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Ethical Decision-Making in Construction Engineering Projects

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2018

Abstract

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by

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Bridge Design Academy (construction), State of California, 2000

MSCE, University of Southern California, 1997

MSCE, University of Alexandria, 1982

BSCE, University of Alexandria, 1978

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Engineering Management

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Abstract

Problems exist with ethical decision-making in U.S. construction engineering projects. The purpose of this study was to explore factors that affect ethical decision-making in engineering construction in the United States. The general concepts of marketing ethics, Kohlberg's discussion of ethical and moral reasoning development, and Gillian's discussion of ethical care served as the basis of the conceptual framework. Factors that inhibit ethical decision making were addressed in the research questions. The resulting narrative framework included implementable initiatives based on these factors that could improve the quality of ethical decision-making and the impact of these initiatives on the cost and quality of construction engineering projects. The use of qualitative grounded theory design led to findings from the research questions and enabled the development of a theory to explain the phenomenon. The research was based on data collected from interviews with a purposive sample of 12 civil engineers with 15 to 45 years of forensic and managerial experience with construction engineering projects. The constant comparative method was used to analyze the data. The principal finding from the research was that unethical decision-making in the legal and political systems undermines the image and authority of construction engineers in the United States. The findings of the study may cause social change by indicating how to enhance the ethical behavior of individuals involved in decision-making within the U.S. construction engineering industry, leading to improvements in the cost and quality of construction projects that benefit individual stakeholders as well as society.

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Dedication

The success that I have achieved in my academic and professional journey throughout my career as a licensed civil engineer and educator in America and on international level would have been impossible without the support of my parents and family who instilled in me the importance of education and self-confidence since childhood, and to think big like a think tank, and out of the box when making decisions and setting goals in life. I am grateful to God's support always for giving me the health and perseverance to reach this level of accomplishments and the doctoral degree safely while overcoming obstacles and difficulties.

Acknowledgments

I am grateful beyond words to Walden University, its higher management, faculty, and staff for their unwavering standing to support the social change goal that I undertook in most difficult industries while synthesizing three interdisciplinary study involving construction engineering, politics, and the legal system. Walden encourages and creates independent researchers ready to implement social change to benefit the world. Facing persistent challenge by all asking me to write the observed events in a book instead of academic paper has caused me to actually write the book while pursuing my doctoral study. It was not easy though, but unexpectedly, I became a published author of Sidaross (2013), titled, *Positive Social Change? Check this journey*... I like it.

Dr. Levasseur, Committee Chair, has been my guide in this dissertation journey, taught me how to be objective. Dr. Banner, Committee member, provided valuable scholarly guidance. Dr. McCollum, URR Proposal Reviewer, demonstrated his Six Sigma knowledge in expediting his reply with effective review. Dr. Barclay, URR Dissertation Reviewer, provided thorough review that enhanced focused areas. Dr. Kolberg, Program Director, with wise management style and effective role with students. Dr. Endres, first Program Director, I cannot forget his strong support for a woman engineer.

My special thanks go to the American Society of Civil Engineers (ASCE) Region 9 Governor At-Large, Kenneth H. Rosenfield, PE, F.ASCE, Env SP, and to the Gayle Stewart Association Planet for the professional design of the ad, as in Appendix D, created and published to the entire membership of engineers in California, which reached other states as well. Engineers replied overnight. This was a big favor that I appreciate and will return when I can. My great thanks go to Dr. Riedel, CAO, for constant support.

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Chapter 1: Introduction to the Study

The focus of this study was on ethical decision-making in construction engineering projects in the United States. A qualitative grounded theory approach enabled development of an explanation of the effect of the legal and political systems, and other factors, on ethical decision-making. The findings from this research may help achieve social change in this complex field by raising the level of ethical decision-making in the industry.

Raising the level of ethical decision-making would align with the construction engineering industry's stipulation that construction engineers should follow a shared code of behavior for conducting themselves in every facet of the business, while managing for cost and quality (ASCE, 2015). The code of behavior would also improve the competitiveness of U.S. construction firms, as competing with businesses worldwide requires a managerial focus and assurance of high-quality products while maintaining low cost (Juran, 1995).

At present, there is very little empirical academic research available regarding how ethical decision-making impacts the engineering industry (Ekici & Onsel, 2013; Kessler, 2011). As to why this is so, Ekici and Onsel (2013) expressed the view based on their research that participants in their study hid real life information out of fear. Some engineers may feel concerns about their jobs if they express their views on issues such as corruption and unequal treatment of women and unequal pay, professional training, legal representation, and other matters (AAUW, 2015; Dainty, Bagilhole, & Neale, 2010; Del Medico, 2003).

The following sections of this chapter consist of an examination of the elements of the proposed research study. This includes the topic selected, purpose of the study, and a brief review of literature pertinent to the study. The chapter contains a description of the conceptual framework for the research, the research questions, research method, and an explication of the definitions, assumptions, limitations, delimitations, and the significance of the study.

Background of the Study

While Ekici and Onsel (2013) asserted that even though negative impact of the legal and political involvement in businesses influences the ethical behavior of firms (EBOF), little academic research existed that clarified their role (p. 273). Adnan, Hashim, Yusuwan, and Ahmad (2012) noted compelling reasons for the occurrence of unethical acts that professionals and management pursue. They emphasized causes such as education programs lacking moral and proper instructions, laws not being adequately and justifiably enforced, differences in culture and philosophy, social and economic problems, a construction industry full of corruption and bribery, and "high profile public sector projects...muddied by problems" (p. 721). Findings of research studies, from the work of Juran (1989) to the contemporary academic research by Ekici and Onsel (2013), serve as evidence that the same concern has been expressed for decades.

The goal for this research study was to address the gap due to the lack of empirical academic research available about ethical decision-making in the construction engineering industry. When hiring newly graduated engineers, engineering employers have expressed concerns about the weakness of educational programs, leaking of

engineering license exams, and misleading exam questions that have all led to lower quality of knowledge of engineering students (Schwinger, 2011). This phenomenon may cause deficiencies in the design performance and calculation and result in the collapse of bridges or structures and cause fatality of citizens (Big Dig, 2009). Once deficiencies are discovered, construction must be halted for engineers to redo or correct the design. When this occurs, the contactors charge fines that cause an increase in the cost of the project (NTSB, 2009).

Regardless of the resultant delay, such necessary stoppages, although they would result in high economic losses, would prevent the failure of structures and deaths to the public that might occur when large projects such as bridges and public structures would collapse. Many cases like these have ended up in lengthy litigations, with contractors demanding fines that were paid from the government funds that the American public had to pay for triggering investigations (Derbeken, 2014; DeSaulnier, 2014). Economic problems like these in America can affect the worldwide economy and its stability (Frankel, 2007; Juran, 1989, 1995).

