Employees Attitudes toward Safety Risk Management and Safety Performance at U.S. Airports

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Abstract

Title: Employees Attitudes toward Safety Risk Management and Safety Performance at U.S. Airports

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Increasing air transportation traffic around the world initiated authorities to take new safety measures into consideration. In 2010, the Federal Aviation Administration (FAA) issued a Notice of Proposed Rulemaking to introduce Safety Management Systems (SMS) to the airport community (FAA, 2016). Throughout the years, the FAA has introduced SMS as a 4-pillar system for airports to provide a systematic approach to identify hazards, mitigate risks, increase safety performance, enhance reporting systems, and increase communication systems. It is advised by the FAA that airport employees should confidently speak up and report safety related incidents for further development of airport safety. The purpose of this study was to determine the relationship between airport employees’ attitudes toward Safety Risk Management (SRM) and airport safety performance. A survey instrument was hosted online to elicit responses from personnel at airports that
have implemented SMS. This questionnaire assessed employees’ attitudes toward SRM and gather their perceptions of safety performance at these airports. Completion of this research study would contribute to the body of knowledge on SMS, as well as shed light on how employees’ attitudes towards safety are related to performance.
# Table of Contents

Acknowledgements ........................................................................................................... viii

Chapter 1 Introduction ........................................................................................................ 1
  1.1 Problem Statement ......................................................................................... 1
  1.2 Purpose Statement ....................................................................................... 2
  1.3 Operational Definitions ............................................................................... 3
  1.4 Research Question and Hypotheses ............................................................. 4
  1.5 Significance of the Study ............................................................................. 5
  1.6 Assumptions and Limitations ....................................................................... 6

Chapter 2 Literature Review .............................................................................................. 8
  2.1 Introduction .................................................................................................... 8
  2.2 The Swiss Cheese Model in Aviation Safety .................................................. 9
  2.3 Safety Culture .............................................................................................. 10
  2.4 The Practical Drift Theory .......................................................................... 12
  2.5 Effect of Work Attitude on Safety at Workplace. ........................................ 13
  2.6 The effect of training and development on employee attitude .................... 14
  2.7 Analyzing Aviation Safety Problems, Challenges and Opportunities .......... 16
  2.8 Relationship between the implementation of SMS and Attitudes toward Unsafe
     Acts .................................................................................................................. 18
  2.9 Reactive, Predictive and Proactive Approach to SRM ................................. 19
  2.10 Why Should We Measure Safety Performance? .......................................... 20
  2.11 Safety Performance Indicators ................................................................... 21
  2.12 Developing Key Safety Performance Indicators .......................................... 23
  2.13 Summary and Study Implications ............................................................... 24

Chapter 3 Methodology .................................................................................................... 26
  3.1 Introduction .................................................................................................... 26
  3.2 Population and Sample ................................................................................ 26
  3.3 Instrumentation ............................................................................................. 27
  3.4 Procedures ..................................................................................................... 28

Chapter 4 Results of the Study .......................................................................................... 32
  4.1 – Introduction ............................................................................................... 32
  4.2 - Descriptive Statistics ................................................................................ 32
  4.3 – Inferential Statistics .................................................................................. 36
  4.4 – Results of the Hypothesis Testing ............................................................... 39

Chapter 5 Discussion ......................................................................................................... 40
  5.1 – Summary of the Study ............................................................................. 40
  5.2 – Discussion of Findings ............................................................................. 41
  5.3 – Conclusion and Inferences ....................................................................... 42
  5.4 – Research Implications ............................................................................. 42
  5.5 – Recommendations for Future Research and Practice ............................ 43

References ......................................................................................................................... 45
List of Figures

Table 1 - Attitudes toward Safety Risk Management (SRM) ................................................................. 34
Table 2 - Airport Safety Performance ..................................................................................................... 34
Table 3 - Summary of Airport Employee Demographics with Respect to Department ......................... 35
Table 4 - Summary of Airport Employee Demographics with Respect to Experience with SMS ..... 36
Table 5 - Correlation Analysis .................................................................................................................. 37
Table 6 - ANOVA .................................................................................................................................. 38
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Chapter 1 Introduction

1.1 Problem Statement

As the demand for air transportation increases, traffic volumes at the airports increase as well. This leads to complex and rapid ground service vehicle operations in the apron. The FAA claims that higher volumes of traffic at airports lead to an increase the number of incidents and accidents. Most of these events are caused by operational errors or vehicle deviations, which are the results of not taking safety seriously enough (FAA, 2015). Thus, airports have made greater efforts and adopted new measures to continue improving aviation safety. The use of Safety Management Systems (SMS) at airports contribute to this effort by helping airports minimize and eliminate the safety risks before they result in incidents or accidents.

Incidents and accidents at airports will continue to occur, because all the risks cannot be fully mitigated. “Airport Safety Program addresses general aviation airport safety, runway safety, Part 139 airports and SMS” to enhance safety and increase awareness (FAA, 2015, para1). Safety risk management is considered by the FAA as the key pillar for successful SMS implementation. Hazard identification and risk mitigation strategies are determined with Safety Risk Management process. The process of SRM identifies the hazards associated with airport activity and determines the risk affiliated with these hazards. Unacceptable
risk is assessed and mitigated and continuously monitored in the system. Safety performance is crucial for determining an airport’s current standards and evaluation. This study was aimed to further examine the relationship between airport employee attitudes towards safety risk management on safety performance at airports.

1.2 Purpose Statement

Airports have been experiencing accidents and incidents resulting in the loss of human life as well as the loss of billions of dollars. In the United States, airlines spent 12.4 billion per year on incidents related to Foreign Debris Object (FOD) on runways (SRI, 2008). Bird-aircraft collisions costed the airline industry $155 million a year (Dolbeer, 2013). Also, based on the data developed by International Air Transportation Association (IATA), major airlines spend at least $10 billion a year on ramp accidents and 243,000 people have gotten injured on ramps (Flight Safety Foundation, 2017). Safety risk management creates a framework to identify hazards and mitigate risks including safety inspection procedures and wildlife management. Britton explains unsuccessful risk management as “lack of prescriptive/performing balance”, or being slow to respond and report (Britton, 2016a). Personnel attitudes towards hazards are very important in risk management, and reporting as well as not underestimating is crucial. Personnel contributing to safety management systems should be well educated and proactive. The purpose of this study was to find out the significance of employee attitude towards SRM on safety performance at the airports.
1.3 Operational Definitions

**Attitudes Towards Safety Risk Management.** An attitude is defined as person’s behavior or way of thinking towards a particular activity (Breckler, 1984). For this study, attitudes toward SRM are employee attitudes towards safety risk management. These attitudes were measured using a researcher developed survey instrument, further described in Chapter 3 of this thesis. Each participant in the study was evaluated in terms of their willingness to contribute to report or take necessary action related to SRM processes. Airport employee attitudes toward SRM was measured on a Likert-type scale.

**Safety Performance.** The International Civil Aviation Organization (ICAO) defines safety performance as “service provider’s safety achievement as defined by its safety performance targets and safety performance indicators” (ICAO, 2013, para. 1). In this study, safety performance was measured using a researcher developed survey instrument, further described in Chapter 3 of this thesis. Each participant in the study was asked about their perceptions regarding the effectiveness of airport employee communications during safety related events, their airport’s capability of reaching safety goals as an organization, and airport employee capabilities with respect to meeting organizational goals and overall personnel efficiency. Airport employee perceptions of safety performance was measured on a Likert-type scale.

