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An Examination Of The Relationship Between Transformational Leadership Tendencies And Safety Outcomes In Selected Manufacturing Settings

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AN EXAMINATION OF THE RELATIONSHIP BETWEEN TRANSFORMATIONAL LEADERSHIP TENDENCIES AND SAFETY OUTCOMES IN SELECTED MANUFACTURING SETTINGS

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ABSTRACT

Each year about 6 to 8 percent of the U.S. workforce sustains a work related injury of which 3 to 4 percent of the injured population ends up losing time from work due to the severity of the injury (National Safety Council [NSC], 2011). According to the NSC Injury Facts (2011), every 147 minutes in the United States, a worker will be fatally injured, and every six seconds a worker will sustain an injury that is serious enough to require medical treatment.

There is a wide variability in safety performance among organizations. Studies have found there is a relationship between transformational leadership and an organization's safety climate and safety culture (Barling, Loughlin, & Kelloway, 2002; Kelloway, Mullen, & Francis, 2006). Safety climate and leadership studies have centered around cultural aspects of safety rather than examining leadership styles in relation to safety outcomes as determined by Incidence Rates, DART Rates, Severity Rates, and leadership style (Barling et al., 2002; Kelloway et al., 2006).

The overall purpose of this study was to investigate the role of managing a manufacturing organization and the impact of the leadership style on the safety of employees. The purpose was to examine a specific leadership style and its relationship with safety outcomes as measured by Incidence Rate and Frequency Rate within a manufacturing organization. Further, the study was to determine if there was an association between a plant manager's transformational leadership tendencies and the safety outcomes of the associated organization as measured by Incident Rate and Frequency Rate.

Manufacturing plants from U.S. automotive manufacturing organizations were asked to participate in the study and the focus was on the plant managers from each facility. Direct-report managers from U.S. facilities were asked to complete the Multifactor Leadership Questionnaire Rater Form (5X-Short) (MLQ) for the plant manager to whom they directly reported. The researcher used an email campaign to administer the questionnaire. Safety performance data for each facility was obtained from the 2010 OSHA Occupational Injury and Illness Log Form 300. Hours worked, to calculate Incidence and Frequency Rate, were also collected from each facility.

Data were analyzed to determine if there was a statistically significant association between leadership behaviors and safety performance. Findings and suggestions for further research are discussed.

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CHAPTER 1

INTRODUCTION

Each year about 6 to 8 percent of the U.S. workforce sustains a work-related injury of which 3 to 4 percent of the injured population loses work time due to the severity of the injury (National Safety Council [NSC], 2011). According to NSC Injury Facts (2011), every 147 minutes in the United States, a worker will be fatally injured, and every six seconds a worker will sustain an injury that is serious enough to require medical treatment. Also, in this publication, authors reported that injuries sustained in 2009 accounted for 55,000,000 lost work days; 40,000,000 days of work were lost by employees who sustained work-related injuries in previous years, and time lost in the future from injuries sustained in 2009 was estimated to be 45,000,000 work days (NSC, 2011).

The Occupational Safety and Health Act (OSH Act), which was signed into law in 1970, ensures employers provide safe and healthful working conditions for employees. This Act includes all employers and employees in the United States, its territories, and the District of Columbia that have one or more employee(s) and who are engaged in a business that affects commerce. As a matter of background information about this governmental agency, OSHA was placed within the Department of Labor (NSC, 1974), and its chief administrator is the Assistant Secretary of Labor.

OSHA requires employers to maintain records of occupational injuries and illnesses. The agency undertakes an annual data-collection initiative that requires employers to submit work-related injury and illness information, hours worked by employees, and number of employees.

One objective of the data-collection effort is to assess OSHA's performance against its goal of reducing occupational injuries and illnesses (Department of Labor [DOL], 2010a).

Various metrics are used by organizations to measure the effectiveness of their safety efforts, trend their safety performance, and to compare their performance with peer groups and different industries. Frequently used rates, calculated from OSHA log information (Appendix A), include the Incidence Rate based on the number of occupational injuries/illnesses, the DART Rate based on the number of day away from work cases, restricted workday cases and job transfer cases, and the Frequency Rate calculated by using the number of cases with days away from work as the result of an occupational injury/illness.

Employers who have superior safety records are recognized annually by the NSC, a non-profit, nongovernmental organization founded in 1913 whose mission focuses on injury prevention (NSC, 2009). In 2010, the NSC awarded its annual Industry Leader Award to 81 companies who had the lowest total incidence rate in their industry classification (NSC, 2010).

In comparison to these safe companies, others that have poor safety records receive attention from OSHA. Each year, OSHA evaluates the employer's DART Rate, and if an employer's rate is higher than the industry average, an OSHA inspection may be triggered. In February 2010, OSHA sent letters to 15,000 employers informing them their DART rates were twice as high (or more) than their industry average and that they were being targeted for an OSHA inspection (DOL, 2010b). Some explanations follow so that a company can ensure a safe work environment and make sure it does not fall in this latter group. A safe work environment is created by eliminating hazards utilizing various technologies including machine guarding, controlling chemical exposure, controlling hazardous energy, providing appropriate personal protective equipment for workers, and employee safety training (Shannon, Mayr, & Haines,

1997). Studies have demonstrated the technology of eliminating or reducing risks can only do so much to achieve safety improvements; therefore cultural factors, combined with the technology, become an important factor in sustaining a successful safety process (Mearns, Whitaker, & Flin 2003; Saari 1990). According to Yang, Wang, Chang, Guo, & Huang (2009) both an organization's safety culture and its leadership behavior will affect safety performance. Integral to a successful safety program and low incident rates is management's commitment to safety, as evidenced by involvement in the various aspects of the safety process (Zohar, 2000).

Studies have found there is a relationship between transformational leadership and an organization's safety climate and safety culture (Barling, Loughlin & Kelloway, 2002; Kelloway, Mullen, & Francis, 2006). These studies concluded that transformational leaders exhibit concern for the welfare of individuals and have a moral obligation to place a high priority on safety. Additionally, these studies revealed that transformational leaders encourage employees to both address occupational safety issues and share information about occupational safety and risks.

The four main leader behaviors exhibited by transformational leaders are idealized influence, inspirational motivation, intellectual stimulation and individualized consideration. There is evidence that these behaviors, in relation to safety in an organization, can influence employee compliance (Avolio & Bass, 2004; Bass, 1990b; Innes, Turner, Barling, & Stride, 2010; Kelloway, et al., 2006). Transformational leadership was also found to relate to safety participation, and it can be used to achieve various organizational goals, including a safe work environment (Inness, et al., 2010).

To date, safety climate and leadership studies have centered around the cultural aspects of safety and have not examined leadership styles in relationship to safety outcomes as determined by Incidence Rates, DART Rates, and Severity Rates (Barling et al., 2002; Kelloway et al.,

2006). It is important to not only examine the cultural aspects of safety but it is also important to connect leadership with the safety outcomes that ultimately reveal how safe the work environment is for the employees.

A wide variability in safety performance exists among organizations which may or may not be due to the influence of leadership. This variability is demonstrated by the large gap between the companies that are recognized by the NSC for having the lowest total Incidence Rate in their industry classification versus those companies on OSHA's target list that have a DART Rate at least twice as high as their industry average. Both the NSC award calculations as well as OSHA's target list calculations are derived from the OSHA log as shown in Appendix A. Data collected from the OSHA log measures injuries/illnesses after they have occurred and as such are considered lagging indicators (Manuele, 2009). Thus, Manuele (1997) cautioned this data cannot be used to develop a proactive safety strategy. The lagging indicators measure failure since the key component is the number of injuries that have occurred over a specified period of time. The data gives no indication as to the amount of effort that has been put into improving the safety program and safety culture (Manuele, 1997). Therefore it would be helpful for all involved in the safety of employees if there were a way to be able to predict safety outcomes rather than using lagging indicators from the OSHA log.

Statement of the Problem

Studies have found there is a relationship between transformational leadership and an organization's safety climate and safety culture (Barling et al., 2002; Kelloway et al., 2006), however the problem is that these studies did not focus on the direct outcomes (e.g., Incidence Rate and Frequency Rate as variables)—rather, they focused on safety climate and safety culture.

Purpose of the Study

The overall purpose of this study was to investigate the role of managing a manufacturing organization and the impact of the leadership style on the safety of employees. The purpose was to examine a specific leadership style and its relationship with safety outcomes as measured by Incidence Rate and Frequency Rate within a manufacturing organization. Further, the study was to determine if there was an association between a manager's transformational leadership tendencies and the safety outcomes of the associated organization as measured by Incidence Rate and Frequency Rate data.

The focus of this research was on plant managers within two automotive manufacturing organizations, and was aimed to determine if leadership styles differ in companies that have higher injury rates compared to companies that have lower injury rates. Additionally, the transformational leadership tendencies of the plant managers in the organizations were determined from ratings provided by the direct report managers that worked for the plant manager. The transformational leadership rating of the plant manager's leadership style was then analyzed in relation to the organization's safety outcomes as measured by Incidence Rate and Frequency Rate.

Research Questions and Hypotheses

For the purposes of this study, the following questions and directional hypotheses were developed based on the published research on transformational leadership and safety culture of the organization. This research was designed to determine if safety outcomes, as measured by OSHA Incidence Rate and Frequency Rate, were correlated with transformational leadership and to determine if transformational leadership may be used to help predict safety outcomes.

Research Question 1: Are higher mean transformational leadership scores, exhibited by plant managers in automotive manufacturing facilities, associated with lower OSHA Incidence Rates?

H1: Higher mean transformational leadership scores, exhibited by plant managers in automotive manufacturing facilities, are associated with lower OSHA Incidence Rates.

Research Question 2: Are higher mean transformational leadership scores, exhibited by plant managers in automotive manufacturing facilities, associated with lower Frequency Rates?

H2: Higher mean transformational leadership scores, exhibited by plant managers in automotive manufacturing facilities, are associated with lower OSHA Frequency Rates.

Research Question 3: Are the mean transformational leadership scores exhibited by plant managers higher in automotive manufacturing facilities that had an OSHA Incidence Rate of zero when compared to those that did not have an OSHA Incidence Rate of zero?

H3: Mean transformational leadership scores exhibited by plant managers are higher in automotive manufacturing facilities that had an OSHA Incidence Rate of zero when compared to those that did not have an OSHA Incidence Rate of zero.

Research Question 4: Are mean transformational leadership scores exhibited by plant managers higher in automotive manufacturing facilities that had an OSHA Frequency Rate of zero when compared to those that did not have an OSHA Frequency Rate of zero?

