EVIL DONE VULNERABILITY ASSESSMENT: EXAMINING TERRORIST TARGETS THROUGH SITUATIONAL CRIME PREVENTION

by

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A Thesis Submitted to the Faculty of

The College for Design and Social Inquiry

in Partial Fulfillment of the Requirements for the Degree of

Master of Science

Florida Atlantic University

Boca Raton, Florida

December 2013

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This thesis was prepared under the direction of the candidate's thesis advisor, Dr. Rachel Santos, Department of Criminology and Criminal Justice, and has been approved by the members of her supervisory committee. It was submitted to the faculty of the College for Design and Social Inquiry and was accepted in partial fulfillment of the requirements for the degree of Master of Science.

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ACKNOWLEDGEMENTS

The author wishes to express her sincere thanks to her family for their support and encouragement throughout the writing of this manuscript. The author is highly appreciative and grateful to Dr. Rachel Santos, who guided the student through each step of the research process. Additionally, the author wishes to thank her colleagues for their support and motivation throughout the writing process.

ABSTRACT

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Title:	EVIL DONE Vulnerability Assessment: Examining Terrorist Targets Through Situational Crime Prevention
Institution:	Florida Atlantic University
Thesis Advisor:	Dr. Rachel Santos
Degree:	Master of Science
Year:	2013

Following the events of September 11th, 2001, national attention has been captivated by terrorism and terrorism prevention. Parallel to this time of increased focus on terrorism prevention, adequate funding to support new departments or increased terrorism prevention efforts in existing departments was unattainable. Consequently, a strong need for prevention strategies that are affordable and highly applicable at the local level has resulted. Thus, it is the purpose of this study to examine methods of risk assessment and test the accuracy of such methodologies in order to assist local organizations in effectively applying limited resources for opportunity reduction at vulnerable locations based on calculated risks. The primary goal of this thesis is to test the validity of the EVIL DONE vulnerability assessment and evaluate its ability to predict the number of fatalities and injured persons resulting from a terrorist attack.

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CHAPTER 1: INTRODUCTION

Background

Historically, a major focus of the government and society has been placed on public safety and crime prevention at the individual or micro-level; more recently, however, the focus has been placed upon protecting large clusters of society at the macro-level. Following the events of September 11th, 2001, national attention has been captivated by terrorism and terrorism prevention. Between 1970 and 2011, there have been 104,689 documented cases of terrorism around the world, 2,362 of which occurred in the United States. These terrorist attacks have resulted in 228,526 fatalities, 299,202 injured persons, and billions of dollars in property damage (Global Terrorism Database, 2012). Parallel to this time of increased focus on terrorism prevention, adequate funding to support new departments or increased terrorism prevention efforts in existing departments was unattainable (Leson, 2005). It was, and still is, unrealistic to expect local, state, or federal authorities to fund additional personnel and equipment in addition to their daily costly behaviors in order to address the vulnerability of their communities to terrorist attacks and implicate the necessary measures to decrease opportunities for such attacks. Consequently, a strong need for prevention strategies that are affordable and highly applicable at the local level has resulted.

Concurrent with the attention spreading to terrorism prevention, there is a growing awareness of significant criminology theories that are highly applicable to the

emerging crime prevention goal. The primary theory of interest, situational crime prevention, provides many valuable techniques to preventing terrorist attacks (Clarke, 1983). Situational crime prevention (SCP) is grounded in the theoretical concepts of routine activities theory (Cohen & Felson, 1979), crime pattern theory (Brantingham & Brantingham, 1993), and rational choice theory (Clarke & Cornish, 1985) and is the application of environmental theory into direct crime prevention actions. Rather than placing emphasis on the offenders or even the victims, SCP allocates emphasis on the place (i.e., location) of the crime. The goal of SCP is to alter the environment to reduce the opportunities for criminal acts, and likewise, terrorist attacks (Boba, 2009). However, as previously mentioned, because of the limitations in government funding and resources, it is impractical to reduce opportunities for terrorism at all locations around the world. Thus, it is the purpose of this study to examine methods of risk assessment and test the accuracy of such methodologies in order to assist local organizations in effectively siphoning limited resources for opportunity reduction at vulnerable locations based on calculated risks.

In response to the need to develop a strategy for identifying vulnerable targets for efficient opportunity reduction, Clarke and Newman (2006) developed the acronym EVIL DONE, which defines attributes of locations that may make particular locations more vulnerable to a terrorist attack. Assessing the vulnerability of specific locations through the factors of EVIL DONE can assist local authorities by emphasizing the places most vulnerable to attack (Boba, 2009). When the most vulnerable locations are

identified, SCP techniques can be more effectively prioritized for terrorism opportunity reduction.

Problem Statement

As a nation struggling with economic resources, facing a prevalent concern of terrorism, and seeking effective methods for terrorism prevention despite these adversities, a comprehensive problem exists in establishing a method for effectively allocating limited resources to the most vulnerable locations in order to reduce the opportunities for terrorist attacks. Additionally, because of the limited resources hindering the capabilities of law enforcement and homeland security at all levels, the applicability of such methods must be as straightforward as possible in order to be employed by an average proletarian. Thus, the method for assessing terrorism vulnerability must be affordable, easily applicable, and efficient at identifying the most vulnerable targets in order to address the locations most in need of terrorism opportunity reduction.

Thesis Goal

The marginal goal of this thesis is to discuss the limitations of pre-existing vulnerability assessment methodologies and present the EVIL DONE vulnerability assessment. In addition to the presentation of EVIL DONE, the primary goal of this thesis is to present the EVIL DONE vulnerability assessment methodology, test its validity, and evaluate its ability to predict the number of fatalities and injured persons resulting from a terrorist attack. Validity refers to how well a test measures what it is designed to measure (Babbie, 2010); thus, a test of validity will assess whether the EVIL DONE vulnerability

score accurately measures the vulnerability of such locations/targets. Although the assessment is designed to be applied proactively to specific locations within a unique jurisdiction, it is impractical to use this same concept in research. One cannot measure the vulnerability of locations all over the world in anticipation of the next terrorist attack to test the validity. Therefore, because terrorists seek to impact as many people as possible in order to strengthen their objectives, this study will be applied reactively to historical terrorist attacks to assess whether or not the vulnerability score is reflective of the number of fatalities and injured persons.

Relevance and Significance

Past efforts by the United States Department of Homeland Security to collect vulnerability assessment methodologies in hopes of discovering an affordable and locally applicable method yielded unsatisfactory results (Leson, 2005). These endeavors emphasized a need for vulnerability assessment methodologies that would be useful to local authorities and could contribute to the prevention of terrorist attacks on locations within local jurisdictions (Leson, 2005; Boba, 2009). Therefore, in a post-9/11 era where terrorism prevention has become a principle concern to both government sectors and the general public, the relevance of the current study is evident.

In addition to the relevance, the current study also offers significant contributions to the field of criminology. Clarke and Newman are two principal contributors to the field of criminology and the earliest advocates of key theories such as rational choice and situational crime prevention. Despite their vast wisdom and contributions, this theory has not yet been tested to the best of their knowledge. Therefore, this study is highly

significant in that it will be the first to test the validity of the EVIL DONE vulnerability assessment for terrorism opportunity reduction. Additionally, contingent on the findings and results, this study may reveal vital attributes of targets and locations whose characteristics influence its vulnerability to terrorist attacks. The design of the EVIL DONE vulnerability assessment was formulated for easy application at the local level; therefore, subject to the validity of the tests, it is possible that future research could further assess the validity and promote integration of the vulnerability assessment into local opportunity reduction efforts.

Summary

Recent shifts in government and public concerns have placed terrorism opportunity reduction on the forefront. Apart from these concerns, increased funding and capabilities for terrorism prevention across the nation is unrealistic and unfeasible. However, through the use of situational crime prevention and EVIL DONE, certain locations that are more vulnerable to attack can be identified in order to more effectively apply limited resources. It is the primary goal of this thesis to test the validity of the EVIL DONE vulnerability assessment to evaluate its usefulness in identifying the locations most vulnerable to a terrorist attack. The increased concerns in terrorism highlight the key relevance of this study in the current era. Additionally, this study will be the first to test the validity of EVIL DONE following its development by Clarke and Newman (2006).

Chapter 2 will discuss the multiple theoretical concepts of environmental criminology that contributed to the development of EVIL DONE. The chapter will also

formally introduce and define terrorism and its components, followed by an application of situational crime prevention to terrorism opportunity reduction. Lastly, the chapter will examine existing vulnerability assessment methodologies, their attributes, and their weaknesses. Chapter 3 will define the purpose of this study, followed by a description of the research design and the data collection and sampling methods. The chapter will then introduce the EVIL DONE vulnerability assessment methodology and the research questions of this study. Chapter 4 will include an examination of the statistical findings through descriptive statistics, correlations, and multiple regression analyses' results. Lastly, chapter 5 will discuss the findings and the limitations of the study. To conclude, this chapter will also discuss the scholarly conclusions and implications for future research.

CHAPTER 2: THEORETICAL FOUNDATIONS AND RESEARCH

Introduction

Multiple theoretical concepts from environmental criminology contributed to the development of the EVIL DONE vulnerability assessment including routine activities theory, crime pattern theory, and rational choice theory. Additionally, key components of situational crime prevention and environmental criminology have further contributed to the assessment. The first section of this chapter briefly examines the key components of each theory, followed by their application to terrorism. Next, the importance of targets, weapons, tools, and facilitating conditions of terrorism are discussed along with an analysis of target vulnerability and its association to EVIL DONE. The second section examines previous research on target vulnerability and discusses the current gaps in the literature, which illustrate the need for determining the validity and reliability of current vulnerability assessments, which is the main focus of this thesis. The third section examines existing vulnerability assessment methodologies and their attributes and weaknesses. Conclusively, the final section will discuss the focal research questions addressed in this study.

Environmental Criminological Theories

Contrary to traditional criminology theories which focus on explaining why people commit crimes, the concepts of environmental criminology focus on explaining

the criminal event, with the setting of the crime being the primary emphasis (Brantingham & Brantingham, 1993; Felson & Boba, 2010). Many traditional criminology theories attempt to explain why certain people commit crimes and what factors indorse criminality (Brantingham & Brantingham, 1993; Felson & Boba, 2010). In environmental criminology, researchers instead focus on a specific location at precise times to find the unique characteristics of these settings that encourage particular behaviors (i.e., crime) (Santos, 2012). Thus, the goal is to identify patterns in the characteristics of settings and behaviors that create opportunities for crime, and consequently to understand how to decrease these opportunities (Santos, 2012).

The three pillars of environmental criminology are routine activities theory, crime pattern theory and rational choice theory. Each of these theories contributes to the understanding of how crime events happen, how offenders and victims come together, and the importance of setting and time. The following is a more in depth discussion of each theory followed by its application to terrorism.

Routine Activities Theory

Cohen and Felson (1979) developed the routine activities theory by establishing that crime results from a convergence of three critical components at a particular time and space. The three critical components include a motivated offender, a suitable target, and the absence of a capable guardian. The three components establish what has become known as the crime triangle (Figure 1). When the three components converge, a crime opportunity is developed. If any of the three components are missing at any given time or setting, the opportunity for crime is decreased (Tillyer & Eck, 2011).

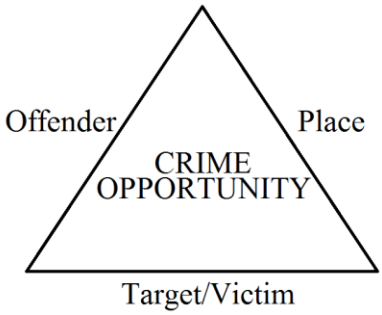

Figure 1: Crime triangle

In addition to the three critical components of crime opportunities, *controllers* can supervise either the target (victim), the place (setting), or the offender. Guardians contribute to crime prevention through protecting and watching over specific targets. Place managers maintain control and supervision over specific places. Handlers oversee and influence the decisions of offenders. Figure 2 depicts the controllers which converge with the three components of a crime opportunity to create a double crime triangle (Tillyer & Eck, 2011).

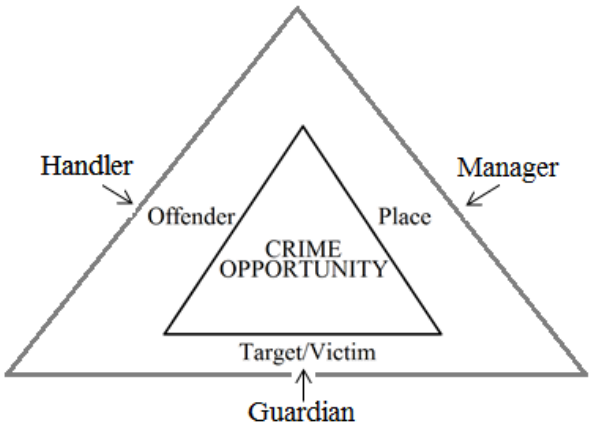

Figure 2: Double crime triangle

The center triangle represents the three critical components of crime. The convergence of these components at a particular time and space creates opportunity. The

outer triangle represents potential controllers whose presence can contribute to crime prevention, whereas their absence promotes the crime opportunities. Guardians can include one's self, an adult looking after a child, bystanders, or anyone responsible for watching over a crime target or victim. Handlers can be a parent, teacher, spouse, probation officer, or any person that could influence the decisions of a potentially motivated offender. Place managers can include homeowners, business managers, or any person who can alter the method in which a place/setting is operated. Homeowners can alter the setting of their homes to increase crime prevention through installing alarm systems, improving perimeter control and lighting, and locking doors. Business managers can maintain control over their settings by enforcing policies, restricting alcohol use and/or sales, and formally responding to crime and disorder (Tillyer & Eck, 2011).

Crime Pattern Theory

Crime pattern theory seeks to explain how likely offenders and suitable targets converge in time and space (Brantingham & Brantingham, 1993). The theory is developed around the concept of activity space which is the area traversed by a particular person throughout the course of his/her daily routines. An activity space typically includes home, work, school, grocery stores, or any specific location that a person routinely visits. The theory suggests that crime will occur when the activity space of a motivated offender overlaps with the activity space of a suitable target/victim. The intersection of the two activity spaces creates the opportunity for criminal behaviors. Thus, activity spaces or locations that are visited by a large amount of people will be more prone to criminal behaviors, being that both motivated offenders and suitable

targets are likely to be present. For example, locations such as restaurants, downtown shopping centers, or movie theaters commonly attract a multitude of individuals. Because these locations fall into the activity space of many people, the convergence of the offender and the victim/target at any particular time and place is probable (Brantingham & Brantingham, 1993).

Crime pattern theory has also developed concepts suggesting that offenders commit crimes in the areas they are most comfortable in and accustomed to, typically the areas closest to their homes. According to Bernasco (2010), offenders are 22 times more likely to commit a crime in an area that they are currently living in or have formerly lived in as opposed to a location the offender is unfamiliar with. The findings suggest that offenders choose the location of the crime in an area that is commonly visited and included in the offender's activity space.

Rational Choice Theory

Clarke and Cornish (1985) applied rational choice theory to the process in which offenders make decisions and choose to deter from or conform to criminality. The theory assumes that all humans are rational individuals who will weigh the potential costs against the perceived rewards or benefits of a particular action during decision making, and suggests that the decision to commit a crime is a two-stage process including the "involvement decision" and the "event decision" (Clarke & Cornish, 1985).

During the involvement decision stage, the offender decides whether or not he/she is ready to commit an offense. The offender contemplates his/her involvement in a certain crime and decides that the offense is the preferred solution to meet his/her needs. This

decision process is driven by the offender's previous experiences and prior learning, which helps guide the offender's choices (Clarke & Cornish, 1985). Drawing from previous experiences, the offender commits to a certain offense under specific circumstances.

Following the involvement decision, the event decision is initiated. During the latter stage, situational factors dominate the decision making process. It is important to note that despite the ability of situational factors to control event decisions, situations are viewed differently by different people. Previous experiences stimulate the manner in which an offender perceives the situation. Reinforcements and punishments modify the offender's perceptions of criminal events. The effects of these consequences later increase or decrease the probability or frequency of future offending (Tillyer & Eck, 2011).

The idea that situations are perceived uniquely acknowledges distinct differences in decision making and recognizes a concept referred to as bounded or limited nature of human rationality (Clarke & Cornish, 1985). The offender's opinions regarding criminal or law-abiding behaviors may change as life-altering situations present themselves. These life-altering situations may include professional opportunities, shifts in peer groups, networking, and family development. When an individual's personal situation or the environment is altered, the costs and benefits of crime are also adjusted, and the perceived benefits may no longer outweigh the risks (Cornish & Clarke, 1985).

Situational Crime Prevention

Situational crime prevention (SCP) is grounded in the theoretical concepts of routine activities theory, crime pattern theory, and rational choice theory and is the application of environmental theory into direct crime prevention actions. Its focus is to reduce the opportunities for very specific crimes by altering the immediate environment (i.e., the setting) (Clarke, 1983). The goal is to modify the environment, to adjust the offender's perception of costs and benefits, and to ultimately influence their decision making process (Clarke, 1983). In order to reduce opportunities and manipulate the offender's perceptions, SCP proposes five general categories of focus, each of which incorporates more specific techniques. The five general categories of focus include increasing the perceived effort of the crime, increasing the perceived risk of the crime, reducing the anticipated rewards, reducing provocations, and removing excuses (Clarke, 1983).

Increasing the perceived effort of committing the crime is the first technique suggested by the SCP model. It is important to note that the actual effort may not need to be increased, but rather the effort perceived by the offender. The five techniques within this category all involve making it more difficult for a crime to occur by requiring the offender to exert more effort to complete the desired task. These include: (1) target hardening (e.g., deadbolt locks or unbreakable glass), (2) controlling access to facilities (e.g., electronic card access or gated communities), (3) screening exits (e.g., ticket, stamped document, or identification needed for exit), (4) deflecting offenders (e.g., street

closures or separating rival sports fans), and (5) controlling tools/weapons (e.g., waiting period on firearms purchases or using plastic cups instead of glass) (Clarke, 1997).

Increasing the risk again refers to the perceived risk of being caught committing a crime by the motivated offender, as opposed to the actual risk which may be quite different in some situations. The goal is to prompt the offender into believing that the risk of being spotted or apprehended outweighs the potential rewards of the crime. The five techniques that increase the perceived risk of being caught include: (1) extending guardianship (e.g., traveling in groups or carry a phone), (2) assisting natural surveillance (e.g., improving street lighting or decrease sight-hindering objects), (3), reducing anonymity (e.g., requiring uniforms or requiring taxi drivers to post photo identification), (4) utilizing place managers (e.g., two clerks at a convenience store), and (5) strengthening formal surveillance (e.g., alarm systems or security guards) (Clarke, 1997).

The third category of situational crime prevention techniques involves reducing the anticipated rewards. The anticipated rewards are what the offender seeks to gain from taking advantage of the crime opportunity (i.e., the anticipated benefits). Consistent with the above mentioned techniques, the actual reward may not need to be reduced, but rather the perception of the reward by the offender. The five techniques to reduce these anticipated rewards include: (1) concealing targets (e.g., parking in a personal garage or hiding valuable out of plain view), (2) removing targets (e.g., keeping a low amount of cash in a register) (3) identifying property (e.g., personal engraving on valuable items or marking property), (4) disrupting markets (e.g., monitoring pawn shops for reportedly

stolen goods), and (5) denying benefits (e.g., ink tags on merchandise or graffiti clean-up) (Clarke, 1997).

The fourth category of situational crime prevention is reducing provocations which involves reducing factors that may instigate criminal tendencies or increase motivations for criminal behavior. The aim of the techniques in this category is to reduce conflicts and triggers for crime. The five techniques include: (1) reducing frustrations and stress (e.g., soothing music or ample seating options in crowded areas), (2) avoiding disputes (e.g., reducing crowding or separating rival sporting teams), (3) reducing emotional arousal (e.g., prohibiting racial slurs or enforcing positive behaviors), (4) neutralizing peer pressure (e.g., promoting designated drivers or saying "no"), and (5) discouraging imitation (e.g., rapid repair of vandalism or conceal details of crimes in media) (Clarke, 1997).

The last category of situational crime prevention techniques involves removing excuses. These techniques seek to reduce reasons or justifications for specific crimes. They include methods of informing citizens about the expectations placed upon them and their behaviors in order to promote legal compliance (Clarke, 1997). The five techniques include: (1) setting rules (e.g., rental agreements), (2) posting instructions (e.g., "No Parking," "No Loitering"), (3) alerting conscience (e.g., roadside speed display boards or "Shoplifting is stealing" signs), (4) assisting compliance (e.g., easy check out or public restrooms), and (5) controlling drugs and alcohol (e.g., alcohol-free events or quantity restrictions on alcohol consumption) (Clarke, 1997).