**Safety Management Systems.** SMS is a top down approach to management of safety risk and includes procedures, practices and policies. SMS is
a great tool used by large organizations to enhance safety, improve communication skills and mitigate hazards with the four components which are safety risk management, safety policy, safety assurance and safety promotion (Ludwig, Andrews, Veen, & Laqui, 2007)

**Safety Employees.** Airport safety employees are those employees dedicated to enhance safety culture at the airport. Their primary roles are to inspect safety related activities or tasks, provide safety training, safety evaluation, create safety objectives and development alternatives and promote safety.

**Operation Officers.** Airport operations officers are those employees dedicated to work on sustaining and maintaining safe airport operations. Operations officers include ramp agents, baggage handlers, wildlife management officers, airside maintenance officers, airside inspection officers. Their primary role is to maintain the operational efficiency at the airport at all times by maintaining the airfield for safe landing and take-off and maintaining the apron for safe parking and baggage handling.

### 1.4 Research Question and Hypotheses

**RQ:** What is the relationship between airport employee attitudes toward safety risk management and safety performance at U.S. airports?

**Null Hypothesis**

H₀₁: Attitude employee attitudes toward safety risk management have no significant relationship with safety performance at U.S. airports.
Alternative Hypothesis

$H_{A1}$: Attitude employee attitudes toward safety risk management have a significant relationship with safety performance at U.S. airports.

1.5 Significance of the Study

The FAA and ICAO recommends that organizations and airports implement SMS and measure their safety performance to evaluate their current standards. The FAA claims that SMS identifies hazards, mitigates risks, promotes safety, and improves safety awareness (Halford, 2016). Implementation of SMS helps identify training needs and assesses the current knowledge of employees. Thus, measuring safety performance consequently validates the effectiveness of safety risk controls.

This study examined how employee’s attitude towards safety risk management could affect the airport’s safety performance. Behavior and confidence of airport employees has a significant effect on successful SMS implementation. The result of this study could be used to design more professional and beneficial parameters for employee training. This study could help reduce the incidents caused by negligence, lack of knowledge, or disinterest. In some cases, airport employees do not know what or how to report safety related concerns, however research will provide the benefits of a proactive approach for more successful SRM implementation.
1.6 Assumptions and Limitations

In this study, data collection was done through online surveys and participants were asked to answer honestly. There were several assumptions throughout the research. First, it was assumed that the airport employees answering the survey questions represents the random sample. Survey questions were sent to participants who works at the airports and contribute to SMS by any means. Random sampling was vital for the research, because randomly selecting participants eliminates bias and therefore the results represent the population. On the other hand, it was assumed that participants would answer the questions honestly. Honesty is very important during surveys or in professional life. Results of the survey answers were used to implement the results and dishonest answers would give the researcher a false impression. Research was analyzed to improve safety by hearing from an employee’s perspective. Conclusion drawn from dishonest answers would be misleading.

Limitations are one of the most important aspects of research for understanding the content. Limitations give information about the validity of the scientific work, and increase the credibility of the published research. In this study, one of the most important limitation was including solely participants from airports with SMS implementation in progress. Airport employees from airports without SMS implementation were not able to participate in this research. Therefore, the researcher could receive answers from airport employees who have already worked on some aspects of SMS, such as risk management and safety performance
evaluation. This limitation increased the validity of the research since the survey questions were answered by employees with experience in the research area. However, one delimitation was that airport employees answering the survey questions do not necessarily have to be working on SMS or airport safety. Surveys were sent to airport employees that contribute to SMS by hazard reporting or risk mitigation. These employees could be working in planning, engineering, airport operations, airside maintenance, building maintenance, or gate security.
Chapter 2 Literature Review

2.1 Introduction

Safety is the most crucial element of airports, as human life has priority. The commercial aviation industry has been facing challenges over the past decades and working towards a common solution for safer air transportation. However, it is fairly impossible to develop safety homogeneously throughout the airports, airlines, and ground service operations. Through the International Civil Aviation Organization’s (ICAO) contribution, SMS has been widely used throughout the world, and it contributes positively to safety culture at airports.

In 2010, Remawi conducted a research study employing survey experimentation and proved that airports implementing SMS have improved employee behavior and confidence levels at the workplace (Remawi, Dix & Bates, 2010). More studies have shown that implementing new safety risk management tools have dropped the accident rates at airports over the past decade (Hersman, 2011). Employees with predictive and creative attitudes have always been successful in the workplace, keeping themselves alert and recognizing unsafe behaviors (Brenner, 2015). Although this holds true, previous studies have not focused specifically on the relationship between employee attitudes toward SRM and safety performance at airports. This chapter reviews the theories underlying safety management systems and previous studies that have addressed employee attitudes in the workplace and their effects, as well as the effect of employee...
training on work performance, the challenges the aviation industry has been facing, and the measurement of safety performance.

2.2 The Swiss Cheese Model in Aviation Safety

The Swiss cheese model is used to implement risk analysis and risk management in mostly aviation safety, engineering, and healthcare. The Swiss cheese model was first introduced by James Reason in 1990, and it was proposed as an accident causation model for complex systems. The Swiss Cheese model is comprised of vertically arranged slices of randomly-holed Swiss Cheese side by side with gaps in between each slice. The main objective is to demonstrate that most accidents happen with one or more levels of failure when the Swiss cheese holes line up with each other (Skybrary, 2016). The failures are listed as organizational influences, unsafe supervision, preconditions for unsafe acts, and the unsafe acts themselves. The Swiss cheese model represents the barriers placed against failure and the holes in the cheese represents the weaknesses. When all the holes in each barrier momentarily align, the system fails and hazards pass through the holes creating “a trajectory of accident opportunity” (Skybrary, 2016).

Unsafe acts are the first layer of failure in the Swiss cheese model explained by James Reason. The incomplete use of a mandatory checklist and insufficient intra-crew or insufficient crew to tower communication are the major weaknesses in unsafe acts. In some cases, pilots or safety employees have fatigue or mental failures that could form weaknesses in the second layer, which is are preconditions for unsafe acts. Insufficient training and incorrect pairing of personnel are
considered weaknesses of third layer of swiss cheese, which are considered unsafe supervision. Lastly, organizational influences are the weaknesses that form after organizations fail to comply with safety regulations or lack training for their work area (Greller, 2013). The Swiss cheese model in aviation safety is extremely important as hazards by eliminated by different levels of safety systems each represented by a layer of Swiss cheese. The Swiss cheese model proposes an idea of accident causation model that illustrates the many layers of defense that lies between hazards and accidents. There are flaws in each layer of swiss cheese and one of these layers could be the employee attitude toward safety risk management. In this proposed study, importance of employee attitude toward safety risk management will be investigated to decrease the number of flaws in human factor layers for more successful SMS implementation.

2.3 Safety Culture

The investigation of multiple disasters, including the Chernobyl Nuclear Reactor explosion and Continental Express Flight 2574 crash, claimed to happened because of lack of safety culture in the past decades (Chen & Jin, 2013). The National Transportation Safety Board (NTSB) explains some of the tragic crashes as a “failure to establish a corporate culture to enforce approved maintenance and quality control measures”. Therefore, a safety culture assessment has been used by organizations to analyze the root cause for these incidents and accidents.