H4: Mean transformational leadership scores exhibited by plant managers are higher in automotive manufacturing facilities that had an OSHA Frequency Rate of zero when compare to those that did not have an OSHA Frequency Rate of zero.

Significance of the Study

The outcomes of this study could serve multiple purposes to address and have an impact on workplace safety. First, the results could be used to identify leadership styles that promote

positive safety outcomes. Understanding the impact of transformational leadership tendencies of the plant manager coupled with specific safety measures may be used to improve safety performance of a manufacturing organization. This information could be useful from a predictive standpoint rather than simply using the lagging indicators of the OSHA data. The results of this research could also point organizations in the direction of investing in transformational management leadership training that may be used to create positive, measurable outcomes of safety within the organization.

By understanding more about the possible relationship between transformational leadership tendencies and safety, the results of the study may also help lead the way for organizations to reduce absenteeism resulting from occupational injuries/illnesses of the employees. An organization would be able to take a more proactive approach to improve the safety of their constituents through the resultant data rather than using the lagging indicators of Incidence Rate and Frequency Rate.

The information garnered from this study may also help improve employee morale by reducing injuries/illnesses in the workplace. Of course, information gained from this study may also be used to improve the company's bottom line by reducing costs as a result of accidents/illnesses. Identifying aspects that would help improve the safety of the employees and overall cost savings to an organization is a desirable area of research.

Limitations of the Study

The limitations of the study were:

1. The quality of the data gathered was based on the ability of the company OSHA record-keeper to properly record occupational injuries/illnesses.

2. Direct Reports to the Plant Manager were used in the study to determine transformational leadership tendencies of their plant manager.
3. Repetitive motion injuries were excluded from the data because of the variability of risk factors when comparing one employee with another.

Delimitations of the Study

The delimitations of this study were:

1. U.S. facilities of two automotive-related manufacturing organizations, involving 17 manufacturing plants, were selected for this study.
2. The study focused on Incidence Rates and Frequency Rates of OSHA recordable injuries/illnesses in two U.S. automotive-related manufacturing organizations. Only U.S. facilities were selected because manufacturers in the U.S. share a common procedure for calculating the outcome variables in this study: Incidence Rate and Frequency Rate.
3. Only plant managers that had worked at the plant for one year or greater were included in the study.
4. Twenty questions, relating to transformational leadership ratings, out of a total of 45 questions in the MLQ were used for this study.

Assumptions of the Study

The researcher made the following assumptions:

1. The minimum number of raters was determined to be three per leader (Avolio & Bass, 2004).
2. All of the raters would answer the MLQ survey questions regarding the management style of the plant managers honestly.

3. All of the raters had worked under the plant manager for a period of time that would allow them to have the knowledge and experience of working for the plant manager to enable them to answer the survey honestly.
4. The organizations volunteering to participate in the study had plants that are representative of other manufacturing facilities.

Definitions

DART Rate: A rate calculated using the number of work-related cases that require a day or more away from work, restricted days, or transferred days identified in Columns H, and I of the OSHA log. The number is inserted into the following formula: DART= H+I X 200,000/ Hours Worked (DOL, 2004).

Direct Report Manager: An individual who reports directly to the plant manager of a facility who manages personnel in production facilities covering a wide range of functions: operations, manufacturing, engineering, shipping/receiving, maintenance, human resources, and quality. These individuals assessed the behavior of the plant manager.

Incidence Rate: "…the number of recordable injuries and illnesses occurring among a given number of full-time workers (usually 100 full-time workers) over a given period of time (usually one year)" (DOL, 2004). This study excluded cumulative trauma injuries because of the variability of risk factors when comparing one employee with another.

Frequency Rate: A rate calculated using the number of work-related lost workday cases from Column H in the OSHA log; it is inserted into the following: FR = (Lost Workday Cases X 200,000)/ Hours Worked (DOL, 2004).

Lagging Indicators: measure injuries/illnesses after they have occurred (Manuele, 2009).

Lost workday case: A work-related injury/illness serious enough to require a day or more away from work and identified in Column H in the OSHA log (DOL, 2004).

The Multifactor Leadership Questionnaire Rater Form (5X-Short) (MLQ): A validated instrument developed by Avolio and Bass (2004) and widely used in research to identify characteristics of a transformational leader.

Temporary Total Disability: Employees are considered to be on temporary total disability when the injury prevents the employees from performing their usual job or modified work assignments (Smith, 2003).

Transformational Leadership: Consists of four dimensions which are idealized influence (the right thing to do), inspirational motivation (high expectation), intellectual stimulation (encourage followers to challenge the status quo) and individualized consideration (each employee is a person and is appreciated) (Arnold, Turner, Barling, Kelloway & McKee, 2007, p. 193).

Work Related Injuries/Illnesses: "…if an event in the work environment caused or contributed to the condition or significantly aggravated a preexisting condition" (DOL, 2004).

CHAPTER 2

REVIEW OF LITERATURE

An accident is an unplanned, unforeseen event that may or may not result in harm to an individual (NSC, 1974). Occupational injuries/illnesses that are the result of workplace accidents can result in medical-only treatment, work restrictions, or even more seriously, days away from work; they have negative connotations for both workers and companies (Hepburn, Kelloway, & Franche, 2010).

Occupational injuries/illnesses can affect the bottom line of a company. Companies must pay medical expenses for occupational injuries and illnesses and, if the injury or illness is severe enough to require time away from work, the company must pay temporary total disability (TTD) payments to the injured worker (Department of Labor [DOL], n.d.). TTD payments are usually paid weekly, and in the majority of the states, the TTD benefits are calculated using 66 2/3% of an individual's gross earnings. The maximum benefit a person can receive is usually set at 100% of the statewide average weekly wage of the injured employee's state (DOL, 2002). Workers' compensation costs become part of a company's operating expense and these have a direct impact on the profitability of a company (Smith, 2003). In 2009, the total cost of occupational injuries in the United States for employers was an estimated $168.9 billion, which included lost wages and productivity, medical costs, and administrative expenses (NSC, 2011). According to the National Safety Council (NSC, 2010) employers can have a positive effect on their bottom line when they become committed to creating a safe work environment and when workers are motivated to work safely.

For this study, a thorough literature review from several disciplines was required. The following review was centered on the following pertinent areas of study: Safe work environments, OSHA and safety measurement, safety in organizations, leadership, and specifically transformational leadership style.

Creating a Safe Work Environment

The OSHA Act, which was signed into law in 1970, ensures that employers provide safe and healthful working conditions for employees. This Act includes all employers and employees in the United States, its territories and the District of Columbia that have one or more employee(s) and who are engaged in a business that affects commerce. Excluded from this Act are government employees (federal, state, and local) as well as church employees. As a matter of background information about this governmental agency, OSHA was placed within the Department of Labor (NSC, 1974), and its chief administrator is the Assistant Secretary of Labor.

Two functions of OSHA are to create standards and conduct inspections. Employers are required to comply with the standards that have been designed to create a safe working environment, and OSHA inspections are performed to assess an employer's compliance with these standards. Compliance means following the requirements of the standards which can include installing machine guards, mandating training, developing procedures, and performing risk assessments (NSC, 2001). If a specific standard does not exist for a certain situation, OSHA will enact Section 5(a)(1) of the Act, also known as the "general duty clause". According to this clause, each employer is required to furnish a place of employment that is free from recognized hazards, which can cause or are likely to cause death or serious physical harm to employees (NSC, 1974). Section 5 of the OSHA Act not only sets forth the employer's responsibility but

also states the employee has the duty to comply with OSHA's standards, regulations, and orders (NSC, 1974). Based from this information, more specific inquiry was needed regarding OSHA's data collection initiatives and the importance of the organization's reporting responsibilities, injury rates, and safety performance of organizations.

OSHA's Data Collection Initiative to Measure Safety Performance

OSHA requires employers to maintain records of occupational injuries and illnesses. Several mandatory forms have been developed by OSHA for employers to use to meet their obligation of recordkeeping.

Form 300, known as the Log of Work-Related Injuries and Illnesses, as shown in Appendix A, is used to classify work related injuries/illnesses. On Form 300, each employee who has been determined to have an OSHA recordable injury/illness is listed, and the work-related injury or illness case is described and classified as a recordable case only, a fatality, a lost-work-day case, or a restricted case. On this log the employer also must enter the number of days an employee is either away from work or has restricted work days or a combination of both (DOL, 2004).

OSHA undertakes an annual data-collection initiative during which it requires employers to submit their work-related injury and illness information, number of hours employees have worked, and employment population details. When requested by OSHA, employers must submit this information using the mandatory OSHA Work-Related Injury and Illness Data Collection Form. The objective of such data-collection efforts is to assess OSHA's performance against their objective of reducing occupational injuries and illnesses (DOL, 2010a).

Injury Rates as a Measure of Safety Performance

Various metrics are used by organizations to measure the effectiveness of their safety efforts, to trend their safety performance, and to compare their performance with peer groups and different industries. OSHA provides guidance for calculating various rates using the information obtained from the OSHA log (Appendix A). Calculations referenced in OSHA's recordkeeping instructions include Incidence Rate (IR) and Days Away Restricted and Transferred (DART) Rate. IR is calculated by placing the number of occupational injuries/illnesses multiplied by a standard number of employee hours worked in one-year (usually 100 employees and 2000 hours) in the numerator and the number of hours worked for a specific time frame, which is usually over a one year timeframe, in the denominator. The DART Rate is calculated by substituting the number of cases with days away from work, restricted cases and number of cases requiring transfer into the same formula used in calculating the IR (DOL, n.d.).

The rates mentioned above are considered lagging indicators because they measure injuries/illnesses after they have occurred (Manuele, 2009). Manuele (1997) cautioned that this data could not be used to develop a proactive safety strategy. The lagging indicators measure failure since the key component is the number of injuries that have occurred over a specified period of time. The data gives no indication as to the amount of effort that has been put into improving the safety program and safety culture (Manuele, 1997). Therefore it would be helpful for all involved in the safety of employees if there were a way to be able to predict safety outcomes rather than using lagging indicators from the OSHA log.

Good Versus Poor Safety Performing Organizations

Safe employers are recognized annually by the NSC, a non-profit, non-governmental organization founded in 1913, whose mission is injury prevention (NSC, 2009). In 2010, the

NSC awarded its annual Industry Leader Award to 81 companies who had the lowest total incidence rate in their industry classification (NSC, 2010).

In comparison to these safe companies, others that have poor safety records receive attention from OSHA. Each year, OSHA evaluates employers' DART rates, and if an employer's rate is higher than the industry average, an OSHA inspection is triggered. In February 2010, OSHA sent letters to 15,000 employers informing them their DART rates were twice as high (or more) than the industry average and that they were being targeted for an OSHA inspection (DOL, 2010b).