Each of the above mentioned situational crime prevention techniques contribute to reducing the opportunities for crime. It is these unique approaches provided by SCP that can be applied to altering the environment to prevent a specific incident and/or a related pattern or trend of criminal activity. Environmental criminology and situational crime prevention have been used to explain and address a variety of different types of crime and problematic behavior (e.g., see POP Center Problem-Specific Guides) (POP Center, 2013). More recently, it has been applied to terrorism which is the focus of this research. Thus, the following section presents these theories and considerations in the context of terrorism and more specifically terrorist targets (i.e., places).

Terrorism

Before discussing the implications of opportunity reduction on terrorism, it is important to define what exactly constitutes a terrorist act. While there is not a single, universally accepted definition of terrorism, an accredited definition can be derived from the United States Code of Federal Regulations which defines terrorism as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives" (28 C.F.R. Section 0.85). Additionally, the United States Federal Bureau of Investigations (FBI) divides the term into two distinct categories: domestic or international. The classification of acts is based upon the origin, base, and objectives of the terrorist group or organization (Terrorism 2002-2005, n.d.).

The two definitions are as follows:

> Domestic terrorism is the unlawful use, or threatened use, of force or violence by a group or individual based and operating entirely within the United States or Puerto Rico without foreign direction committed against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof in furtherance of political or social objectives.
>
> International terrorism involves violent acts or acts dangerous to human life that are a violation of the criminal laws of the United States or any state, or that would be a criminal violation if committed within the jurisdiction of the United States or any state. These acts appear to be intended to intimidate or coerce a civilian population, influence the policy of a government by intimidation or coercion, or affect the conduct of a government by assassination or kidnapping. International terrorist acts occur outside the United States or transcend national boundaries in terms of the means by which they are accomplished, the persons they appear intended to coerce or intimidate, or the locale in which their perpetrators operate or seek asylum. (Terrorism 2002-2005, n.d.).

Traditional criminology focuses on explaining the motivations of criminals. Although terrorists' motivations are substantively different than a "typical" criminal's motivation in committing Part I index crimes (homicide, rape, robbery, burglary, assault, larceny, motor vehicle theft, and arson), Clarke and Newman (2006) assert that these

differences are frivolous in terms of crime prevention. Rather, Clarke and Newman (2006) suggest that in reality, although motivation for different types of crimes may vary, all crimes are the result of situational opportunities, and thus can be explained using theories of environmental criminology and addressed with situational crime prevention techniques. For example, the motivation for robbery differs greatly from the motivation for rape or murder. Likewise, political motivations differ greatly from religious motivations of terrorism; yet, despite the differences, Clarke and Newman (2006) assert that all offenses can be prevented through SCP and opportunity reduction. Therefore, it is vital to understand that in any type of crime, in order to reduce opportunities, one must look at how crime opportunities are developed rather than motivations for why offenders commit crimes.

Another important factor facing researchers who attempt to apply criminal justice theories to the realm of terrorism is the differences between Part I index crimes and terrorism. The focus of research has been placed upon identifying these differences and recognizing similarities among the two. The current terrorism research focuses on the following differences: (1) terrorists' determination is much greater than typical criminals, (2) terrorism requires much more excessive planning than most crime and is less dependent on opportunities, (3) terrorism is heavily dependent on external funding whereas most crime is not, (4) terrorism involves much larger criminal acts, and (5) terrorist acts are typically conducted by organized groups, whereas most index crimes are committed by individual people (Clarke & Newman, 2006).

Clarke and Newman (2006) rebut these claims and suggest that in reality, the differences between terrorism and ordinary crimes are trivial. Many terrorists value their lives, and despite their motivations, they procure similar measures to protect themselves. In their view, planning for terrorist attacks can have the same complexity level as other offenses and is just as strongly reliant on opportunity, thus planning is not as vital to the completion of terrorism as is the opportunities to execute the acts. Additionally, while terrorism does require more tools and costly weapons (discussed later), the funds are usually consequential and sometimes exclusive of conventional crimes' gain. Although it is commonly believed that terrorist attacks affect a large population, many acts are provoked against a single individual or small group, as with conventional crimes. Conversely, conventional crimes can also be targeted against a large population, such as fraud or cyber-crimes that victimize populations in the millions (Clarke & Newman, 2006). Lastly, like a majority of terrorist attacks, an ample amount of ordinary crimes are conducted in large groups as opposed to single individuals such as drug dealing and corporate crimes (Clarke & Newman, 2006).

Consequently, Clarke and Newman (2006) assert that just as an index crimes can be successfully prevented through identifying and reducing opportunities, so too can terrorist attacks. It is a two-step process in which the first step involves identifying the opportunities that terrorists exploit to fulfill their desires, and the second step involves removing these opportunities through SCP techniques. However, these two steps are not unidirectional. That is, because terrorists are likely to adapt to opportunity changes and seek new opportunities, it is important to observe the opportunities that may be developed

as a result of SCP. Eliminating opportunities allows terrorists to adapt to new circumstances that facilitate new opportunities, which must once again be identified and removed (Clarke & Newman, 2006).

Because terrorist acts are substantively different that traditional crime, Clarke and Newman (2006) have broken down the opportunities exploited by terrorists to complete terrorist acts into four vital pillars of opportunity—targets, weapons, tools, and facilitating conditions. Targets are the endless locations that are potentially attractive to terrorists. They include, but are not limited to, public transportation systems, government buildings, and political/iconic infrastructures. Weapons are the devices used to carry-out a specific act. Different motivations, tasks, and intentions require different weapons, which emphasizes the need for specific applications of SCP to very specific acts. Possible weapons could include, but are not limited to, firearms, explosives, toxic materials, missiles, and nuclear weapons.

Tools include the gear and instruments needed to carry out the act, not including the actual weapon. For example, in the case of the September 11th attacks, the terrorist attacks required an airplane, identification, box cutters to gain control of the plane, a trained pilot, etc. to carry out their attack. Tools comprise of items in everyday life that assist in carrying out a specific act. They include, but are not limited to, methods of transportation and identification. Facilitating conditions are any societal circumstance that generates greater opportunities for crime. These conditions include, but are not limited to, insufficient policies and procedures on firearms sales and ease of access to toxic or nuclear materials. The importance of the four pillars of opportunity will be

discussed in greater detail in the following sections. Being that terrorism is the result of opportunities presented to motivated offenders (i.e., terrorists), it is essential to address the unique opportunities at each pillar before reaching step two, the removal of opportunities (Clarke & Newman, 2006).

Removing opportunities for terrorism has not prevailed as a topic of concern among government officials. The reasoning behind this inattention is that the focus has been ineffectively placed upon "taking-out" the terrorist (i.e., motivated offender) rather than altering the setting/place to reduce opportunity (Clarke & Newman, 2006). Focusing on the terrorist is both a daunting and ineffective task due to the limitless and expendable nature of motivated offenders. Rather than "taking-out" offenders, SCP assists in "out-smarting" them through removing opportunities at targets/places as an effective method for terrorism prevention (Clarke & Newman, 2006). Terrorists spend a considerable amount of time selecting a target that meets their needs and objectives. Likewise, analysts must also strategically identify the most vulnerable locations in order to prioritize opportunity reduction efforts. By understanding terrorists' strategies and target tendencies, targets can be prioritized based on their relative vulnerability and risk.

Targets.

All places are not equally attractive to terrorists as possible targets. Because of this, applying opportunity reduction strategies to all locations is unwarranted. Research has concluded that terrorists devote a large amount of time to selecting a location that suits specific intentions (Clarke & Newman, 2006). Thus, just as terrorists seek the most vulnerable places as possible targets, it is important to identify the most vulnerable places

in order to prioritize SCP efforts. Additionally, because terrorists have many different objectives, the kind of targets they select will be consistent with their motivations. Therefore, knowing the objectives of terrorism provides insight into which places terrorists may choose.

Weapons.

The weapons available to terrorists have been categorized into three classes by Clarke and Newman (2006). The choice of weapon is highly dependent on certain factors, including the objective of the attack, and dictates which of the following classes of weapon the terrorists may choose: guns and other small arms, explosives, and unconventional weapons (e.g., nuclear, chemical, or biological weapons) (Clarke & Newman, 2006). Like targets, there are certain factors that make specific weapons more or less attractive to terrorists. The factors that contribute to the terrorists weapon selection have been summed up by the acronym MURDEROUS by Clarke and Newman (2006)—Multipurpose, Undetectable, Removable, Destructive, Enjoyable, Reliable, Obtainable, Uncomplicated, and Safe.

Multipurpose refers to the weapons applicability to a wide variety of situations. An example of a multipurpose weapon would be an explosive that could be used in different situations, compared to a high-powered rifle that is only applicable to assassinations (Clarke & Newman, 2006). Undetectable refers to the weapon's ability to remain concealed and hidden. This is especially important for targets with heavier security (Clarke & Newman, 2006). Removable weapons are light, small, and easily portable. Destructive refers to the weapon's ability to cause as much damage as possible.

Enjoyable weapons are those that trigger excitement and pleasure upon using. Reliable refers to a weapon that will operate properly at any given time. To test the reliability of a weapon, some terrorists participate in experimental attacks of a smaller magnitude prior to the actual planned event. This ensures that the weapons are reliable and will function when needed (Clarke & Newman, 2006).

Obtainable is the most important attribute for weapon selection. This refers to the amount of efforts needed to access the weapon. For instance, small arms, which are the most common weapon among terrorists, are easily obtained in today's society (Clarke & Newman, 2006). Conversely, unconventional weapons are hard to access because they are not as widely available as small arms. An uncomplicated weapon is one that is user-friendly and requires little to no training for proper handling (Clarke & Newman, 2006). Clarke and Newman (2006) declare that "the more widely used particular weapons are, the more easily available will be personnel who are trained to use them or who can train others to use them" (p.115). Lastly, a safe weapon is preferred over an unsafe weapon. For example, it is not uncommon for terrorists to accidently detonate a bomb while building it. Thus, terrorists seek to reduce dangers to themselves and others until the desired time (Clarke & Newman, 2006).

Tools and facilitating conditions.

The two major components of a terrorist attack include the targets and weapons selected. In order for the terrorist attack to be completed, Clarke and Newman (2006) conclude that a link between these two components must be created. That is, to bring the weapons together with the selected target, both tools and facilitating conditions are

needed (Clarke & Newman, 2006). Tools include tangible products that enable the terrorists to commit a specific act. Common tools include methods of transportation (e.g., cars and truck), finances (e.g., credit card and cash), identification (e.g., driver's licenses, passports, or visas - typically stolen or fake), methods of communication (e.g., cell phones), and specific information about the selected target (e.g., maps, addresses, and specific details) (Clarke & Newman, 2006).

While weapons resemble the definition of tools, they hold a more specific function and are therefore classified by Clarke and Newman as a distinct label. Because terrorists rely heavily upon tools to carry out specific acts, it is possible to reduce the opportunities presented to terrorists by restricting the availability and access to these tools. Clarke and Newman (2006) provide three options for disrupting the availability and usefulness of tools to terrorists. They suggest modifying the tools design to reduce misuse, limiting illegal access to the tools, and tracking the products, as well as the people using them. The third option, tracking the products and users, holds the greatest potential due the advances in technology and electronic capabilities.

Beyond the use of tools, facilitating conditions further enable terrorist acts (Clarke & Newman, 2006). Unlike tools, facilitating conditions include the specific features of a society and/or system that assist terrorists in launching attacks. Clarke and Newman (2006) provide a framework for distinguishing which conditions facilitate terrorism. This framework is established around the five situational crime prevention categories (i.e., increase effort, increase risk, reduce reward, remove excuses, and remove provocations).

Facilitating conditions include those that make crime Easy, Safe, Excusable, Enticing and Rewarding (ESEER) (Clarke & Newman, 2006).

While the four pillars of opportunity are vital to decreasing the vulnerability of targets to terrorism, it is of equal importance to put emphasis on the target (i.e., location) as the primary focus for opportunity reduction. Focusing on the target with consideration of the four pillars creates the most effective strategy for terrorism prevention.

Vulnerability.

The availability of tools and the degree of facilitating conditions in a certain area can further contribute to the vulnerability of a place. The four pillars of opportunity (targets, weapons, tools, and facilitation conditions) can be reduced through implementing SCP strategies. In order to reduce or remove the opportunities, the vulnerability of specific locations must be addressed with the purpose of prioritizing efforts. Therefore, a methodology is required to analyze which locations represent the most vulnerable targets for terrorism. In order to establish an effective methodology for vulnerability assessment, there must first be a clear distinction of factors that foster or hinder vulnerability (Clarke & Newman, 2006).

Research conducted by Boba (2009) breaks down the examination of terrorism opportunity and SCP into three units of analysis (UOA) which include: (1) a specific target under a specific threat, (2) a general threat to a specific target, and (3) a general threat to a general target (i.e., broad areas within a community) (Boba, 2009). The first UOA is typically addressed by federal authorities in response to promising terrorism intelligence or a direct threat. Because these threats are out of the jurisdiction of local

enforcement, there are few situational techniques applicable to this UOA. The second UOA refers to specific locations or settings that have a general risk of becoming a target for terrorism. The third UOA includes areas surrounding a cluster of "risky" locations that establish a "hot spot" for target vulnerability (Boba, 2009).

Boba (2009) asserts that the second and third UOA are used to select and prioritize specific locations that are susceptible to terrorist attack which can then be addressed through the application of SCP techniques. Being that there are endless potential targets, in a practical application of vulnerability assessment, locations must be prioritized based on the calculated risks, just as terrorists would prioritize based an evaluation of maximum opportunities when choosing a specific target. Because it is impractical to reduce opportunities for terrorism at all settings around the world, the purpose of this study is to examine methods of risk assessment and test the accuracy of such evaluations.

Prior to examining risk assessments, a definition of risk must first be assigned. The risk of a place/setting becoming a target of terrorism is dependent on two factors—expected loss and vulnerability (Boba, 2009; Clarke & Newman, 2006). The expected loss of a location can be calculated through the consideration of the probable magnitude and type of damage resulting from a terrorist attack. It can include fatalities, injuries, financial loss, destruction or hindrances of transportation, and deprivation of necessities (clean water, food, electricity, etc.) (Boba, 2009).

The vulnerability of a target is calculated based on "the inherent features of targets that make them susceptible or attractive to attack by terrorist" (Clarke & Newman,

2006, p.90). In order to prioritize specific settings based on risk assessment (i.e., expected loss + vulnerability), Clarke and Newman established a set of factors that assist in evaluating the vulnerability of such locations. The factors, known collectively by the acronym EVIL DONE, are consistent with the techniques of SCP and aim to assess the vulnerability of settings within the second UOA previously mentioned - general risk at a specific location.

EVIL DONE.

Prior to assessing the factors of EVIL DONE at a location, possible targets must be narrowed down to prioritize the examination of those locations with a greater potential for risk. Literature on the topic of terrorism targets assists in confining the sample locations down to the areas with historically higher risks. In other words, it is very unlikely that a convenience store will be a target for terrorism over a power plant or a major transient station. Once the at-risk locations have been focused in on, the factors of EVIL DONE can be assessed.

The primary purpose of EVIL DONE is to be the first step in identifying vulnerable targets through identifying features of specific locations that make it more vulnerable to attack (Clarke & Newman, 2006). The elements of EVIL DONE include: Exposed, Vital, Iconic, Legitimate, Destructible, Occupied, Near, and Easy (Clarke & Newman, 2006). The more elements that apply to a location, the more vulnerable the target is to terrorism. Assessing the risk of specific locations through the factors of EVIL DONE can assist local authorities by emphasizing those places most vulnerable to attacks. Once the most vulnerable locations have been identified, SCP techniques can be

more effectively prioritized for terrorism opportunity reduction. The following sections describe, in detail, each element of EVIL DONE as described by Clarke and Newman (2006):

Exposed.

Exposed refers to the ability of the location to attract attention and be visible to surrounding areas or to stand out in any manner. Targets that "stick out" are more vulnerable than locations that are hidden among other buildings or structures. The degree of exposure is contingent upon the type of environment that surrounds the target. In other words, the only three-story building in a rural area may be considered highly Exposed, whereas a three story building in New York City would be smothered and hidden by surrounding high-rises. Therefore, the degree of exposure is dependent on the surrounding structures and landscape style. An example of an Exposed target would be an inner city high-rise such as the Twin Towers, Statue of Liberty, or the only large shopping plaza among single retail stores and small buildings.

Vital.

Vital targets are those that play a crucial role in the daily behaviors of a community. Locations that are highly Vital include water and food supply sources, electricity grids, and transportation systems. The inability of any of these locations to operate properly greatly inhibits the functionality of the community. These targets attract the attention of terrorists due to their ability to cause mayhem when inoperative.

Iconic.

Iconic refers to the symbolic value of the specific location. Symbols that represent the nation's power and unity are attractive to terrorists who seek to figuratively impair the strength of the country. Examples of Iconic locations include the Statue of Liberty or the White House.

Legitimate.

Legitimate targets include those that will bring about a positive reaction from the supporters of the terrorist or the terrorist organization. Consistent with the idea that terrorists are rational beings, they seek to maximize positive reinforcements and avoid condemnation, or negative consequences. Therefore, terrorists seek targets that will be viewed as Legitimate, which typically include locations housing military and government officials. Illegitimate targets would be considered locations housing children or defenseless persons.

Destructible.

Destructible refers to the ability to destroy the target/location or kill a targeted person. Although all targets are destructible in some way, some locations are more durable than others, and some persons are more heavily protected than others. Thus, the Destructible element refers to "the amount and accessibility of weapons required to destroy a target" (Boba, 2009, p.14). Targets that would require a large amount of weapons that are not easily accessible could be less attractive to terrorists than a target that could be destroyed with easily obtainable, conventional weapons.

Occupied.

Occupied targets include those that house a large amount of people. Terrorists characteristically seek to harm as many people as possible in order to strengthen their purpose (increase fear, increase legitimacy, etc.). Locations with high population densities provide the greatest opportunities for terrorists to exert great harm and establish fear among the targeted community. The Occupied element is dependent on timing as some locations may be heavily occupied only during certain times of the day or certain periods in the year. For example, a sporting arena houses tens of thousands of people in a compact location, but only during a sporting event. The locations with greater occupancies will be more vulnerable than those with fewer.

Near.

Near refers to the distance from which the location is to the terrorist's home or the terrorist organization's abode. Crime pattern theory and criminological studies have emphasized that offenders prefer targets that are closer to home and rarely travel large distances to commit crimes. This theory holds true for terrorism in that terrorists prefer opportunities in locations that they are familiar with and require less travel. Targets that are near home are not only easier to attack, but also easier to escape from. Clarke and Newman suggest that this element holds the greatest relevance in domestic terrorism when the jurisdiction is larger. In foreign terrorism, all terrorists are relatively distant.

Easy.

Easy targets include those that are weakly protected or are accessible to the public. It refers to the effort required to obtain access to the locations based on the

provided security measures. For example, it was easy for the recent domestic terrorists to place the pressure-cooker bomb in a duffle bag and leave it on a busy public street during the 2013 Boston Marathon. It would be much more difficult to gain access to a federal building to do the same. The lack of security measures and accessibility reduces the required effort and increases the ease targeting a specific location.

Research on Vulnerability Assessments for Terrorist Attacks

Understanding that terrorism risk is contingent upon the combination of expected loss and vulnerability establishes the foundation for research analyses to reveal specific locations susceptible to terrorist attacks. Given the theories that contribute to the creation of EVIL DONE, the application of SCP to terrorism, and the comprehension of each EVIL DONE element, risk assessments can be developed to effectively apply the concepts to opportunity reduction. While many methodologies of risk assessment exist, few have been successfully applied in research studies.

Research on vulnerability assessments of potential terrorist targets exposes an imperative gap in the literature. Multiple methodologies for vulnerability assessment exist; however, many dwell in the field of science and mathematics rather than in criminology. Among these methodologies are the Fuzzy Integrated Vulnerability Assessment Model (FIVAM), Quantitative Terrorism Risk Assessment, and the Infrastructure Vulnerability Assessment Model (I-VAM). Because these assessment models are focused around heavily convoluted scientific and mathematical formulas, they require subject matter experts. They are not easily applicable to local or state

jurisdictions, nor are they pertinent to the field of criminal justice. Therefore, they will not be considered for the purposes of this paper.