Safety Culture is a way of ensuring high levels of safety performance in an organization. Safety culture can be defined as the organizations’ values, beliefs,
common working practices, or the way in which they respond to unusual situations (ICAO, 2013). Safety is very critical in the aviation industry. Especially in general aviation, commercial aviation, and airport operations, safety culture is highly embedded into the process that it is hardly recognized as the concept of safety and its meaning. Patrick Hudson describes a safe environment as “allowing dangerous activities to take place successfully, which means without harm or damage” (Hudson, 2001, p.3). Safety should be well explained and managed to allow profit or advantage to be gained. The aviation industry involves high risks which could turn in to higher profits if well managed. To achieve an acceptable level of safety and promote safety culture, risk is managed well or operations are scaled down. Organizations with highly involved and intelligent employees who are personally involved in ensuring safety would be reaching high levels of safety, and therefore they would have remarkable safety culture (Hudson, 2001).

According to Hudson (2001), generative techniques have been the most effective safety culture following Bureaucratic technique and Pathological technique. In a Generative culture, information is actively sought, messengers are trained well, responsibilities are shared, failures cause inquiry, and new ideas are always welcomed (Hudson, 2001). However, in Pathological and Bureaucratic cultures providing information is not important, responsibilities are not shared, failure is covered up, and new ideas create confusion and problems. For extensive development, organizations should be open to new ideas and provide as much information and training to the employee as possible. Hudson discovered that
organizations using Generative techniques have the lowest number of incidents and their quality of safety culture peaks. As the organizations’ top management and the employee’s stays on the same page and pass information to each other, safety culture will always be an intensive quality, which would provide better safety performance (Hudson, 2011). As safety culture improves in an organization, the level of trust as well as communication between the management and the rest of the company improves, resulting in reduction in time and improved performance. As safety culture is considered a way of ensuring high safety performance at airports, this proposed study must take safety culture of airports into consideration when evaluating safety performance of airports.

2.4 The Practical Drift Theory

In aviation industry, organizations have to operate in a zone which is defined as safety space. The safety space is defined as “a continuum between baseline performance and the continuum of accident” (Baron, 2016). Practical drift occurs within the zone defined as safety space and it extremely dynamic that can shift continuously. In this continuum, when there is a drift toward accident, safety is deteriorating which may cause and accident. Thus, when there is a drift toward baseline performance, safety is improving. Baseline performance is the level that every organization aims to reach, which is a state of full efficiency with no chance of accident (Baron, 2016). Theoretically it is fairly impossible for aviation organizations to reach baseline performance level unless there is no activity. Aviation organizations can almost reach baseline performance level by adopting
perfect policies, rules, regulations and procedures. However, people tend to fail to follow the procedures, policies, rules and regulations. Most accidents occur not because of lack of procedures, but people fail to follow them (Baron, 2016). Unfortunately, even though it has been tried hard to eliminate the risks and reach baseline performance level, airports drift back to accidents as the traffic volume increases and airports gets busier (Baron, 2016). In this proposed study, one important factor to keep the operations in the practical drift will be investigated which is employees attitudes toward SRM.

2.5 Effect of Work Attitude on Safety at Workplace.

Brenner explains the importance of one’s attitude towards work as it “Not only affects how well you do your job, but also affects how safe when you are doing it” (Brenner, 2015). In the workplace, people with positive attitudes maintain open minds and perform better. Positive attitudes at the workplace help to develop team work, productivity, and employee morale, while people with negative attitudes tend to complain and not care about the quality of the work they have done (Root III, 2017).

Most of the time people with negative attitudes do not care if the workplace is safe, because they usually have distracted minds (Brenner, 2015). Negative attitude cause people to retract and close down, which results in people losing interest in the workplace. Thus, it restricts the employees’ creativity, as they are not invested in the success of the organization (Root III, 2017).
Brenner describes positive attitude at the workplace as “the fuel that drives you and it determines the ways which you think and feel” (Brenner, 2015). Positive attitudes help people maintain openness to new ideas and pay attention to details in the workplace. Positive attitudes keep one alert and allows one’s mind to recognize unsafe behavior or habitats. (Brenner, 2015). Attitude does not necessarily create competition at the workplace, but Root claims that attitude enhances the competitive environment, and competition between employees is regarded as motivator for employees’ performance to improve (Root III, 2017). It is proven that positive attitude develops greater organization and greater efficiency at workplace (Brenner, 2015).

2.6 The effect of training and development on employee attitude

In 2011, Truitt investigated the effect of training and development on employee attitudes as it relates to work proficiency. The relationship between training attitudes of the employees and their work proficiency were investigated, and the results were not surprising. At the end of the study, 86.8% of the employees who had positive training attitudes had positive views on their work proficiency, and 80% of the employees who had negative attitude towards training had negative views on their work proficiency (Truitt, 2011).

Employee performance is one of the most crucial measures emphasized by the top management of organizations. Nowadays, it seems like employees are more
concerned about their performance and productivity, thus the knowledge and skills at the workplace has increased drastically. Therefore, as sufficient training and development is provided to employees, their personal and organizational motivation will increase (Truitt, 2011). Tsai, Yen and Huang claim that employees who are committed to participating and learning have higher job satisfaction and performance at their workplace (Tsai, Yen, Huang & Huang, 2007).

Truitt investigated this relationship by sampling 487 full-time salaried employees from four organizations through business contacts. Each four of those organizations reported that their employees participated in trainings on a regular basis. Survey questionnaires were sent to all 487 employees, however, only 237 returned the surveys, yielding a response rate of 48.6%. The survey was designed by the author and the main points it explored were job training, development training, effective coaching, teamwork, and mentor meetings. Upon completion of the study, it was proven that 86.8% of employees with positive attitudes had higher work proficiency (Truitt, 2011). The result of the study effectively demonstrates a strong positive correlation between work proficiency and attitude about training. “Employees who fully agreed that they received effective coaching and those who fully agreed they received meaningful coaching felt they demonstrated an increase in job proficiency” (Truitt, 2011, p. 3).
2.7 Analyzing Aviation Safety Problems, Challenges and Opportunities

Since the aviation industry’s birth over 100 years ago, commercial and general aviation operational safety has grown drastically. The commercial aviation industry has reached a point such that air transportation is the safest means of traveling, accompanied by the fall in accident rates. However, safety performance does not develop evenly worldwide. It is proven that aviation safety performance has increased more drastically in well-developed countries compared to developing countries. The aviation industry has been facing challenges over the years to improve safety performance in areas such as development and the understanding of new safety parameters and new forms of data. Oster and Strong affirm that the best way to do so is to move from the reactive approach to the proactive, predictive, and system based approach with much more involvement (Oster, Strong & Zorn, 2013).

In 2011, the International Air Transportation Association reported that there was 1 accident rate per 1.6 million flights and that there has been 42 percent improvement since 2000 (Hersman, 2011). This improvement was achieved by utilizing improved hazard identification and risk mitigation strategies before take-off and after landing (Oster, Strong & Zorn, 2013). Safety reports show that the aviation industry improves in safety also in the analyses of accidents after they occur. One of the most important reasons for this improvement is the proactive approach towards safety and the understanding and implementation of the Swiss Cheese model of safety management. Accidents occur after numerous failures,
explained in the Swiss Cheese model as multiple slices of Swiss Cheese lined up, creating a big loop. Therefore, the FAA emphasizes a proactive approach towards the implementation of SMS. The proactive approach is tedious; however, it is extremely important for enhancing aviation safety. Traditional safety metrics fail to capture the complex safety related incidents, while the proactive approach and analysis creates more measurable indications to develop safety practices and oversight (Oster, Strong & Zorn, 2013).