Examining the working conditions in several manufacturing sectors allowed the researcher to gain insight into the risks to the worker. Understanding the variability of the working conditions and implications for these sectors is important for the context of this study.

Safety in Five Manufacturing Sectors

Manufacturing is still of great economic importance in the United States. In 2009, U. S. manufacturers produced approximately $1.7 trillion in goods (Associated Press, 2011). Even with increased global competition, in 2010 the U.S. manufacturers continued to outpace those in Japan and China, number two and three global manufacturers respectively and thus the United States remained the world's number one producer of manufactured goods (Associated Press, 2011). U. S. manufacturing jobs are competing with manufacturing jobs in low-cost countries, which adds pressure for the U.S. manufacturers to ensure competitive pricing (Amiti & Stroh, 2007). Understandably, one direct impact on competitive pricing is the cost of work-related injuries. Because of the competition, employers must be mindful of the impact that occupational injuries have on their profits. In light of such competition, it is worth repeating that in 2009,

U.S. employers paid an estimated $168.9 billion for lost wages and productivity, medical costs, and administrative expenses for work-related injuries (NSC, 2011).

A description of the working conditions in five manufacturing industries is presented next. Table 2.1 shows a relative high variability of injury rates within the five manufacturing sectors.

Table 2.1:
Incidence and Frequency Rates for Five Manufacturing Sectors

Manufacturing Sector	NAICS Classification	Incidence Rate	Frequency Rate
Food	0311	5.7	1.0
Machinery	0333	4.3	0.9
Computer & Electronic	0334	1.6	0.4
Primary Metal Manufacturing	0331	6.2	1.5
Chemical	3251	2.3	0.6
Motor Vehicle	3361	7.8	1.3

National Safety Council Injury Facts 2011 Edition

Food Manufacturing

The Food Safety and Inspection Service within the U.S. Department of Agriculture (USDA) oversees working conditions relative to food safety to help ensure food is safe for human consumption. It does not however oversee safety of food manufacturing workers; this is the responsibility of federal or state OSHA (U.S. Bureau of Labor Statistics [BLS], 2011).

Food manufacturing includes a wide variety of industries such as baking, dairy product manufacturing, animal slaughtering and processing, fruit and vegetable preserving, and seafood product preparation. The manufacturing involves numerous tasks, for example, lifting heavy objects, working in awkward postures, using sharp hand tools, and working with dangerous

equipment, such as large mixers, high-speed blenders, and rotary cutters. Workers may be required to work around ovens or in cold, refrigerated areas. The jobs in food manufacturing are labor intensive; typical injuries involve cuts, burns, back injuries, fractures, and amputations. The food industry is widely known for a large number of repetitive motion disorders. Many companies have automated a number of tasks in an attempt to reduce costly repetitive motion disorders and remain cost competitive in the global economy. In the food industry, occupational injury and illness incidence rates rank as one of the highest among the manufacturing industries (BLS, 2011).

Machinery Manufacturing

This segment includes manufacturing machinery for agriculture, construction and mining; metalworking machinery manufacturing; heating, air-conditioning, and commercial refrigeration equipment manufacturing; and industrial machinery manufacturing. Many processes used in machinery manufacturing have been automated over the past several decades, and this has improved working conditions for employees. In 2011, plants are generally clean; however, depending on the task, hazards may include noise, heavy lifting of components and chemical exposure. Overall, occupational and illness rates in the machinery manufacturing industry are typically very low compared with other manufacturing industries (BLS, 2011).

Computer and Electronic Product Manufacturing

This industry is highly integrated, and it includes specialized manufacturers of components that are brought together during the final assembly process. The work environment is clean and is typically free of heavy lifting and noise. The greatest hazard present in this industry is exposure to chemicals during the circuit board soldering processes. The occupational

injury and illness rates for computer and electronic product manufacturing are historically very low (BLS, 2011).

Steel Manufacturing

This segment makes steel by melting iron ore or scrap metal in hot furnaces; solidified sheets, rods, beams or bars are then created from this ore through various processes, including extruding and rolling. Steel manufacturing involves many hazardous tasks, including working with hot, molten steel; using electric arc furnaces; working in noisy environments, and withstanding high temperatures. At the present time, significant advancements have been made to improve the steel manufacturing work environment. One such advancement is that some highly labor-intensive activities have been automated; however, the manufacturing of steel remains a highly hazardous industry, and it has a significantly higher incidence rate when compared to other industries (BLS, 2011).

Chemical Manufacturing

Chemical manufacturing includes processes that create chemicals; these chemicals, in turn, are used to produce other products. In the chemical manufacturing environment, employees are required to work with toxic, reactive, flammable, and explosive chemicals that can pose significant hazards in the workplace. (AIChE, Oct 2009). OSHA's standard on Process Safety Management sets in place requirements for employers relating to the handling of highly hazardous chemicals and this standard also covers processes involving large quantities of flammable liquids and gases. The standard was developed to prevent accidental releases of highly hazardous chemicals that could compromise the safety of workers (OSHA, 1992). Even though the hazards are significant within the chemical manufacturing sector, the incidence rates are lower than that of the average manufacturing sector (BLS, 2011).

Motor Vehicle and Parts Manufacturing

The Motor Vehicle and Parts Manufacturing sector includes the manufacturing of a wide variety of vehicles, including automobiles, vans, heavy- and light-duty trucks, buses and trailers. It also involves manufacturing of parts including engines, seats, brakes and electrical systems, and electronic systems. Workers perform a variety of tasks that include the use of powered hand tools-- often times requiring employees to work in awkward positions and to use manipulators to assist with the movement of heavy components. At present, important progress has been made in the manufacturing of motor vehicles and their parts: Robotic and manual welding operations are commonplace as is automated painting processes and application of chemicals to prevent rusting. Assembly lines have been upgraded to include the use of robotics and manipulators to assist employees with the movement of components. Still, employees may be exposed to awkward working postures, heat, noise, and fumes, depending on the specific tasks that are part of their jobs. Injury rates are higher in the motor vehicle and parts manufacturing industry than they are in the other industries reviewed (BLS, 2011).

In summary, all of the five manufacturing sectors that were just described include occupational hazards, which if left uncontrolled, could result in work-related injuries and illnesses. Because of the competitive nature of manufacturing, management within these manufacturing sectors must be mindful of how the costs of work-related injuries and illnesses could affect a company's bottom line. It is management's responsibility to provide a safe and healthful working environment; therefore the leadership it provides is of vital importance in preventing work-related injuries and illnesses.

What is Leadership?

To understand how a person can guide or lead others in an organization, the concept of leadership is examined in the following section. It is no surprise that the concept of leadership begins early in a person's life. One of the first and most important contacts with a leader is the parent in a parent/child relationship (Avolio, 1990; Bass, 1990a). In the parent/child relationship, the child can be considered a follower and the parent can be thought of as the leader who provides the child with a vision and values. The leadership process continues as the child grows. In academia, first teachers and then professors lead students as they progress through the educational system transforming the followers (students) into future leaders in the business world. The actions and the words stated by the leaders throughout the development of the individual reflect and influence the actions of the follower (Avolio, 1990).

Definitions of leadership abound, as reflected in Bass' (1990a) statement "There are almost as many different definitions of leadership as there are persons who have attempted to define the concept" (p. 11). He further defined leadership in broad terms as "an interaction between two or more members of a group that often involves a structuring or restructuring of the situation and the perceptions and expectations of the members" (p. 19). Yukl (2006) described leadership in another way, as being "the process of influencing others to understand and agree what needs to be done and how to do it, and the process of facilitating individual and collective efforts to accomplish shared objectives" (p. 8).

Leadership has an influence on the success or failure of an organization (Bass, 1990a). As explained next, leadership also affects an organization's climate as well as the commitment one has to that organization. Investigation into the organization's safety climate was an important component in this literature review.

Safety Climate and Effect on Safety

Neal, Griffin, and Hart (2000) defined safety climate as "a specific form of organizational climate, which describes individual perceptions of the value of safety in the work environment" (p.100). Neal et al. (2000) identified several factors that are important to safety climate, and these include: management values, management and organizational practices, communication, and employee involvement in workplace health and safety.

Neal et al. (2000) investigated the effects that safety climate had on safety behavior by studying 32 work groups from an Australian hospital. In this research, employee's perceptions were studied by having them rate various items from an Organizational Climate Scale. The study showed "organizational climate predicts safety climate" (p. 105).

In the area of occupational safety, there has been a growing interest in transformational leadership because the process of leading and interacting with individuals under the transformational leadership style is inherently more aligned with the values that are often associated with creating a safe work environment such as trust, caring, and honesty (Barling, et al., 2002).

In their 1998 safety climate research, Thompson, Hilton and Witt studied 329 Federal Aviation Administration (FAA) Logistic Center managers and supervisors and the ways in which each have an effect on workplace safety. Job duties of these managers included setting production schedules, identifying production goals, and establishing the priorities for enforcing policies and procedures. The study revealed that a manager's safety support may be indirectly assessed by employees when carrying out these duties. For instance, lack of insistence that their supervisors enforce safe work procedures in order to keep up with unrealistic production

schedules indirectly leads employees to assume the manager is not supportive of safety (Thompson et al., 1998).

These researchers (Thompson et al., 1998) also found supervisors, in contrast, influence safety more directly. Because supervisors are on the shop floor throughout the day, they are able to continuously interact with employees. While on the shop floor, supervisors monitor employees' work performance and provide feedback to the employees on how well they may or may not be performing their job duties. Additionally, supervisors communicate with managers about employees' compliance, or lack of compliance, with management's policies and procedures. Because of this interaction with the employees, supervisors more directly communicate management's support for safety (Thompson et al., 1998).

Maierhofer, Griffin, and Sheehan (2000), studied the link manager's values had on influencing safe behavior as it related to the requirement to wear personal protective equipment (PPE) when dyeing hair. Information was gained through a questionnaire and interviews that involved approximately 50 hairdressers in the hairdressing industry in Australia. According to the study, employees were more likely to use PPE when their supervisors also used it. It was concluded employees do as their supervisors do, and the supervisors' values become the employees' values. Thus, whenever safety issues are disregarded, workers will infer a lower priority for safety simply by default, resulting in weak safety climate perceptions.

Zohar (2000) studied 534 production workers in a metal-processing plant. Participants completed a safety climate questionnaire. As a result, Zohar concluded that management's disregard to safety leads workers to conclude safety is a low priority and this leads to a weak safety climate.