Many criminology-based methodologies exist that provide instructions on how to measure the vulnerability of certain locations or potential targets; however, despite their existence, results of analytical testing of these methodologies are not available. Extensive research seeking results of vulnerability studies has yielded inconclusive findings in terms of methodology application. The specific methodologies implemented at the state and federal level are discussed later in this chapter. Albeit the absence of methodology testing, few departments have concluded generalized findings of critical infrastructures related to the vulnerability of terrorist attacks.

Previous research on the vulnerability of places has identified generalized infrastructures that pose greater risks for becoming a terrorist target. Following the September 11th attacks, George W. Bush initiated a strategy for identifying the critical infrastructures and key assets of the United States (Leson, 2005). The locations deemed to be the most vulnerable included those that were "the most critical to national public health and safety, governance, economic, and national security, and retaining public confidence" (Leson, 2005, p.3).

Many of the elements that contribute to vulnerability, according to Bush, are similar to those considered in the EVIL DONE methodology. The infrastructures considered critical or vulnerable to attack include agriculture, banking and finance, chemical and hazardous waste, defense industrial base, energy, emergency services, food, government, information and telecommunications, transportation, postal and shipping

services, public health, and water (Leson, 2005). Additionally, key assets were listed as national monuments and icons, nuclear power plants, dams, government facilities, and commercial assets (Leson, 2005). Bush utilized the abovementioned information on vulnerability in order to structure what became known as the National Infrastructure Protection Plan (Leson, 2005).

National Infrastructure Protection Plan.

While the guidelines provided by Bush in the post-9/11 era offered a generalized approach to identifying targets vulnerable to attack, there is still a dire need for a more specialized methodology. In response to this need, the United States Department of Homeland Security (DHS) founded the National Infrastructure Protection Plan (NIPP). The NIPP provides guidelines for critical infrastructure and key resource (CIKR) identification, prioritization, and protection (National Infrastructure Protection Plan, 2009). Most importantly, the NIPP proposed clearly defined roles and responsibilities of vulnerability assessment methodologies.

The NIPP's core criteria for risk and vulnerability assessment methodologies include: documented, reproducible, defensible, and complete (National Infrastructure Protection Plan, 2009). Documented refers to the methodology's ability to clearly record the information that will be used and how the information will be integrated for risk estimates. Reproducible refers to the methodology's ability to produce comparable, repeatable results. The defensible criteria ensures that the methodology must be logically integrated and be free of significant errors. Lastly, the complete criteria suggest

that the methodology should assess consequences, vulnerabilities, and threats for each applied target (National Infrastructure Protection Plan, 2009).

Homeland Security – Comprehensive Assessment Model.

Following the requirements provided by the NIPP, the National Domestic Preparedness Coalition (NDPCI), a non-profit organization in Florida, developed what is now known as the Homeland Security - Comprehensive Assessment Model (HLS-CAM) (Glantz & Turner, 2009). Though no specific studies on the assessment of the HLS-CAM methodology have been documented, basic conclusions have been developed.

HLS-CAM is a software program used to develop a database of all critical and vulnerable assets and infrastructure locations. The program integrates threat, risk, and vulnerability assessment into a five step process (Glantz & Turner, 2009). Steps one through four include a threat assessment, criticality assessment, risk assessment, and a community priority assessment plan, respectively. The fifth step is the vulnerability assessment. The vulnerability assessment utilized by the HLS-CAM requires a thorough, on-site physical inspection of specific places and assets. The inspection also includes property within the location, the building's exterior and interior spaces, and all operational systems (Glantz & Turner, 2009).

During the inspection, four factors are measured to assess vulnerability. These factors include: location, accessibility, adequacy, and availability. Location refers to the geographic placement of the target in relation to public areas, transportation, or other susceptible areas. Accessibility refers to ability of a terrorist to "enter, operate, collect information, and evade response forces" (Leson, 2005, p.7). Adequacy refers to the

capability of the facility to store, protect, or deny access to valuable assets such as weapons and tools. Lastly, availability refers to the obtainability of equipment, response forces, or physical security measures to protect the target (Leson, 2005). Using the four aforementioned factors, vulnerability is then calculated using a five-point scale. A highly vulnerable target is scored as a five; a moderately vulnerable target is scored as a three; a low vulnerability target is scored as a one (Leson, 2005).

As previously mentioned, specific research providing detailed results of methodology assessments are seemingly nonexistent. However, one evaluation of the HLS-CAM methodology revealed somewhat useful results. The DHS' Office of Grants and Training conducted an evaluation titled Comparative Analysis Evaluation of Assessment Methodologies: Phase II – Task 3 HLS- CAM – Validation Team (Glantz & Turner, 2009). The evaluation discovered that the HLS-CAM satisfied all the requirements of the NIPP for methodology assessments. Additionally, the Validation Team found that the assessment captured 92 percent of the critical infrastructures in the targeted location. Though the team found the HLS-CAM to be a valid measure of target vulnerability, additional concerns must be addressed.

The limitations of the HLS-CAM include ease of application, costs, and validity testing. In their explanation of the methodology, Leson (2005) asserts that the evaluation may seem overwhelming to many law enforcement and emergency service agency. Considering that implementation and application of assessments are vital to such evaluations, one could argue that if the vulnerability assessments are not user friendly

and/or easily applicable, their contributions to SCP and opportunity reduction will be depleted.

An additional concern regarding the HLS-CAM methodology is the costs associated with implementation. State officials have expressed a major concern that the cost of application is excessive (Glantz & Turner, 2009). The methodology requires software that may not be accessible or affordable to some departments. Lastly, the validity testing reveals a source of uncertainty. The HLS-CAM Validity Team concluded that the program successfully identified 92 percent of the critical infrastructures in the target area; however, as key developers to the program, the members of the Validity Team were critical proponents of the methodology; thus, biases ought to be considered.

Review of Existing Methodologies

Less than a year after the historical September 11th attacks, the President of the United States approved the National Strategy for Homeland Security, which addressed and emphasized the need to prevent terrorist attacks from occurring (Leson, 2005). Following the strategy approval, the U.S. Department of Homeland Security (DHS) Office for Domestic Preparedness (ODP) moreover expressed a need for vulnerability assessment methodologies that would be useful to local authorities and that could contribute to the prevention of terrorist attacks on locations within local jurisdictions. As a result of identifying this need, the ODP conducted a Vulnerability Assessment Methodology Report that identified, analyzed, and reported vulnerability assessment methodologies from around the country (Leson, 2005).

A notice was published and distributed to various commercial and government organizations requesting information on the vulnerability assessment methodologies, software, and tools that were being implemented at the time. Although the number of organizations included in the initial request is not available, 44 responses were received and considered in the report (Leson, 2005). Of the 44 responses received, only 24 methodologies had sufficient information to conduct thorough assessments. It is important to note that although the DHS collected information on each of the reported vulnerability assessment methodologies, the report did not include testing on the accuracy, usability, or effectiveness of each of the methodologies. Thus, the report was for basic descriptive purposes only. However, despite its limitations, this report seems to be the most comprehensive source of vulnerability assessment methodologies available.

Extensive research seeking assessment methodologies at both the commercial and government level yielded no evidence on the existence and details of additional methodologies or research testing the validity and applicability of the methodologies. Consequently, the report from the DHS ODP was the main data source for collecting information and reviewing existing methodologies. The following is a brief description of each of the vulnerability assessment methodologies reported to the DHS ODP and all the documented details derived from the Vulnerability Assessment Methodology Report.

A major weakness of the data source is the lack of reported information from the commercial or government organization. Unless otherwise stated, information for each methodology on the specific data collection methods, vulnerability and risk assessment validity, findings based on the use of the methodology, and exact costs of implementing

the methodology was not reported to the ODP, and thus, is not reflected in the data report. All information included in the report has been transcribed in the following description of each methodology.

ASDWA Vulnerability Self-Assessment Guide.

The Association of State Drinking Water Administrators created a vulnerability assessment in the form of a self-conducted checklist designed specifically for evaluating small drinking water system facilities. The self-conducted checklist list is designed for physical, personnel, and cyber security to address people, information, equipment, and facilities. The specific threats addressed include tampering of or the threat of contamination through biological, chemical, or explosive disruption.

The Buddy System.

This vulnerability assessment is a survey-based risk management software program that was developed around pre-existing Navy and Coast Guard methodologies. The software provides ready-to-use datasets which contain information on threats, vulnerability, and counter measures on gas, oil, energy, transportation, water, non-government critical and governmental functions. The cost of implementation includes a two-day training course and the cost of the software.

Business Continuity Management (BCM) Methodology.

This vulnerability assessment was designed specifically for use by financial institutions to identify and place value on assets in order to identify potential threats, losses or disruptions, and/or vulnerabilities. The assets examined included “loss or

disruptions in confidentiality, integrity, and availability of financial information" (p. D-3).

California Highway Patrol Crime Prevention Plan.

This vulnerability assessment is a self-assessment which provides guidelines for crime prevention awareness, risk assessment, and responding actions for property and personal security. It is strongly directed towards physical security of law enforcement facilities.

DOJ Assessment and Strategy Development Tool Kit.

This vulnerability assessment was developed by the Department of Justice and the Office for State and Local Domestic Preparedness Support. It is applicable to all sectors to identify potential terrorist targets and conduct vulnerability assessments in order to effectively allocate State Domestic Preparedness funds to the proper locations. Data is collected via a subjective self-assessment of people, facilities, and values. The assets considered for loss include injuries and fatalities, damages to facilities, and financial disturbances. Threats are measured using a revised Department of Defense terrorist threat analysis methodology. Vulnerability is measured via consideration of eight factors: visibility, attractiveness, criticality, value, access, target threat of hazard, population capacity, and collateral mass casualties. Each factor is subjectively scored on a 0 to 5 numerical scale. The risk is then estimated based on a risk assessment matrix.

Fixed Chemical Sites.

This vulnerability assessment, Guidelines for Analyzing and Managing the Security Vulnerabilities of Fixed Chemical Sites, offers strategies given by the Center for

Chemical Process Safety, American Institute of Chemical Engineers specifically directed towards chemical sites and physical, personnel, and operational security. The data collection method is qualitative, though specific details were not reported. The assets considered include people, chemicals, information, environment, equipment, facilities, and activities and consequences including loss of chemical containment, theft or misuse, contamination or spoilage, and degradation of assets or infrastructure. Threats of such locations are based on responses to terrorist attacks and internal and external risks. The vulnerability is measured by estimating risk via a methodical process that was not disclosed.

Florida Domestic Security Risk Assessment Model.

This vulnerability assessment was developed for use by Florida's Regional Domestic Security Task Forces and public and private organizations to protect Florida citizens, facilities, and infrastructures from terrorist attacks. The assessment focuses specifically on the physical security of facilities and venues that are the most likely to be vulnerable to terrorist attacks. The data collection involves visiting specific sites and interacting with site personnel. The assets considered for loss include injuries and fatalities, economic impact, environmental impact, impact on critical infrastructure, and symbolic effects. The threat of each infrastructure is based on critical intelligence and/or terrorists attacks on similar locations. Each factor is subjectively scored on a 1 to 5 scale to calculate a numerical estimated risk. After an estimated risk is developed, countermeasure recommendations are made to improve policy, procedural, and structural weaknesses.

Method to Assess the Vulnerability of US Chemical Facilities.

This vulnerability assessment provides a methodology prototype that compares relative security risks of chemical facilities and offers recommendations for risk reduction. It focuses on collecting qualitative and quantitative data on chemical facilities, equipment, and operations. The asset considered included disruption of chemical facilities. Threats of chemical detection, delay, and response are assessed, and vulnerability is measured based on the availability, accessibility, organic security, target design and construction, and countermeasures of the chemical facilities. Risk is then estimated based on these evaluations.

MIL-STD-882D, DoD Standard Practice for System Safety.

This vulnerability assessment provides environmental, safety, and health risk assessments for the development, testing, production, use, and disposal of Department of Defense systems, equipment and facilities. Threats of numerous sub-categories of hazards (e.g., natural or man-made) are examined. Vulnerabilities are then estimated based on the probabilities of such mishaps. After the assessment, recommendations for risk reductions are made.

Naval Criminal Investigative Service (NCIS) Threat Planner.

This vulnerability assessment is a software program that assesses risk based on relative terrorist and criminal threats. It is used strictly by the Navy and Marine Corps to generate threat assessments of people, equipment, facilities, and operations. The initial cost of the program is $442,000, with a total cost of $7,614,000 over a 7-year period. The risk is estimated, though specific methodologies were not disclosed.

NC Terrorism Vulnerability Self-Assessment.

This vulnerability assessment provides a general guidelines worksheet for subjective qualitative data collection. The worksheet is completed by state agencies and allows them to rank locations and/or assets on a scale from one to twenty in each of the following factors: potential terrorist intentions, specific targeting, visibility, on-site hazard, population, mass casualty potential, security environment, criticality, high risk personnel, communications, and security/emergency response preparedness with emphasis on bio-terrorism response capabilities.

Port Facility Vulnerability Assessment (prevention and suppression of acts of terrorism against shipping).

This vulnerability assessment set guidelines and criteria for accessing port facilities consistent with risk analysis. The assessment uses a risk analysis tool to understand, identify, and mitigate vulnerabilities through criticality, threat, and vulnerability assessments specifically for port facilities.

Probabilistic Risk Assessment.

This vulnerability assessment is a human reliability assessment training course designed to train staff to use the Probabilistic Risk Assessment techniques in order to regulate and inspect nuclear power plants. The primary focus is on personnel security (i.e., human reliability). The qualitative data are collected by examining human contributions to risk. Risk is then estimated based on these findings.

Risk Management for Non-Profit Organizations.

This vulnerability assessment follows a five-part process that focuses on establishing context, identifying risk, evaluating and prioritizing risk, strategies and responses, and monitoring the program.

Sandia National Lab Community Vulnerability Assessment Methodology.

This vulnerability assessment is a computer-based vulnerability assessment tool that examines all mission categories, such as education, recreational venues, emergency facilities, foreign governments, and special locations such as abortion clinics and religious facilities. The assessment considers the number of injuries and fatalities, revenue, vital equipment, and vital capabilities as the primary concerns. Vulnerability is then measured based on these assets with consideration of availability, accessibility, organic security, and target design and construction. Risk is measured through consideration of the severity of the event consequences, likelihood of attack, and effectiveness of security. The resource costs include the cost of training personnel.

Sandia National Lab RADTRAN 5.

This vulnerability assessment uses a technical manual with mathematical calculation models and numerical formulas to compute transportation risk and consequence assessments. It was specifically developed for the analysis of consequences and risk of radioactive-material transported via highway, rail, water, and air. Risk is estimated based on the exposure of transportation systems, receptor populations, package behavior, and accident severity and probability.

Sandia National Lab Risk Assessment Methodology for Water Safety.

This vulnerability assessment focuses specifically on water utilities and the associated physical, cyber, operational, and personnel risks. Data is collected in a qualitative manner and considers people, facilities, equipment, and processes. The assets examined include fatalities, number of illnesses, loss of critical customers, economic losses, and loss of public confidence. Threats are then measured through consideration of threat type, tactic mode, capabilities, threat level, and likelihood of threats. Risk is calculated using a matrix of the above mentioned factors.

Sandia National Lab VAM-CF.

This vulnerability assessment focuses specifically on chemical facilities and transport activities with a primary emphasis on physical security. Data is collected using surveys and worksheets that concentrate on the detection, delay, response, safety, and mitigation of chemical transportation paths. A matrix is then used to identify vulnerabilities and risks. The assets examined include chemical facilities which are screened and prioritized prior to assessment based on population and the potentially impacted areas. The type of attack, tactics, and capabilities are considered in the threat assessment. Vulnerability is then measured based on estimates of attack with consideration of the existence, capability, history and intent, motivation, targeting, attractiveness, and accessibility of such facilities.

SmartRISK.

This vulnerability assessment is a software program implemented by the Environmental Protection Agency. No further information was reported.

State of Colorado CIKA Assessment Methodology.

The Critical Infrastructure and Key Asset (CIKA) vulnerability assessment is a self-assessment software program that allows users to numerically scale critical infrastructures from 0 to 5 based on ten factors: visibility, value, accessibility, hazard, population, mass casualties, criticality, service disruption, primary function, and geographical impact. The cumulative score of each ten factors creates the criticality/vulnerability rating. The data is collected via subjective self-assessment to generate a reported estimated risk.

USAF Operational Risk Management (ORM).

This vulnerability assessment is a six-step process used to detect, assess, and control risk while maximizing performance and combat capabilities of the Air Force. The six steps include identifying hazards, assessing risk, analyzing risk controls, making control decisions, implementing risk controls, and supervising decisions. The risk of an attack is calculated using a pre-designed risk assessment matrix.

US Coast Guard Risk Assessment (RA) Project Management.

This vulnerability assessment process involves guidelines for selecting risk assessment based on the scope of the evaluation, required stakeholders, required preparations, data validation, and recommendation evaluations. The assets considered include public or personal injury, equipment, property, or environmental damages, revenue losses, and community relations.

US Coast Guard Risk-Based Decision Making.

This vulnerability assessment is implemented specifically by the transportation sector for port and waterway conveyance. It examines physical, personnel, cyber, and operational security to reduce the risk of attack and asset loss consequences. The assessment is geared towards reducing and controlling hazards that increase terrorism vulnerabilities, though specifics on vulnerability reductions were not reported. Risk of attack is estimated by the probability, consequence, and severity of such events. The costs of implementing such resources include proper training and procedures, though no monetary values were reported.

Virginia Statewide Terrorism Target Assessment Survey.

This vulnerability assessment is implemented by law enforcement and examines the potential of terrorist attacks at local events or locations. The vulnerability of local events and locations is measured using a 0 to 5 scale for the following factors: visibility, criticality, value, access, threat of hazard, population involved, and potential collateral mass casualties.

Summary.

The ODP's Vulnerability Assessment Methodology Report is the most comprehensive record of existing methodologies, yet even this report is ineffectual. This collection of information from commercial and government organization provided an opportunity for departments to market their methods and maximize their department's potential; however, despite the opportunity to share compelling methodologies, the reported methods were highly deficient, at best. While many methodologies exist, very

few offer inclusive instructions, details, and guides to measuring the vulnerability of locations. Furthermore, in the rare event that the methodology does provide feeble guidelines, the evaluations are highly subjective, leaving major room for error and biases in the vulnerability scores. As presented through the above descriptions of existing vulnerability assessment methodologies, there is a dire need for a comprehensive, understandable, applicable, and objective-based methodology that can be easily applied to assess the vulnerability of specific locations at the local level. The lack of objectivity and difficulty applying existing methodology to real life targets and locations supports the strengths of the EVIL DONE vulnerability assessment and the underlying need to implement such a comprehensive and pertinent methodology.

Research Questions

Conclusively, a review of the literature reveals limited research findings on the application of vulnerability assessments. Though many methodologies exist, a thorough review of peer articles, government publications, and academic journals has yielded inconclusive results on the application, as well as testing the validity of such methodologies. In the post 9/11 era, government officials and the general public have advocated for a simple and applicable method of assessing the vulnerability of specific places. The research illuminates a need for a place vulnerability assessment that is based on the theoretical foundations of situational crime prevention. The implementation of vulnerability assessments that are easily applicable at the local level may contribute to terrorism opportunity reduction.

Thus, the research questions that will frame this thesis examine the vulnerability assessment methodology created by Clarke and Newman (2006) and Boba (2009), as well as its validity in predicting the aftermath of terrorist attacks. In response to the advocates' desire for a simple, applicable method of assessing vulnerability, the study will apply this methodology to a number of targets in hopes of determining the ease of application for local officials.

Research Question 1

Is there a relationship between the EVIL DONE vulnerability score and the number of fatalities and injured persons resulting from a terrorist attack? This research question seeks to understand the correlation between the vulnerability score and the aftermath of a terrorist attack in order to determine if there is a statistically significant relationship.

Research Question 2

How are the components of EVIL DONE predictive of the number of fatalities and injured persons resulting from a terrorist attack? This research question seeks to understand how the individual components of EVIL DONE are related to the aftermath of a terrorist attack. In other words, how does the score of Exposed/Vital/Iconic/etc. independently reflect the number of fatalities and injured persons?

Research Question 3

How are the components of EVIL DONE predictive of the EVIL DONE vulnerability score? This research question seeks to understand how the individual components of EVIL DONE are related to the overall vulnerability score. In other words,

how does the score of Exposed/Vital/Iconic/etc. independently reflect the overall vulnerability score once all factors have been considered?