To improve safety, the aviation industry must maintain and improve the collection and storage of data. The process of maintaining this ongoing data recording is demanding and becoming much more challenging as the industry grows. Airlines could improve this effort by extending safety to other segments and by sharing their data and information. Improving aviation safety globally is very challenging, because in developing countries, some safety issues are related to old and worn out equipment or a poor regulatory environment. The next generation of safety challenges requires airlines to have better communication with federal authorities, and with each other. The most important aspect of this effort is to create a systematic approach to develop and understand new forms of data and to move from the reactive to the proactive and predictive approach (Oster, Strong & Zorn, 2013).
2.8 Relationship between the implementation of SMS and Attitudes toward Unsafe Acts

The main objective of ICAO is to ensure the safe and orderly growth of international civil aviation throughout the world. ICAO recommends for organizations to approach the term safety with a systematic plan for better results. Safety Management Systems have been the most effective and efficient way to enforce safety rules and regulations throughout the aviation industry. Research conducted by Remawi, Dix and Bates (2010) determined that a performance based approach to SMS increases the maturity and performance of the work done. Remawi et al. go on to explain that SMS must be taken seriously and should be approached in the same manner as any other business process or strategy in an organization. Remawi et al. (2010) also investigated the relationship between the implementation of SMS and attitudes towards unsafe acts in aviation. The purpose of the research was “to determine whether a relationship exists between implementation of an SMS and consequent attitudinal change towards unsafe acts with an airport that had not had any formal SMS” (Remawi et al., 2010).

This research was conducted using a survey experimentation and participants were asked to answer question regarding the safety culture of their organization, how their staff perceive safety, the behavior of employees during safety related events, and the organization’s safety management structure. The survey was sent to a total of 299 participants and 95% of the participants responded to contribute to the experiment. The data collected from the experiment was
analyzed using the MANOVA method to complete multiple outcome variables. At
the end of the analyses it was affirmed that the introduction of the SMS to an
airport would result in an improvement in safety culture. Thus, the conclusion of
the study was that implementation of SMS brings confidence to employees which
in turn improves the behavior of employees towards the work that they do (Remawi
et al., 2010, p2).

2.9 Reactive, Predictive and Proactive Approach to SRM

Britton claims that, “Aviation safety managers and employees who
understand the real difference between reactive, predictive and proactive risk
management activities gain considerable benefit generating good safety
performance (Britton, 2016b). Most of the time, these three strategies are
misunderstood or confused. In the reactive approach, the mitigation severity of
safety threats is the main objective, while the proactive approach identifies the
safety concerns before the incident occurs. Moreover, the predictive approach
anticipates future exposure based on past safety performance data (Britton, 2016b).

Reactive safety risk management is mostly found in underdeveloped safety
programs lacking in safety culture. The reactive approach is an underdeveloped
form of risk management, seeing as it is the action of mitigating risk only after a
safety incident occurs. However, in new SMS programs there is no previous data to
practice a proactive or predictive approach, therefore it is the best approach to start
the new system of safety management (Britton, 2016b, para. 3).
The proactive approach identifies the hazards and mitigates the risks. The main objective is to understand and observe the underlying causes that lead to failure of a system. Practicing a proactive approach to risk management requires airports to have previous safety related data and the ability to monitor complex safety metrics. However, it does not mean new SMS designs cannot have a proactive approach. Proactive risk management includes specific activities, and it uses leading indicators to directly assess the underlying causes. Using a proactive risk management strategy is beneficial for airports, as it identifies hazards before incidents occur and data recording creates a professional training environment (Britton, 2016b).

Lastly, the predictive risk management approach identifies possible risks and new threats to the system. Predictive risk management is largely used to predict future safety incidents. The predictive approach employs lagging indicators, as it uses past historical data to predict the expected future outcome. This strategy is opposite that of the proactive risk management, because the proactive approach uses leading indicators.

2.10 Why Should We Measure Safety Performance?

The FAA and ICAO recommend organizations and airports measure their safety performance to evaluate their current standards. Measuring safety performance also validates the effectiveness of safety risk controls (ICAO, 2013). The safety policy of an organization can be defined as the safety related objectives and the corresponding safety targets. However, the basis of safety policy is the
assessment and analysis of how the organization functions and delivers the product. Safety performance should be evaluated considering improvements to safety, efficiency and capacity, therefore, safety performance is the overall assessment of the safety culture and organization’s overall efficiency and effectiveness (SCI, 2004).

Safety management is highly dependent on an airport’s capability of systematically analyzing, monitoring, and further developing the organizational safety performance. Effective safety management process can only be fully developed by understanding organizational systems and procedures. Organizational systems, procedures, and achievability cannot be understood without some type of measurement (SCI, 2004). Therefore, organizations should select safety performance indicators to correctly evaluate the process and provide feedback for further development. However, these indicators cannot be random outcomes that are easy to measure. Indicators should provide the necessary feedback to evaluate and improve the safety management process.

2.11 Safety Performance Indicators

“Safety performance indicator is the data based safety parameter used for monitoring and assessing performance” (ICAO, 2013, para.3) and “safety performance target is the planned or intended objective for safety performance indicator over a given period” (ICAO, 2013, para.3). Safety Performance Indicators (SPI’s) are classified in different areas according to the conceptual information.
required. There are two different types of safety performance indicators, these are referred to as Lagging and Leading indicators.

Lagging indicators are measures of safety incidents that had a negative impact on the organization’s safety performance; they are used to measure the unwanted safety events that already happened. Lagging indicators measure safety outcomes and they are mainly used to validate the safety performance and effectiveness of the system. Lagging indicators can be used for accidents or incidents with high severity negative outcomes or lower safety system failures with lower negative outcomes (S.C.I., 2004).

Leading indicators are metrics that provide information about the possible negative outcomes that may ensue from the current situation. Leading indicators measures both the positive effects contributing to safety performance and negative effects that may have negative outcome in the future. Providing positive safety indicators encourages employees to focus more on the system and increases safety management capability. Leading indicators are used to influence safety priorities and provides information for safety improvement (S.C.I., 2004).

However, safety performance measurement should consider combination of lagging and leading indicators. Both indicators should be used to ensure that the safety management is effective; specifically, lagging indicators can be used to evaluate the safety risk management process since they are the indicators for lower system failures with lower negative outcomes.
2.12 Developing Key Safety Performance Indicators

The purpose of developing safety performance indicators is to obtain information about the current safety level of the airport operations and the safety training that has been done. Granberg and Munoz (2013) conducted a research to develop performance indicators to monitor and manage an airport by reviewing current level of work proficiency. To be able to develop key performance indicators, airport was divided into five activity areas as operations, environmental issues, safety and security, and customer service. For each area, initial set of performance indicators were selected and ranked by airport officials in Sweden and Spain for interpretation and use in analyzing the entire airport (Granberg & Munoz, 2013).

Airport safety performance indicator are selected regarding the work to prevent and handle accidents. Initial set of safety performance indicators were number of aircraft safety incidents, number of incidents at security checkpoints, time it takes to begin operations after evacuation, and time taken and grade of destruction when returning to normality (Granberg & Munoz, 2013). Completing the survey questionnaires and analyzing the data received from airport executives, it was decided that key safety performance indicators should be number of incidents at security checkpoints and number of aircraft safety incidents (Granberg & Munoz, 2013).