Conchie and Donald (2009) explored how employee safety-specific-trust in a leader might influence safe behavior; they studied 139 frontline workers and immediate supervisors from construction projects in the United Kingdom. Employees completed a questionnaire that measured the supervisors' safety leadership style. Likewise, supervisors were asked to complete the same questionnaire for each employee they supervised. The study showed trust in supervisors positively influenced employees' safety behavior. Employees exhibited a positive safety attitude when their supervisor showed a strong commitment to ensure a safe work environment; this led to employees also trusting in the supervisor. As trust in the supervisor declined, so did the safe behaviors of the employee. Conchie and Donald (2009) additionally found the trust was associated with transformational leadership style.

Leadership Theories

A number of leadership theories have developed over the past several decades. Bass (1990a) contended there is no shortage in theorizing about leadership. Some theories focused on the traits of the leader (e.g. the Great-Man theory or the Trait theory). Other theories intended to explain the interpersonal leader-follower relationship, and these include House's Path-goal theory and Hersey and Blanchard's Situational Leadership theory (Bass, 1990a). From an organizational perspective, the theory of transformational leadership has attracted a large amount of attention, much more than all other common leadership theories (Judge & Bono, 2000; Judge & Piccolo, 2004).

Great-Man Theory

Popular during the 19th century, this theory contends leaders are born, not made (Cawthon, 1996) and the leader has unique qualities to which the masses migrate (Bass, 1990a). However supporters of the Great-Man theory believe that even though leaders possess innate

talents without specific situational factors they will not become great leaders (Cawthon, 1996). Cawthorn (1996) explained in his article on revisiting the Great Man theory, that the theory lost its support with the rise of behavioral sciences.

Trait Theory

This theory contends leaders have different individual traits than followers and that these traits are inherited. Most widely researched until the 1940s, the Trait theory fell out of favor because many researches believed that both traits and situations had to be considered in leadership (Bass, 1990a).

Path-goal Theory

Robert House presented the Path-goal theory in 1971 (Barnett, 2011; Silverthorne, 2001). The basis of the theory is that the leader clarifies the goals and shows the followers the direction (path) to those goals and the rewards that are available. Because of the clarification, the followers increase their efforts to perform to obtain the rewards the leader has identified (Bass, 1990a). Four different leader behaviors within the Path-goal theory can be identified (Barnett, 2011; Silverthorne, 2001). According to these two researchers, those behaviors include directive leaders who tell subordinates what is expected of them and give specific guidance; supportive leaders who give attention to the needs and well-being of subordinates and who back their employees; participative leaders who involve subordinates in the decision-making process; and achievement-oriented leaders who set high standards and expresses confidence to their followers that they will achieve the goals

Bass believes the type of behavior exhibited by the leader is dependent upon the situation. And, according to Silverthorne (2001), leaders provide just the right amount of direction and motivation to achieve the goals.

Situational Theories

Hersey and Blanchard named the Situational Leadership theory in 1977 (Graeff, 1983). These theorists contended situational factors influence who will emerge as a leader. The situational theorists believed a great leader emerges as the result of circumstances, as well as the time and place (Bass, 1990a).

Transformational Leadership

The transformational leadership theory in terms of organizational leadership research, has gained an exceptionally large amount of attention when compared to other leadership theories (Judge & Bono, 2000; Judge & Piccolo, 2004). The theory is not new. As reported by Chemers (1997), writings about the theory date back to the early 1900s. As the result of the need for organizations to determine factors that contribute to organizational effectiveness and success in the wake of competition, interest in the topic resurfaced and has become the topic of studies over the past several decades (Bass, 1999).

Transformational leadership can be found in a variety of organizations, including educational institutions, the military, and nursing facilities as well as all levels within such organizations from top officers to lower level officers and middle managers to supervisors (Bass, 1997). Bass also stated that adapting and sharing common goals among individuals within the organization, motivating followers and getting followers to commit to such a goal, characterize transformational leadership. Bass (1999) explained transformational leaders work toward the good of the organization; they also are dedicated towards reaching higher goals than initially envisioned (Bass, 1999). Judge and Bono (2000) described transformational leaders as individuals who "obtain support by inspiring followers to identify with a vision that reaches beyond their own immediate self-interests" (p. 751).

The following words have been used to describe leaders who influenced an individual's actions: inspirational, intellectually stimulating, challenging, visionary, development oriented, and determined to maximize performance. Bass (1997) found transformational managers are committed to their leaders. Furthermore, this researcher believed that adapting and sharing common goals among individuals within the organization characterize transformational leadership. Bass (1997) believed that through transformational leadership, a leader could both motivate and gain commitment from followers. It is with these characteristics that transformational leaders change the organization (Bass, 1997).

Numerous researchers have described four characteristics exhibited by transformational leaders (Avolio & Bass, 2004; Bass, 1990b; Innes, et al., 2010; Kelloway, et al., 2006)). The four characteristics, as described by these researchers, include: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. It is generally agreed by these individuals that the four characteristics affect organizational outcomes in a positive way and that transformational leadership is considered a highly effective leadership style.

By way of these characteristics, transformational leaders positively affect important organizational and individual outcomes including organizational commitment, employee performance, employee satisfaction with leadership, and business unit performance (Kelloway, et al., 2006). Given its positive impact on a number of important organizational outcomes, transformational leadership is considered a highly effective leadership style (Kelloway, et al., 2006).

Transformational Leadership Studies

Numerous studies have been conducted on transformational leadership. These studies have covered a wide range of applications and interest in the leadership style and the impacts

those leaders have on their organizations and employees. The studies have ranged from descriptive to correlational in nature, and from local interests to wide-reaching global interests. Understanding the larger context of the literature regarding Transformational Leadership is important however for the purpose of this study, the studies reviewed are purposefully narrowed to directly relate to the context of this study. In this next section, a few of the major ones related to performance as well as safety are discussed.

Howell and Avolio (1993) studied leadership styles and unit performance within a large Canadian financial institution. Seventy-eight senior-level managers, from 29 to 64 years of age and having 1 year to 42 years of service with the financial institution participated in the study. The study was conducted at this particular institution due to the organization's uncertainty and disruption caused by competition and deregulation within financial institutions. The results of the study revealed there is a positive relationship between transformational leadership and unit performance. The outcome of this study was of interest because of the similarities between the financial institutions and the automotive industry. The automotive manufacturers were dealing with a significant change in their business climate creating business disruption as a result of the global recession in 2009, which could be considered similar to the Canadian financial institution's experience of uncertainty and disruption due to competition and deregulation.

Inness et al., (2010) studied moonlighters in a wide array of occupations who held two jobs and had a different supervisor for each job. Questionnaires were administered to 159 participants. The participants completed items measuring transformational leadership, safety compliance, safety participation, and other compounding variables, such as safety concern and hours worked. Transformational leadership was measured via four items (idealized influence, inspirational motivation, individualized consideration, and intellectual stimulation) which were

taken from the MLQ. Safety compliance and safety participation were assessed through specific questions, for example, what safety procedures were used and how much participation did the person contribute in tasks to improve workplace safety. The results of the study revealed transformational leadership was a statistically significant positive predictor of safety participation (Inness, et al., 2010).

Barling, et al. (2002) used selected items from the MLQ to assess 174 individuals' perceptions of their direct supervisors' safety-specific transformational leadership behaviors. The participants were employed in the restaurant, hotel, or fast-food industry. The average age was 26.75 years and individuals had been employed in their job for an average of 3.13 years. The MLQ questions were modified to ensure they were appropriate for occupational safety situations. The study showed strong support for linking safety-specific transformational leadership and fewer occupational injuries.

Judge & Bono (2000) studied transformational leadership tendencies of leaders who held management or leadership positions from over 200 organizations representing manufacturing, banking, insurance, and service organizations. The average age of participants was over 39 years and 88% of the participants had a bachelor's degree or higher. The transformational leadership behaviors were measured using the MLQ. The study provided evidence that individuals who were rated by their followers as exhibiting transformational behaviors are judged by their superiors to be more effective leaders.

Summary

As there are many different inferences that affect the safety of employees and thus the organization, this study's focus was on the leadership style of the plant managers and the safety outcomes of the organizations. The literature review provided the necessary information to

understand previous studies and the implication that transformational leadership plays an important role in the safety climate of an organization. Further application of the literature to provide direction for study, is important to understand that organizations must compete on a global scale and that human capital is one of the most important reasons for the success of an organization. Safety of employees is reason for the advanced study and paramount for organizations to invest in leaders to guide organizations to create a safe and healthful working environment.

CHAPTER 3

METHODOLOGY

As previously illustrated, safety climate and leadership studies have been centered on cultural aspects of safety; they have not examined leadership styles in relationship to safety outcomes as determined by Incident Rates, DART Rate, and Severity Rates (Barling, et al., 2002; Kelloway, et al., 2006). There remains a wide variability in safety performance among organizations. This is demonstrated by the large gap among companies that are recognized by the NSC for having the lowest total Incidence Rate in their industry classification and companies on OSHA's target list which have DART Rates at least twice as high as their industry average.

This chapter focuses on the methods used in this study to examine possible relationships between the independent variable of leadership behaviors and the dependent outcome variable of workplace safety. The research design is a non-experimental, descriptive research.

This chapter includes the following sections: Restatement of the Problem, Restatement of the Research Questions and Hypotheses, Population and Sample Selection, Instrumentation, Questionnaire Administration, and Data Collection

Restatement of the Problem

Studies have found there is a relationship between transformational leadership and an organization's safety climate and safety culture (Barling, et al., 2002; Kelloway, et al., 2006) however the problem is that these studies did not focus on the direct outcomes (e.g., Incidence Rate and Frequency Rate as variables)–rather, they focused on safety climate and safety culture.

Restatement of the Research Questions and Hypotheses

For the purposes of this study, the following questions and hypotheses were developed. The intent of the research was to determine if safety outcomes, as measured by OSHA Incidence Rate and OSHA Frequency Rate, are correlated with transformational leadership and to determine if transformational leadership can be used to predict safety outcomes.

Question 1: Are higher mean transformational leadership scores, exhibited by plant managers in automotive manufacturing facilities, associated with lower OSHA Incidence Rates?

H1: Higher mean transformational leadership scores exhibited by plant managers in automotive manufacturing facilities are associated with lower OSHA Incidence Rates.

Question 2: Are higher mean transformational leadership scores exhibited by plant managers in automotive manufacturing facilities, associated with lower Frequency Rates?

H2: Higher mean transformational leadership scores exhibited by plant managers in automotive manufacturing facilities are associated with lower OSHA Frequency Rates.

Question 3: Are the mean transformational leadership scores exhibited by plant managers higher in automotive manufacturing facilities that had an OSHA Incidence Rate of zero when compared to those that did not have an OSHA Incidence Rate of zero?