A national survey conducted in 280 local governments led to the discovery of massive legal corruption, illegal corruption, and bribery (Cross, 2015). Cross, a political writer and a professor of journalism, asserted that legal corruption was currently increasing in the United States (para 15). Illegal and legal corruption extends to injustice against female engineers in the engineering industry concerning unequal pay, less training on the job, and unfair grading at the academic level (AAUW, 2013; Del Medico, 2003).

The literature and research findings described above indicated the need for the specialized research that this study entailed. Conducting the research led to important insights into ethical decision-making in. U.S. construction projects. These findings have the potential to instigate positive social change in the quality of engineering management in the modern era.

Problem Statement

Unethical decision-making can have serious effects on the quality, cost, and safety of construction engineering projects (Adnan et al., 2012). Adnan et al. (2012) noted that unethical decision-making takes several forms, such as negligence in performance, bias/unjust behavior, conflict of interest by legal involvement, fraud, and bribery, among others. The general business problem, as Ekici and Onsel (2013) asserted, was that unethical construction engineering decision-making persists despite clear evidence of its potential negative consequences. The specific business problem was that little empirical evidence exists regarding the factors that affect ethical decision-making in U.S. construction engineering projects.

Purpose of the Study

The purpose of this qualitative, grounded theory study was to identify the factors that affect ethical decision-making in construction engineering projects in the United States. Interviews with a purposive sample of 12 civil engineers with 15 to 45 years of experience at the managerial level with construction engineering projects provided data for the study. This study has the potential to instigate positive-social-change by offering insights to engineers and managers regarding ethical decision-making when dealing with

stakeholders, and ameliorate/reorganize the legal and political systems and their processes. This study might also result in improving the quality and lowering the cost of U.S. construction engineering projects, and in contributing empirical research findings to the literature on ethical decision-making in the United States.

Research Questions

The following three research questions guided the exploration of what causes the problem, what could be done to mitigate the effects of the problem, and how these changes might impact society. The goal for this research was to create and formulate a theory based on the data collected from literature and participants based on these research questions:

RQ1. What factors affect ethical decision-making in U.S. construction engineering projects?

RQ2. What initiatives based on these factors could be implemented to improve the quality of ethical decision-making in U.S. construction engineering projects?

RQ3. What would be the impact of these initiatives on the cost and quality of U.S. construction engineering projects?

Conceptual Framework

The basis for the conceptual framework of this study was Ekici and Onsel's (2013) research directly targeting the effect of the legal and political systems on the ethical behavior of firms, in which the authors found that no research had been produced to "clarify [the legal and political systems] role" (p. 27) within firms. Ho (2011) and

Juran (1989, 1995), who traced the phenomenon and supported contemporary engineers, confirmed this phenomenon. The following sections include a description of the concept and theories within the framework as related to this study, which focuses on understanding the unethical decision-making in construction engineering in the United States.

The General Theory of Marketing Ethics

Ekici and Onsel (2013) noted several conceptual models that defined factors affecting ethical decision-making in firms and among management. The general theory of marketing ethics is one such tested theory. This theoretical model was initiated by Hunt and Vitell (Vermillion, Lassar, & Winsor, 2002) as a general model and framework for ethical decision-making and behavior in marketing. This theory, along with the seminal theories of ethics of Lawrence Kohlberg and Carol Gilligan, served as the conceptual framework for the study.

Kohlberg's Ethical Theory: Moral Reasoning Development

Inspired by Piaget's work on childhood development, Kohlberg based the theory of moral development on "Socrates, Jean Piaget and John Dewey" (Barry & Ohland, 2009, p. 383). As Kohlberg's theory stems from his study using all-male participants, it was not generalizable to both genders, so Gilligan established the theory of ethics of care based on female only participants (Barry & Ohland, 2009; CSUN, 2006). The instrument that Kohlberg used to measure moral reasoning is named the Moral Judgment Interview (MJI) and is a "qualitative, structural, phenomenological method of analysis" (Barry & Ohland, 2009, p. 383).

The general theory of marketing ethics, Kohlberg's ethical theory of moral reasoning development, and Gilligan's theory of ethics of care, adapted to fit the proposed study, served as the conceptual framework for this study. The theories were viewed in the conceptual framework as related to the research questions that are: First, investigating factors affecting ethical decision-making in construction engineering projects. Second, suggesting initiatives based on these factors to implement in order to improve the quality of ethical decision-making in construction engineering projects. Third, the achievement or the impact of these initiatives on the cost of construction engineering projects.

Conceptual Framework as Related to the Research Questions

The conceptual framework lens includes elements/factors affecting the quality of ethical decision-making in engineering projects, within both the construction engineering industry and the legal/political system. The chief factor is the impact of the political and legal environments on the engineering industry's services and products. This impact is shown in the engineering industry's personnel, especially female engineers, who have lost trust in the legal system (Dainty et al., 2010).

Adnan et al. (2012) emphasized reasons for the unethical acts of professionals and management, including educational programs lacking ethical instructions, laws not being adequately and fairly enforced, differences in culture, and economic problems, saying that "[projects in the] high profile public sector are muddied by problems" (p. 721). Adnan et al. suggested initiatives they claimed would improve project quality, reduce costs, and improve the ethical decision-making of managers and engineers.

Nature of the Study

The focus for this research study was on finding factors affecting the phenomenon of ethical decision-making in the construction industry, such as legal, economic, and social systems, and developing an explanation of how they collectively affect ethical decision-making. Hunt and Vitell (2006) suggested that future researchers should focus on legal and political systems in their research (as cited by Ekici & Onsel, 2013, p. 274). Similarly, Ekici and Onsel (2013) stated that even though negative impacts of the legal and political systems are expected to affect ethical decision-making within management, there has been little academic research on the topic (p. 273). I addressed this gap in understanding by focusing on the effect of the legal and political systems, and other pertinent factors, on ethical decision-making in construction engineering projects.

This focus for this study was on the collection of subjective information, which is used when a researcher investigates a phenomenon that cannot be well quantified or measured adequately (Denzin & Lincoln, 1994). Qualitative methods enable the collection of answers to questions and the discovery of evidence seeking to understand the community, events, or particular situations under research (as in ethical decision-making in construction engineering projects in this research study). The application of qualitative methods involves focusing on the natural settings of phenomena and drawing interpretations based on participants' opinions and perceptions.

The goal was to learn about participants actual experience related to the phenomena of interest (Denzin & Lincoln, 1994; Patton, 2002). Charmaz (2006) asserted that theorizing involves stopping, asking questions, rethinking, seeing potentials, and

making a connection. Then coding and categorizing to enhance the validity of the grounded theory developed to explain the event or experience under research (pp. 135-136). According to Bryant and Charmaz (2010), the grounded theory method has been used to a great extent in many disciplines that consider qualitative research (p. 1, para 2). Grounded theory methodology was utilized in this study.