**Number of aircraft safety incidents.** Aircraft incidents are the most important safety performance indicators at the airports. It could be a result of
vehicle deviations on apron, emergency landings, bad weather conditions or human error (Granberg & Munoz, 2013).

**Number of incidents at security checkpoints.** Low number of incidents at security checkpoints should not be considered success, since it might be due to inefficiency of security checkpoints or ineffectiveness of security officers. However, high numbers of incidents at security checkpoints must be considered (Granberg & Munoz, 2013).

### 2.13 Summary and Study Implications

Airport safety is very crucial for the public and airport employees. Maintaining the safety and participating in Safety Risk Management is every employees’ responsibility and it could only be successful with well-designed SMS program and collaboration between employees and tenants. Well-articulated SMS’s will be able to define the hazards and mitigate the risks. Swiss cheese relates the accident causation model to a vertically arranged slices of swiss cheese with random holes on each slice. Accidents happens when these holes lines up and the failure slides through the holes ending up in an accident. If every employee does their job correctly system has a lower chance of failure, which relates to the safety culture of an airport. Airport managements objective should be ensuring high levels of safety performance at the airports with effective and efficient as well. However, employees attitude toward the work or duty has a significant effect on the work
outcome. Employees with positive attitudes take their jobs more seriously and achieve higher standards. Employee’s approach and interest toward the duty determines attitude. It is expected that employee attitude would have an impact on airport safety performance which is the overall assessment of safety culture, efficiency and effectiveness of an airport. Safety performance indicators for such airport could be intensity of incidents and accidents, employee safety training and safety system failures.
Chapter 3 Methodology

3.1 Introduction

This chapter describes the population and sample, instrumentation, procedures, and data analyses of the study. A detailed explanation of population and sample is provided in this chapter. A power analysis was conducted to ascertain the minimum number of participants needed and a respective description is provided. A description of independent and dependent variables as well as research methodology is explained with the threats to the internal validity of the study.

3.2 Population and Sample

Population. The population of this research was the US Airports that have implemented SMS. The accessible population for this research included the FAA’s OEP-35 airports that have implemented SMS. Since OEP airports handle more than 70% of U.S. passenger traffic (FAA, 2015), the accessible population provided the opportunity to include a greater amount of employees participating in the research.

Sample. The sample for the study was selected using convenience sampling. Airports that have been implementing SMS was targeted to improve the accuracy of the survey results. Sample selection was done without prior study or experience and without any pilot study. Questions were sent through an online
survey system and in order to participate, sample airports must be implementing SMS.

**Power Analysis.** Power of the study is calculated using alpha level of 0.05, effect size of 0.7348 and sample size of 44. The power analysis was run using the software G*Power 3.1 and the software determined a power of 0.99. Therefore, the probability of making a Type II error, or concluding there is no effect, is very low.

### 3.3 Instrumentation

A researcher developed survey instrument was used to collect data. The questionnaire is comprised of three main sections: attitude towards safety risk management, safety performance of the airport, and background information. A copy of the survey instrument used in this study is provided in Appendix A for ease of reference.

**Employees Attitudes toward SRM.** In this section of the survey instrument, participants were asked to answer questions regarding their experience at the associated airport related to SRM process. Answers for the questions were designed in such a way that participants were able to answer on a 1-6 scale. The scale consists of 6=N/A, 5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Strongly Disagree. An example survey question would be “I am willing to participate in SRM by reporting any unsafe act in the airport”. A positive answer to this survey question would be “Strongly Agree” and would receive 5 points on the Likert scale.
**Airport Safety Performance.** To evaluate the safety performance of the airport, participants were asked to answer a survey question and the scale of 1-6 was used as described in attitude towards SRM section. An example question would be “I have been trained by my airport for safety and the training was sufficient”. The positive answer for this survey question would be “Strongly Agree” and would receive 5 points on the Likert scale.

### 3.4 Procedures

**Research Methodology.** The study was analyzed using correlational design and data collection was completed by sample survey instrumentation. I measured the strength of a relationship between two factors, therefore correlation analysis was the right research design for this study. Data was collected using survey instrumentation, which consists of obtaining information from the participants. The survey questionnaire was sent to airport employees who work at an airport with SMS implementation in progress. The analyzed results then were used to generalize the population from which the sample was selected.

**Human Subject Research.** This research and the proposed implementation involves human subjects; therefore, I followed the ethical principles of human subject research. To comply with the rules, I submitted a “Student Application for Research Involving Human Subjects” form to Florida Institute of Technology’s Institutional Review Board (IRB) prior to commencing the study. On February 1st, 2018, Certificate of Clearance for Human Subject Research was received from
Florida Institute of Technology’s Institutional Review Board (IRB). A copy of this application and certificate of clearance is provided in Appendix B.

**Description of the independent and dependent variable.** The study includes a single independent variable and a single dependent variable. The independent variable in this study is employee attitudes toward safety risk management, and it was evaluated using the survey answers from participants. The dependent variable in this study is the airport safety performance, and it was evaluated using the survey questionnaire answers. Airport safety performance was expected to improve with positive employee attitudes toward safety risk management.

**Study Implementation.** Internal validity of the survey questions was reviewed by the Florida Institute of Technology Internal Review Board and thesis committee members before it was sent out to the participants. The survey was hosted online and an invitation to participate in the survey was sent to employees of the airports with SMS in place. The survey was available for a period of six weeks for participants to answer the questions. I sent out reminders to the possible participants to remind them about the survey after 2 weeks. Participants were asked to answer a set of questions as explained in the instrumentation section. I checked the internal consistency and reliability of the data using Cronbach’s alpha before performing the analysis.
**Cronbach’s Alpha.** The reliability of the survey answers was checked by Cronbach’s Alpha for internal consistency before analyzing the data. Cronbach’s Alpha is a measure of internal consistency, that is how closely related a set of items are as a group. Worthen et al. (1999) proposed that instruments with reliability coefficients greater that 0.5 are acceptable in practice when they are used to make decisions about a group of individuals. In this study Cronbach’s Alpha of 0.8465 was achieved which indicates that the instrument is highly reliable.

**Threats to Internal Validity.** In this study, internal validity refers to the validity of the interferences that may be drawn from the results of the study. “Threats to internal validity compromise the confidence in saying that a relationship exists between the independent and dependent variables” (Michael, 2002, p. 2). Threats to internal validity is identified as selection, location, instrumentation, testing, and mortality (Michael, 2002). The relevance of these threats to the proposed study and the discussion is provided below.

**History.** The history threat is explained as the events occurring between first and second measurements in addition to the experimental variables. History is a threat for one group design, however in this study, survey experiment was not effected by history as both dependent and independent variables were affected.

**Maturation.** The maturation threat is the processes within the participants as a function of a passage of time, such as growing older or becoming tired. In this
study maturation was not a threat to validity as the dependent and independent variables were measured at the same time.

**Instrumentation.** The instrumentation effect is the changes in calibration or design of a survey that may produce changes in the obtained results. The survey questionnaire was reviewed by the Institutional Review Board (IRB), and the same survey was sent to all participants. Instrumentation was a threat to the internal validity of this study. Therefore, the survey was reviewed by committee members for face validity.

**Selection bias.** Selection bias refers to the bias of the selection of a participant that would result in a difference between the control group and treatment group before the experiment begins. In this study, selection bias was a threat to the internal validity, since the participants were selected using convenience sampling and it was voluntary to participate. Thus, it is likely that participants answering the survey questions were safety professionals or people that are interested in SMS.