H3: Mean transformational leadership scores exhibited by plant managers are higher in automotive manufacturing facilities that had an OSHA Incidence Rate of zero when compared to those that did not have an OSHA Incidence Rate of zero.

Question 4: Are mean transformational leadership scores exhibited by plant managers higher in automotive manufacturing facilities that had an OSHA Frequency Rate of Zero when compared to those that did not have an OSHA Frequency Rate of zero?

H4: Mean transformational leadership scores exhibited by plant managers are higher in automotive manufacturing facilities that had an OSHA Frequency Rate of zero when compared to those that did not have an OSHA Frequency Rate of zero.

Population and Sample Selection

Approximately fifty automotive manufacturing-related organizations were made aware of the research by way of a presentation at a regional meeting of the Original Equipment Suppliers' Association. Executives from Human Resources, Environmental Health and Safety, Legal, Operations and Manufacturing were in attendance to hear the presentation. The researcher asked for participants to volunteer their organizations for the study. In the presentation, the researcher requested participation of the managers who report directly to the plant manager. Initially six organizations, representing an estimated 100 facilities, expressed interest in participating in the study. Each individual representing their organization was asked to provide a commitment letter indicating their organization would participate in the study. Three automotive manufacturing organizations provided the researcher with a commitment letter indicating they would participate in the study (Appendix C). Of the three organizations, two organizations participated in the study. The third organization was not able to provide the required data to the researcher and therefore dropped out of the study. The researcher made contact with the remaining three organizations two additional times however the organizations were not able to commit to participating in the study. The manufacturing plants from the three U.S. automotive manufacturing organizations were considered a convenience sample based on their interest in the study purpose.

The operations of the organizations that participated in the study were categorized under Motor Vehicle and Parts Manufacturing. Each organization was a major global supplier to the

automotive industry and product offerings included bearings, metal stampings, and rubber over-mold components. Employment among the participating organizations ranged from 7800 to 19,000 employees.

For the purpose of this study, the focus was on the plant managers from each facility. Direct-report managers from U.S. facilities were asked to complete the MLQ as shown in Appendix B for the plant manager to whom they directly reported. According to Avolio and Bass (2004), no fewer than three raters should be used to evaluate a leader. Additionally these authors did not specify an optimal size for the group who would carry out the rating.

Protection of Human Subjects

The researcher submitted an application to the Indiana State University Institutional Review Board (IRB) and an Exempt Review status was issued to the researcher on April 3, 2012 (Appendix D). The researcher complied with all requirements of the IRB during the research.

Instrumentation

The MLQ (Appendix B) developed by Avolio and Bass (2004) was used in this study. Several authors examined the validity of the MLQ. In their study Antonakis, Avolio, and Sivasubramaniam (2003) stated "The MLQ is the most widely used survey for assessing transformational, transactional, and non-leadership" (p. 271). Muenjohn and Armstrong (2008) studied the structural validity of the MLQ and concluded it is successful in adequately capturing the full leadership factor constructs of transformational leadership theory.

The Short Form of the MLQ consists of 45 questions used to capture a broad range of leadership behaviors and to differentiate among ineffective and effective leaders. The MLQ focuses on individual behaviors observed by associates, and it is used to assess leadership behaviors that motivate associates.

Many researchers agree that leadership can be identified by nine specific components (Avolio & Bass, 2004; Bycio, Hackett & Allen, 1995; Antonakis et al., 2003). The MLQ measures each of the "nine leadership components along a full range of leadership styles" (Avolio & Bass, 2004, p. 13). The leadership scale titles, the number of items for each title, and their behavior descriptions, as cited by Avolio and Bass (2004), are identified next.

Transformational Leadership

Idealized Attributes-4 items. "Instills pride in others for being associated with him/her; focuses on the good of the group and not self interest; performs in a way that builds others' respect; displays a sense of power and confidence" (Avolio & Bass, 2004, p. 96).

Idealized Behaviors-4 items. "Talks about his/her most important values and beliefs; emphasizes having a strong sense of purpose; considers the moral and ethical consequences of decisions; stresses the importance of having a collective sense of mission" (Avolio & Bass, 2004, p. 96).

Inspirational Motivation-4 items. "Talks optimistically about the future; talks enthusiastically about what needs to be accomplished; articulates positive vision of the future; expresses confidence that goals will be achieved" (Avolio & Bass, 2004, p. 96).

Intellectual Stimulation-4 items. "Seeks differing perspectives when solving problems; gets others to look at problems from many different angles; suggests new ways of looking at how to complete assignments" (Avolio & Bass, 2004, p. 97).

Individual Consideration-4 items. "Spends time teaching and coaching others as individuals rather than just a member of the group; considers each individual as having

different needs, abilities and aspirations from others; helps others to develop their strengths" (Avolio & Bass, 2004, p. 97).

Transactional Leadership

Contingent Reward-4 items. "Provides others with assistance in exchange for their efforts; discusses in specific terms who is responsible for achieving performance targets; makes it clear what one can expect to receive when performance goals are achieved; expresses satisfaction when others meet expectations" (Avolio & Bass, 2004, p. 97).

Management-by-Exception (Active)-4 items. "Focuses attention on irregularities, mistakes, exceptions and deviations from standards; concentrates full attention on dealing with mistakes, complaints and failures; keeps track of all mistakes (Avolio & Bass, 2004, p. 97).

Management-by-Exception (Passive)-4 items. "Fails to interfere until problems become serious; waits for things to go wrong before taking action; shows a firm belief in 'if it ain't broke, don't fix it'; demonstrates that problems must become chronic before action is taken" (Avolio & Bass, 2004, p. 98).

Laissez-Faire-4 items. "Avoids getting involved when important issues arise; absent when needed; avoids making decisions; delays responding to urgent questions" (Avolio & Bass, 2004, p. 98).

The MLQ as shown in Appendix B uses a five-point Likert-type scale for rating the frequency of observed leadership behaviors. The rating scale for leadership items follows:

0 = Not at all

1 = Once in a while

2 = Sometimes

3 = Fairly often

4 = Frequently, if not always

Questionnaire Administration

Questionnaire administration occurred via e-mail using a web based survey service known as SurveyMonkey™. SurveyMonkey™ is a survey support service and a familiar tool for many researchers that provides a well presented and comfortable approach to data collection (SurveyMonkey, 2011). This method of questionnaire administration was selected because of both the large distribution of facilities throughout the United States and to protect rater information. Participating organizations provided company email addresses of all raters for each facility. An explanation of the study was provided to all participants in an email attached to the survey (Appendix E). The researcher stressed that the information would be held confidential and information would be reported in aggregated data. Raters were asked to indicate the frequency of behaviors exhibited by their plant manager on a scale ranging from 0=not at all to 4=frequently, if not always. Raters were instructed to complete the entire questionnaire and were not told that the research was only to focus on transformational leadership. The researcher was concerned that having the raters complete only the questions relating to transformational leadership may have affected the validity of the survey.

The scores of the items corresponding to transformational leadership were added together and divided by the number of items to form a scale range from 0.0 to 4.0. A mean transformational leadership score for individuals that were being rated was created by adding the scale scores of the raters and dividing that answer by the number of responses. The transformational leadership scale was of most importance to this investigation, and it was used to compare against the outcome variables.

Data Collection

All data relating to the plant managers' leadership behaviors was obtained using the MLQ as seen in Appendix B. Safety performance data for each facility was obtained from the 2010 Occupational Injury and Illness Log Form 300 (Appendix A) for each organization that participated in the research. The OSHA log information did not contain employee names. Repetitive motion injuries were deleted from the data because of the variability of risk factors when compared among employees. Hours worked, to calculate Incidence and Frequency Rates were also collected from each facility. Dependent variables in this study were Incidence Rate and Frequency Rate. The independent variable was transformational leadership. Descriptive statistics, measures of frequency, central tendency, variance, and normality were calculated.

CHAPTER 4

RESULTS

This chapter includes the analysis of safety performance as measured by OSHA Incidence Rate and OSHA Frequency Rate and transformational leadership as measured by the MLQ (Avolio & Bass, 2004) for 17 plant managers within two U.S. automotive manufacturing organizations. The chapter is organized into seven main sections which include: background, demographics, instrumentation, data collection process, data analysis procedures, descriptive statistics, findings and a summary.

Background

The overall purpose of this study was to investigate the role of managing a manufacturing organization and the impact of the management style on the safety of the employees. The purpose was to examine a specific leadership style and its relationship with safety outcomes within a manufacturing organization. Further the study was to determine if there was an association between a plant manager's transformational leadership tendencies and the safety outcomes of the associated organization as measured by Incidence Rate and Frequency Rate data.

The four research questions this study attempted to answer were:

Question 1: Are higher mean transformational leadership scores, exhibited by plant managers in automotive manufacturing facilities, associated with lower OSHA Incidence Rates?

Question 2: Are higher mean transformational leadership scores exhibited by plant managers in automotive manufacturing facilities, associated with lower Frequency Rates?

Question 3: Are the mean transformational leadership scores, exhibited by plant managers, higher in automotive manufacturing facilities that had an OSHA Incidence rate of zero when compared to those that did not have an OSHA Incidence Rate of zero?

Question 4: Are mean transformational leadership scores, exhibited by plant managers, higher in automotive manufacturing facilities that had an OSHA Frequency Rate of zero when compared to those that did not have an OSHA Frequency Rate of zero?

The four hypotheses tested in this study were:

H1: Higher mean transformational leadership scores exhibited by plant managers in automotive manufacturing facilities are associated with lower OSHA Incidence Rates.

H2: Higher mean transformational leadership scores exhibited by plant managers in automotive manufacturing facilities are associated with lower OSHA Frequency Rates.

H3: Mean transformational leadership scores exhibited by plant managers are higher in automotive manufacturing facilities that had an OSHA Incidence Rate of zero when compared to those that did not have an OSHA Incidence Rate of zero.

H4: Mean transformational leadership scores exhibited by plant managers are higher in automotive manufacturing facilities that had an OSHA Frequency Rate of zero when compared to those that did not have an OSHA Frequency Rate of zero.

Demographics

The population of interest for this study was plant managers in U.S. automotive manufacturing organizations. The sample was plant managers of two U.S. automotive manufacturing organizations. There was a possibility of a total of 35 U.S. plant managers to participate from the two manufacturing organizations used in this study. The manufacturing plants were considered a convenience sample based on their interest in the study purpose.

The operations of the organizations that participated in the study were categorized under Motor Vehicle and Parts Manufacturing. Each organization was a major global supplier to the automotive industry and product offerings included bearings, metal stampings, and rubber over-mold components. Employment among the participating organizations ranged from 7800 to 19,000. The plants participating in the study were located in the Midwest and southern states.