Definitions

For purpose of operational measures and working definitions as related to this research study:

American Society of Civil Engineers (ASCE): Is an engineering entity that adopts Code of Ethics and Policy as guidance to engineers when making a decision (Appendix A). Ethical engineering requires engineers to maintain the safety and welfare of the public, advise if the project is unsafe or unsuccessful, uphold the integrity of engineering profession with zero tolerance for corruption, support continuous education, and attend seminars and professional meeting and present research papers to disseminate their findings (ASCE, 1996-2015a).

Board of Engineers (BoE): A legislative and government body created in 1929 with mission and vision to protect the public's safety and property, and promote the ethical engineering, gender equality, and professionalism in engineering practice and licensing (CA.Gov, 2012).

Contractor: This refers to either an individual or organization that enters into a financial arrangement with another business entity for the purpose of construction. This function might include constructing a bridge, a building, or an automated system, among

many others. According to the Merriam-Webster Dictionary, a contractor is, “a person who is hired to perform work or to provide goods at a certain price or within a certain time” (Contractor, 2015). There are different kinds of contractors, including general and independent, but this research study is primarily concerned with general contractors.

Engineers' Union: An engineering corporation Professional Engineers in California Government (PECG) is a non-profit organization established in 1963 to represent state engineers as a bargaining representative (PECG, 2015a). It represents 17 sections in the state with 13,000 members' engineers and related professionals who perform design and inspection for the state infrastructures and issue permits for the state right of way (PECG, 2015a). The Union comprises an executive board, a president, a legal firm that manages the union. The Engineers’ Union is deeply involved in such matters and has an influence on the BoE, legislators, politics, and courts (PECG, 2015b).

Ethical decision-making: Ethics is defined as a universal guideline upon which all social conduct depends (Beder, 1995). According to engineering code of ethics, engineers are required to consider public interest over self-interest and business interest (ABET, 1977).

Feminist theory as related to engineering field: Feminism and gender are significant human aspects in the engineering construction industry, as it is a male dominated field. For this research study, female engineers are considered as equals to men engineers, as the ethical behavior and professional civil rights of all parties are of primary concern in the success of companies and the quality of products. To date, female engineers comprise a small percentage of the engineers in the construction engineering

industry (Del Medico, 2003). Moreover, the AAUW (2013) reported the existence of a pay gap between men and women engineers that may persist for another 124 years until women achieve parity.

Forensic Engineering: Civil engineers who focus on studying and researching failures and damages of structures; some forensic engineers can act as expert witnesses in court (Columbia University, 2012). Merriam-Webster Dictionary (2015) defined *forensic* as "the art or study of argumentative discourse," "relating to or dealing with the application of scientific knowledge to legal problems," and "relating to…a court of law."

Reflexivity: Refers to the researcher's study, inquiry, analysis, and interpretation of the research data and findings so that the reader may see the reflection of the researcher and his/her involvement, assumptions, and influence in the study (Charmaz, 2006, p. 188).

The Caught.net website: This is a collaborative Internet site, set up to perpetuate itself, updated regularly, that examines the quality of management and ethics in the legal and judicial systems. Editors are aggrieved citizens. Its role is to expose injustice, educate the public, improve the legal system (Caught.net, 2015b).

The River Project: The River Project is an empty flood-control channel to protect the entire Southern California region during the raining season, "The Rio Hondo River is part of a river system responsible for draining much of L.A. County's watershed" (Your Parks, 2015).

US Chamber of Commerce: An entity for business and economic arena along with the Institute for Legal Reform that hosted a Legal Summit for the past 15 years to explore

and discuss the status of the legal reform. They noted that "The American civil justice system is the costliest in the world" and fosters "often meritless lawsuits" that need change (U.S. Chamber Institute for Legal Reform, 2014).

Utilitarian Theory: This theory describes a pattern of behavior based on human nature as described by the British philosopher Jeremy Bentham. He wrote that people are predisposed to seek the greatest good for the greatest number and that people are also inclined to avoid pain in the pursuit of pleasure (Bentham & Mill, 2003, p. 92). In the business world, this concept has been interpreted in a variety of ways; for this study, it refers to a tendency to avoid unpleasant situations and outcomes, regardless of the possible consequences.

Assumptions

Due to the nature of the construction industry, with its high level of political involvement, and despite assurances that all interview responses would be private and carefully protected, some subjects proved less willing to speak freely, mainly female engineers. More experienced participants, such as engineers, contractors, legal personnel, and politicians are very conservative. Nevertheless, it was assumed that such participants provided honest answers to the interview questions. The interviews conducted were with male and female civil engineers from around the United States with high levels of experience (i.e., between 15 to 45 years). Male engineers were all willing to share readily their experiences and conflicts that they face, but female engineers collectively were conservative and declined to participate for the most part. The three female engineers

who participated had either retired or recently quit their engineering position and were upset.

Another assumption was that because I am a professional licensed civil engineer and a woman, bias was to be expected, but was not willfully intended. Great effort was made to remain aware of and minimize the effects of potential bias. This bias, if it exists, would appear in the design, analysis, and result stages. Addressing the bias issue, there was no negative outcome as my experience in engineering construction was equal to that of the participants, and I established a good rapport and understanding with each participant, resulting in very informative discussions and the collection of valuable data. At the request of participants, the interviews lasted from 2 to 3 hours, instead the 1 hour specified in the interview protocol. At first, I asked only the main research questions, and I listened to and recorded each participant's answers. Later, I asked deeper, more probing questions to understand each participant's feelings and critical incidents related to ethical decision making and social change.

Scope and Delimitations

Delimitations are defined as choices that researchers make to set boundaries for the study (Simon, 2011). The delimitations process results in narrowing the scope of the framework of the study. Selection of participants for the interviews and surveys was restricted to 20 U.S. civil engineers with more than 5 years of experience at the managerial level. This level of engineers possesses practice and expertise in structural design, construction, and forensic skills.

Engineers with forensic experience get the chance to act as expert witnesses in courts. The choice of participants for interviews involved consideration of their locations, the demographics of the engineering population, and the need to achieve data saturation before completing the interviews. Participants consisted of male and female engineers. Interviews were conducted in person via telephone to ensure the comfort of the participants. Participants from legal and political communities were not be included to keep the scope of the research manageable in the time permitted by the IRB for dissertation research.