CHAPTER 3: METHODOLOGY OF RISK AND VULNERABILITY ASSESSMENT

Introduction

Prior to assessing the factors of EVIL DONE on a location, possible targets within a specific jurisdiction must be narrowed down to examine the locations with greater potential risks. Literature on the topic of terrorism targets assists in confining the sample locations down to the areas with historically higher risks. In other words, it is very unlikely that a convenience store will be a target for terrorism over a skyscraper or a major transient station. Therefore, previous literature reveals the types of locations that are typically selected for assessment given their tendencies to bear greater risks. These locations include water supplies, government buildings, schools, transportation hubs, hospitals, information technology infrastructures, stadiums/arenas, ports, large buildings, power plants, federal facilities, military locations, and international borders (Newman & Clarke, 2008). Once the at-risk locations have been focused in on, the factors of EVIL DONE can be assessed.

The purpose of this study is to evaluate the EVIL DONE vulnerability assessment in order to determine if the methodology produces a cumulative vulnerability score that is consistent with the number of fatalities and injured persons resulting from a terrorist attack. Recognizing that the ultimate consequence from terrorist attacks is injury or loss of human life justifies the selection of these variables as the primary dependent variables

of the study. Additionally, the study will seek to determine how strongly each component of EVIL DONE predicts the number of fatalities and injured persons in specific terrorist attacks. Lastly, this study will seek to distinguish which EVIL DONE factors best predict the same dependent variables while controlling for other factors.

Research Design

The research design of this study is correlational given that the goal is to determine the relationships between multiple variables. The correlational research design does not insinuate a causal relationship with a definite cause and effect between variables, but rather declares that a change in one variable is associated with a change in the other (Babbie, 2010). Additionally, the research is designed to examine the application of EVIL DONE to targets or locations that have previously been attacked, and not in the original, prescriptive design to predict where an attack may occur. The reactive application of EVIL DONE will be implemented in order to inform law enforcement officials, researchers, and comparable practitioners of the uses of EVIL DONE so that the methodology can be prescriptively applied within their jurisdictions.

The research will utilize both bivariate and multivariate analyses. A bivariate analysis is used to examine two variables simultaneously in order to determine the relationship between them (Babbie, 2010). The bivariate analysis used in this research design is the computation of simple correlation coefficients. A multivariate analysis is used to examine multiple variables simultaneously in order to determine the relationships between them. Unlike bivariate analysis where there is one dependent variable and one independent variable, multivariate analysis has more than one independent variable

(Babbie, 2010). Thus, rather than explaining variations in the dependent variable as a result of changes in a single independent variable, multivariate analysis explains the variations in the dependent variable as a result of multiple independent variables.

Data Collection

In examining the application of EVIL DONE to historical terrorist attacks, there are many data that must be collected prior to the assessment. In collecting data on historical terrorist attacks, one main data source and multiple supplemental data sources were utilized.

The Global Terrorism Database (GTD) functioned as the main data source for terrorist attacks occurring between 1970 and 2011. This is an open-source database that includes detailed information on domestic, transnational, and international terrorist attacks that have occurred around the world throughout the forty-year span (Global Terrorism Database, 2012). When known and identifiable, information is reported on the date and location of the incident, type of attack, type of target, type of weapons used, number of fatalities and injured persons, and the extent of property damage as well as an array of supplemental details. The data is collected, released, and updated via the University of Maryland and The National Consortium for the Study of Terrorism and Responses to Terrorism (START): A Center of Excellence of the U.S Department of Homeland Security (GTD, 2012).

In addition to the GTD, multiple supplemental data sources were utilized to collect information on terrorist attacks occurring after 2011 and to acquire more comprehensive material on select incidents that was not available through the main data

source. The primary location of the supplemental data was Google Earth. Google Earth is a "virtual globe" software system that allows users to view satellite images of locations around the world (Sheppard & Cizek, 2009). The 3-dimensional interface of the entire planet provides satellite imagery with the ability to zoom into individual countries, cities, streets, and down to precise buildings (Sheppard & Cizek, 2009). Thus, to collect information on the level of exposure, destructibility, and precise locations of specific targets, each location was examined using this software program.

For this study, Google Earth was used to examine cases from the GTD (consisting of terrorist attacks from 1991 to 2011) where the attributes of certain locations were initially unknown. The notorious terrorist attacks selected that occurred prior to 1991 were not examined using Google Earth because of the potential inaccuracy of the images due to physical changes over time and because there was sufficient information about each location from other sources. That is, these notorious attacks were heavily supported by media coverage at the time of the attack; therefore, the attributes of the locations were heavily reported and easily identified.

Additionally, information was collected via Clarke and Newman's text, *Outsmarting the Terrorist* (2006). This text served not only as a sample population source of historical terrorist attacks, but also as a source of data on each of these incidents. Lastly, Google Internet searches provided newspaper articles from around the world that were published shortly after each terrorist attack. Many of these publications originated from the area immediately surrounding the targeted location, thus, they served as an important source of information regarding each attack.

Sampling

Because the nature of terrorism is very complex and there are many factors that differ from one attack to another, the sample was derived using a purposive sampling method. Purposive sampling is a form of nonprobability sampling which does not utilize randomization of selection (Babbie, 2010). Rather, purposive sampling, sometimes referred to as judgmental sampling, is a method used to select a sample based on available data and the purpose of the study (Babbie, 2010).

The sample size selected is based upon previous statistical analyses' recommendations for the minimum number of subjects required to conduct the appropriate tests. In conducting multiple regression analyses, the minimum number of subjects can be equated through the greater total of two formulas: 50 + 8K or 104 + K where k equals the number of variables in the study (Green, 1991). In this study, there are seven variables (Exposed, Vital, Iconic, Legitimate, Destructible, Occupied, and Near). The formulas correspond to a minimum of 106 or 111 subjects, respectively. In selecting the greater of the two, the minimum number of subjects required to perform a multiple regression analysis in this study is 111.

In this study, the data available via the GTD was a strong decree as to which terrorist attacks would be selected for examination. Additionally, the purpose of the study is to identify locations (i.e., targets) where the terrorist attacks occurred whose characteristics stimulated terrorist attacks' consequences. Thus, because the focus of situational crime prevention and EVIL DONE is placed profoundly upon the target and

location, terrorist events were further selected based on the availability of information meeting these criteria.

The primary data source, the GTD, consists of a population of over 104,000 terrorist attacks that occurred between 1970 and 2011. The database is divided into two separate documents - terrorist attacks occurring between 1970 and 1990 and terrorist attacks occurring between 1991 and 2011. The database of terrorist attacks occurring between 1970 and 1990 is limited in the number of variables and information collected on each attack in comparison to the data available in the latter database. For this reason, as well as the relativity of more recent attacks in relation to older attacks, the data from 1991 to 2011 were chosen from which further purposive sampling was done.

The 1991 to 2011 database consisted of 59,786 terrorist events (i.e., cases). Using the Global Terrorism Database Codebook: Inclusion Criteria and Variables, certain events were eliminated after failing to meet specific requirements. In accordance with the definition of terrorism, events were eliminated from the database if they 1) did not meet the criterion for a political, economic, religious, or social goal, 2) if they did not meet the criterion for intention to coerce, intimidate, or publicize to larger audiences, and 3) if they did not meet the criterion for outside international humanitarian law. This resulted in 42,736 cases. Secondly, events were eliminated if there was a doubt as to whether the incident was in fact an act of terrorism which resulted in 20,945 cases. Lastly, events were eliminated if any important characteristics relevant to the EVIL DONE coding were unknown, such as the type of target, location, and the type of weapons used which resulted in 19,673 cases.

After narrowing down the sample by the abovementioned eliminations, frequency by country was conducted. There were two natural breaks in the distribution at less than 50 and more than 500 terrorist events. The countries with much higher counts of terrorist attacks included Afghanistan (864), India (1,123), Pakistan (1,157), and Iraq (1,844). Thus, countries with less than 50 events and more than 500 were eliminated from the data resulting in approximately 1,500 cases.

From this point, particular events were chosen based on the amount and quality of the available information on the targeted locations and the applicability of these locations to the factors in EVIL DONE. In other words, the cases with the strongest information available to assess the level of exposure, vitality, iconicity, legitimacy, destructibility, occupancy, and location of the target were selected for evaluation. This final selection resulted in 237 cases, which were then selected on a case-to-case basis to meet the required number of cases for the multiple regression analyses.

In addition to the units selected through the database, terrorist attacks were also selected for evaluation based on their historical value and notoriety. Because a preponderance of information on terrorism and EVIL DONE has been collated in Clarke and Newman's book *Outsmarting the Terrorists* (2006), this source acted as a secondary data source for terrorist events. Clarke and Newman (2006) used a wide variety of important and notable terrorist events, such as the attack on the U.S.S. Cole and the Oklahoma City bombings, as examples. Thus, 16 cases discussed in the text were also included in the sample if they were not already included in the GTD.

Finally, notorious terrorist attacks occurring after the 2011 cut-off of the Global Terrorism Database and the publishing of *Outsmarting the Terrorists* (2006) were selected for target vulnerability assessments. These included events such as the 2012 bombing of the U.S. Embassy in Bengasi, Libya and the 2013 bombings at the U.S. Boston Marathon. The combination of cases from the GTD, *Outsmarting the Terrorists* (2006), and the recent terrorist attacks selected through purposive sampling results in a database of 111 which is within the requirements for multivariate analysis (Green, 1991) previously discussed.

Through the abovementioned sources, information valuable to the coding process was collected. The data includes:

- Country, Province or State, City: the location where the terrorist event occurred.
- Location: the landmark or precise site of the terrorist event.
- Attack type: the primary form of attack or tactics inflicted upon the target/location (includes seven categories: bombing/explosion, armed assault, hijacking, assassination, facility/infrastructure attack, hostage, and chemical).
- Target type: the primary type of target or victim (includes eleven categories: government, private citizens and property, police, military, business, transportation, utilities, religious figures, airport and airlines, educational institutions, and tourists).
- Corporation: the name of the primary entity that was targeted (for example, Pan Am Flight 103, Israeli Army, or the Russian Law Enforcement).

- Target: the specific person, building, business, etc., from the corporation that was victimized during the terrorist event (for example, civilians on Pan Am Flight 103, Israeli Defense Force (IDF) Reservists, or police patrol guarding an oil pipeline near Goragorsky, Chechnya, Russia).
- Number of fatalities: the total number of confirmed fatalities resulting from the terrorist event. The number includes victims of the attack as well as the terrorists involved.
- Number of injuries: the total number of confirmed non-fatal injuries resulting from the terrorist attack for both victims and the terrorists involved.

EVIL DONE Vulnerability Assessment Methodology and Coding

To further specify EVIL DONE, Boba (2009) established an objective coding methodology, similar to some of the above-mentioned scaling methods, that assists in scoring each one of the EVIL DONE factors. However, unlike the previously mentioned methods, the methodology created by Boba attempts to reduce the biases and fickleness of the coding procedures to strengthen the reliability of the EVIL DONE vulnerability assessment score by breaking down each factor of EVIL DONE into a specific set of criteria.

The coding methods were formulated similar to the CARVER schema, which is a practice used by the U.S. Special Operations Forces as a guide for assessing targets from the view point of the target's owner (Criticality, Accessibility, Recuperability, Vulnerability, Effect, and Recognizability) (Boba, 2009). By contrast, because the focus of situational crime prevention is placed upon perception (e.g., increasing *perceived*

efforts and *perceived* risks**,** reducing *perceived* rewards, etc.) and "outsmarting" terrorists, the coding method for EVIL DONE was formulated from the viewpoint of the terrorists (Boba, 2009).

The goal of the coding system is to quantify and standardize a vulnerability assessment based on the EVIL DONE concept (Boba, 2009). The first six factors (Exposed, Vital, Iconic, Legitimate, Destructible, and Occupied) are scaled from zero to five, meaning each item is ordinal and mutually exclusive. The last two factors (Near and Exposed) are indexed, meaning each relevant item is summed to reach a numeric total (Boba, 2009). For each factor, zero represents the lowest possible value and is only warranted when the target does not meet the minimum criteria for the vulnerability of that particular factor (Boba, 2009). Five represents the highest value and signifies the greatest vulnerability of a target for that particular factor. Therefore, the utmost vulnerable target and highest cumulative score for all EVIL DONE factors is 40. The least vulnerable target and lowest cumulative score is 0.

Each factor has the highest vulnerability score of 5 and a lowest of 0 and is coded based on knowledge of terrorist targets and key concepts of situational crime prevention (Boba, 2009). After scoring each factor of a particular target, the cumulative score functions as the EVIL DONE vulnerability score. The following coding information was acquired from Boba (2009) and will function as the methodology for the vulnerability assessment of each target from sampled terrorist attacks in this study.

Exposed.

Large high rise structure in an urban area …….5

Examples: World Trade Center, Washington Monument

Large identifiable structure in an urban or rural area …….. 4

Examples: Golden Gate Bridge, nuclear power plant, Pentagon

Large building or complex in a suburb ……3

Examples: shopping mall, high school

Large building or structure in a rural area or town …….. 2

Examples: multi-story courthouse, water tower

Cluster of buildings in an urban area …… 1

Examples: retail shopping district, university campus

Vital.

Major transportation overcoming a major barrier …….5

Examples: bridge, tunnel

Major transportation paralysis point ……4

Examples: freeway interchange (stack), railroad/subway hub

Power, water, and fuel plants ……3

Examples: power plant, refinery, water treatment plant

Power, water, and fuel conduits ……2

Examples: pipelines, electricity grids, canals

Food distribution ……...1

Iconic.

Major political symbol ……. 5

Examples: White House, Capitol

Major national symbol …….. 4

Examples: Statue of Liberty, Mt. Rushmore, Washington Monument

Federal and state government building …… 3

Examples: FBI building, State capitol

Major commercial symbol …… 2

Examples: Disney, Microsoft

Major city, town, religious building ……. 1

Examples: city hall, large church or synagogue

Legitimate.

Houses military personnel or politicians …….. 5

Examples: Pentagon, Capitol

Houses federal government employees or federal law enforcement personnel …… 4

Examples: State Department, Treasury Building, FBI headquarters

Houses state or local government or police ……..3

Examples: state capitol building, city hall, NYPD headquarters

Houses civilian workers ……... 2

Examples: World Trade Center, Microsoft, Ford auto making plant

Houses general citizenry …….. 1

Examples: shopping mall, amusement park, house of worship

Destructible.

Destructible with IED (improvised explosive device) ……. 5

Contains chemicals or other material that would hasten its

own or another targets destruction ……. 4

Examples: chemical plant, oil refinery, train carrying radioactive material

Destructible with small conventional weapons …… 3

Destructible with heavy conventional weapons ……2

Destructible with a combination of weapons listed

in items 2 through 5 destruction……..….. 1

Occupied.

Houses many people 24 hours per day, 7 days per week ……. 5

Examples: military base, hospital

Houses many people 8 – 12 hours daily …….. 4

Examples: schools, large office buildings

Crowded space at specific times of day and days of the week ……. 3

Examples: subway terminals, buses, houses of worship

Crowded space at specific dates and times …….. 2

Examples: concert hall, political speech/rally, sports stadium

Crowded spaces at specific times of the year; seasonal ……1

Examples: shopping mall at holiday season, water park, outdoor park on holidays

Near.

Close to known/suspected domestic/foreign terrorist base …….. __

Close to country's border, land, or sea (coast) …… __

Close to domestic immigrant community ……__

Close to major transportation hub …… __

Examples: airport, train station, port

Many similar targets …… __

Examples: bus stops, open markets, subway stations

Total Score ……__

Easy.

Public access to building/ no security check …… __

Parking near the building and/or unrestricted …… __

Some entry points unsecured or not monitored …… __

Inadequate security personnel …….. __

Inadequate security cameras and monitoring ……__

Total Score ……__

For example, the coding process of the September 11th, 2001 attack on the World Trade Center is as follows: For the Exposed factor, the large high rise structure in an urban area was coded as a 5. Because the target does not meet the minimum criteria for the Vital factor, Vital was coded as a 0. For the Iconic factor, the target is not a political symbol, but does meet the criteria for a major national symbol; therefore, the Iconic factor was coded as a 4. Due to the lack of political or government relations and

following the criteria for Legitimate, the target received a 2 for housing civilian workers. While the destructibility of each location is subject to the internal composition and construction of the building, this factor is scored on the basic/observable structure of the target. Because of the failure to destruct the in the 1993 attack using an IED and based on the durability of present-age construction, the Destructible factor was scored as a 2, meaning destructible with heavy conventional weapons. The Occupied factor was scored as a 4 due to the nature of the building – large office building that houses many people for 8-12 hours daily. The indexed Near factor earned a total of 3 points for being close to the country's border, close to major transportation hub, and close to many similar targets. For reasons that will be subsequently discussed, two of the five criteria for the Near factor (close to known/suspected domestic/foreign terrorist base and close to domestic immigrant community) as well as the entire Easy factor were excluded from this analysis. Thus, the total vulnerability score for the World Trade Center is a 20.

Data Analysis Procedures

In analyzing the relationship between the EVIL DONE vulnerability assessment and the number of fatalities and injured persons resulting from a terrorist attack, multiple methods will be utilized based on the nature of the research question. Before discussing the analyses that was used in this study, an examination of the variables is warranted. The dependent variables of the study are the number of fatalities, the number of injured persons, and the EVIL DONE vulnerability assessment score (i.e., the sum of all scores from each EVIL DONE factor).

Dependent and Independent Variables

Throughout the coding process, certain variables were revealed after assessing the research questions and the data required to answer each. Two dependent variables were used in the analyses depending on the research question. The first is a sum of the injuries and fatalities caused by the terrorist attack. The two measures—fatalities and injuries—are combined to indicate the results of the terrorist attack and thus its overall seriousness. To compute this variable, total number of injuries was added to the number of deaths multiplied by 20. That is, fatalities were scaled to a value of 20 per individual fatality, to represent the fact that fatalities are a much deeper consequence than less severe/nonfatal injuries.

The second dependent variable is the EVIL DONE vulnerability assessment score which indicates the level of vulnerability of a particular location. Although Boba (2009) provides specific and objective criteria for each factor of EVIL DONE, this study excludes the Easy factor due to unknown and/or unreported information regarding the specific criteria of this factor from the selected data sources. For example, parking near the building and/or unrestricted parking is difficult to accurately measure from a remote location. Additionally, the other factors, such as the adequacy of security personnel on duty and the number and adequacy of security cameras and monitoring systems are not reported in the GTD, nor are they typically reported to the public. However, this is not a weakness of EVIL DONE but a deficiency in the data that were used. This deficiency further accentuates the importance of applying the assessment as a method of situational crime prevention and opportunity reduction rather than subsequent application after a

terrorist attack. The vulnerability assessment was created with the intention of identifying targets vulnerable to terrorist attacks, and not for application to locations that have already been victimized. Thus, during the identification process of potential targets, the criterion for the Easy factor may be more easily measured and obtained.

Additionally, two of the criteria for the Near factor were also excluded from this study for comparable reasons. The Near factor is indexed based on five criteria—close to known/suspected terrorist base, close to own country's border or coast, close to domestic immigrant community, near major transportation hub, and many similar targets. Based on the information provided via the main data source and supplemental data sources, sparse findings regarding the location of known/suspected terrorist bases and domestic immigrant communities would result in inconsistent scoring of the Near factor. Furthermore, because of the age of some events, this information is not available through additional inquiries. Thus, to increase the reliability of the overall vulnerability assessments, these two criteria were eliminated from the Near index, resulting in a maximum score of 3 instead of 5 for this factor. Considering the exclusion of the Easy factor and two of the indexes for the Near factor, the maximum EVIL DONE vulnerability assessment score is 33 instead of 40. Finally, the independent variables are the seven coded factors which include Exposed, Vital, Iconic, Legitimate, Destructible, Occupied, and Near. The following sections lay out how these variables will be examined for each research question.

Analysis Methods Research Question 1

The first research question is: Is there a relationship between the EVIL DONE vulnerability score and the cumulative number of fatalities and injured persons resulting from a terrorist attack? The question seeks to determine if there is a bivariate relationship between the EVIL DONE vulnerability score and combined number of fatalities (multiplied times 20) and injured persons. This question was examined using a simple correlational analysis.

The correlation statistics show relationship between two variables and the strength of the relationship (or linear association) (Norusis, 2008). Multiple correlation coefficients can be used to discover the relationship of the variables depending on the nature and measurability of those variables. For example, a Pearson correlation coefficient is used when the variables are measured at the interval level. Kendall's tau-b correlational coefficient is used when the variables are measured at the ordinal level. Lastly, a Spearman correlational coefficient is used when variables have ranking orders that are also measured at an ordinal level (Norusis, 2008). Because the variables in this study are measured at the interval level, a Pearson correlation coefficient was used.