Managers who directly reported to the plant managers were asked to complete the MLQ as shown in Appendix B for the plant manager to whom they directly reported. All participants were 18 years of age and had been in their current position for at least one year prior to the year from which the OSHA injury information was collected. Gender of the plant manager as well as the direct report managers was not obtained.

Instrumentation

MLQ developed by Avolio and Bass (2004) was used in this study (Appendix B). Several authors examined the validity of the MLQ. In their study Antonakis, et al.,(2003) stated "The MLQ is the most widely used survey for assessing transformational, transactional, and non-leadership" (p. 271). Muenhohn and Armstrong (2008) studied the structural validity of the MLQ and concluded it is successful in adequately capturing the full leadership factor constructs of transformational leadership theory.

Data Collection Process

Data collection was via e-mail using a web based survey service known as SurveyMonkey™. SurveyMonkey™ is a survey support service and a familiar tool for many researchers that provides a well presented and comfortable approach to data collection (SurveyMonkey, 2011). This method of questionnaire administration was selected because of both the large distribution of facilities throughout the U.S. and to protect rater information.

Participating organizations provided company email addresses of all raters for each facility. An explanation of the study was provided to all participants in an email attached to the survey.

All data relating to the plant managers leadership behaviors was obtained using the MLQ (Appendix B). Raters were instructed to complete the entire questionnaire; however for this research only the transformational leadership scale was used which consisted of twenty questions. Safety performance data for each facility was obtained from the 2010 Occupational Injury and Illness Log Form 300 as shown in Appendix A for each facility that participated in the research. Repetitive motion injuries were deleted from the data because of the variability of risk factors when compared among employees. Hours worked, to calculate Incident and Frequency Rates, were also collected from each facility.

Data Analysis Procedures

Twenty questions from the 45 questions of the MLQ (Appendix B) were used to provide the data to calculate a transformational leadership score. This procedure is typical of researchers who utilize the MLQ to assess transformational leadership (Avolio & Bass, 2004; Krishnan, 2005). Idealized Influence Attributed, Idealized Influence Behavior, Inspiration Motivation, Intellectual Stimulation, and Individual Consideration provided the numerical value for the transformational leadership score. Rather than analyzing each factor individually, the single factor of transformational leadership was used as the independent variable in the analyses. The range of the aggregate transformational leadership score was from 0 to 4.

Descriptive statistics were obtained from the three variables of interest: Transformational Leadership Score, Incidence Rate, and Frequency Rate. Pearson correlations, Spearman rho correlation coefficient, and *t* tests were used to analyze and interpret the data. Quantitative measures for safety performance were obtained from each facility and analyzed along with the

transformational leadership data obtained from the scoring of the MLQ by the direct report managers for their plant managers.

Descriptive Statistics

Transformational Leadership Score

The mean Transformational Leadership Score was 2.63 with a standard deviation of .513. The range was 1.9 with a minimum of 1.78 and maximum of 3.68. The median was 2.51. The distribution has a slightly positive skewness (skewness = 0.212) and the distribution is mesokurtic (Kurtosis = -0.438). (See Table 4.1).

Table 4.1:
Descriptive Statistics for Transformational Leadership Score

			Statistic	Std. Error
Mean Transformational Leadership Score (Mean)	Mean		2.633	0.133
	95% Confidence Interval for Mean	Lower Bound	2.380	
		Upper Bound	2.944	
	5% Trimmed Mean		2.641	
	Median		2.510	
	Variance		0.263	
	Std. Deviation		0.513	
	Minimum		1.780	
	Maximum		3.680	
	Range		1.900	
	Interquartile Range		0.780	
	Skewness		0.212	0.550
	Kurtosis		-0.438	1.063

Tests of Normality for the Mean Transformational Leadership Score

Tests of normality for the Mean Transformational Leadership Score indicate there was not enough evidence that the assumption of normality had been violated. (Kolmogorov-Smimov = 0.167; p= 0.20 and Shapiro-Wilk = 0.953; p= 0.50). (See Table 4.2).

Table 4.2:
Tests of Normality for Mean Transformational Leadership Scores

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Mean Transforma-tional Leadership Score (Mean)	0.167	17	0.200*	0.953	17	0.501

a. Lilliefors Significance Correction
*. This is a lower bound of the true significance.

OSHA Incidence Rate

The mean OSHA Incidence Rate was 8.6 with a standard deviation of 5.76. The range was 17.18 with a minimum of 2.10 and maximum of 19.28. The median of 7.13 indicated a positive skew. This was corroborated by the skewness measurement of 0.673. Skewness value distribution was slightly platykurtic (-0.84). (See Table 4.3).

Table 4.3:
Descriptive Statistics for OSHA Incidence Rate

			Statistic	Std. Error
OSHA Incidence Rate	Mean		8.605	1.396
	95% Confidence Interval for Mean	Lower Bound	5.644	
		Upper Bound	11.566	
	5% Trimmed Mean		8.373	
	Median		7.130	
	Variance		33.167	
	Std. Deviation		5.759	
	Minimum		2.100	
	Maximum		19.280	
	Range		17.180	
	Interquartile Range		9.540	
	Skewness		0.673	0.550
	Kurtosis		-0.840	1.063

Tests of Normality for the OSHA Incidence Rate

Tests of normality for the OSHA Incidence Rate indicate there was not enough evidence to reject the assumption of normality (Kolmogorov-Smimov = 0.149; p = 0.20 and Shapiro-Wilk = 0.89; p > 0.05) (See Table 4.4).

Table 4.4:
OSHA Incidence Rate Test of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
OSHA Incidence Rate	0.149	17	0.200*	0.895	17	0.057

a. Lilliefors Significance Correction
*. This is a lower bound of the true significance.

OSHA Frequency Rate

Descriptive statistics for OSHA Frequency Rate were obtained and are reported in Table 4.5. The mean was 2.07 with a median of 1.05. The range was 10.09 with a minimum of 0 and maximum of 10.09. The standard deviation of 2.89 indicated a high degree of variance around the mean. The distribution was positively skewed (Skewness = 1.82). The distribution was also leptokurtic (Kurtosis = 2.9).

Table 4.5:
Descriptive Statistics for OSHA Frequency Rate

			Statistic	Std. Error
OSHA Frequency Rate	Mean		2.068	0.701
	95% Confidence Interval for Mean	Lower Bound	0.582	
		Upper Bound	3.555	
	5% Trimmed Mean		1.738	
	Median		1.050	
	Variance		8.362	
	Std. Deviation		2.891	
	Minimum		0.000	
	Maximum		10.090	
	Range		10.090	
	Interquartile Range		3.130	
	Skewness		1.822	0.550
	Kurtosis		2.914	1.063

Tests of Normality for OSHA Frequency Rate

Tests of normality indicated Frequency Rate was not normally distributed (Kolmogorov-Smimov = 0.281; $p<0.05$ and Shapiro-Wilk = 0.745; $p<0.001$). (See Table 4.6) The results of the tests for normality for Frequency Rate may have been affected by the one plant that had a Frequency Rate of 10.09 and the six plants that had a zero Frequency Rate. The raw data showed a 3 point difference between the highest rate and the next highest rate.

Table 4.6:
Tests of Normality for OSHA Frequency Rate

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
OSHA Frequency Rate	0.281	17	0.001	0.745	17	0.000

a. Lilliefors Significance Correction

Findings

Hypothesis 1: Higher mean transformational leadership scores, exhibited by plant managers in automotive manufacturing facilities, are associated with lower OSHA Incidence Rates.

A Pearson correlation was calculated examining the relationship between transformational leadership and OSHA Incidence Rate. The Pearson r correlation was chosen because data in each variable was normally distributed and it was interval data. Coefficients close to 0.0 represent a weak relationship. Coefficients close to 1.0 or -1.0 represent a strong relationship. Generally correlations greater than 0.7 are considered strong and correlations less than 0.3 are considered weak. The Pearson correlation showed a weak correlation that was not significant ($r(15) = -0.072$; $p > 0.05$) (See Table 4.7).

A statistically significant linear relationship between the mean Transformational Leadership Score and OSHA Incidence Rate did not exist. This means the OSHA Incidence Rate did not decrease significantly as the mean Transformational Leadership Score increased. Therefore transformational leadership may not be predictive of OSHA Incidence Rate. There was not enough evidence to accept Hypothesis 1.

Table 4.7:
Pearson Correlation Between Transformational Leadership Score and OSHA Incidence Rate

		Mean Transformational Leadership Score (Mean)	OSHA Incidence Rate
Mean Transformational Leadership Score (Mean)	Pearson Correlation	1.000	-0.072
	Sig. (2-tailed)		0.784
	n	17.000	17.000
OSHA Incidence Rate	Pearson Correlation	-0.072	1.000
	Sig. (2-tailed)	0.784	
	n	17.000	17.000

Hypothesis 2: Higher mean transformational leadership scores, exhibited by plant managers in automotive manufacturing facilities, are associated with lower OSHA Frequency Rates.

Because the Frequency Rate was not normally distributed, a Spearman rho correlation coefficient was calculated for the relationship between the Mean Transformational Leadership Score and OSHA Frequency Rate. The closer the correlation is to either +1 or -1, the stronger the correlation. If the correlation is 0 or very close to 0, there is no association between the two variables. The direction of the correlation shows how the variables are related. If the correlation is positive, the two variables have a positive relationship meaning as one increases, the other also increases. If the correlation is negative, the two variables have a negative relationship meaning as one increases, the other decreases. Using the Spearman rho correlation coefficient calculation, an extremely weak correlation that was not significant was found ($r(15) = -0.351$; $p > 0.05$). The calculation showed a negative relationship. (See Table 4.8). This negative relationship may

demonstrate some tendencies toward Transformational Leadership and lower OSHA frequency rates.

Transformational Leadership was not related to OSHA Frequency Rate to a statistically significant degree. This means OSHA Frequency Rates did not significantly decrease as the mean transformational leadership scores increased. Therefore transformational leadership may not be predictive of OSHA Frequency Rate. There was not enough evidence to accept Hypothesis 2.

Table 4.8:
Spearman's Rho Correlation Between Mean Transformational Leadership Score and OSHA Frequency Rate

			Mean Transformational Leadership Score (Mean)	OSHA Frequency Rate
Spearman's rho	Mean Transformational Leadership Score (Mean)	Correlation Coefficient	1.000	-0.351
		Sig. (2-tailed)		0.167
		n	17.000	17.000
	OSHA Frequency Rate	Correlation Coefficient	-0.351	1.000
		Sig. (2-tailed)	0.167	
		n	17.000	17.000

Hypothesis 3: Mean transformational leadership scores exhibited by plant managers are higher in automotive manufacturing facilities that had an OSHA Incidence Rate of zero when compared to those that did not have an OSHA Incidence Rate of zero.