Limitations

Limitations are conditions, influences, and situations that are out of control of the researcher. They may affect, restrict, and control research data, analysis, and findings (Simon, 2011). One potentially problematic built-in limitation was the extent to which research participants might feel reluctant to be open about the subject of ethics in decision-making. Hiding information can be a particularly troublesome issue, given the negative consequences that may result from unethical behavior in a construction project, particularly one in which public funding is a major factor. Despite assurances that all interview responses were to be private and carefully protected, it was still quite likely that subjects, particularly older, more experienced engineers. may prove less willing to talk freely (Dainty et al., 2010).

Significance of the Study

This study has the potential to significantly impact many facets of society. The impact could be not only on the construction engineering industry, but also on

professional practice in the engineering and legal professions, the academic disciplines of engineering and law, the quality and ethics of the management of the legal/political systems, and human and gender interaction in the engineering and legal professions. There is a considerable research gap in this area of construction engineering. The observed gap comes about because politicians have an interest in construction engineering projects and may obstruct social change (Juran, 1995, p. 578)., They often have an interest in staying out of the public eye when they levy pressure behind the scene on engineers (Piller, 2014). I examined and conceptualized the interplay among those categories by gathering empirical data.

Significance to Practice

To effect social change related to the practice of construction engineering in the United States, the focus for this study was on determining how engineering standards, legal systems, political systems, management and administrative systems, and other factors, as explicated by the participants in the study, impact ethical decision-making on construction engineering projects. The findings suggest the ways in which illustrates how to improve the practice of civil engineering based on the information provided by participants.

Significance to Theory

The primary focus of this study was on the development and discovery of factors affecting ethical decision-making in U.S. engineering construction projects to serve as the basis for development of a theory. Discovering a theory is an inductive process where the theory induced/generated from the data collected should be checked against the data

again to verify the theory is grounded in the data (Charmaz, 2006). There is very little empirical academic research available regarding how ethical decision-making affects the engineering industry (Ekici & Onsel, 2013; Kessler, 2011). By leading to the discovery of a set of factors of ethical decision-making in the U.S. construction industry upon which a theory could be developed, this study could make a significant contribution to theoretical knowledge in this area of research.

Significance to Social Change

The focus for the study was the development of greater understanding of ethical decision-making in U.S. construction engineering projects as related to political, legal, and managerial processes that have a direct impact on engineering construction projects, and indirectly on engineers, the economy, and others working in the industry, such as the citizens who use the structures created as a result of these projects. Improvements in ethical decision-making resulting from the application of the findings of this study thus have the potential to impact social change significantly.

Summary and Transition

Chapter 1 contains an overview of the rationale for this qualitative research study, using the grounded theory methodology, which guided the research design. The emphasis of this study was on ethical decision-making in construction engineering projects in the United States. Chapter 1 includes the problem statement, purpose of the study, research questions, conceptual framework, background of the study, definitions, scope of delimitations, limitations, assumptions, and significance of the research in practice,

theory, and to social change. I elaborate on this information in Chapter 2 with a detailed examination of the databases used, and an in-depth review of pertinent literature.

Chapter 2: Literature Review

This chapter includes the problem statement, purpose of the study, a summary of the literature search strategy, the conceptual framework of the study, and a review of the classic and current literature relevant to the problem.

Problem Statement

Unethical decision-making can have serious effects on the quality, cost, and safety of construction engineering projects (Adnan et al., 2012). For example, the collapse of a dam in California released 12 billion gallons of water, destroying thousands of houses, washing out bridges, and resulting in loss of lives. Adnan et al. (2012) noted that unethical decision-making takes several forms, such as negligence in performance, bias/unjust behavior, conflict of interest by legal involvement, fraud, and bribery, among others. The general business problem, as Ekici and Onsel (2013) asserted, is unethical decision-making persists despite clear evidence of its negative consequences. The specific-business problem is that little empirical evidence exists regarding the factors that lead to unethical decision-making and how they interrelate to impact ethical decision-making in U.S. construction engineering projects, as well as the effect that ethical decision-making has on the construction engineering industry.

Purpose Statement

The purpose of this study was to identify the factors that affect ethical decision-making in construction engineering projects in the United States. A theory is a set of principles on which the phenomenon or practice based (Charmaz, 2006). Interviews with a purposive sample of 12 civil engineers with 15 to 45 years of experience at the

managerial level with construction engineering projects provided data for the study. This study has the potential to initiate positive-social-change by offering insights to engineers/managers about how to make effective/ethical decisions when dealing with stakeholders, and ameliorate/reorganize the legal and political systems and their processes. This study may also result in improving the quality and lowering the cost of U.S. construction engineering projects, and in contributing empirical research findings to the literature on ethical decision- making in the United States.

Literature Search Strategy

The library research required for the literature review was not without its challenges. This section contains a description of the obstacles encountered and the resulting strategy adopted to discover research relevant to the study.

Obstacles

This research focuses on the engineering construction industry intertwined with the legal/political systems that may affect the ethical decision-making in U.S. construction projects. Most U.S. articles found related to the topic of research were not peer-reviewed. Authors from almost all countries except the United States have published peer-reviewed literature about construction ethics and corruption. Walden Librarians and foreign libraries could *not* find peer-reviewed U.S. articles. This absence of U.S. peer-reviewed literature about corruption in the construction industry and the related legal/political systems constituted a gap in the literature. As a result, an exception was sought and approved by the Walden University Department of Management in Fall 2015

to have the freedom to use nonpeer reviewed literature, and waiving the policy of 85% peer-reviewed articles.

Strategy Adopted in the Search

The iterative search process used in this proposal consisted of single words or a combination of search terms. These terms included: *ethics, codes of ethics, engineering ethics, profession, morality, code of conduct, quality, engineers, forensic construction, decision-making, corruption, legal corruption, legislative institutions*, and *lobbying*. Also used were: *interest group, discipline, voting, legal and legislative, engineering construction ethics, corruption within the legal system and politics, ethical decision making in engineering construction*, and *construction engineering forensic between 2012 and 2015*. Recently used terms were: *corruption in construction engineering in the USA* (no dates), *corruption in construction in USA 2014,* and *corruption in ethical decision-making in the USA from 2012 to 2016.*

Many other search terms, discovered from the materials/articles identified from the searches conducted, were also used. They include peer-reviewed materials along with other credible non-peer reviewed materials that constitute gaps missing in research academic papers, mainly in relation to corruption in the legal and political systems in the United States of America. In March/April 2016, I asked for help with the literature search at Walden University Library and foreign libraries, locally and abroad, to locate peer-reviewed U.S. articles for the keywords *ethical decision-making corruption in the United States,* but they found nothing.

Conceptual Framework

The basis for the conceptual framework that grounded this study was Ekici and Onsel's (2013) research directly targeting the effect of the legal and political systems on the ethical behavior of firms, which found that no research had been produced to "clarify [the legal and political systems] role" (p. 27) within firms. The phenomenon of the effect of the legal and political system on firms was also confirmed by Ho (2011), who addressed the difficulty in the construction industry and factors affecting ethical decision-making with an eye on the conflict and the need to maintain the quality of management in a cost-effective manner (p. 533).