**Experimental Mortality.** Experimental mortality is referred to as the loss of participants in the study, which could change the results of the proposed study. The survey questionnaire was sent to participants, but was unknown how many participants would answer the questions. Therefore, mortality was a threat to internal validity. To control this threat, I designed a clear and understandable survey. In addition to that, I documented the characteristic of the sample and follow Cohen, West and Aiken’s (2003) guidelines for handling missing data.
Chapter 4 Results of the Study

4.1 – Introduction

This chapter presents the results of the study. The first section presents the descriptive statistics and contains survey results of the Employee Attitude Toward SRM and Airport Safety Performance including number of participant answering the survey, average score and standard deviation in Likert scale as well as background information regarding participants experience with airport safety and Safety Risk Management procedures.

The second section presents inferential statistics which consists of primary data analysis and secondary data analysis. Primary data analysis consists of correlation analysis. In this section I addressed the invalid data, use of Jackknife outlier analysis and extraction of outliers as well as results of correlation analysis. In this section, secondary analysis is presented as well using Analysis of Variance (ANOVA) to determine the effect of employee experience on the results.

In the final section of this chapter, results of hypothesis testing that is outlined in Chapter 1. This section explains the decision I have made regarding the research question and the null hypothesis.

4.2 - Descriptive Statistics

Descriptive statistics was used to report the total number of participants answering the survey questions, the participant’s background information, and the
participant’s attitudes toward SRM and airport safety performance. These statistics includes the participant’s attitude towards SRM and airport safety performance in a Likert-scale 1-5, as well as the participant’s experience in the industry and the years of the airport’s experience implementing SMS. The mean of the participants recorded scores on a scale of 1-5 were used to measure the central tendency. I could determine if the airport employees have positives attitude toward SRM, and if the airports have a positive safety performance, using mean values of the participants scores.

In this study, survey instrument was answered by 48 participants. These individuals have different job titles and different responsibilities at the airport as well as different levels of experience. Survey results, participant scores and standard deviation are shown below.
4.2.1 Survey Results

Survey results, participant scores and standard deviation are shown below.

Table 1 - Attitudes toward Safety Risk Management (SRM)

<table>
<thead>
<tr>
<th>Item</th>
<th>Statement</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>I am interested and willing to acquire further knowledge about SRM.</td>
<td>48</td>
<td>4.35</td>
<td>0.67</td>
</tr>
<tr>
<td>A2*</td>
<td>I do not have to pay attention following SRM procedures.</td>
<td>48</td>
<td>3.79</td>
<td>1.47</td>
</tr>
<tr>
<td>A3</td>
<td>My duties are enjoyable and stimulating to me.</td>
<td>48</td>
<td>4.44</td>
<td>0.61</td>
</tr>
<tr>
<td>A4</td>
<td>I am willing to communicate with my co-workers about SRM.</td>
<td>48</td>
<td>4.40</td>
<td>0.64</td>
</tr>
<tr>
<td>A5*</td>
<td>I have never liked SRM.</td>
<td>48</td>
<td>3.51</td>
<td>1.34</td>
</tr>
<tr>
<td>A6</td>
<td>I am willing to report safety related incidents at the airport.</td>
<td>48</td>
<td>4.35</td>
<td>0.73</td>
</tr>
<tr>
<td>A7</td>
<td>SRM is important in the day to day operation of an airport.</td>
<td>48</td>
<td>4.38</td>
<td>0.67</td>
</tr>
<tr>
<td>A8</td>
<td>I am confident that Safety Risk Management improves safety.</td>
<td>48</td>
<td>4.40</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Note. Attitudes toward Safety Risk Management (SRM) was an eight-item researcher-constructed instrument measured on a Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Overall scores could range from 1 to 5 with higher scores indicating more positive of attitudes toward SMS procedures. Asterisked items (*) are negatively worded and the reported corresponding M and SD reflects the raw data prior to reverse scoring. When item A2 and A5 were reverse scored, the overall mean was 4.20, which reflects positive attitudes toward SRM overall.

Table 2 - Airport Safety Performance

<table>
<thead>
<tr>
<th>Item</th>
<th>Statement</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>I have been provided with sufficient safety training to perform my duties safely.</td>
<td>48</td>
<td>4.35</td>
<td>0.70</td>
</tr>
<tr>
<td>A2</td>
<td>My airport has a well-functioning safety committee.</td>
<td>48</td>
<td>4.38</td>
<td>0.64</td>
</tr>
<tr>
<td>A3</td>
<td>Vehicle deviations and operational errors occur frequently on the airside.</td>
<td>48</td>
<td>4.50</td>
<td>0.62</td>
</tr>
<tr>
<td>A4</td>
<td>My airport has a well-articulated emergency response program.</td>
<td>48</td>
<td>4.35</td>
<td>0.64</td>
</tr>
<tr>
<td>A5</td>
<td>Airport management provides enough support for safety and communicates well with employees.</td>
<td>48</td>
<td>4.38</td>
<td>0.67</td>
</tr>
<tr>
<td>A6*</td>
<td>Airport management does not provide enough safety training.</td>
<td>48</td>
<td>3.60</td>
<td>1.40</td>
</tr>
<tr>
<td>A7*</td>
<td>Several airport employees continuously receive citations for safety violation.</td>
<td>48</td>
<td>3.48</td>
<td>1.46</td>
</tr>
<tr>
<td>A8</td>
<td>Airport management conducts a sufficient amount of safety audits.</td>
<td>48</td>
<td>4.30</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Note. Attitudes toward Safety Risk Management (SRM) was an eight-item researcher-constructed instrument measured on a Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Overall scores could range from 1 to 5 with higher scores indicating a greater perception of attitude toward SMS procedures. Asterisked items (*) are negatively worded and the reported corresponding M and SD reflect the raw data prior to reverse scoring. When item A6 and A7 were reverse scored, the overall mean was 4.03, which reflects a relatively high level of perceived airport experience.
Table 4.1 presents the survey results for attitude toward safety risk management. Average mean scores for all 8 questions is 4.20. Item A3 “My duties are enjoyable and stimulating to me” achieved the highest mean score of 4.44 in a Likert Scale and the lowest standard deviation of 0.61. Most of the participants enjoy their duties and they are around the same range. However, Item A2 and Item A5 achieved the highest standard deviation and lowest mean scores. These items were negatively worded questions and the cores were reversed. Negatively worded items achieved the lower scores compared to rest of the items.

Table 4.2 presents the survey results for airport safety performance for each question. Item A3 “Vehicle deviations and operational errors occur frequently on the airside” achieved the highest mean score of 4.50 and lowest standard deviation of 0.62. With respect to item A3, vehicle deviation does not happen frequently at the airside. Item A6 and Item A7, were negatively worded questions. These items had the lowest mean scores and highest standard deviation.