No plants reported a zero incidence rate therefore Hypothesis 3 could not be tested. This result was not anticipated because historically many organizations have successfully accomplished a zero OSHA Incidence Rate which lead to the research question and hypothesis. There were perhaps confounding variables that lead to the reporting of OSHA Incidence rates at the manufacturing facilities.

Hypothesis 4: Mean transformational leadership scores exhibited by plant managers are higher in automotive manufacturing facilities that had an OSHA Frequency Rate of zero when compared to those that did not have an OSHA Frequency Rate of zero.

The means and standard deviations for plants that did not experience lost work day cases and those plants that did experience lost work day cases are presented in Table 4.9. The mean Transformational Leadership Score of plants that had a frequency rate greater than zero (meaning lost work day cases) was 2.52 with a standard deviation of 0.43. Those plants that had a frequency rate of zero (meaning no lost work day cases), the mean frequency rate was 2.93 with a standard deviation of 0.68.

Table 4.9:
Group Statistics Based on OSHA Frequency Rate and Transformational Leadership Score

	OSHA Frequency Rate	n	Mean	Std. Deviation	Std. Error Mean
Mean Transformational Leadership Score (Mean)	>=.001	11	2.518	0.428	0.129
	<=.001	6	2.925	0.682	0.278

The independent samples *t* test compared the means of two samples. The two groups being compared in each of the *t* tests (Mean Transformational Leadership and Frequency Rate)

were presumed to be independent of each other, which was required in this analysis. The *t* test assumed an equality of means in the group being evaluated.

An independent-samples *t* test was calculated comparing the Mean Transformational Leadership Score of plant managers who had an OSHA frequency rate of zero and those plant managers who did not have an OSHA frequency rate of zero. No significant difference was found ($t(15) = -1.52$, $p > 0.05$). (See Table 4.10). The data does show indications that the mean Transformational Leadership score of the plant managers was higher in several plants with lower OSHA frequency rates, however there was not enough to prove significance.

Table 4.10:
Independent Samples *t* Test

		Levene's Test for Equality of Variances		*t* test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Mean Transformational Leadership Score (Mean)	Equal variances assumed	0.53	0.48	-1.52	15.00	0.14	-0.41	0.267	-0.97	0.16
	Equal variances not assumed			-1.33	7.21	0.22	-0.41	0.307	-1.12	0.31

Summary

The overall purpose of this study was to investigate the role of managing a manufacturing organization and the impact of the management style on the safety of the employees. The purpose was to examine a specific leadership style and its relationship with specific safety outcomes as measured by Incidence Rate and Frequency Rate within a manufacturing organization. Further, the study was to determine if there was an association between the plant

manager's transformational leadership tendencies and the safety outcomes of the associated organization as measured by Incidence Rate and Frequency Rate data.

Descriptive statistics were obtained from the three variables of interest: Transformational Leadership Score, Incidence Rate, and Frequency Rate. Tests for normality indicated the Transformational Leadership Score and Incidence Rate were normally distributed. The Frequency Rate however was not normally distributed.

The statistical results from the data collected, along with verbiage for each hypothesis are presented in Chapter 4. The following bullet points summarize the data:

- Hypothesis 1 was tested using a Pearson correlation. A weak correlation that was not significant was found. A statistically significant linear relationship between the mean Transformational Leadership Score and OSHA Incidence Rate did not exist. This means the OSHA Incidence Rate did not decrease significantly as the mean Transformational Leadership Score increased. Therefore Transformational Leadership may not be predictive of OSHA Incidence Rate.
- Hypothesis 2 was tested using a Spearman rho correlation coefficient because the Frequency Rate was not normally distributed. The Spearman rho correlation coefficient was calculated to determine the relationship between the mean Transformational Leadership Score and OSHA Frequency Rate. There was not enough evidence to accept Hypothesis 2. This means OSHA Frequency Rates did not decrease significantly as the mean Transformational Leadership scores increased. Therefore Transformational Leadership may not be predictive of OSHA Frequency Rate.
- Because no plants reported a zero Incidence Rate, Hypothesis 3 could not be tested.

- An independent-samples *t* test was calculated comparing the mean transformational leadership score of plant managers who had an OSHA Frequency Rate of zero and those plant managers who had an OSHA Frequency Rate greater than zero. No significant difference was found between the two categories

CHAPTER 5

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

This research examined leadership styles in the automotive manufacturing industry. The overall purpose of this study was to investigate the role of managing a manufacturing organization and the impact of the leadership style on the safety of employees. The purpose was to examine a specific leadership style and its relationship with safety outcomes as measured by Incidence Rate and Frequency Rate within a manufacturing organization. Further, the study was to determine if there was an association between a plant manager's transformational leadership style and the safety outcomes of the associated organization as measured by Incidence Rate and Frequency Rate data.

The focus of the study was on plant managers within two U.S. automotive manufacturing organizations. The study was aimed to determine if leadership styles differ in companies that have higher injury rates compared to companies that have lower injury rates.

Transformational leadership studies suggest there is support for linking safety-specific transformational leadership with fewer occupational injuries (Barling, et al., 2002). It has also been stated that there is a positive relationship between transformational leadership and performance (Howell & Avolio, 1993). Additionally transformational leadership is a statistically significant positive predictor of safety compliance (Inness et al., 2010). These studies however did not exam leadership styles in relationship to safety outcomes as determined by Incidence Rates, DART Rates, and Severity Rates.

This chapter provides a discussion and conclusions based on the data within the context of the research hypotheses. Also presented in this chapter is a discussion about the sample and recommendations for further study.

Respondents

Approximately fifty automotive manufacturing-related organizations were made aware of the research by way of a presentation at a regional meeting of the Original Equipment Suppliers' Association (OESA). Participants who represented various functions of their organization (Human Resources, Environmental, Health and Safety, Legal, Manufacturing, and Operations) were asked by the researcher to volunteer their organization for the study. Initially six organizations, representing an estimated 100 U.S. facilities, expressed interest in participating in the study. Three automotive manufacturing organizations provided the researcher with a commitment letter indicating they would participate in the study as shown in Appendix D. The researcher reached out to the remaining organizations two additional times with no responses. Two of the three organizations that committed to the study provided the necessary information to participate in the research. Of the two organizations, a total of 35 plants were represented. Of the 35 plants, 17 plants qualified for research participation. The 17 plants represented 17 plant managers and a total of 66 respondents that were direct reports to the plant managers. All plants were within the United States. Specific plant locations were not divulged by one organization however the other organization had plants located in the Midwest and southern states. Employment among the participating organizations ranged from 7800 to 19,000 employees with specific plant populations ranging from 100 to 500 employees.

Hypotheses and Outcomes

For the purposes of this study, the following hypotheses were developed and will be discussed in relation to the data collected.

H1: Higher mean transformational leadership scores exhibited by plant managers in automotive manufacturing facilities are associated with lower OSHA Incidence Rates.

A weak correlation between transformational leadership scores and lower OSHA Incidence Rates was found. However, a statistically significant linear relationship between the mean Transformational Leadership score and OSHA Incidence Rate did not exist. This means the OSHA Incidence Rate did not decrease significantly as the Mean Transformational Leadership score increased. This means Transformational Leadership may not be predictive of OSHA Incidence Rate. Therefore there was not enough evidence to accept Hypothesis 1.

H2: Higher mean transformational leadership scores exhibited by plant managers in automotive manufacturing facilities are associated with lower OSHA Frequency Rates.

An extremely weak correlation that was not significant was found. There was not enough evidence to accept Hypothesis 2. Transformational Leadership was not related to OSHA Frequency Rate to a statistically significant degree. This means OSHA Frequency Rates did not significantly decrease as the Mean Transformational Leadership scores increased. Therefore Transformational Leadership may not be predictive of OSHA Frequency Rate. There was not enough evidence to accept Hypothesis 2.

While there was not enough evidence to accept either Hypothesis 1 or Hypothesis 2, there was an interesting fact discovered upon further review of the data. An assumption of this study was that all of the raters (direct report managers) would answer the survey questions honestly. A review of the results of the scoring revealed an interesting pattern of two raters. Of the twenty

transformational leadership questions, one rater scored the plant manager with all three's (fairly often) with the exception of one question which the rater scored the plant manager a two (sometimes). Another rater, from a different plant, scored the plant manager with all four's (frequently, if not always) with the exception of one question which the rater scored the plant manager a three (fairly often). A review of the other raters from the two plants revealed scores that were much different which makes the researcher question the honesty of the scoring. This could have affected the outcome of the study.

The weak correlation found in Hypothesis 2 may have been associated with the return to work policy at each participating facility. The Frequency Rate is calculated using the number of work-related lost workday cases serious enough to require a day or more away from work. The Frequency Rate can be affected by plant return to work policies. Plants that have lower OSHA Frequency Rates would exhibit strong return to work programs meaning a facility will accommodate an employee's restrictions thus eliminating a lost workday case. Evaluating the return to work policy of the participating plants was outside the scope of this study but it is possible the plants did not have strong return to work programs which affected the outcome of this study.

H3: Mean transformational leadership scores exhibited by plant managers are higher in automotive manufacturing facilities that had an OSHA Incidence Rate of zero when compared to those that did not have an OSHA Incidence Rate of zero.

There were no plants that had an OSHA Incidence Rate of zero, therefore Hypothesis 3 could not be tested. A zero Incidence Rate means a plant has no OSHA recordable injuries/illnesses. This hypothesis was developed because it is common for an organization to have plants that do not have OSHA recordable injuries/illnesses. Examples of organizations that

had zero OSHA recordables in the recent past include: Milliken, a textile company, AmQuip, a crane company, Signal International, a supplier of marine and fabrication services, and DuPont, a chemical company. Although these organizations were not classified in the motor vehicle manufacturing sector, it was evidence that no OSHA recordables is quite possible. This researcher found it unusual that of the seventeen plants that participated in the research, none had an OSHA Incidence Rate of zero.

One limitation to the study was the quality of data gathered, as it was based on the ability of the OSHA record keeper to properly record occupational injuries/illnesses. Possibly, OSHA recordkeeping may not have been completely accurate. It might be the record keepers were counting some injuries/illnesses as recordable when in fact they were not recordable.