Additionally, there are two forms of Pearson correlation coefficient – one-tailed tests and two-tailed tests. One-tailed tests are used when the relationship between the variables is directional (i.e., the higher the Exposure score, the higher the overall vulnerability score). Two-tailed tests are used when the relationship between the variables is non-directional (i.e., the higher the Exposure score, the lower or higher the

overall vulnerability score may be) (Field, 2009). Because the relationship between the two variables is non-directional, two-tailed tests were used.

Correlation coefficient tests reveal the strength of the relationship between two variables in the form of a numeric decimal ranging from positive or negative 0.00 to 1.00. A correlation of 0.00 indicates that the two variables are entirely unassociated with one another. A correlation of 1.0 indicates that the two variables are directly associated with one another. Additionally, a positive score reveals that the two variables hold a positive relationship; in other words, as one variable rises, so too does the other. A negative score reveals that the two variables hold a negative relationship; in other words, as one variable rises, the other variable declines.

Once the relationship is expressed in a numerical value, the significance of the findings must be examined. In other words, what does a -.037 correlation mean? Does a significant relationship exist between two variables with a -.037 correlation coefficient? While many measures of significance exist, the measure utilized in this study was developed by Salkind (2011). Salkind (2011) states the following regarding the significance or strength of the correlation coefficient:

+/- .8 to .10 – very strong relationship

+/- .6 to .8 – strong relationship

+/- .4 to .6 – moderate relationship

+/- .2 to .4 – weak relationship

+/- .0 to .2 – very weak relationship

Thus, according to Salkind's guidelines for the strength of a correlation, the relationship between two variables was considered moderate at the 0.40 level and significantly stronger thereafter.

The hypothesis for this research question is that the more fatalities and injured persons resulting from a terrorist attack, the higher the EVIL DONE vulnerability score.

Analysis Methods Research Question 2

The second research question is: How are the components of EVIL DONE predictive of the cumulative number of fatalities and injured persons? This question seeks to determine how well the independent variables (i.e., EVIL DONE factors) predict the value of the dependent variable – the number of injured fatalities and injured persons. This question was examined using multiple regression analysis. A multiple regression analysis examines the relationships more precisely than the previous analysis (correlation) in that it seeks to determine how well the independent variables explain the variance in the dependent variable, while controlling for other independent variables. The variance is a measure of variability based on the distance between each value to the mean (Norusis, 2008). To compute the variance of any given sample, the following formula is used (Norusis, 2008):

$$\text{Variance} = \frac{\text{Sum of squared distances from the mean for all cases}}{(\text{Number of cases} - 1)}$$

A variance of 0 indicates that all of the cases in the sample have the same value. A low variance indicates that the value of each variable is close together. A high variance indicates that the value of each variable is highly spread out. Once the variance is

calculated, the standard deviation can be found by taking the square root of the variance (Norusis, 2008).

Multiple regression analysis is a more complex form of testing often used when a dependent variable is affected by multiple independent variables and is used to understand the impact of two or more variables on a single dependent variable (Babbie, 2010). While there are multiple methods of multiple regression analysis, the most commonly used methods require less complex computations and are the methods used in this study: forward selection and backward elimination (Norusis, 2008).

Backward elimination method, also referred to as backward stepwise, begins with all variables included and considered in the initial model. In each step or model of the analysis, the variable with the lowest significance is eliminated, thus resulting in the variable with the strongest significant effect on the dependent variable being the only variable in the final model (Norusis, 2008). This method of multiple regression was used to reveal which factor of EVIL DONE was the most predictive of the cumulative number of fatalities and injured persons resulting from a terrorist attack.

The hypothesis for this research question is that Occupied and Destructible will be most predictive of the number of fatalities and injured persons resulting from a terrorist attack.

Analysis Methods Research Question 3

The third research question is: How are the components of EVIL DONE predictive of the EVIL DONE vulnerability score? It seeks to determine how the components of EVIL DONE are predictive of the overall vulnerability score using a

multiple regression analysis as well. That is, this analysis essentially tests whether the EVIL DONE methodology and its components are valid and whether individual factors have more influence over the determination of a location's overall vulnerability score.

To test this research question, a forward selection, also called forward stepwise, multiple regression test was conducted. Unlike backward stepwise, forward stepwise methods starts the analysis using only the strongest constant (i.e., variable) in the initial model, and progressively adds the next variable that results in the largest increase in significance, or R^2. Variables are added to the model in the order of most to least significant, and finally ending when no more variables exists that would result in a significant increase to R^2 (Norusis, 2008). This method of multiple regression was used to discover which component of EVIL DONE was the most predictive of the overall vulnerability score.

The hypothesis for this research question is that Iconic and Legitimate will be the most predictive of the EVIL DONE vulnerability score of any given location/target.

Summary and Limitations

The overall goal of this study is to evaluate the validity of the EVIL DONE vulnerability assessment score in comparison to the number of fatalities injured persons resulting from a terrorist attack. In order to do so, data has been collected using the most comprehensive source of information available through the Global Terrorism Database and supplemental research tactics, such as the use of Google Earth for visual analysis and international news reports.

Using an objective scaling guide provided by Boba (2009), 111 terrorist attacks have been coded to reveal an overall vulnerability score. The data was then entered into an SPSS software program where multiple analyses were conducted to address the above mentioned research questions. While the results of the study will be discussed in the next section, it is important to address the limitations of the current study.

The greatest limitation of this study concerning the ability of the EVIL DONE vulnerability assessment to predict the number of fatalities and injured persons is the exclusion of the Near and Easy factors. While 3 of the 5 indexes in the Near factor were included in the study, 2 valuable indexes were excluded: close to known/suspected domestic/foreign terrorist base and close to domestic immigrant community. The entire Easy factor was also excluded. The exclusion of these factors not only resulted in a maximum overall vulnerability score of 33, as opposed to 40, but also excluded valuable variables that may be significantly related to the outcome (i.e., number of fatalities and injured persons) of the examined terrorist attacks. Future studies implementing EVIL DONE should seek to apply the assessment in a proactive, rather than reactive manner, in order to address each of the essential dependent variables.

In addition to the inability to collect information on the Easy and Near factors, details of every target and/or terrorist attack were not always available and/or uniform. Thus, in some instances, coding for certain factors was estimated based on the best available information. In rare events, the number of fatalities and/or injured persons varied from source to source; though, in most cases, the discrepancies were trivial.

In summary, the research design of this study utilized a correlational rather than causal examination of the variables related to the respective research questions via both bivariate and multivariate analyses. The data was collected primarily from the GTD, which acted as both a strength and weakness. Despite the fact that the GTD was the most comprehensive source available for information on terrorist attacks occurring over the past forty-years, some information vital to the EVIL DONE methodology was not available, such as data related to the Easy and Near factor. Thus, two of the five criteria for Near and all of the Easy factor were excluded from the study. Despite the mentioned limitations, the study still holds many valuable insights to the use of EVIL DONE as a vulnerability assessment for potential terrorist targets. The findings of the study will be examined and analyzed in great detail in the following chapter. Through the use of correlation and multiple regression analyses, the responses to each research questions developed through the examination of EVIL DONE and terrorism will be addressed.

CHAPTER 4: DATA ANALYSIS

The purpose of this chapter is to present the results of the examination of each of the research questions and their hypotheses. The chapter covers descriptive statistics of key variables examined including the frequencies of the type of attack, target type, year of attack, and distribution of attacks per country. Following that, the statistical findings of the bivariate and multivariate analysis will be illustrated, specifically, the Pearson correlations between the dependent and independent variables that seek to answer Research Question 1, the backward stepwise multiple regression analysis for Research Question 2, and the frontward stepwise multiple regression analysis for Research Question 3. The data collected for this study was entered into SPSS statistical software program. The program was then used to analyze the data and run a variety of statistical operations (Norusis, 2008). SPSS was utilized as the solitary statistical software in this study, and conducted both the correlation and multiple regression analyses that were used to address the research questions. The analysis and interpretation of the results will be presented in this chapter, while the following chapter will include a discussion and conclusion of these findings.

Descriptive Statistics

Descriptive statistics provide detailed information about each of the ratio and nominal variables used in this study. The descriptive analyses examined the attributes of the 111 terrorist attacks in the study, such as the type of attack, type of target,

locations/countries of the terrorist attack, and the years that the attacks occurred. The independent and dependent variables (i.e., ratio variables) were examined through the use of mean, median, standard deviation, and minimum and maximum values.

Characteristics of the Terrorist Attacks

Table 1 depicts the breakdown of the terrorist attacks by their type/form. It shows that the majority of the attacks were bombings or explosions, which totaled 65.8 percent of the 111 terrorist attacks examined here. These findings are consistent with research concluding that explosives accounted for nearly 75 percent of all terrorist incidents occurring between 1980 and 2001 (Clarke & Newman, 2006). The second most frequent type of attack was armed assault, which comprised 15.3 percent of the total. Following armed assaults, the subsequent forms of terrorist attacks held minor percentages including hostage (6.3 percent), hijacking (5.4 percent), facility/ infrastructure attack (4.5 percent), assassination (1.8 percent), and chemical (0.9 percent).

Table 1

Frequency of Type of Attack

	Frequency	**Percent**
Bombing/Explosion	73	65.8
Armed Assault	17	15.3
Hostage	7	6.3
Hijacking	6	5.4
Facility/Infrastructure Attack	5	4.5
Assassination	2	1.8
Chemical	1	0.9
Total	**111**	**100.0**

Table 2 depicts the breakdown of terrorist attack target types. The most frequent target was the government, which totaled 21.6 percent of the 111 terrorist attacks examined here. The second most frequent type of target was private citizens, which comprised 18.9 percent of the total. Police and military were equally targeted and comprised 10.8 percent of the total targets independently. Following police and military targets, the subsequent forms of target types held minor percentages including businesses (9.9 percent), transportation (7.2 percent), utilities (6.4 percent), religious figures, (5.4 percent), airports and airlines (2.7 percent), educational institutions (2.7 percent), tourists (1.8 percent), and non-government organizations (1.8 percent).

Table 2

Terrorist Attack Target Type

	Frequency	**Percent**
Government	24	21.6
Private Citizen & Property	21	18.9
Police	12	10.8
Military	12	10.8
Business	11	9.9
Transportation	8	7.2
Utilities	7	6.4
Religious Figures	6	5.4
Airports/Airlines	3	2.7
Educational Institutions	3	2.7
Tourists	2	1.8
NGO	2	1.8
Total	**111**	**100.0**

Table 3 depicts the frequency of terrorist attacks in 5 year increments, with the exception of the first and last category. The first category includes all attacks prior to 1990, and the last category includes all attacks from 2011 to 2013. The frequencies show

5.4 percent of the attacks occurred in or prior to 1990, with the earliest terrorist attack occurring in 1972. From 1991 forward, terrorist attacks were examined in 5 year intervals. Between 1991 and 1995, 5.4 percent of the terrorist attacks occurred. Between 1996 and 2000, 19.8 percent of the attacks occurred. Between 2001 and 2005, 27.9 percent of the attacks occurred. Between 2006 and 2010, 24.3 percent of the attacks occurred. Lastly, between 2011 and 2013, 17.1 percent of the terrorist attacks occurred. It is important to note that the frequencies of the attacks by year are not a reflection of the actual frequencies of terrorist attacks globally, but rather a result of the purposive sampling method. Each attack was selected using the methodology discussed in the previous chapter and is not an indication of the frequencies of actual terrorism.

Table 3

Terrorist Attacks by Year

	Frequency	**Percent**
1972-1990	6	5.4
1991-1995	6	5.4
1996-2000	22	19.8
2001-2005	31	27.9
2006-2010	27	24.3
2011-2013	19	17.1
Total	**111**	**100.0***

*Totals may not equal 100% because of rounding.

Table 4 depicts the location/country where the terrorist attacks occurred. The table shows that 14.4 percent of the terrorist attacks in this study occurred in Russia. The second most frequent country was the United States, which comprised a total of 11.7 percent. Algeria was the third most frequent location for terrorist attacks and comprised a

total of 9.9 percent. Following Algeria, 21 countries ranged from 0.9 to 9.0 percent of the study.

Table 4

Terrorist Attacks by Country

	Frequency	Percent
Russia	16	14.4
United States	13	11.7
Algeria	11	9.9
Colombia	10	9.0
Philippines	9	8.1
Israel	7	6.3
Nigeria	6	5.4
Somalia	6	5.4
Thailand	5	4.5
United Kingdom	5	4.5
Yemen	4	3.6
Indonesia	3	2.7
Turkey	3	2.7
Nepal	2	1.8
Northern Ireland	2	1.8
Germany	1	0.9
Greece	1	0.9
India	1	0.9
Japan	1	0.9
Kenya	1	0.9
Lebanon	1	0.9
Libya	1	0.9
Scotland	1	0.9
Tanzania	1	0.9
Total	**111**	**100.0***

*Totals may not equal 100% because of rounding.

Independent and dependent variables.

The subsequent analyses used the following 11 variables: Exposed, Vital, Iconic, Legitimate, Destructible, Occupied, Near, the number of fatalities, the number of injured

persons, the number of fatalities and injured persons, and the EVIL DONE vulnerability score. The independent variables are each of the EVIL DONE factors, whereas the number of fatalities and injured persons comprise the first dependent variable. The EVIL DONE vulnerability score functions as an independent variable in Research Question 2 and as a dependent variable in Research Question 3. Measures of central tendency are used to examine each variable individually, and then correlation is used to describe the relationship of each variable to one another prior to examining the relationships addressed in the research questions.

Measures of central tendency.

Table 5 depicts the means, medians, standard deviations, minimum values, and maximum values of all the variables.

Table 5

Description of Variable Data

	Mean	Median	Standard Deviation	Minimum	Maximum
Exposed	1.52	1.00	1.75	0	5
Vital	0.59	0.00	1.34	0	5
Iconic	1.60	1.00	1.87	0	5
Legitimate	2.43	2.00	1.66	1	5
Destructible	3.84	4.00	1.25	1	5
Occupied	3.10	3.00	1.65	0	5
Near	2.14	2.00	0.95	0	3
Vulnerability Score	15.23	15.00	4.33	6	25
Fatalities	47.99	3.00	268.48	0	2,772
Injured	81.15	8.00	404.80	0	4,000
Fatalities/Injured	511.15	70.00	1448.73	0	8,800

Note: n=111

For Exposed, the results show that the minimum score was 0 and the maximum score was 5. The average for the Exposed factor of the locations was 1.52 with a standard deviation of 1.75. Fifty percent of the locations scored less than 1 and fifty percent scored more than 1. Thus, these statistics show that the majority of locations were not highly Exposed at the time of the attack and resembled a cluster of buildings in an urban area rather than high-rise structures.

For Vital, the results show that the minimum score was a 0 and the maximum score was a 5. On average, the locations scored a 0.59 for vitality with a standard deviation of 1.34. Fifty percent of the locations scored a 0 and fifty percent score higher than 0. These statistics show that a large majority of the locations (81.6 percent) were highly non-vital locations at the time of the attack and did not meet the minimum criteria for scoring.

For Iconic, the results show that the minimum score was a 0 and the maximum score was a 5. On average, the locations scored a 1.60 for iconicity with a standard deviation of 1.87. Fifty percent of the locations scored less than 1 and fifty percent scored more than 1. These statistics show that, similarly to the Exposed factor, the majority of the locations were not highly Iconic but rather more closely resembled a major city, town, or religious building.

For Legitimate, the results show that the minimum score was a 1 and the maximum score was a 5. On average, the locations scored a 2.43 for legitimacy with a standard deviation of 1.65. Fifty percent of the locations scored less than 2 and fifty percent scored more than 2. These statistics show that the sample included locations with

a fair variety of Legitimate rankings, though the majority still scored towards the lower end of the scale, resembling locations which house civilian workers.

For Destructible, the results show that the minimum score was a 1 and the maximum score was a 5. On average, the locations scored a 3.84 for destructibility with a standard deviation of 1.25. Fifty percent of the locations scored less than 4 and fifty percent scored more than 4. These statistics show that a majority of the locations were moderately Destructible (e.g., destructible with small conventional weapons) and that the majority of scores were only slightly skewed from the mean value of 3.84.

For Occupied, the results show that the minimum score was 0 and the maximum score was 5. On average, the locations scored a 3.10 for occupancy with a standard deviation of 1.65. Fifty percent of the locations scored less than 3 and fifty percent scored more than 3. These statistics show that the distribution of locations' Occupied score was relatively equal in that median reflects the true middle value on the occupancy scale, resembling a crowded space at specific times of day/days of week.

For Near, the results show that the minimum score was a 0 and the maximum score was a 3. On average, the locations scored a 2.14 with a standard deviation of 0.95. Fifty percent of the locations scored less than 2 and fifty percent scored more than 2. Because 3 was the maximum value for the Near index, the statistics show that the distribution is relatively even; however, a majority of the locations met the criteria for at least two of the three indexes.

For the EVIL DONE vulnerability score, the results show that the minimum score was a 6 and the maximum score was a 25. On average, the locations merited a cumulative

vulnerability score of 15.23 with a standard deviation of 4.33. Fifty percent of the locations scored less than 15 and fifty percent scored more than 15. Considering that the maximum vulnerability score is 33 with a median of 16.5 according to the cumulative maximum scores of all the EVIL DONE components, the median and mean value of 15, and the standard deviation being around one third of the mean reflects a fairly equal distribution of vulnerability scores for the sampled locations.

For the total number of fatalities, the results show that the minimum value was 0 and the maximum value was 2,722. The terrorist attacks resulted in an average of 47.99 fatalities with a standard deviation of 268.48. Fifty percent of these attacks resulted in less than 3 fatalities and fifty percent resulted in more than 3 fatalities. These statistics show that the distribution is highly skewed in that most of the incidents had very few fatalities; however, there were also few incidents with many fatalities which distorted the mean value. For example, the 9/11 attacks resulted in 2,772 fatalities. The terrorist attack that resulted in the second most fatalities in this study was a hostage situation at an Elementary School in Russia, occurring in 2004. This attack resulted in 332 fatalities. Disregarding the terrorist attacks at the lower end of the fatality reports, the range between the terrorist attacks with highest and second highest fatalities was 2,440.

For the total number of injured persons, the results show that the minimum value was 0 and the maximum value was 4,000. The terrorist attacks resulted in an average of 81.15 injured persons with a standard deviation of 404.80. Fifty percent of these attacks resulted in less than 8 injured persons and fifty percent resulted in more than 8 injured persons. Similarly to findings in the fatalities results, the statistics show that the

distribution is highly skewed in that most of the incidents had very few injured persons; however, there were also very few incidents with many injured persons which distorted the mean value. For example, the 1998 attack on the U.S. Embassy in Nairobi, Kenya resulted in 4,000 injured persons. The attack with the second highest number of injured persons was the 1991 attack on the World Trade Center in New York City, which resulted in 1,042 injured persons.

For the combined number of fatalities and injured persons, the results show a minimum value of 0 and a maximum value of 8,800. The terrorist attacks resulted in an average of 511.15 harmed (i.e., killed or injured) persons with a standard deviation of 1,448.73. Fifty percent of the attacks resulted in less than 70 harmed persons and fifty percent resulted in more than 70 harmed persons. Again, similar to the fatalities and injured persons results, the statistics show that the distribution is highly skewed in that most of the incidents had few harmed persons; however, there were few incidents with many harmed persons which distorted the mean value. These findings are sensible considering that the variable is a combination of the two variables fatalities and injured persons. Thus, the results should frame the statistical findings of those two variables.

In summary, most of the EVIL DONE components had relatively low average scores, with the few exceptions of Destructible and Occupied. Occupied was the most evenly distributed of all components, with a relatively equal distribution of terrorist attacks at each scoring level. Destructible and Legitimate were the only EVIL DONE components whose minimum criteria were met for every terrorist attack in the study (i.e., no attacks failed to meet the minimum criteria and scored a zero). Three variables had

significant outliers that dramatically skewed the average results, including the number of fatalities, the number of injured persons, and the combined number of fatalities and injured persons

Correlations

Prior to examining the research questions, it was important to conduct descriptive statistics on the relationships between the EVIL DONE components to see how, for this sample, the components are related to one another. The correlations between each variable in this study can be examined in Table 6.