Theorist engineer Juran (1989, 1995) traced the phenomenon of quality and found that deficiencies in leading for quality and decision-making have increased and thus harmed American culture. Juran noted that the reason for this harm was that the legal and political issues dominated the system in America, contrary to other countries. Juran recommended immediate changes. This supported earlier work by Medina (1967), a judge, was also supported by contemporary engineers, who adopted his theory of change, stating that the government and legal system "have to put [their] own house in order" (p. vii). Other researchers asserted that the construction engineering industry was full of corruption, fraud, and bribery caused by unethical decision-making that takes several forms, such as negligence in performance, bias/unjust behavior, and conflict of interest by legal involvement (Adnan et al., 2012).

This study has the potential to instigate positive-social-change by offering insights to engineers and managers to make effective ethical decisions when dealing with

stakeholders, and ameliorate/reorganize the legal and political systems and their processes. This study may also result in improving the quality and lowering the cost of U.S. construction engineering projects, and in contributing empirical research findings to the literature on ethical decision-making in the United States.

The General Theory of Marketing Ethics

All these seminal theorists, in effect, suggested that future researchers should study and understand the effect of the legal and political systems, and other factors, on the ethical decision-making of management, which was the focus of this proposed research study. Ekici and Onsel (2013) noted several conceptual models (p. 273) that defined those factors. The general theory of marketing ethics is one such tested theory that suggests some factors that influence ethical decisions of managers. This model was initiated by Hunt and Vitell in (Vermillion, Lassar, & Winsor, 2002) as a general model and framework for ethical decision-making and behavior in marketing.

The framework of marketing ethics theory illustrates the concept that the theory was founded not only on economic benefits but also on morals and values. The implication of morals and values is demonstrated by engineers' ethical behavior in the bridge construction project of the Bay Area (Derbeken, 2014; Piller, 2014). Such factors are: (a) “cultural environment (e.g., religion, legal system, and political system),” (b) “general business environment (professional, industry, and organizational),” and (c) “personal characteristics of the decision maker” (p. 273). I used the marketing theory because Ekici and Onsel (2013) used it. The theory deals with several conceptual models that include decision making, such as culture and business environment and personal

characteristics of decision makers. This theory, along with the seminal theorists of ethics, Kohlberg and Gilligan, served as the conceptual framework for the study.

Kohlberg's Ethical Theory: Moral Reasoning Development

Inspired by Piaget's work on childhood development, Kohlberg based the theory of moral development on "Socrates, Jean Piaget and John Dewey" (Barry & Ohland, 2009, p. 383). Kohlberg's theory of moral development focused on adult development, using only men as subjects. Kohlberg's study was followed by Carol Gilligan's theory of ethics of care, which focused on the moral development of women. Gilligan accused Kohlberg's research of gender bias that cannot be generalized to women (Barry & Ohland, 2009; CSUN, 2006). Kohlberg specified his theory in form of six stages and three levels with consecutive stages, and explained that the moral reasoning is not something to be learned, but rather it is constructed and developed from ideas and observations shared by participants about their interaction with the environment (Barry & Ohland, 2009).

Barry and Ohland (2009) asserted that in professions such as engineering, business, health, and law, the study of applied ethics should be mandatory before students begin to practice professionally. Barry and Ohland applied Kohlberg's theories in their research. They concurred with several engineering-ethics authors, such as Whitbeck (1998), Herkert (2002), and Fleddermann (2008), arguing that each profession acquires unique qualities or characteristics that are reflected in its ethical codes and moral rules. Barry and Ohland stated that the first code of ethics adopted in the United States was in 1911 by the American Institute of Consulting Engineers. Their studies, based on

Kohlberg's theory and applying the “stages of moral reasoning" (p. 383) considered several characteristics such as age, gender, culture, religion, and education (Kohlberg, 1981, as cited in Barry & Ohland, 2009), similar to the framework of marketing ethics theory.

The instrument that Kohlberg used as assessment tools to measure moral reasoning is named the Moral Judgment Interview (MJI) and is a "qualitative, structural, phenomenological method of analysis" (Barry & Ohland, 2009, p. 383). The MJI consists of three questions that participants read and answer, followed by nine or 12 probing questions to ask participants the reasons for their answers. Kohlberg focused his assessment on justifying the reasoning of participants' answers in lieu of evaluating the responses as to whether they are correct. Through the years, researchers found that the MJI is a “valid and reliable assessment of moral reasoning" (Colby & Kohlberg 1987; Kohlberg, 1981, as cited in Barry & Ohland, 2009, p. 383).

Conceptual Framework as Related to the Research Questions

The conceptual framework includes elements/factors that affect the quality of ethical decision-making in engineering projects, within both the construction engineering industry and the legal/political system. In the following sections, I describe the framework by functions. The framework covers the factors affecting ethical decision-making, the initiatives, and the impact of these initiatives on the cost of the engineering projects.

Legal and Political System

The chief factor in ethical decision-making is the impact of political and legal environments on the engineering industry's services and products (Ho, 2011; Juran, 1989, 1995). Engineering industry personnel, especially female engineers, have lost trust in the legal system (Dainty et al., 2010), which could affect participants' responses in the interviews. Adnan et al. (2012) emphasized reasons for the unethical acts professionals and management pursue, including educational programs lacking ethical instructions, laws not being adequately and fairly enforced, differences in culture, economic problems, and "[projects in the] high profile public sector are muddied by problems" (p. 721). Whitfield (2012) noted that 250 legal cases were filed in 1960 for construction disputes, and that 30 years later the number of legal cases filed had increased by five times.

Kessler (2011) conducted research on how the courts deal with the forensic cases of construction engineering and found that judges have limited knowledge about forensic information and computer technology. As noted in several facets earlier, process, justice, and quality of management in courts are not managed adequately nor justly. Caught.net (2015, para 2) noted, "We want to live with justice, not spend our lives pursuing it." A case in point is that of Lilly Ledbetter (2011), who worked in a supervisory position in a male dominated field, and was paid 3/4 of the salary of her counterparts' male supervisors for 20 years of her employment.

When Ledbetter attempted to get justice, she got the run around in all level of courts, and lost her income as well. Caught.net concluded regarding such cases, "We are no longer a country of laws, we are a country where laws are creatively interpreted!"

(para 31). This notion coincides with Huffer's (2011) assertion of the phenomenon of legal abuse syndrome and switching facts inside the court during the hearing process, she noted “you get in with an apple…they try to convince you it is an orange by the end of the court hearing” (Huffer, 2008, 2011).