The OSHA record keeper must have a full understanding of the recordkeeping requirements in order to log occupational injuries and illness correctly. An OSHA recordable case is a work-related injury or illness that does not involve death, one or more days away from work, or one or more days of restricted work or job transfer and where the employee receives medical treatment beyond first aid. OSHA provides a list of 14 first-aid treatments and only those treatments included on the list are considered first aid for OSHA recordkeeping purposes. Company OSHA record keepers may find this list confusing, or may not even be aware of the list, and therefore log an injury as recordable when in fact it is not. This researcher found, through OSHA log auditing over the past several years, the following common logging mistakes: counting a non prescription medication at non prescription strength as OSHA recordable; counting the use of a butterfly bandage or Steri-Strip™ as OSHA recordable; determining that drilling a fingernail to relieve pressure as OSHA recordable. An audit of the OSHA logs

provided by the participating plants was outside the scope of this research but perhaps inaccurate determination of OSHA recordability could have affected the outcome of the study.

H4: Mean transformational leadership scores exhibited by plant managers are higher in automotive manufacturing facilities that had an OSHA Frequency Rate of zero when compared to those that did not have an OSHA Frequency Rate of zero.

The mean Transformational Leadership Score of plants with a zero frequency rate was not significantly different from the mean of plants that had a frequency rate greater than zero. Therefore Hypothesis 4 was not accepted.

An assumption of the study was that all of the raters would answer the survey questions honestly. There were six plants that had a frequency rate of zero meaning no lost work day cases. Two of the six plants with a zero frequency rate had interesting scoring patterns. Of the twenty transformational leadership questions, one rater scored the plant manager with all three's (fairly often) with the exception of one question which the rater scored the plant manager a two (sometimes). Another rater, from a different plant, scored the plant manager with all four's (frequently, if not always) with the exception of one question which the rater scored the plant manager a three (fairly often). A review of the other raters from the two plants revealed scores were much different which makes the researcher question the honesty of the scoring. This could have affected the outcome of the study.

Discussion

Findings and Sample Size

Findings of this research did not support the information found in a review of published literature as evidenced by several studies. According to Yang, Wang, Chang, Guo, and Huang (2009), both an organization's safety culture and its leadership behavior will affect safety

performance. Turner, Barling, Loughlin, and Kelloway (2002) and Kelloway, et al., (2006) found there is a relationship between transformational leadership and an organization's safety climate and safety culture. Transformational leadership was found to relate to safety participation and it can be used to achieve various organizational goals, including a safe work environment (Inness, et al., 2010). These studies however did not examine leadership styles in relationship to safety outcomes as determined by Incidence Rate and Frequency Rate.

Seventeen plants participated in the research and possibly the relatively small sample size may have affected the outcome. Gravetter and Wallnau (2000) stated a large sample should be more accurate than a small sample and according to the law of large numbers the larger the sample size (n), the more probable it is that the sample mean will be close to the population mean.

The researcher was personally informed by individuals from some of the potential participating organizations of reasons why they were unable to support the research within their organizations. The reasons they stated included the time commitment to provide information to the researcher: the OSHA log information to calculate the incidence and frequency rates and email addresses of the potential respondents. Also, concern was expressed that the rater information would work its way back to the plant manager. This appeared to be a major concern since the automotive industry was rebounding from a large number of plant closings and with major downsizing, individuals may have feared retaliation even though confidentiality was assured. This concern may have been compounded by the fact that company emails of the raters were utilized for the survey distribution.

Focus on Plant Manager

For the purpose of the study, the focus was on the plant manager from each facility. Direct-report managers from U.S. automotive manufacturing facilities were asked to complete the MLQ for the plant manager. Since the direct report managers report directly to the plant manager, they were in the best position to rate the plant manager.

The researcher chose to focus on the plant managers because they have the ultimate responsibility for successfully managing a plant. The researcher had observed throughout her safety career, numerous plants within the same organization with exceptional safety records as well as many plants with poor safety records as measured by Incidence Rate and Frequency Rate. As a process of deductive reasoning, focusing on the plant manager was the most logical starting point to determine if there was any association between transformational leadership style and safety outcomes measured by Incidence Rate and Frequency Rate.

The plant manager typically has daily operations meetings with the direct report managers to discuss various topics including quality, production schedules, absenteeism, inventory levels, maintenance planning and in some instances injuries. The daily interaction between the direct reports and the plant manager contributed to the justification that they were in the best position to rate the plant manager.

The literature review cited several studies relating to supervisors and safety: Maierhofer, et al., (2000) concluded employees do as their supervisors do, and the supervisor's values become the employee's values. Thompson et al., (1998) found supervisors influence safety more directly because they are on the shop floor throughout the day and continuously interact with employees and communicate management's support for safety.

The researcher chose to focus on direct outcomes (e.g., Incidence Rate and Frequency Rate as variables) and, the aim was to focus on plant managers. Results of this research may suggest the plant manager is not close enough to the day-to-day shop floor activities to affect the safety outcomes as measured by Incidence Rate and Frequency Rate.

Threats to Validity and Generalization

Geographical location of the participating facilities, age range of participants, and union versus non union facilities were factors that might have influenced the results of the study but were outside the control of the researcher. The researcher did not ask for plants in certain geographical areas nor did the researcher ask for union/non union affiliation. Although the researcher ensured all participants were greater than 18, age was not taken into consideration as part of the research.

This study focused on automotive manufacturing organizations that have unique operations when compared to other industries such as food manufacturing, machinery manufacturing, computer and electronic product manufacturing, or steel and chemical manufacturing. The results of this investigation should not be generalized to these organizations due to the varying nature of their specific hazards.

Recommendations for Further Research

Because this study was addressing specific measurables associated with safety outcomes in an automotive manufacturing organization, there were several recommendations to further this line of research. These recommendations included.

- Because the relatively small sample size may have affected the outcome, this study should be replicated using a larger number of plants. Gravetter and Wallnau (2000) stated a large sample should be more accurate than a small sample and according to the law of large

numbers the larger the sample size (n), the more probable it is that the sample mean will be close to the population mean.

- Thompson et al., (1998) found supervisors influence safety more directly because they are on the shop floor throughout the day and continuously interact with employees and communicate management's support for safety. While on the shop floor, supervisors monitor an employees' work performance and provide feedback to the employees on how well they may or may not be performing their job duties (Thompson et al., 1998). Maierhofer, et al., (2000), concluded from their study of approximately 50 hairdressers, that employees do as their supervisors do, and the supervisor's values become the employee's values. Conchie and Donald (2009) explored how employee safety-specific-trust in a leader might influence safety behavior. The study showed trust in supervisors positively influenced employee's safety behavior. Therefore, this study should be replicated with supervisors as a focus to determine if there is any association between transformation leadership style exhibited by supervisors and safety outcomes as measured by Incidence Rate and Frequency Rate.
- This study could be replicated using union and non-union facilities as additional variables. It is possible organizational dynamics are substantially different in union and non-union facilities and it would be of interest to determine if there is an association between a transformational leadership style of the management in union and non-union facilities and the safety outcomes of the associated organization as measured by Incidence Rate and Frequency Rate data.

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APPENDIX A

LOG OF WORK RELATED INJURIES AND ILLNESSES

OSHA's Form 300 (Rev. 01/2004)

Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 20__ __

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

You must record information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name ________________

City ________________ State ________

Identify the person			**Describe the case**			**Classify the case** CHECK ONLY ONE box for each case based on the most serious outcome for that case:				**Enter the number of days the injured or ill worker was:**		**Check the "Injury" column or choose one type of illness:**					
								Remained at Work				(M)					
(A) Case no.	(B) Employee's name	(C) Job title (*e.g., Welder*)	(D) Date of injury or onset of illness	(E) Where the event occurred (*e.g., Loading dock north end*)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (*e.g., Second degree burns on right forearm from acetylene torch*)	Death (G)	Days away from work (H)	Job transfer or restriction (I)	Other record-able cases (J)	Away from work (K)	On job transfer or restriction (L)	Injury (1)	Skin disorder (2)	Respiratory condition (3)	Poisoning (4)	Hearing loss (5)	All other illnesses (6)
___	___	___	___/___ month/day	___	___	☐	☐	☐	☐	___ days	___ days	☐	☐	☐	☐	☐	☐
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					Page totals ➤	___	___	___	___	___	___	___	___	___	___	___	___
												Injury (1)	Skin disorder (2)	Respiratory condition (3)	Poisoning (4)	Hearing loss (5)	All other illnesses (6)

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

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APPENDIX B

MULTIFACTOR LEADERSHIP QUESTIONNAIRE RATER FORM (5X-SHORT)

MLQ **Multifactor Leadership Questionnaire**
Rater Form (5x-Short)

Forty-five descriptive statements are listed on the following pages. Judge how frequently each statement fits the person you are describing. Use the following rating scale:

Not at all	Once in a while	Sometimes	Fairly often	Frequently, if not always
0	1	2	3	4

THE PERSON I AM RATING. . .

1.	Provides me with assistance in exchange for my efforts	0	1	2	3	4
2.	Re-examines critical assumptions to question whether they are appropriate	0	1	2	3	4
3.	Fails to interfere until problems become serious	0	1	2	3	4
4.	Focuses attention on irregularities, mistakes, exceptions, and deviations from standards	0	1	2	3	4
5.	Avoids getting involved when important issues arise	0	1	2	3	4

APPENDIX C

COMMITMENT LETTER

September 26, 2011

Barbara Boroughf
4371 Cherry Hill Drive East
Orchard Lake, MI 48323

understands the topic of your study is leadership style and the objective of the study is to determine if there is an association between transformational leadership style and safety outcomes as measured by Incidence Rate and Frequency Rate (number of day away from work cases).

We agree to have a selected number of employees located in our manufacturing facilities participate in a management leadership survey which will take our employees approximately 10-15 minutes to complete. We understand this survey is necessary so your study can go forward. We also understand the survey will take place in the January 2012 timeframe.

We look forward to participating in this study. Please contact me directly when the study is ready to proceed.

Sincerely,

Director, EHS Americas

APPENDIX D

EXEMPT LETTER STATUS

From: Thomas Steiger <no-reply@irbnet.org>
To: Donna Trautman <dktraut@bgsu.edu>; Barbara Boroughf <wboroughf@aol.com>; George Maughan <george.maughan@indstate.edu>
Subject: IRBNet Board Action
Date: Tue, Apr 3, 2012 8:54 am

Please note that Indiana State University Institutional Review Board has taken the following action on IRBNet:

Project Title: [317858-1] An Examination of the Relationship Between Transformational Leadership Tendencies and Safety Outcomes in Manufacturing Settings
Principal Investigator: Barbara Boroughf

Submission Type: New Project
Date Submitted: March 27, 2012

Action: EXEMPT
Effective Date: April 3, 2012
Review Type: Exempt Review

Should you have any questions you may contact Thomas Steiger at thomas.steiger@indstate.edu.

Thank you,
The IRBNet Support Team

www.irbnet.org