Table 6

Pearson Correlation

		Fatalities	Injured	Fatalities / Injured	E	V	I	L	D	O	Near	Vul Score
Fatalities	P.Corr	1	.388**	.966**	.212*	-.066	.130	-.013	-.184	.092	.106	.121
	Sig		.000	.000	.025	.491	.174	.889	.054	.337	.269	.204
Injured	P.Corr	.388**	1	.613**	.215*	-.058	.223-	.127	-.182	.135	-.063	.198*
	Sig	.000		.000	.025	.553	.020	.192	.059	.165	.517	.040
Fatalities /Injured	P.Corr	.966**	.613**	1	.137	-.099	.065	.046	-.200*	.182	.062	.096
	Sig	.000	.000		.157	.307	.501	.636	.038	.059	.525	.322
E	P.Corr	.212*	.215*	.137	1	-.021	.486**	.229*	-.585**	.562**	-.114	.715**
	Sig	.025	.025	.157		.825	.000	.016	.000	.000	.234	.000
V	P.Corr	-.066	-.058	-.099	-.021	1	-.285**	-.280**	.069	-.056	.029	.077
	Sig	.491	.553	.307	.825		.002	.003	.473	.562	.762	.424
I	P.Corr	.130	.223*	.065	.486**	-.285**	1	.614**	-.449**	.344**	-.251**	.720**
	Sig	.174	.020	.501	.000	.002		.000	.000	.000	.008	.000
L	P.Corr	-.013	.127	.046	.229*	-.280**	.614**	1	-.323**	.244**	-.258**	.596**
	Sig	.899	.192	.636	.016	.003	.000		.001	.010	.006	.000
D	P.Corr	-.184	-.182	-.200*	-.585**	.069	-.449**	-.323**	1	-.457**	.049	-.407**
	Sig	.054	.059	.038	.000	.473	.000	.001		.000	.606	.000
O	P.Corr	.092	.135	.182	.562**	-.056	.344**	.244**	-.457**	1	.015	.703**
	Sig	.337	.165	.059	.000	.562	.000	.010	.000		.879	.000
Near	P.Corr	.106	-.063	.062	-.114	.029	-.251**	-.258**	.049	.015	1	-.005
	Sig	.269	.517	.525	.234	.762	.008	.006	.606	.879		.956
Vul Score	P.Corr	.121	.198*	.096	.715**	.077	.720**	.596**	-.407**	.703**	-.005	1
	Sig	.204	.040	.322	.000	.424	.000	.000	.000	.000	.956	

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed)

Salkind (2011) defined parameters for interpreting the strength of the relationships via the correlation coefficient. The parameters of the coefficient strength are as follows:

+/- .8 to 1.0 – very strong relationship

+/- .6 to .8 – strong relationship

+/- .4 to .6 – moderate relationship

+/- .2 to .4 – weak relationship

+/- .0 to .2 – very weak relationship

Two "very weak" relationships were found, one of which is related to Research Question 1, which will later be discussed in greater detail. The first is between the combined variable of number of fatalities and injured persons and the destructibility of the location/target with a Pearson correlation of -.200 (p= 0.04). The correlation expressed a negative relationship between the destructibility and the number of fatalities and injured persons that suggests that as the destructibility of a target increases, the number of fatalities and injured persons decreases. This correlation is not in the expected direction; however, possible explanations for this finding will be discussed in the final chapter.

The second very weak relationship was found between the number of injured persons and the EVIL DONE vulnerability score with a Pearson correlation of .198 (p=0.40). This finding suggests that as the EVIL DONE vulnerability score increases, the number of injured persons also increases. The positive correlation between the EVIL DONE vulnerability score and the number of injured persons is in the expected direction

based on the founding principles of the vulnerability assessment methodology. The methodology was established to generate a vulnerability score that reflected the aftermath of a terrorist attack in an equivalent direction.

Twelve "weak" correlations were found. The relationship between Exposed and the number of fatalities and the number of injured persons is .212 (p=.03), and .215 (p=.03), respectively. Although weak correlations, the direction of these relationships are positive and suggest that the more Exposed a target or location is, the more fatalities and injured persons resulted from the terrorist attack independently. These findings are expected considering the literature which suggests that locations that are more visible are more attractive to terrorists and receive much more attention than less visible targets.

Iconic was found to have a weak relationship with both the number of injured persons (.223, p=.02) and the Vital factor (-.285, p=.00). Although weak, the findings suggest that the more Iconic a target or location is, the more injured persons would result from a terrorist attack and the less Vital the location may be. These relationships are in the expected direction given that Iconic locations are characteristically large in size, or hold some unique feature. Therefore, their ability to house large amounts of people allows for a greater population to potentially be harmed. Also, the findings between Iconic and Vital are in the expected direction as Iconic targets (e.g., Statue of Liberty, Disney World, City Hall, etc.,) are not major necessities of a community, and therefore are not considered vital to everyday behaviors, as a major transportation point or power source would be.

Legitimate was found to have a weak relationship with five other factors: Exposed, Vital, Destructible, Occupied and Near. Legitimate held a positive relationship with both Exposed and Occupied, with a correlation coefficient of .229 and p=.02 and a correlation coefficient of .244 and p=.01, respectively. The positive relationships suggest that the more Legitimate a target is, the more Exposed it will be and the more people it will house. The relationships between these factors are in the expected direction as one would anticipate highly Legitimate targets (i.e., those that house military personnel or politicians) to be large identifiable structures that consequently house many people for longer periods of time, such as the White House or military bases. Legitimate also has a negative relationship with Vital, Destructible, and Near, with a correlation coefficient of -.280 and p=.00, -.323 and p=.00, and -.258 and p=.00, respectively. The negative relationships suggest that as the Legitimate score increases, the Vital, Destructible, and Near scores decrease. All three of these relationships are in the expected direction considering that highly Legitimate targets are seldom Vital locations that would deny a community access to necessities. Additionally, it is expected that highly Legitimate targets would be less Destructible given their political and military alliances and prerogatives. The negative relationship between Legitimate and Near is also as expected as it would be presumed that highly Legitimate targets would be in less susceptible locations far from borders/coasts, major transportation hubs, and similar targets.

Lastly, Iconic was found to have two weak relationships with Occupied and Near. Iconic and Occupied held a correlation coefficient of .344 with p=.01, suggesting a positive relationship in that as one factor increase, so does the other. The direction of this

relationship is as expected in that a majority of Iconic targets are large, relative to the surrounding areas. For example, Disney World is a major commercial symbol in the United States and has the capacity to house thousands of people at any given time. Conversely, Iconic and Near held a correlation coefficient of -.251 with p=.008, which suggests a negative relationship. The findings suggest that the most Iconic locations fail to meet some, if not all, of the criteria of the Near factor, including close to a country's border, land, or sea, close to a major transportation hub, or many similar targets. The relationship was in the expected direction since most Iconic locations are unique, hence their Iconic value.

Seven "moderate" correlations were found amongst the EVIL DONE variables, meaning the correlation coefficient fell between +/- .4 and .6, all of which held p-values of .00. Exposed and Iconic yielded a correlation coefficient of .486, where Exposed and Occupied held a correlation coefficient of .562. Both tests indicate that as the exposure of these locations increases, the iconicity and occupancy also increases. The findings are as expected considering that large structures typically hold some symbolic value deemed solely on size. Additionally, large buildings or structures, according to the EVIL DONE methodology, are considered highly Exposed locations. Thus, given the size of the target, the occupancy is expected to manifest in a similar manner.

Destructible was found to be related to four other variables moderately and negatively. That is, Destructible was moderately related in a negative direction to Exposed (correlation coefficient of -.585), Iconic (correlation coefficient of -.449), Occupied (correlation coefficient of -.457), and the EVIL DONE vulnerability score

(correlation coefficient of -.407). The findings suggest that large structures, which typically hold Iconic value and higher occupancies based off the previous correlation, are less Destructible. In other words, as the exposure, iconic value, and occupancy of the location or target increases, heavier weaponry is needed to destroy the target. The negative relationship between Destructible and the EVIL DONE vulnerability score is not as anticipated. Rather, it was expected that the less Destructible a location or target is, the less vulnerable it would be to a terrorist attack, and consequently result in a lower vulnerability score. However, possible explanations for this finding will be discussed in the final chapter.

The last moderate relationship was found between Legitimate and the EVIL DONE vulnerability score, which yielded a correlation coefficient of .596 with p= .00. This positive relationship suggests that as the legitimacy of a location increases, the EVIL DONE vulnerability score also increases. The finding implies that, according to the EVIL DONE vulnerability methodology, the more Legitimate a location is, the more vulnerable it is to a terrorist attack.

Lastly, and perhaps most importantly, four "strong" correlations were found among the studied variables. All of the strong correlations held a p-value of .00, and each of relationships were positive. Iconic and Legitimate yielded a correlation coefficient of .614, p=.000 which suggests that as the iconic value of a target or location increases, so does the legitimacy of the target. Finally, the EVIL DONE vulnerability score was strongly related to Occupied (correlation coefficient of .703), Exposed (correlation coefficient of .715), and Iconic (correlation coefficient of .720). These findings indicate

that a majority of the relationships are weak, with the exception of a few moderate and strong correlations. Despite the correlational findings, regardless of relationship strength, the relationships examined here are all bivariate. Conversely, considering all the variables together in a multivariate analysis rather than in a bivariate analysis will strengthen the research and academic contributions of this study.

Research Question 1

Research Question 1 states: Is there a relationship between the EVIL DONE vulnerability score and the number of fatalities and injured persons resulting from a terrorist attack? Hypothesis 1 declares that the more fatalities and injured persons resulting from a terrorist attack, the higher the EVIL DONE vulnerability score. The null hypothesis is that there is no relationship between the number of fatalities and injured persons and the EVIL DONE vulnerability score. The alternative hypothesis is that there is a positive and strong relationship between the number of fatalities and injured persons together and the EVIL DONE vulnerability score. Deriving from Table 6, the Pearson correlation of these two variables resulted in a correlation coefficient of .10 ($p = .32$). Thus, because the coefficient is in the very weak range and the p-value is greater than .05, the null hypothesis is retained in that no relationship exists between these two variables. The results do not support the original hypothesis that more fatalities and injured persons resulting from a terrorist attack would result in a greater EVIL DONE vulnerability score.

Research Question 2

Research Question 2 states: How are the components of EVIL DONE predictive of the number of fatalities and injured persons resulting from a terrorist attack? The hypothesis of this research question was tested using a multiple regression analysis to determine how the components of EVIL DONE were predictive of the mentioned dependent variables.

Hypothesis 2

Hypothesis 2 is that Occupied and Destructible will be the most predictive of the number of fatalities and injured persons resulting from a terrorist attack. This hypothesis is developed around logical connotations and essential themes in the literature. Primarily, in order for a large number of persons to be killed and/or injured, there must be a large number of persons present. For instance, a terrorist attack targeting a small supermarket whose maximum occupancy is 50 is unlikely to result in as many fatalities/injured persons as an attack on a full sporting arena whose occupancy is 30,000. Secondly, the literature suggests that locations with high occupancies provide the greatest opportunities for terrorists to exert great harm and establish fear among the targeted community. Thus, because terrorists typically seek to harm as many people as possible to strengthen their purpose, it is hypothesized that the occupancy of a location will greatly predict the number of fatalities and injured persons resulting for a terrorist attack even when considering other important factors within the EVIL DONE criteria.

Additionally, the literature suggests that less Destructible targets require less conventional and accessible weaponry. Consistent with the theories of situational crime

prevention, increasing the effort needed to obtain powerful weaponry to destroy durable targets will decrease the opportunities for attack. Thus, a target that is highly Destructible will be more effortlessly destroyed with easily accessible weapons resulting in a greater number of fatalities and injured persons even when controlling for the other factors.

Multiple Regression Results

Research Question 2 seeks to understand how the components of EVIL DONE are predictive of the cumulative number of fatalities and injured persons. Using the cumulative number of fatalities and injured persons as the dependent variable, the multiple regression analysis was able to determine how well the independent variables explain the variance in the dependent variable, while controlling of other independent variables.

The data collected for this study was entered into SPSS statistical software program. The program was then used to analyze the data and run a variety of statistical operations (Norusis, 2008). SPSS was utilized as the solitary statistical software in this study, and conducted both the correlation and multiple regression analyses that were used to address the research questions.

Regression analyses are statistical techniques used to predict the value of one variable using the value of another variable or set of variables (Allen, 1997). The variables whose predictive values are being assessed are the independent variables, whereas the variable that the analysis is attempting to predict is the dependent variable (Allen, 1997). In this case, the components of EVIL DONE are the independent variables whose values are being used to predict the number of fatalities and injuries. The analysis

then displays the relationship between the independent variables and the dependent variable and "determines the proportion of variation in the dependent variable that can be accounted for by the variation in the independent variable" (Allen, 1997). Lastly, the analysis reveals the level of statistical significance of each result to determine whether or not there is true relationship.

A backward stepwise multiple regression analysis was conducted in SPSS, which tested the hypothesis for this research question. In the backward stepwise model, the initial model contained all independent variables. As each step progressed, the independent variable that was responsible for the smallest change in R^2 was eliminated, thus, ending with the single independent variable whose elimination yielded the greatest impact on the predictability of the number of fatalities and injured persons (Norusis, 2008). Table 7 presents the results from all models in the backward stepwise regression. Tables 8 and 9 breakdown the analysis into each individual model to examine how the statistics changed as each variable was removed.

Table 7

Backward Stepwise Regression

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	R^2 Change	F Change	DF 1	DF 2	Sig. F Change
1	.256[a]	.066	.000	1448.64538	.066	1.002	7	100	.435
2	.256[b]	.065	.010	1441.57155	.000	.016	1	100	.900
3	.254[c]	.065	.019	1435.05926	-.001	.081	1	101	.777
4	.251[d]	.063	.026	1429.45785	-.002	.197	1	102	.658
5	.240[e]	.058	.031	1426.39180	-.005	.554	1	103	.458
6	.225[f]	.051	.033	1424.87530	-.007	.777	1	104	.380
7	.200[g]	.040	.031	1426.12685	-.011	1.186	1	105	.279

a. Predictors: (Constant), VulScore, NALL, V, D, L, O, E (Iconic excluded)

b. Predictors: (Constant), VulScore, NALL, V, D, O, E (Legitimate excluded)

c. Predictors: (Constant), VulScore, NALL, V, D, O (Exposed excluded)

d. Predictors: (Constant), NALL, V, D, O (Vulnerability score excluded)

e. Predictors: (Constant), V, D, O (Near excluded)

f. Predictors: (Constant), D, O (Vital excluded)

g. Predictors: (Constant), D (Occupied excluded)

Table 8

Backward Stepwise Multivariate Regression Analysis Models 1, 2, 3

	Model 1			Model 2			Model 3		
	B	Std. Err	Beta	B	Std. Err	Beta	B	Std. Err	Beta
Constant	920.225	904.042		935.229	891.865		942.501	887.469	
Destructible	-152.268	170.597	-.130	-164.280	141.087	-.140	-181.359	127.027	-.154
Occupied	142.332	153.406	.163	131.012	124.047	.150	131.240	123.484	.150
Vital	-70.77	138.990	-.066	-82.273	104.713	-.077	-83.924	104.079	-.079
Near	125.681	177.040	.083	113.633	148.562	.075	106.692	145.872	.070
Vul Score	-40.931	109.160	-.121	-29.030	55.235	-.086	-20.578	46.305	-.061
Exposed	52.315	179.094	.062	36.730	129.445	.044			
Legitimate	24.046	189.926	.027						
R		.256			.256			.254	
R^2		.066			.065			.065	
Adj. R^2		.000			.010			.019	
Std. Error		1448.65			1441.57			1435.06	
R^2 Change		.066			.000			-.001	
F Change		1.002			.016			.081	
DF1		7			1			1	
DF2		100			100			101	
Sig. F Change		.435			.900			.777	

Table 9

Backward Stepwise Multivariate Regression Analysis Models 4, 5, 6, 7

	Model 4			Model 5			Model 6			Model 7		
	B	Std. Err	Beta	B	Std. Err	Beta	B	Std. Err	Beta	B	Std. Err	Beta
Constant	719.57	729.23		912.91	679.97		868.72	677.40		1417.95	452.71	
Destruct.	-175.25	125.79	-.149	-168.95	125.23	-.144	-173.63	124.99	-.148	-234.86	111.73	-.200
Occupied	95.49	93.31	.109	98.74	93.10	.113	101.15	92.87	.116			
Vital	-92.26	101.98	-.087	-89.63	101.70	-.084						
Near	108.16	145.27	.071									
Vul Score												
Exposed												
Legitimate												
R		.251			.240			.225			.200	
R^2		.063			.058			.051			.040*	
Adj. R^2		.026			.031			.033			.031	
Std. Error		1429.46			1426.39			1424.88			1426.13	
R^2 Change		-.002			-.005			-.007			-.011	
F Change		.197			.554			.777			1.186	
DF1		1			1			1			1	
DF2		102			103			104			105	
Sig. F Change		.658			.458			.380			.279	

The results reveal multiple important statistics including the B, Beta, R, R^2, and adjusted R^2 values as well as the statistical significance of the findings. The B value, referred to as the unstandardized coefficient, represents the direction and amount of change in the dependent variable that would result from an increase or decrease in the independent variables by one unit (Norusis, 2008). However, the B value is generally not a highly informative measure because of the range in the unstandardized values of the variables. The beta value refers to the standardized coefficient of the model, or the direction and amount of change in the dependent variable that would result from an increase or decrease in the independent variables by one standard deviation once all variables have been standardized to a common mean of 0 and a variance of 0 (Leech, Barrett, & Morgan, 2008).

The R value refers to the absolute value of the correlation coefficient between the observed value of the dependent variable and the predicted value of in the independent

variables collectively (Norusis, 2008). In other words, an R value of 1 indicates that the dependent variable can be predicted from the independent variables with absolute certainty. An R value of 0 indicates that the independent variables are not related to the dependent variable in a linear manner (Norusis, 2008). The R^2 value displays the proportion of variation in the dependent variable that is explained by independent variables in the current model (Norusis, 2008). For example, an R^2 value of .938 signifies that nearly 94 percent of the variability in the dependent variable is explained by variability in the independent variables (Norusis, 2008). These two values (R and R^2) will be the main focus of the analysis considering their significance to the research questions. The adjusted R^2 reflects an estimate of how well the current model would fit into a subsequent model or dataset of the sample population when other variables are either included or excluded (Norusis, 2008).

The overall purpose and objective of multiple regression analysis is to determine which variable, or set of variables, most effectively explains the variation in the dependent variable primarily through the examination of the R and R^2 values (Eyduran, Ozdemir, & Alarslan, 2005). Thus, this analysis was the most important measure of the strength of the EVIL DONE methodology given the overall purpose of this study and the selected dependent variables.

Model 1 of the backward stepwise multiple regression analysis used the number of fatalities and injured persons as the dependent variable and began with all independent variables (Exposed, Vital, Legitimate, Destructible, Occupied, Near, and EVIL DONE vulnerability score) except Iconic, which was the most insignificant variable and yielded

the smallest change in R^2. The R value was .256, showing that the independent variables have a weak linear relationship to the dependent variable. The R^2, or how much of the variability was explained by the independent variables, was .066, meaning that 6.6 percent of the variability in the number of fatalities and injured persons was explained by the 7 included independent variables, however, the p-value of this test was .435, yielding non-significant results. Model 2 eliminated Legitimate, whose exclusion produced the smallest change in the R^2 value, resulting in an R value of .256, R^2 of .065, and p-value of.324. Model 3 eliminated Exposed and resulted in an R value of .254, an R^2 of .065, and p-value of .227. Model 4 eliminated the EVIL DONE vulnerability score and resulted in an R value of .251, an R^2 of .063, and a p-value of .150. Model 5 eliminated Near and resulted in an R value of .240, an R^2 of .058, and p-value of .101. Model 6 eliminated Vital and resulted in an R value of .225, an R^2 of .051, and a p-value of .065. Lastly, Model 7 eliminated Occupied, leaving Destructible as the only independent variable being tested against the number of fatalities and injured persons. This resulted in an R value of .200, an R^2 of .040, and reached a significant p-value of .038, suggesting a statistically significant relationship. This finding implies that 4 percent of the variability in the number of fatalities and injured persons is explained solely by Destructible.

In testing the hypothesis, Iconic was the first independent factor to be eliminated, followed by Legitimate, Exposed, EVIL DONE vulnerability score, Near, Vital, and Occupied. The results of this analysis suggested that Destructible held the strongest impact on R^2 because it was the last variable left in Model 7, after all other variables were eliminated. After removing all other independent variables, Destructible resulted in R^2

of .200 with p=.040, suggesting a statistically significant, weak relationship. However, the Beta value, or standardized coefficient of Model 7, reveals that the direction of the relationship is negative. Therefore, considering that the final two variables in the models were Occupied and Destructible and considering the statistically significant relationship between Destructible and the number of fatalities and injuries, the null hypothesis is rejected, even though the direction of the relationship was unexpected.