4.2.2 Background Information

Table 3- Summary of Airport Employee Demographics with Respect to Department

<table>
<thead>
<tr>
<th>Is SMS Beneficial</th>
<th>OPS&lt;sup&gt;a&lt;/sup&gt;</th>
<th>LE&lt;sup&gt;b&lt;/sup&gt;</th>
<th>ARFF&lt;sup&gt;c&lt;/sup&gt;</th>
<th>APRON&lt;sup&gt;d&lt;/sup&gt;</th>
<th>ENG&lt;sup&gt;e&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Yes</td>
<td>45</td>
<td>28</td>
<td>58.3</td>
<td>7</td>
<td>14.6</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>1</td>
<td>2.1</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Overall</td>
<td>48</td>
<td>29</td>
<td>60.4</td>
<td>7</td>
<td>14.6</td>
</tr>
</tbody>
</table>

<sup>Note</sup>. Of the overall sample size of N = 48, only 3 participants did not feel SMS was beneficial. <sup>a</sup>OPS – Operations Department. <sup>b</sup>LE- Law Enforcement <sup>c</sup>ARFF – Aircraft Rescue and Firefighting <sup>d</sup>APRON - Apron <sup>e</sup>ENG - Engineering.
Table 4. Summary of Airport Employee Demographics with Respect to Experience with SMS

<table>
<thead>
<tr>
<th>SMS Experience</th>
<th>N</th>
<th>OPS(^a)</th>
<th>LE(^b)</th>
<th>ARFF(^c)</th>
<th>APRON(^d)</th>
<th>ENG(^e)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>&lt; 1 Year</td>
<td>18</td>
<td>10 20.8</td>
<td>3 6.3</td>
<td>1 2.1</td>
<td>2 4.2</td>
<td>2 4.2</td>
</tr>
<tr>
<td>1 to 3 Years</td>
<td>20</td>
<td>12 25.0</td>
<td>4 8.3</td>
<td>0 0</td>
<td>2 4.2</td>
<td>2 4.2</td>
</tr>
<tr>
<td>&gt; 3 Years</td>
<td>10</td>
<td>8 16.7</td>
<td>0 0</td>
<td>2 4.2</td>
<td>0 0</td>
<td>0 0</td>
</tr>
</tbody>
</table>

Note. Of the overall sample size of \(N = 48\), 18 participants with less than 1 year of experience, 20 participants with 1-3 years of experience and 10 participants with more than 3 years of experience.

\(^a\)OPS – Operations Department. \(^b\)LE- Law Enforcement \(^c\)ARFF – Aircraft Rescue and Firefighting \(^d\)APRON - Apron \(^e\)ENG - Engineering.

Table 4.3 and Table 4.4 summarizes the participant’s answers for background questions. 3 participants out of 48, thinks SMS is not beneficial for airport safety. These 3 participants were from Airport Operations, Airport Engineering and Aircraft Rescue and Firefighting. Majority of the participants (93.8%) thinks that SMS is beneficial for the airport. 62.5% of the participants were airport operations officers. 37% of the participant had less than 1 year of experience with airport SMS, 42% of the participants had between 1-3 years of experience and 21% of the participants had more than 3 years of experience.

4.3 – Inferential Statistics

Primary Data Analysis – Correlation Analysis

A Correlation analysis was to determine the relationship between the variables. Correlational analysis provides Pearson’s correlation (r), which measures
a linear dependence and the strength of relationship between two numerically measured variables. JMP statistical analysis software was used to perform the correlational analyses. Out of 48 samples data, 4 outliers were found by using Jackknife distance analysis. These sample data were distant from other samples or observations. Outliers may cause experimental errors, therefore I extracted outliers and ran the correlational analysis without outliers. The results of the correlational analyses is reported in table;

**Table 5 - Correlation Analysis**

<table>
<thead>
<tr>
<th>Results of Correlation Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable 1</td>
</tr>
<tr>
<td>Variable 2</td>
</tr>
<tr>
<td>Number of Samples</td>
</tr>
<tr>
<td>Pearson’s Correlation, r</td>
</tr>
<tr>
<td>Significance Probability</td>
</tr>
</tbody>
</table>

**Pearson’s Correlation, r.** Correlation coefficient of $r=0.7348$, indicates significant positive correlation between employee attitudes toward safety risk management and airport safety performance.

**Significance Probability.** $P<0.0001$ indicates that the evidence is significantly strong against null hypothesis since alpha level is 0.05.

**Secondary Data Analysis – ANOVA**

Survey answers were also analyzed using the background information participants provided. Participants were divided into 3 groups per their experience
levels. These 3 groups were names as Group A with participants less than 1 year of experience, Group B with participants between 1-3 years of experience and, Group C with participants with more than 3 years of experience. Secondary analysis shown below is conducted using One-Way ANOVA test to determine the mean scores achieved with respect to experience levels of participants. Mean scores out of 40 points are shown in the table below.

Table 6 - ANOVA

<table>
<thead>
<tr>
<th></th>
<th>Employee Attitudes Toward Safety Risk Management</th>
<th>Airport Safety Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Score, Entire Data</td>
<td>33.58</td>
<td>33.31</td>
</tr>
<tr>
<td>Average Score, Group A</td>
<td>32.18</td>
<td>32.35</td>
</tr>
<tr>
<td>Average Score, Group B</td>
<td>34.50</td>
<td>34.00</td>
</tr>
<tr>
<td>Average Score, Group C</td>
<td>35.30</td>
<td>34.70</td>
</tr>
<tr>
<td>F ratio</td>
<td>4.49</td>
<td>2.33</td>
</tr>
<tr>
<td>ANOVA Test for Group A-B-C</td>
<td>Prob&gt;F 0.0078</td>
<td>Prob&gt;F 0.0873</td>
</tr>
</tbody>
</table>

Group A with less than 1 year of safety risk management experience shows has the lowest score for employee attitude toward SRM which indicates weaker attitude toward SRM procedures. Meanwhile Group B with individuals 1-3 years of experience has a lower mean score compared to Group C with individuals more than 3 years of experience. Same trend can be determined from Airport Safety Performance, where, individuals with higher experience has higher Airport Safety Performance mean scores. One-way ANOVA results shown in the table indicates that there is a significant difference between the mean scores of employees with different experience levels for Attitude Toward Safety Risk Management.
However, individuals with different levels of experience does not have significant difference in means for Airport Safety Performance score.

4.4 – Results of the Hypothesis Testing

**RQ:** What is the relationship between airport employee attitudes toward safety risk management and safety performance at U.S. airports?

**Null Hypothesis**

$H_0$: Attitude employee attitudes toward safety risk management have no significant relationship with safety performance at U.S. airports.

Results of the correlation analysis indicates correlation coefficient of $r=0.7348$. Correlation coefficient between $r=0$ and $r=1$ indicates positive relationship with $r=1$ being strong positive relationship. P<0.0001 indicates that the evidence is significantly strong against null hypothesis. Therefore, null hypothesis was rejected and research hypothesis supported. In this research, it was determined that employee attitudes toward safety risk management have a significant positive relationship with safety performance at U.S. airports.
Chapter 5 Discussion

5.1 – Summary of the Study

This study was conducted to determine the relationship between airport employees’ attitudes toward Safety Risk Management (SRM) and airport safety performance. Safety Risk Management (SRM) is a key pillar of FAA’s Safety Management Systems (SMS) program. SRM is the pillar that oversees the risk mitigation methods and its effectiveness. This study analyzed the importance of attitude toward SRM and its effect on airport safety performance for better SMS practice at the airports. The researcher contacted 94 airport professionals and received 48 answers for the survey experiment. These airport professionals had experience with safety risk management between 2 months to 8 years.

Data collected from the airport professionals is analyzed using correlation analysis. Correlation coefficient of \( r = 0.7348 \), indicates significant positive correlation between employee attitudes toward safety risk management and airport safety performance. Correlation analysis also indicated a P-value of 0.0001 was less than the significance level of 0.05. Based on this finding, the null hypothesis which stated “employee attitudes toward safety risk management have no significant relationship with safety performance at U.S. airports” was rejected.