The Committee for the Rule of Law (n.d.) as a legal reform group in California reported the following quote: “The law is so inconsistently applied that the Chief Justice of California has publicly said: You'd have a hard time telling the wheat from the chaff when reviewing Court of Appeal decisions" (para 3). The above form the conceptual framework lens' observation for the legal system.

Engineers in the U.S. are “grappling with ethical dilemmas” (Beder, 1995, para 2) and lack of respect that caused disruption of projects, budget overruns, delayed schedules, and incompetence (Derbeken, 2014; Piller 2014). Vaughan and Buss (1998) stressed the importance of helping practitioners to think more critically in order for them to understand policy analysis and close the gap that exists between “analysts in academe and decision makers” and “analysts in government” (p. x). The engineering industry has been advancing and creating a great deal of technology and innovation, but literature shows that the industry is still facing problems and is held back by political and legal involvement in its affairs (Juran, 1989, 1995).

Brunn (2011) noted that ethics in the government workplace suffers when government-employed engineers are under duress and coerced to violate the ethics and expose the public to danger for hidden reasons. Murray and Meghji (2008) called this phenomenon “the abuse of public office for private gain” (p. 7). Cross (2015) also

commented on legal corruption for gain by political activities. Singh and Rathore (2012), in their article on engineering and politics, stated that “many non-engineers and attorneys at the top” (p. 128), although they were experts in leadership, public policy, communication, and political aspects, were unsuccessful. Singh and Rathore (2012) criticized engineers for their lack of global leadership skills to lead nations, describing their impression as engineers "'dance' to attorneys" (para7), and stated that “engineers without political knowledge are like machine parts without lubrication” (para 4), which undermines the image of engineers in society.

Without causing social change in the current legal system, the engineering industry may not be able to advance or protect the economy (Juran, 1995), public safety (Huffer, 2011), and women engineers (AAUW, 2014) in the engineering industry. The focus for this study was trying to understand the phenomenon, critically analyze and interpret data related to it, and discover factors that would enable the development of a new theory with new perspective to cause social change.

The Role of Education

In general, the ethical framework is influenced by the code of canon of civil engineering as shown in Appendix A. The ethical engineering code requires engineers to maintain safety and welfare of the public, advise if the project is unsafe or unsuccessful, uphold the integrity of engineering profession with zero tolerance to corruption, maintain continuous education, and attend seminars and professional meeting and present research papers (ASCE, 1996-2015). Schwinger (2008) noted the lack of education for recent engineers in comparison to earlier ones and wondered what the cause could be. Adnan et

al. (2011) noted that educational programs were lacking courses on ethics, and that laws were not enforced adequately or fairly.

The Role of Business and Board of Engineers (BoE)

In the business practice arena, the U.S. Chamber of commerce and the Institute for Legal Reform, which has hosted a Legal Summit for the past 15 years to explore and discuss the status of the legal reform, said, "The American civil justice system is the costliest in the world" and fosters "often meritless lawsuits" (U.S. Chamber Institute for Legal Reform, 2014). Unfortunately, this situation has affected engineers' status and ethical decision-making, particularly in light of the lack of enforcement of the BoE canons, as demonstrated in Piller 's (2014) article.

Piller (2014) noted that a non-engineer who humiliated and opposed engineers when they complained about defective construction work done by the contractor managed the construction of a new bridge. In addition to the threat posed by this unsafe structure to the public, the project is in litigation, which will negatively affect the economy, costing the public future losses and higher taxes (Piller, 2014). Frankel (2007) asserted that competitors have achieved major success over America’s engineering construction work habit in that they “build major infrastructure in less than half the time and at less than half the cost as we do" (para 13). Frankel advised that there is an urgent need to improve U.S. education, develop and train new generation of engineers, and produce strong infrastructure; otherwise, “America's economic future may well be in danger" (para 12)..

The Role of Professional Ethics in Construction Industry

Vee and Skitmore (2003) demonstrated factors of unethical conducts, breaches of public obligation, breaches of environmental ethics, and breaches of environmental ethics, as well as the negligence, bribery, fraud, dishonesty and unfairness, and altering construction documents, as shown below From Vee and Skitmore:

- Unethical conduct in the industry,
    - Developers (fraud, dishonest and unfair practices),
    - Product suppliers (bribery),
    - Government bodies (dishonest and unfair practices).
    - Engineers (negligence)
    - Unions (dishonest and unfair practices).
    - Impact of political ethics (State & Federal) on the Construction Industry
    - Lack of ethics in government organizations
- Breaches of public obligation, including:
    - Contamination of the soil
    - Degradation of vegetation
    - Soil erosion
    - Inadequate perimeter fencing on construction sites
    - Careless execution of demolition and construction
    - Storage of construction waste products offsite
    - Inadequate protection for public from debris
    - The prioritization of obligations to the client or public is clearly a difficult

task for professionals.

- Breaches of environmental ethics:
    - Builders failure to stop erosion and acid sulphate leeching during construction
    - Unsolicited clearing of vegetation
    - Illegal dumping of building debris (pp. 7-11)

The literature shows that the legal and political systems in the United States impact individuals, education, the construction engineering industry, the environment, and the ethics of management decision-making.

Literature Review

The focus of this literature review is on factors affecting ethical decision-making and the quality of engineering projects in the construction industry in the United States. As all researchers must build on the work of pioneering ancestors, this study is built on the work of pioneers and seminal theorists from two major fields—engineering and legal—such as engineer Juran (1995), engineers Ekici and Olsen (2013), and Medina (1967), a judge, who are all contributors to social change. All information included in this dissertation is for the purpose of academic studies, gaining insight into the factors that affect the phenomenon of ethical decision-making in U.S. construction projects, and sharing the study findings to foster social change per the mission and vision of the university. The literature review consists of an exploration of the work of relevant theorists and researchers, like Juran, Ekici and Olsen, and Medina.

The important theorist/engineer Juran (1989) traced the phenomenon of quality and found that deficiencies in leading for quality and decision-making had increased and harmed the American culture. In his follow-up seminal work, he noted that the reason for the deficiencies was that legal and political issues dominated the system in America, contrary to other countries (Juran, 1995). He recommended immediate changes. More than a decade later, Ekici and Olsen (2013) recommended the same changes after conducting their research directly targeting the effect of the legal and political systems on the ethical behavior of firms. They found that no academic research had been produced to "clarify [the legal and political systems] role" (p. 273). Their research encapsulates the focus of this dissertation research.