Research Question 3

Research Question 3 asks: How are the components of EVIL DONE predictive of the EVIL DONE vulnerability score? Similarly to Research Question 2, the hypothesis for this research question was tested using a multiple regression analysis to determine how the individual components of EVIL DONE were predictive of the EVIL DONE vulnerability score.

Hypothesis 3

Hypothesis 3 is that Iconic and Legitimate will be the most predictive of the EVIL DONE vulnerability score of any given location/target. This hypothesis is developed around the literature which suggests that Iconic targets, whose symbolic value represents that nation's power and unity, are highly attractive to terrorist whose motives involve a coercion of government in furtherance of political of social objectives. Targeting an Iconic location figuratively impairs the strength of a country and can potentially result in greater satisfaction among terrorists seeking substantial implications. Additionally, this hypothesis is developed around the parallels found in the Iconic and Legitimate criteria. Targets that are considered highly Iconic, according to the EVIL DONE criteria, house

political personnel or people with influential power. Likewise, targets that are considered highly Legitimate house people of similar stature. Therefore, not only would Legitimate targets denote a strong symbolic threat which is a common goal among terrorists, but the association with iconicity may result in a greater EVIL DONE vulnerability score.

Multiple Regression Results

Research Question 3 seeks to understand how the components of EVIL DONE are predictive of the EVIL DONE vulnerability score. Using the EVIL DONE vulnerability score as the dependent variable, the multiple regression analysis was able to determine how well each independent variable (i.e., each factor of EVIL DONE) explains the variance in the dependent variable, while controlling for other independent variables. A forward stepwise model of multiple regression analysis was conducted to test this research question. Contrary to a backward stepwise multiple regression model, the initial model in forward stepwise, excluded all independent variables. As each step progressed, the independent variable that causes the greatest change in R^2 was added, thus beginning with the single independent variable that yielded the greatest impact on the predictability of the EVIL DONE vulnerability score. Table 10 presents the results from all models in the stepwise regression. Tables 11 and 12 breakdown the analysis into each individual model to examine how the statistics changed as each variable was added.

Table 10

Forward Stepwise Regression

Model	R	R^2	Adjusted R^2	Std. Error	R^2 Change	F Change	DF 1	DF 2	Sig. F Change
1	.720[a]	.519	.514	3.020	.519	117.510	1	109	.000
2	.868[b]	.754	.750	2.169	.235	103.322	1	108	.000
3	.910[c]	.828	.823	1.823	.074	45.923	1	107	.000
4	.935[d]	.874	.869	1.569	.046	38.281	1	106	.000
5	.956[e]	.915	.911	1.294	.041	50.863	1	105	.000
6	.978[f]	.957	.955	.922	.042	103.029	1	104	.000
7	1.000[g]	1.000	1.000	.000	.043	.	1	103	.

a. Predictors: (Constant), I (Iconic included)
b. Predictors: (Constant), I, O (Occupied included)
c. Predictors: (Constant), I, O, V (Vital included)
d. Predictors: (Constant), I, O, V, L (Legitimate included)
e. Predictors: (Constant), I, O, V, L, E (Exposed included)
f. Predictors: (Constant), I, O, V, L, E, D (Destructible included)
g. Predictors: (Constant), I, O, V, L, E, D, NALL (Near included)

Table 11

Frontward Stepwise Multivariate Regression Analysis Models 1, 2, 3

	Model 1			Model 2			Model 3		
	B	Std. Err	Beta	B	Std. Err	Beta	B	Std. Err	Beta
Constant	12.548	.378		8.993	.443		8.242	.388	
Iconic	1.669	.154	.720	1.258	.118	.543	1.456	.103	.628
Occupied				1.360	.134	.517	1.324	.113	.503
Vital							.915	.135	.284
Legitimate									
Exposed									
Destructible									
Near									
R		.720			.868			.910	
R^2		.519			.754			.828	
Adj. R^2		.514			.750			.823	
Std. Error		3.020			2.169			1.823	
R^2Change		.519			.235			.074	
F Change		117.510			103.322			45.923	
DF1		1			1			1	
DF2		109			108			107	
Sig. F Change		.000			.000			.000	

Table 12

Frontward Stepwise Multivariate Regression Analysis Models 4, 5, 6, 7

	Model 4			Model 5			Model 6			Model 7		
	B	Std. Err	Beta	B	Std. Err	Beta	B	Std. Err	Beta	B	Std. Err	Beta
Constant	7.111	.381		7.356	.316		2.713	.510		1.05 E-13	.000	
Iconic	1.097	.106	.473	.827	.095	.357	.909	.068	.392	1.00	.000	.432
Occupied	1.293	.097	.491	.975	.092	.370	1.084	.066	.412	1.00	.000	.380
Vital	1.018	.117	.316	.937	.098	.297	.952	.063	.295	1.00	.000	.310
Legitimate	.717	.116	.274	.802	.096	.306	.882	.069	.337	1.00	.000	.382
Exposed				.667	.093	.270	.935	.072	.378	1.00	.000	.404
Destructible							.927	.091	.267	1.00	.000	.288
Near										1.00	.000	.219
R		.935			.956			.978			1.000	
R^2		.874			.915			.957			1.000	
Adj. R^2		.869			.911			.955			1.000	
Std. Error		1.569			1.294			.922			.000	
R^2 Change		.046			.041			.042			.043	
F Change		38.281			50.863			103.029			.	
DF1		1			1			1			1	
DF2		106			105			104			103	
Sig. F Change		.000			.000			.000			.	

Before examining the statistics of the EVIL DONE vulnerability score analysis, it is important to note that because the dependent variable is an accumulation of all independent variables, the significance level of each finding is .000, demonstrating that the results of each analysis are statistically significant. Model 1 of the forward stepwise multiple regression analysis used the EVIL DONE vulnerability score as the dependent variable and began with the independent variable whose inclusion results in the greatest increase in significance (i.e., R^2), which was Iconic. The inclusion of Iconic resulted in an R value of .720 and an R^2 of .519. An R value of .720 shows considerable predictability of Iconic on the EVIL DONE vulnerability score. The R^2 value suggests that 51.9 percent of the variability was explained by Iconic alone. Model 2 included Occupied, which was the factor whose addition yielded the greatest increase in the predictability of the independent variable, subsequent to Iconic. Model 2 resulted in an R value of .868 and an R^2 of .754; thus, Occupied explained a .235 (or 23.5 percent) increase in the variability of

the vulnerability score. Model 3 included Vital and resulted in an R value of .910 and an R^2 of .828; thus, Vital explained a .074 (or 7.4 percent) increase in the variability of the vulnerability score. Model 4 included Legitimate and resulted in an R value of .935 and an R^2 of .874; thus Legitimate explained a .046 (or 4.6 percent) increase in the variability. Model 5 included Exposed and resulted in an R value of .956 and an R^2 of .915; thus Exposed explained a .041 (or 4.1 percent) increase in the variability. Model 6 included Destructible and resulted in an R value of .978 and an R^2 of .957; thus Destructible explained a .042 (or 4.2 percent) increase in variability. Lastly, Near was included and resulted in R value of 1.00 and an R^2 of 1.00; thus, Near explained a .043 (or 4.3 percent) increase in variability, the smallest increase of all variables.

Examining the standardized coefficients, or beta, of each model independently displays how many standard deviations the dependent variable would change as a result of a change in the independent variable by one standard deviation (s.d.), while holding the other independent variables constant. In Model 1, the standardized coefficient (i.e., beta) of Iconic was .72, meaning that an increase in Iconic by 1.0 s.d., while all other independent variables remained the same, would result in an increase to the EVIL DONE vulnerability score 0.72 s.d. In the final model, Model 7, when all independent variables were included, Iconic and Exposed had the greatest impact on the variation of the EVIL DONE vulnerability score, yielding an increase of .432 s.d. and .404 s.d. in the EVIL DONE vulnerability score from an increase of 1.0 s.d. for each independent variable. An increase in Legitimacy by 1.0 s.d. resulted in an increase of .382 s.d. in the EVIL DONE vulnerability score, followed by Occupied, Vital, Destructible and Near, which caused an

increase of .380, .310, .288, and .219 s.d. respectively. Therefore, considering that the initial two variables in the models were Iconic and Occupied, and the strength of the beta values of Iconic and Exposed in the final model, when all independent variables were considered, the null hypothesis is retained.

Summary

The main goal of this chapter was to present and interpret the results of each research question and their hypotheses. First, descriptive statistics of key variables were examined, including frequencies of the type of attack, target type, year of attack, and attacks per country. Second, Pearson correlations between dependent and independent variables were examined to address to Research Question 1. Next, multiple regression analyses were conducted using a backward stepwise and frontward stepwise model to address Research Questions 2 and 3, respectively.

An examination of the descriptive statistics reveals that a large majority of the terrorist attacks examined were bombings/explosions, accounting for over 65 percent of all attacks examined in this. The other six types of terrorist attacks accounted for 35 percent collectively. The two primary target types were government affiliations, accounting for over 21 percent, and private citizens/property, accounting for nearly 19 percent. The other ten types of terrorist targets accounted for 60 percent collectively. The large majority of the terrorist attacks examined in this study occurred between 2001 and 2013, accounting for nearly 70 percent. Only a small percentage of terrorist attacks examined occurred prior to 2000. The frequency of terrorist attacks by country revealed that four countries were represented in the study 10 or more times, including Russia,

United States, Algeria, and Colombia. The additional 61 terrorist attacks occurred in 20 different countries. The measures of central tendencies revealed the normal nature of the some variables and skewed results for others. Exposed, Vital, and Iconic all resulted in low median values of 0.00 or 1.00. Legitimate, Near, and Occupied resulted in medians of 2.0, 2.0, and 3.0, respectively. Destructible resulted in the highest median value of 4 and second lowest standard deviation among all the EVIL DONE components. The numbers of fatalities, injured persons, and consequently, the combined number of fatalities and injured persons resulting from a terrorist attack, were all highly skewed based on the large range between the minimum and maximum values. For example, for the combined number of fatalities and injured persons, the minimum was 0 and the maximum was 8,800, with a median of 70.00. Thus, the nature of these variables was highly skewed.

Despite the findings that there is no significant correlation between the EVIL DONE vulnerability score and the number of fatalities and injured persons, four vital correlations were discovered. First, the correlation found that Iconic is strongly related to the legitimacy of a target, yielding a correlation coefficient of .614, p=.00. These findings are credible based on the definitions found in the EVIL DONE vulnerability scoring criteria. The criteria for Iconic and Legitimate ranks political affiliations as the highest possible standard and allocate a score of 5 to each (i.e., Iconic scores "major political symbol" as a 5, and Legitimate scores "houses military personnel or politicians" as a 5) (Boba, 2009). Thus, the correlation between the two is conceivable. More importantly, however, the correlation between the vulnerability score and the individual factors of

EVIL DONE indicated that three EVIL DONE factors are strongly correlated to the EVIL DONE vulnerability score, including Occupied (correlation coefficient of .703, p=.00), Exposed (correlation coefficient of .715, p=.00), and Iconic (correlation coefficient of .720, p=.00). The findings suggest that the correlation between each of these factors represents a strong linear relationship in that if a target or location scores high in any of these three factors, the EVIL DONE vulnerability score is likely to rise in a similar manner.

The multiple regression analysis found that the destructibility of a location/target was the greatest predictor of the number of fatalities and injured persons resulting from a terrorist attack, with an R value of .200 and an R^2 of .04. This was the last factor remaining in the backward stepwise regression, signifying that the elimination of Destructible would have yielded the largest impact on the predictability of the number of fatalities and injured persons. Additionally, the multiple regression analysis found that Iconic was the greatest predictor to the overall vulnerability score, with an R value of .720 and an R^2 of .519. This was the first factor included in the forward stepwise regression, signifying that the inclusion of Iconic in the model yielded the greatest impact on the predictability of the EVIL DONE vulnerability score.

A discussion of the above findings as well as the implication of such results will be presented in the final chapter. Additionally, the limitations of this study and recommendations for future research based on these limitations will be discussed.

CHAPTER 5: DISCUSSION, LIMITATIONS, CONCLUSIONS, AND IMPLICATIONS

Discussion of the Findings

Despite multiple issues, there are three that have predominately hindered the ability to successfully reduce opportunities for terrorist attacks. Historically, the responsibility of the initial impediment has fallen on government officials and political parties whose endeavors have been ineffectively and inappropriately focused on eliminating terrorists rather than altering the physical environment to reduce the opportunities for attack.

Secondly, and consequential of the first hindrance, the capabilities of situational crime prevention and opportunity reduction in this area of study have yet to be recognized or exploited to their full potential. Developed around the key theoretical foundations of environmental criminology, SCP takes great consideration for each of the components of a criminal act. The two-step process of identifying and eliminating opportunities via SCP techniques has yet to be fully implemented due to the misplaced efforts focused around the motivated offender rather than the suitable target.

Lastly, postulating that the first two obstacles were removed, the final hindrance rests in the methodology for identifying the suitable targets (i.e., opportunities) mentioned in the two-step process. The nationwide efforts of the United States Department of Homeland Security to collect methodologies for identifying locations

vulnerable to terrorist attack illuminated the evident need for a vulnerability assessment whose methodology is easily understood, applicable, and affordable by local authorities. The methodologies that currently exist lack some, if not all, of the essential characteristics for a useful vulnerability assessment. However, each of these aforementioned issues limiting the successful reduction of opportunities for terrorist attacks has the potential to be eradicated via the EVIL DONE vulnerability assessment.

The EVIL DONE vulnerability assessment was developed around the same theoretical foundations as SCP and opportunity reduction; thus, the focus is placed upon the suitable target/location which increases the applicability of the assessment at the local level. Local authorities are better able to assess the locations and targets within their jurisdiction rather than futilely focusing on motivated offenders which is an insurmountable task. The EVIL DONE methodology embraces each essential characteristic of a useful vulnerability assessment in that it is easily understood, easily applicable to a preponderance of locations, and a very affordable method for identifying highly vulnerable targets in need of opportunity reduction and SCP efforts.

Reflecting on the literature of SCP and terrorism, this study examined the relationships between the EVIL DONE vulnerability assessment and the aftermath of historical terrorist attacks. This was the first academic endeavor aimed at applying the EVIL DONE methodology to real life locations/targets and terrorist events. The study first examined the relationships between each EVIL DONE factor and the consequences of terrorist attacks, measured by the number of fatalities and injured persons. Succeeding the examination of correlations, subsequent multiple regression analyses examined the

relationships between individual EVIL DONE factors, the overall vulnerability score, and the number of fatalities and injured persons. The discussion of the study will begin with an interpretation of these relationships and emphasize its scholarly contributions. Finally, the limitations of the current study and consequential implications for future research will be addressed.

Pearson Correlation Discussion

The findings of the Pearson correlations express multiple relationships among the components of EVIL DONE and the selected dependent variables. The results suggest that the destructibility of a location is weakly and negatively related to the number of fatalities and injured persons. This negative relationship conflicts with the literature which suggests that targets that require large amounts of inaccessible weapons to destroy them are less attractive to terrorists due to the perceived increased efforts and reduced rewards of the attack. Therefore, the relationship between the two variables was not in the expected direction. This finding may be the result of the power of the weaponry required to successfully attack an easily/highly destructible location versus the power of the weaponry required to successfully attack a less destructible/more durable location.

According to the EVIL DONE criteria, the weapons required to destroy highly destructible locations include IED's or small conventional weapons, which have a very narrow range of destruction (Boba, 2009). Small conventional weapons include guns and other small arms (Clarke & Newman, 2006). The range of destruction or span for these weapons is very narrow in comparison to heavy conventional weapons, or other unconventional devices that have historically been used as armaments, such as aircrafts.

Thus, when a target requires minimal weaponry to destroy (i.e., scores high on the Destructibility scale), the result may be fewer fatalities and injured persons due to the limited range of the weaponry. Alternatively, when a target requires heavy weaponry to destroy (i.e., scores low on the Destructibility scale), the range of demolition and devastation is much greater, and consequently, results in more fatalities and injured persons given the greater strength of the weapon.

Exposed held a statistically significant relationship with both the number of fatalities and the number of injured persons, independently. The consistency of these findings independent of one another suggests that the rate of exposure of a target influences the outcome of the terrorist attack in terms of the number of people affected. The literature supports this finding by emphasizing the importance of required effort in finding an opportunity for crime. The larger and/or more Exposed a location is, the easier it may be to identify and target for a terrorist attack.

However, the relationship is weak showing that an increase in the exposure score would only feebly influence the rise in the number of fatalities and injured persons. Additionally, Exposed was also found to be correlated with Iconic and Occupied, both of which held moderate relationships. Thus, locations that are highly Exposed also tend to house large amounts of people and hold strong Iconic values. This combination of factors has been observed in locations like the Twin Towers in New York City, New York, which were highly Exposed, housed thousands of people, and were nationally iconic due to the economic and political powers encompassed in the business building.

Iconic held a significant relationship with the number of injured persons. While the strength of this relationship was weak, the combination of destructibility, exposure, and iconicity create a consistent pattern in the number of fatalities and/or injured persons. Thus, while the findings only represent a weak relationship, the trend suggests that locations or targets that encompass these three factors may result in a greater number of harmed persons. Conversely, the strength of the relationship suggests that no factor, or combination thereof, considerably increases the number of harmed persons in a strong linear pattern.

Additional findings of the Pearson correlation suggest significant relationships between the EVIL DONE vulnerability score and certain factors, which concurrently address Research Question 1 of the study. The findings show that Legitimates hold a positive moderate correlation and Occupied, Exposed, and Iconic hold strong positive correlations to the EVIL DONE vulnerability score. Destructible holds a moderate negative relationship to the EVIL DONE vulnerability score. Reflecting back on the historical terrorist attacks occurring around the world and more specifically, around the United States, many locations that were targeted for a terrorist attack emulated these exact characteristics.

For example, as part of the 2001 terrorist attack, the Pentagon was targeted in Arlington, Virginia. For reasons previously discussed, the durability of the structure required the terrorists to utilize a much stronger powered weapon in order to penetrate and building and successfully attack the location. Thus, small conventional weapons or IED's, though more easily accessible, would not have been sufficient to fulfill the needs

of the terrorists. Therefore, the low destructibility score prompted the unconventional use of an aircraft to destroy the target. Despite the Pentagon's durable construction, literature on the Pentagon attack proclaims that "no building could have absorbed the energy of such a crash without suffering structural damage, and if occupied, casualties" (Goldberg, Papadopoulous, Putney, Berlage, & Welch, 2007, p.20). The portion of the building that suffered the initial blow, referred to as Wedge 1, occupied 3,800 workers, with over 20,000 occupants in the entire building (Goldberg et al., 2007). The exposure of the target was evident based on the sheer size and location of the building, with over 17 miles of corridors and covering a spread of nearly 29 square acres of land (Goldberg, 1992). The legitimacy of the Pentagon is apparent given its political affiliations and responsibilities. Lastly, the Pentagon's Iconic value was unsurpassed as it earned the nickname "one of the wonders of the modern world," and became a major symbol of America's strength and power (Goldberg, 1992). Thus, the components of EVIL DONE that were found to be correlated to the vulnerability score are further exemplified in this example as well as many other historical terrorist targets and attacks.

Equally as important as the identification of strong correlations within the study are the relationships that do not exist. The results suggest that Vital, Legitimate, and Near are not strong predictors of the EVIL DONE vulnerability score. The absence of a relationship between Vital and the vulnerability score may be supported by advances in technology that can diminish the amount of time required to repair damages caused by terrorist attacks on Vital sites. Thus, the interruption and consequential impact of the impairment on Vital targets is tapered, and the effect on society is reduced. Therefore, the

vitality of a target may not significantly increase its attractiveness to terrorist, thus creating no effect on its vulnerability to attack.

The absence of a relationship between Legitimate and the vulnerability score may be a result of the vast number of targets that could potentially be considered Legitimate in the eyes of a terrorist organization and/or terrorist supporters. Considering the importance of the legitimacy of a target, as described by Boba (2009), terrorists seek to avoid moral condemnation and to achieve positive support and reaction for their behaviors. Reflecting back to the 9/11 attacks, targeting civilian workers led to one of the largest national bouts of terror in history. Thus, while military personnel or politicians are considered more legitimate targets than civilians, the implications of targeting civilians has historically resulted in equally devastating and provoking consequences.

Lastly, the absence of a relationship between Near and the vulnerability score may also be the result of advances in technology which make transportation between countries much less problematic than in previous eras. Figuratively, the distance between countries is shrinking as developments in technology allow for communication, travel, and transportation to move more fluently. Boba (2009) states that the value of ease of travel to the target is an important criterion for the Near factor. Moreover, aircrafts reduce the efforts required to reach distant targets, and increases in population have warranted the mass development of major transportation hubs globally. Thus, the ease of travel is expanding, limiting the number of targets that remain distant or inaccessible.