In addition to the correlation analysis, findings from background questions indicated that airport employees with more experience have stronger attitude
toward safety risk management which increased the airport safety performance significantly.

5.2 – Discussion of Findings

Results from correlation analysis, r=0.7348, indicated that employee attitudes toward safety risk management have a significant positive relationship with safety performance at U.S. airports. Airports with employees that have stronger attitudes towards safety risk management have better safety performance.

Findings from the background questions indicated that airport employees with higher level of experience with safety risk management procedures have stronger attitude toward safety risk management. Employees with higher experience are aware of the importance of safety risk management and have a stronger attitude because of the training and the issues they have witnessed during their careers. As explained in Swiss cheese model, failure does not happen with one mistake, it is most of the time combination of mistakes and negligence. Experienced employees are more aware of the results of negligence which makes them have stronger attitudes towards the work they are performing.

Experienced and trained employees would bring safety awareness to the airport. In this study, it is shown that employees with higher levels of experience has stronger attitude toward Safety Risk Management and has higher Airport Safety Performance scores. Airports with responsible safety employees, safety committees and suitable rules would have a safety culture. Building a safety culture would be the most efficient way to enhance safety within employees at the airport and ensure
high levels of safety performance. Therefore, we can conclude that airports with employees having higher levels of experience would create a better safety culture and enhance airport safety performance.

5.3 – Conclusion and Inferences

The purpose of this study was to determine the relationship between airport employees’ attitudes toward Safety Risk Management (SRM) and airport safety performance. To determine the relationship between two variables, correlation analyses was conducted. Results of the correlation analyses indicated that correlation coefficient of r=0.7348 and significance probability of p<0.0001. These results indicate significant positive relationship between employee attitudes toward safety risk management and airport safety performance. Therefore, null hypothesis is rejected and research hypothesis supported. Employee attitude toward SRM procedures highly contributes to airport safety performance. Positive attitude towards SRM increases the efficiency of Safety Management Systems and airport safety performance by enhancing the proactive approach.

5.4 – Research Implications

It is concluded from this research that employees with positive attitude toward SRM procedures improves airport safety performance significantly. Based on the findings from this study, airport employees with positive attitude would enhance their airport safety performance. Airports with lower safety performance rankings should work on developing safety cultures with higher standards. Safety
culture is organizations’ values, beliefs, common working practices, or the way in which they respond to unusual situations (ICAO, 2013). Safety committees with well-prepared meetings will develop successful safety cultures which encourages employees to have positive and proactive attitude toward Safety Risk Management (SRM)

5.5 – Recommendations for Future Research and Practice

Based on the results of this study, airport employees with positive attitude towards Safety Risk Management (SRM) procedures, have higher safety performances at their airport in U.S.

5.5.1 Recommendations for future research

Researcher gathered the data by survey experiment method and most of the airports participated in this study was large airports with SMS practice in place. Future research could examine the Safety Risk Mitigation methods at the airports with SMS practice is not in place along with the employee attitude towards the safety procedures. By investigating these research topics, airports with SMS and without SMS in practice can be comparable.

In my experiment, 6 weeks was given to participants to answer the survey questions. I sent the survey experiment to 98 airport employees, however I received only 48 completed survey responses. I would recommend researchers to allow extra time and encourage participants to answer survey questions with additional e-mails for future
5.5.2 Recommendations for future practice

Completion of the study demonstrates the benefits of different approaches to the safety risk management and its contribution to the safety performance. Airports without SMS may also benefit from their own analysis of similar research and benefit, since the study contributes to airport safety. Airports with less experienced staff had lower scores for airport safety performance. Therefore, I would recommend airports to have their staff trained on Safety Management Systems. FAA offers “Publicly Available Training” online for Safety Management Systems awareness.

This study proves the importance of experienced staff, airport safety culture and airport safety committees. I would recommend airports to have airport safety committees with experienced employees and have weekly meetings to keep up with the updated risk mitigation methods and train new employees. Education must be given the most important role in this process. Educated employees would be more likely to understand the importance safety risk management and would have stronger attitude toward mitigation methods.
References


Appendix A

Attitudes toward Safety Risk Management and Safety Performance Survey

Name of Airport___________________        Date____________

Guidelines: Read each of the following questions and circle the number that most appropriately represents your opinion. For the qualitative questions in Section C, please clearly print your responses in the space provided. N/A is not applicable.

Section A: Attitudes toward Safety Risk Management (SRM).

Please rate the following statements.

1-Strongly Disagree   2-Disagree   3-Neutral   4-Agree   5-Strongly Agree   6-N/A

1. I am interested and willing to acquire further knowledge about SRM.
2. I do not have to pay attention following SRM procedures.
3. My duties are enjoyable and stimulating to me.
4. I am willing to communicate with my co-workers about SRM.
5. I have never liked SRM.
6. I am willing to report safety related incidents at the airport.
7. SRM is important in the day to day operation of an airport.
8. I am confident that Safety Risk Management improves safety.

Section B: Safety Performance

Please rate the following statements.

1-Strongly Disagree   2-Disagree   3-Neutral   4-Agree   5-Strongly Agree   6-N/A

1. I have been provided with sufficient safety training to perform my duties safely.
2. My airport has a well-functioning safety committee.
3. Vehicle deviations and operational errors occur frequently on the airside.
4. My airport has a well-articulated emergency response program.
5. Airport management provides enough support for safety and communicates well with employees
6. Airport management does not provide enough safety training
7. Several airport employees continuously receive citations for safety violation.
8. Airport management conducts a sufficient amount of safety audits.

Section C: Background Information

Please provide the following information:

1. What is your total work experience in the aviation industry in years? ____
2. What airport department do you work for? ____
3. When was SMS implemented at your airport? ____
4. Please provide a description of any hazardous event(s) you observed during your tenure at the airport?
5. Do you feel the implementation of SMS has been beneficial to your airport? Please explain why?
Appendix B

Institutional Review Board Certificate

Notice of Exempt Review Status
Certificate of Clearance for Human Participants Research

Principal Investigator: Urnat Oztekin
Date: February 1, 2018
IRB Number: 18-014
Study Title: Employee attitudes towards safety risk management and safety performance at US airports

Your research protocol was reviewed and approved by the IRB Chairperson. Per federal regulations, 45 CFR 46.101, your study has been determined to be minimal risk for human subjects and exempt from 45 CFR46 federal regulations. The Exempt determination is valid indefinitely. Substantive changes to the approved exempt research must be requested and approved prior to their initiation. Investigators may request proposed changes by submitting a Revision Request form found on the IRB website.

Acceptance of this study is based on your agreement to abide by the policies and procedures of Florida Institute of Technology’s Human Research Protection Program (http://web2.fit.edu/cerm/irb/) and does not replace any other approvals that may be required.

All data, which may include signed consent form documents, must be retained in a secure location for a minimum of three years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained on a password-protected computer if electronic information is used. Access to data is limited to authorized individuals listed as key study personnel.

The category for which exempt status has been determined for this protocol is as follows:

2. Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior so long as confidentiality is maintained.
   a. Information is recorded in such a manner that the subject cannot be identified, directly or through identifiers linked to the participant and/or
   b. Subject’s responses, if known outside the research would not reasonably place the subject at risk of criminal or civil liability or be damaging to the subject’s financial standing, employability, or reputation.