five research questions. These research questions include:

1. What are the communication barriers at SACN which inhibit employees to report workplace incidents and how can SACN combat these incident communication/reporting barriers?

2. What is the manner in which incident investigations are conducted at SACN and are they effective in providing sufficient data/information regarding the incident?

3. What methods are considered to be industry best practices with regards to conducting an incident investigation?

4. Are incident analyses performed using the information gathered during the investigation and can the analysis identify the incident's root cause and determine corrective actions?

5. What are the best practices for performing an effective incident analysis?

This study is significant in that it can provide SACN an opportunity to effectively manage and prevent the reoccurrence of employee injuries, motor vehicle accidents, and/or property damage by improving the current procedures and methods for reporting, investigating, and analyzing incidents.

Risks and Benefits:
No additional risk will be placed on subjects involved in the study and participation is completely voluntary. The decision not to participate in the study will not bring about any adverse consequences.

The benefit gained from this study to the subjects is identifying possible deficiencies in SACN's current incident reporting, investigation, and analysis procedure. By identifying these

deficiencies, SACN can then make the necessary changes to the safety management system to better manage incidents so their reoccurrence can be prevented.

Time Commitment and Payment:
To complete the questionnaire in full is estimated to take no more than 1 hour, however the duration of time you are willing to spend on the study is decided by you.

No payment or compensation is provided for participating in this study.

Confidentiality:
Participants of this study will not be identified by name or other means as to make them identifiable. There shall be no public dissemination of results with identifiable information. The data shall be restricted to be viewed only by the researcher for its intended analysis. All data and electronic documents shall be secured with a high level of security. All documents shall be shredded following data input. There shall be no direct/indirect identifiers. No names or other identifiers shall be recorded.

Right to Withdraw:
Your participation in this study is entirely voluntary. Your choice not to participate in this study will not cause any adverse consequences to you. Should you choose to participate and later wish to withdraw from the study, your decision to withdraw will not cause any adverse consequences to you.

IRB Approval:
This study has been reviewed and approved by The University of Wisconsin-Stout's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

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Statement of Consent:
By completing the following questionnaire you agree to participate in the project entitled, *An Incident Reporting, Investigation, and Analysis Procedure for the Saint Croix National Scenic Riverway.*