In summary, despite the many correlations found among the variables in this study, most of the relationships were statistically weak, yielding correlation coefficients

of +/- .4 or less. These findings are not as expected considering that each location included in the study had previously been the target of a terrorist attack. Additionally, not only was each location a previous target, but the criteria for each EVIL DONE component was established and defined with consideration of the other components; therefore, it was expected that the components would hold stronger relationships. The findings refuting the hypothesis that the EVIL DONE vulnerability score is a reflection of the number of fatalities and injured persons suggest possible limitations in the operationalization of the study, which will be addressed in a later discussion.

Conclusively, the scholarly contributions of the Pearson correlation emphasize that Iconic and Exposed are the strongest correlated variables to the EVIL DONE vulnerability score, whereas Destructible is the strongest correlated variable to the number of fatalities and injured persons resulting from a terrorist attack, however the relationship was not in the expected direction.

Multiple Regression Analyses Discussion

The second and third analyses focused on the predictive value of the individual components of EVIL DONE. The examination utilized two different forms of analyses. The second analysis tested the predictive value of the components of EVIL DONE against the number of fatalities and injured persons resulting from a terrorist attack. This analysis was conducted by testing the independent variables' explanatory values against the variability of the dependent variable – the number of fatalities and injured persons. The third analysis tested the predictive value of the components of EVIL DONE against the EVIL DONE vulnerability score. This analysis was also conducted by testing the

independent variables' explanatory values against the variability of the dependent variable – the EVIL DONE vulnerability score.

Research Question 2 sought to determine the relationships between the components of EVIL DONE and the number of fatalities and injured persons. For the second analysis, a backward stepwise multiple regression, statistically significant results were not found until Model 7, where all variables, except Destructible, were removed. The lack of statistical significance in these results was not expected. The findings suggest that no combination of EVIL DONE factors can significantly predict the number of fatalities or injured persons, except for Destructible, independently. Similar to the absence of a relationship found in the correlation, the lack of relationship between the EVIL DONE vulnerability score and the number of fatalities and injured persons in the multiple regression analysis may be a reflection of poor selection of the dependent variable in a reactive approach. The operationalization of the dependent variable will be addressed in the limitations discussion.

Nevertheless, the analysis suggested that Destructible was the independent variable that yielded the greatest explanatory value in the variation of the number of fatalities or injured persons, as expressed in Model 7. Following Destructible, Occupied had the second greatest explanatory value in the variability of the number of fatalities and injured persons, but failed to reach a statistical significance at the .05 level. However, despite the statistical significance of the findings, the results render logical connotations. In order for a large amount of people to be harmed, the location or target must house a large amount of people (similar to the small market versus sporting arena example given

in Chapter 4). For reasons previously discussed, less destructible locations result in a greater number of fatalities and injured persons due to the strength of the weaponry required to destroy the target/location.

Contrary to the most predictive factors, the two factors that were the least predictive of the number of harmed persons were Iconic and Legitimate. Again, the consistency of the findings in consideration of the Pearson correlations suggests reliability in the testing. In both the multiple regression analysis and correlation, legitimacy was found to have very little influence on the number of persons harmed. Reflecting back to the literature, the reasons behind these findings may be a result of the vast number of targets that could potentially be considered legitimate in the eyes of a terrorist organization and/or terrorist supporters.

For similar reasons, targeting a specific nation may denote a symbolic attack, regardless of the Iconic value of the specific location. In other words, the mere attack on a nations' people may reflect a strong enough iconic connotation that the symbolic value of the actual location or building is trivial. Conclusively, the scholarly contributions of the second analysis offer that a location that is easily destructible may result in a greater number of fatalities and injured persons, followed by a location that is highly occupied. Additionally, Iconic and Legitimate values of a location do not affect the outcome of terrorist attacks in terms of the number of fatalities and injured persons.

Research Question 3 sought to determine the relationships between the components of EVIL DONE and the EVIL DONE vulnerability score. For the third analysis, a frontward stepwise multiple regression, Iconic yielded the greatest

predictability of the EVIL DONE vulnerability score in the initial model. Surprisingly, this finding suggested that once all of the variables were considered and included in the analysis, Iconic and Exposed generated the greatest explanatory value, followed by Legitimate and Occupied. The strength of predictability for Iconic may be a reflection of similarities in two of the EVIL DONE components: Iconic and Legitimate. Iconic scores "major political symbols" as the highest possible rank, and Legitimate scores "houses military personnel or politicians" as the highest possible rank. Consequently, the two factors are moderately correlated; thus, an increase in one factor results in an increase in the other. Because of this relationship, locations that are considered Iconic or Legitimate typically score relatively high for both factors, resulting in a higher EVIL DONE vulnerability score.

The strength of the Exposed component, when all other components were considered, suggests that larger, more Exposed structures result in higher overall vulnerability scores. Again, similar to the correlation between Iconic and Legitimate, Exposed and Occupied are also moderately correlated to one another. Logically, the larger the building or structure, the more people it will house. Thus, the moderate relationship between Exposed and Occupied, and consequently, their relationship to the EVIL DONE vulnerably score, is a logical result.

The two factors which least explained variations in the EVIL DONE vulnerability score were Destructible and Near. Reflecting back to the literature and scoring criteria for these variables, the findings may be due to variation and increased power of improvised explosive devices (IEDs). Historically, IEDs have been used to execute a variety of

attacks, all varying in the extent of the effects. For example, in the 2013 Boston Marathon bombings in Boston, Massachusetts, domestic terrorists constructed IEDs using household pressure cookers filled with hardware, such as nails and ball bearings. This simply constructed device detonated on a sidewalk and sent sharp pieces of metal flying through the air causing wounds and amputations to hundreds of people. Likewise, Timothy McVeigh used an IED to target the Alfred P. Murrah Federal Building in the 1995 Oklahoma City bombing, causing half the building to collapse.

Thus, because the capabilities of IEDs vary greatly, they can be used on diverse targets (e.g., large crowds versus federal buildings), and a majority of locations are destructible with this choice of weaponry. Furthermore, reflecting back on the descriptive statistics of the sample, 65 percent of the terrorist attacks in this study were bombings/explosions, and the mean Destructible score was the highest among all EVIL DONE variables (3.84) with the second lowest standard deviation. Accordingly, a majority of the locations were targeted using explosive devices and resulted in a higher destructibility score than any other EVIL DONE component. Thus, because the variation in scoring for the Destructible factor was low and scores were repetitively high, the lack of explanatory value for the Destructible factor on the variation of the overall vulnerability score is fathomable.

An interesting finding thus far is the consistency between analyses. First off, there is great consistency relating to the Near factor. Both the correlation and multiple regression analysis deemed Near as one of the least predictive and least explanatory components of EVIL DONE on the EVIL DONE vulnerability score as well as the

number of fatalities and injured persons. The lack of explanatory value of Near may reflect justifications similar to those addressed in the correlation discussion in that technological advances have made transportation between countries much less problematic than in previous eras; thus, the location of the target and its nearness to a terrorist's abode is not as pivotal as once believed.

An additional consistency in the findings is the ability of Occupied to explain the variability of both the EVIL DONE vulnerability score and the number of fatalities and injured persons. In both the forward and backward stepwise multiple regression analysis, Occupied was the second best explanatory variable for the respective dependent variable. In other words, Occupied explained more of the variance in the vulnerability score and in the fatalities and injured persons than any other EVIL DONE component, barring Iconic for the former and Destructible for the latter.

Lastly, in both the correlation and multiple regression analysis, Iconic was found to be the strongest predictor of the EVIL DONE vulnerability score. However, it was also found to be the second worst predictor of the number of fatalities and injured persons. These findings may be the result of an increase in two factors – Iconic and Legitimate – as a result of highly analogous scoring criteria that causes the vulnerability score to be doubly increased. Consequently, the enhanced increase in the vulnerability score does not accurately reflect an increase in the number of fatalities and injured persons. An additional explanation for this finding may be that an attack on an Iconic target may denote a strong enough impairment on a nation's strength and unity that the number of people injured is extraneous. In other words, though terrorist seek to inflict great harm in

order to force their motivations, an attack on an Iconic target may be symbolic enough that there does not necessarily have to be any harmed persons. Conclusively, the third analysis suggests that the Iconic value of a location most accurately predicts the EVIL DONE vulnerability score, followed by Exposed. Additionally, the Destructible and Near values of a location do not affect EVIL DONE vulnerability score.

In all, the study concludes that Iconic, Exposed, and Occupied are the strongest predictors of the EVIL DONE vulnerability score. Concurrently, Destructible and Occupied are the strongest predictors of the number of fatalities and injured persons resulting from a terrorist attack. However, despite these conclusions, the analyses and conclusions in the present study have limitations which should be considered. Consideration of the abovementioned findings as well as the limitations of the study establishes the basis for recommendations of future research on this topic.

Limitations

In discussing the results of the research, it is important to address a number of limitations that were presented throughout this study. Some of the findings from this research did not sustain expectations. For example, the absence of relationships between the EVIL DONE vulnerability score and the number of fatalities and injured persons was not an expected outcome. One reason for the lack of significant relationships was the way in which the dependent variable was operationalized. The operationalization of a variable is the process of developing a measurement for a concept, or in this case, an event that cannot be directly measured (Babbie, 2010). In other words, the outcome of historical terrorist attacks was operationalized (i.e., measured) solely by the number of fatalities or

injuries resulting from the event. Using this value as the only factor for measuring the outcome of a terrorist attack may not be the most effective means of measuring the success of terrorists' efforts or the consequences of attacks on vulnerable targets.

Another limitation of this research study is the inclusion of terrorist attacks targeted predominantly at transportation systems, such as passenger trains, planes, ferries, and police convoys in route to various destinations. Fourteen of the 111 attacks in the study, nearly 13 percent, were inflicted on these types of targets. Because the EVIL DONE vulnerability assessment was designed to identify permanent locations in a community that are the most vulnerable to attack, rather than locations that are temporarily vulnerable given their short-term uses, the EVIL DONE vulnerability score that the transportation systems received was not a true reflection of their vulnerability at the time of the attack.

For example, an attack on an en route ferry boat in the Philippines that resulted in 44 fatalities and 50 injured persons received a vulnerability score of 11. The target yielded a relatively low vulnerability score because it failed to meet the minimum criteria for certain EVIL DONE components, such as Exposed. The minimum criterion for Exposed is a "cluster of buildings in an urban area" (Boba, 2009, p.10). Despite the fact that the ferry is a large identifiable object respective to the surrounding areas, the target is not a permanent structure/building; therefore, the Exposed score was a zero.

A comparable example is the attack on the U.S Navy guided-missile destroyer, U.S.S Cole, which occurred in Yemen in 2000 and resulted in 17 fatalities and 85 injured

persons. The size of the vessel was comparable to a large identifiable structure; however, given the temporary location of the vessel, the Exposure score was a zero.

The methodology for scoring the vulnerability of each terrorist attack in this study also created a limitation. Two criteria of the Near index were excluded from the analyses due to deficiencies in the data sources. Of the five criteria for the Near factor, two were not considered in the scoring process: close to known/suspected terrorist base and close to domestic immigrant community. Based on the information provided via the main data source and supplemental data sources, sparse findings regarding the location of known/suspected terrorist bases and domestic immigrant communities would have resulted in inconsistent scoring of the Near factor.

An additional struggle in collecting data on the indexes is the role of the researcher as opposed to a government agent. Identifying known or suspected terrorist bases may require government intelligence and information that is not readily available to the general public or an academic researcher. As a government agent, information on suspected terrorists may be more accessible and applicable for the EVIL DONE vulnerability assessment. The capabilities of a government agent versus an academic researcher highlights a major difference in the ease of data collection relevant to the excluded indexes of the EVIL DONE vulnerability assessment. Furthermore, because of the age of some events, this information was not available through additional inquiries.

Likewise, Easy was excluded from the vulnerability score for similar reasons of unknown and/or unreported information regarding the specific criteria of this factor from the selected data sources. For example, parking near the building and/or unrestricted

parking is difficult to accurately measure from a remote location. Moreover, the other factors, such as the adequacy of security personnel on duty and the number and adequacy of security cameras and monitoring systems are not reported in the Global Terrorism Database, nor are they typically reported to the public. However, this is not a weakness of EVIL DONE but rather a deficiency in the data that were used. Due to the possible discrepancies and inability to collect data on each attack for these criteria, the exclusion of such items was warranted.

Although the exclusion of Easy from the analysis was warranted based on the lack of available data, this may have limited the results which could explain the weakness in the models. All of the components of EVIL DONE are based on situational crime prevention in some way. However, the Easy component is somewhat different than the others as it addresses highly specific characteristics about a target and real-time characteristics that are particularly relevant to the immediate situation of the attack (i.e., dynamic characteristics). The items of Easy include public access to the building, parking near the building, unsecured entry points, inadequate security personnel, and inadequate security monitoring. The other seven components address more general and static characteristics, for example, the height and presence of the building, its proximity to other important locations, and how many people the location generally occupies (versus how many people there on the day of the attack). Thus, it might have been that inclusion of Easy, if the data had been available, may have significantly contributed to the analysis and increased the strength of the models because the data was the most specific and dealt with the dynamic opportunities presented at each location.

Moreover, the conductor of the research creates another viable limitation of this study. As a graduate student, the researcher had minimal expertise on terrorism prior to the commencement of this thesis. The lack of expertise may have disseminated throughout the coding process as the student researcher was the sole party responsible for coding all the terrorist events examined in the study. Collaborating with other researchers, possibly those with terrorism backgrounds and knowledge, may have increased the validity and reliability of the coding process. However, to reduce the flaws caused by this limitation, the researcher applied the EVIL DONE vulnerability assessment as objectively and impartially as possible, given the data available.

Another limitation of the study is the sample size. This study examined exactly 111 terrorist attacks which was the minimum number of cases recommended for the statistical analyses (Green, 1991). This is a limitation because using the minimum number of cases results in lesser power, making it difficult to see small effects (Salkind, 2011). However, the study did find some fundamental relationships between the EVIL DONE factors and the selected dependent variables that future research can build upon.

The final, and arguably most important, limitation of this study is the timing of application. The objective of the EVIL DONE vulnerability assessment is to analyze the vulnerability of targets long before a specific threat or attack occurs (Boba, 2009). By design, the methodology is a proactive approach to identifying which targets are the most vulnerable to attack, and consequently, which targets are in the greatest need of terrorism opportunity reduction. Opposing the initial timing intentions of the assessment, this study applied the EVIL DONE methodology in a reactive manner to locations that were

already targets of terrorist attacks. Granted, for research purposes, it is unrealistic to assess locations that have not been targeted and await the next terrorist attack in order to examine the value of EVIL DONE. Therefore, applying the EVIL DONE vulnerability assessment in a reactive manner was the only viable technique for testing the methodology. When applied proactively, and at the local, rather than international level, the components of EVIL DONE that were excluded from this study could be more easily measured and incorporated.

Future Research

The current study sought to evaluate the EVIL DONE vulnerability assessment in order to determine if the methodology produces a vulnerability score that is consistent with the number of fatalities and injured persons resulting from a terrorist attack. Additionally, the study sought to determine how strongly each component of EVIL DONE predicts the number of fatalities and injured persons in specific terrorist attacks. Cogitating on the above-mentioned limitations, this research provides the foundation and suggestions for future examinations of this topic.

First, future researchers ought to consider the limitation of the operationalization of the dependent variable and attempt to develop a better measurement for the outcome of terrorist attacks. How do terrorist attacks on highly Iconic targets with few fatalities reflect the true outcome as a result of their vulnerability? Perhaps the number of people injured or killed in such attacks is not the best method of assessing the true result of high vulnerability.

Considering that extensive research seeking the application of vulnerability assessments yielded inconclusive results and that this was the first study that applied EVIL DONE to real life targets, alternative proposals for measurements were not available. Nevertheless, it was ideal for this study to measure the outcome of terrorist attacks by the number of fatalities and injured persons because of the data available. The primary data source for the terrorist incidents, the Global Terrorist Database, included these numbers for all attacks. Bearing in mind that loss of human life is considered the most detrimental consequence of a terrorist attack, using these variables as the sole measure for the outcome of attacks on vulnerable targets was warranted. However, future research utilizing an alternative dependent variable may contribute to additional findings on this topic.

Second, future research should consider the limitation of coding transportation systems methodically and instead rank these locations using the best judgment for each EVIL DONE component that is not directly applicable. The failure of these locations to meet the minimum criteria for certain components highlights opportunities for research improvements. Boba (2009) suggests that when certain attributes of a target are not covered by the criteria provided in the vulnerability assessment, logical and thoughtful choices should be applied since the criteria is a general method for assessing vulnerability rather than a meticulous formula. However, as the first endeavor to test EVIL DONE, it was ideal for this study to apply the vulnerability assessment methodically (or as near to a formula as possible) in order to determine its true value. Therefore, future research

should consider these suggestions and score transportations systems in a less meticulous manner.

Third, this study examined a set of terrorist attacks with no specific focus on certain attributes. The terrorist attacks occurred in 24 countries and included targets ranging from civilian children to military officials and attack types ranging from bombings/explosions to assassinations. Narrowing the events by specific locations, such as attacks solely in the United States, specific targets, such as attacks solely on transportation systems, or even on specific types, such as attacks solely using IEDs, may reveal more significant patterns. Thus, future research should seek to examine terrorist attacks by category or specific attributes in hopes of reaching more specific findings.

Fourth, future research could use alternative statistical analyses to examine these data. For example, factor analysis is a commonly used statistical method for identifying the relationship between certain measureable variables and a number of unobservable factors (Tryfos, 1998). More specifically, it determines "the general dimensions or factors that exist within a set of concrete observations" (Babbie, 2010, p. 491). This type of analysis may reveal relationships among the EVIL DONE components that differ from those that were found in the examination of the third research question in this study.

Fifth, the data examined could be improved upon in future research. That is, cases considered extreme or "outliers" could be eliminated from the analyses. As discussed in Chapter 4, the mean of the dependent variable (i.e., number of injured persons and fatalities) was highly skewed because of one or two cases (e.g., 9/11 had 2,722 fatalities where the average was 47.99). Conducting the analysis on more normally

distributed data would ensure that the data more closely adhere to the assumptions of the statistics used and might result in more meaningful results. Also, a larger sample size could be used for the analysis. This study examined only 111 terrorist attacks, and the use of a greater sample size may assist in discovering relationships that were not evident through the fewer cases examined here.

Lastly, future research should consider the design of the EVIL DONE vulnerability assessment and the importance of timing. Applying the assessment reactively and at the international level resulted in numerous limitations, including the exclusions of key EVIL DONE components. Additionally, because the vulnerability assessment was applied after terrorist attacks had already occurred, the internal validity of the findings may be low. Therefore, future research should seek to apply the methodology at a local level and assess the vulnerability of locations proactively in order to bring about more pertinent results.

Conclusions and Implications for Terrorism Opportunity Reduction

Terrorism prevention has slowly become a primary concern to not only the federal government, but also to local police departments who seek to protect their communities from devastating terrorist attacks. Alongside the expanding interest in terrorism prevention, financial constraints have forced local authorities to allocate funding efficiently based on the cost-benefit analyses of certain tasks and programs. Thus, at a time where terrorism prevention and financial hardships are evident, adopting affordable methodologies that assist in effectively reducing the opportunities for terrorism is essential. The current research suggests that EVIL DONE vulnerability assessment is an

effective methodology for assisting local police in identifying which locations are the most vulnerable to terrorist attack. By identifying these targets, limited resources can be more effectively applied to reduce the opportunities through techniques of situational crime prevention.

Considering the results of this study, local authorities should focus opportunity reduction efforts on locations that are Destructible and Occupied. The findings conclude that these components of EVIL DONE are the most related to the number of fatalities and injured persons. Building on these results, local authorities should seek to reduce opportunities of a terrorist attack at the locations that are less destructible and house large amounts of people for a majority of the day and days of the week by increasing perceived efforts and risks and reducing perceived rewards, as suggested by SCP. Additionally, a proactive solution may be to discourage the construction of large buildings that house many people and hold media-attractive names, as these locations typically comprise many components of a vulnerable target.

Despite the recommendations provided by the results of the analyses, it is important to note that research on the EVIL DONE vulnerability assessment is in the very early stages, with this study being the first academic manuscript to test its validity. Thus, a more long-term implication of this study is that future analyses of EVIL DONE should seek to expand the research findings, test the internal and external validity of the assessment, and postulate future policy recommendations.

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