Ho (2011), who addressed construction industry uniqueness and noted forces behind the scenes that have been influencing ethical decision-making and responses of participants in the academic survey process, also confirmed this phenomenon. Ho focused on the conflict and the need to maintain the quality of management in a cost-effective manner (p. 533). The California Bay-Area bridge has developed cracks and is in the litigation process due to lack of quality in management and unethical decision-making by legal personnel overruling engineers in doing their job properly. This lack-of-quality management—due to a misrepresentation of the profession—affects the economy and safety of citizens who carry the consequences for generations (Derbeken, 2014; DeSaulnier, 2014; Piller, 2014).

The profession of civil engineering and its engineers are guided by engineering and legislative entities that provide codes and policy about engineers' role, ethics, and

litigations as they arise in the construction industry. These entities include the BoE, ASCE, The Union, and U.S. Chamber of Commerce. ASCE adopts "Code of Ethics and Policy" as guidance to engineers when making their decision (Appendix A). Ethical engineering requires engineers to maintain the safety and welfare of the public, advise if the project is unsafe or unsuccessful, uphold the integrity of engineering profession with zero tolerance for corruption, support continuous education, and attend seminars and professional meeting and present research papers to disseminate their findings (ASCE, 1996-2015a).

Likewise, BoE adopts its mission and vision that that contains a promise to protect the public's safety and property and promote the ethical engineering, gender equality, and professionalism in engineering practice and licensing (CA.Gov, 2012). The Union adopts a bylaw and bargaining role to represent state engineers (PECG, 2015a). Moreover, the U.S. Chamber of Commerce supports small business owners and responds to their business and economic concerns. And, ASCE adopts its canon and laws (detailed in Appendix A) and acknowledges that most litigations are lengthy and expensive in the United States, and sometimes the engineering construction experiences frivolous lawsuits (ASCE, 1996-2015, b)

As Brunn (2011) noted, ethics in the government workplace suffers while putting government-employed engineers under duress and coercing them to violate the ethics and expose the public to danger for hidden reasons. Murray and Meghji (2008) called this phenomenon “the abuse of public office for private gain” (p. 7). Cross (2015) commented on legal corruption for gain by political activities. As demonstrated above, seminal

theorists, contemporary researchers, and victims of actual projects have suggested that future researchers should study the effect of the legal and political system, and other factors, on managers' and engineers' ethical decision-making.

Ways Researchers Approached the Problem Academically

Researchers can approach academic research in several ways, by using quantitative, qualitative, or mixed-methods. The scope of this research study cannot be quantified, so a qualitative grounded theory methodology by Charmaz (2006) was selected. The qualitative method is based on exploring and gaining a deeper understanding of human behavior, emotions, beliefs, ethical decision-making, and researchers experiences in the engineering construction industry.

The first step in the process was to conduct an academic review of the historical and current literature, then surveying and interviewing selected participants from the population under research and collecting data based on lived experiences. These data, in turn, were compared, analyzed, coded, and synthesized to discover patterns and identify the factors that affect ethical decision-making in the U.S. construction industry. Below, I synthesized collected literature on theories and articles to show how researchers have approached the ethical decision-making in engineering construction industry, what major factors have most influence on the discipline and the industry, and what social change approach they have considered.

Structural engineering quality in design, inspection, and decision-making are very crucial for the safety of structures and the public. This concept is incorporated in the undergraduate engineering education that engineers learn. Schwinger (2008) described

how he established in-house quality assurance (QA) program for structural engineering firms to counteract the decline in education that has occurred in undergraduate engineering during the past couple of decades. Schwinger indicated that putting quality assurance into practice would benefit a firm, its employees, and its clients. He noted that QA did not exist before 1990, when companies relied on the experience and skills of a senior engineer who offered engineers, structural designers, and drafters the technical guidance needed.

The individual expert's notion was the norm until now in forensic construction engineering-- that is engineering and legal intertwined. In engineering, expert witness system relies on the individual engineers' expertise without specific engineering curriculum. In the court, the legal representation relies on individual attorneys' expertise without checks and balances. In the court hearing, justice depends on exchange papers and the decision/ruling rests on hand of judges on what [papers] submitted to them by attorneys while judges rely on the individual attorney's expertise and decision whether it is fair or prejudiced or personal reasons exists behind it.

On the other hand, judges lack the computer and internet knowledge per the research conducted by Kessler. Kessler (2011) investigated this scenario to inquire about the quality of education and knowledge of judges, and found a lack of concern and education among the judicial community. Thus, as demonstrated in this section of how researchers approached the problem academically, the ethics and quality of information are compromised by both engineering and legal/judicial industries regarding the forensic construction quality of knowledge and decision-making/rulings. The research design

starts with the qualitative methodology that is the best fit for this dual-industry study, engineering and legal.

Methodology Consistent with the Scope of Study

Qualitative grounded theory methodology (Charmaz, 2006) was used in this study to conduct surveys and interview civil engineers participating in the study. The focus for this study was to develop a theory to help engineers and managers make more efficient and ethical decisions in the face of political and economic upheavals (Juran 1989, p. 2). This is necessary to achieve high standards of competition with countries that are free of legal deficiencies while keeping quality high and costs low in construction engineering projects. This study has the potential to instigate positive social change in the quality of engineering management in the modern era.

The central concept of this research study dealt with dual variables interconnected—engineering and legal. The engineering construction industry was examined as it pertains to ethical decision-making and quality of management in the field of engineering. Similarly, the legal and political systems' quality of management, ethical decision-making, and rulings was considered and examined too in a wider scope. Then both were synthesized. The following three general research questions enabled an in-depth exploration of the phenomenon and guided the scope of analysis within the study:

RQ1. What factors affect ethical decision-making in U.S. construction engineering projects?

RQ2. What initiatives based on these factors could be implemented to improve the quality of ethical decision-making in U.S. construction engineering projects?

RQ3. What would be the impact of these initiatives on the cost and quality of U.S. construction engineering projects?

History of Quality and Ethics in the USA

Native Indian tribes occupied the North American continent until Christopher Columbus' voyage of discovery in 1492. Members of these tribes were farmers, food gatherers, fishermen, and hunters. Some were astronomers and others created high-quality handicrafts (Juran, 1995, p. 553). The colonists of Great Britain, Spain, and France took possession of the North American continent and declared independence in 1776, forming the United States of America (USA). The independence of the colonists resulted in the transition from manufactured goods to industrialization, self-reliance, risk-taking, upholding quality control of products and inspection to meet the quality level customers' needed.

Juran (1995) noted that in the nineteenth century, Frederick W. Taylor gave priority to productivity while sacrificing quality. Juan's "concept was to separate planning from execution" (Juran, 1995, p. 555). After that, quality suffered and managers started to pay attention to improving quality along with production. But during the second half of the twentieth century, challenges in the areas of satisfaction and quality surfaced due to many factors, mainly "the growth of litigation over quality" and "the growth of government regulation of quality" (Juran, 1995, p. 563). This resulted in considerable

damage to the economy due to many product liability lawsuits and deficiencies in the American legal system. These shortcomings in the system arise from the following factors:

- Lay juries lack the technological literacy needed to determine liability on technical matters. In most other developed countries, judges make such decisions.
- Lay juries are too easily swayed emotionally to determine the proper size of awards.
- In the United States, punitive damages may be awarded along with compensatory damages and damages for pain and suffering. Punitive damages sometimes run into many millions of dollars.
- In the United States, lawyers are permitted to work on a contingency-fee basis—an arrangement which significantly stimulates lawsuits. This method is illegal in most countries.
- Only a minority of the award money goes to the injured parties. The majority goes to lawyers and to pay administrative expenses. (Juran, 1995, pp. 577-578)

Juran (1995) stated that the legal system has continued to suffer from major deficiencies that are "deeply rooted in the American culture," and suggested that this has negatively affected society (p. 578). Juran suggested that the system should be changed soon to enable the United States to compete effectively with other countries that are free from the deficiencies that have harmed the American economy. He pointed out that

lawyers, and legislators—who are lawyers as well—opposed the changes because they had an interest in what was a defective system. Juran cited Greek history that demonstrated technology and innovation versus American history, which he viewed as dominated by lawsuits.

History of Quality and Ethics in Greece

Juran (1995) collected a wealth of historical information about the Greek legacy, especially "Quality management in the construction of ancient Greek temples and theaters," (p. 63). "*History* is a Greek word (*historia*); and the Greek historian Herodotus accepted as the Father of History," (p. 64). Ancient Greeks founded the fields of science, mathematics, architecture, figural arts, and technology, and made a significant contribution to human endeavor through the work of Aristotle, Archimedes, Euclid, Democrats, Pythagoras, Hippocrates, and many others. The Greeks were very creative and innovators in the old history.

Greek philosophers, such as Socrates and Plato made history with their unique intelligence and work when they developed all the major fields of philosophy that are used to date "in the areas of the economy, ship construction, agriculture, metal working, and others" (p. 64). This precedent of success and innovation shows the leading role and legacy of the ancient Greeks in reaching a high-quality management system.

The ancient Greeks adopted an "efficient manner" in handling the process of construction; the result was an apparent "high quality achieved in the ancient Greek temples" (Juran, 1995, p. 69). The tools used in maintaining this efficiency among contractors and workers were as follows:

- Promoting and encouraging “personal initiative” (p. 69)
- Creating laws and regulations for construction businesses using a “highly developed litigation system” that states clearly, “the liabilities” that each party in the litigation would hold, taking into consideration “the welfare of the workers” (p. 68)
- Incentives which encouraged contractors to finish work promptly to avoid fines and penalties for delay or “unsatisfactory workmanship”, plus bonuses for good achievement and initiative (p. 70)
- limiting the number of contractors in each job to two to minimize financial losses (p. 70)
- Making efforts to “[reduce] conflicts of opinions on the work site” and avoid opposition and disagreement among workers, thus saving time and money (p. 70)
- Precise training of architects and craftsmen in ancient Greece during which “stonemasons learn their craft through an apprenticeship” is still unknown to Modern Greek (p. 77).

This system originated in the 4th century B.C., which created an environment of striving for excellence and maintaining high levels of quality of work in construction (Juran, 1995, p. 68). The art of successful business and rulings in litigations in the ancient era are worth taught to contemporary students in order to widen their views to recognize the successful change from the failed one as Juran (1989) and Chirot (1994) did.

A Historical Perspective on Change

Chirot (1994) presented sociological thinking and a historical perspective, aiming to broaden students' visions of how societies have changed over the past 5000 years, from pre-agrarian states to agrarian communities and then to industrial societies. He went on to inform his students that many organizations and social institutions have been developed through the years to manage events and occurrences of social problems and inequality, but all have failed to achieve the changes needed. He held that all challenges are repetitive in different forms through the decades, but no compelling or legitimate solution found so far; rather, some social forms have caused social tragedy and ruined communities (Chirot, 1994, p. xiii). He noted that the pace of change was slow until the past 500 years ago, when people started to feel that change and its impact on their lives.

Chirot (1994) also explained how the population tripled during the decades before and after the beginning of the Common Era, or "C.E." He presented patterns in cultural change that began 4700 years ago, when the pyramids in Egypt were built, and lasted until the time of Queen Cleopatra, a Greek descendant female who reigned on Egypt for 21 years, about 2000 years before Chirot's 1994 book.

Chirot (1994) explained that the growth of population was an indication of the rate of social change. Up to the fifth millennia, 5,000 B.C.E., the population tripled over 15,000 years; by the fourth millennia 4,000 B.C.E., when agrarian societies began to develop, there were 5 to 7 million humans. Then the population started to increase even more swiftly to reach about 200 million at the time of Christ, roughly tripling in just 1,500 years. In the twentieth century, the population tripled in less than 100 years. Chirot

(1994) maintained that almost all starvation and other human tragedies were not the results of inadequate provisions but rather of political problems (p. 6).

Chirot (1994) advised that when society decides to create social change, it has to study and analyze several aspects. Some of the aspects, such as new programs, the causes of change, and the consequences that may result must be examined to determine whether they would be beneficial or harmful to the public and the economy. Chirot noted the "social subsystems: economies, political systems, social institutions or organizations, and cultures" (p. 120) if mishandled may negatively impact societies. On the other hand, Chirot asserted that the United States depends heavily on immigrant groups for its scientific and economic progress and development, while influential leaders have controlled politics, and that no changes would be accomplished if a society were still tied to "old orthodoxies" and refused to change (p. 125), instead they wear masks.

The Influence of Masks on Decision Making

Masks are used to articulate feelings, misuse of power and words to intimidate audience, or to project a particular image that the performer wishes the audience to perceive. A performer may be sincere or cynical. A cynical performer may deceive others out of self-interest or for the good of the community (Goffman, 1959, p. 18). Many masks go unrecognized, according to Goffman (1959). The concept of the mask can be generalized to apply on other arenas, as well. In fields as diverse as engineering construction, academia, and court process and rulings, participants often wear several unpredicted masks (Goffman, 1959).

The mask people wear can positively or negatively influence ethical decision-making in almost every place and community. In another setting, Dr. Huffer (2008, 2011) demonstrated how she perceived the mask in actual litigation processes. She witnessed the jury actions, management styles, and decision-making during the court process during the trial of her client's case. To describe the adverse effect on her client as a result of the court process, Dr. Huffer called this mask the "legal abuse syndrome" (Huffer, 2008; Huffer, 2011).

The Engineering Construction Industry

Adnan et al. (2012, p. 719) stated that the engineering industry is "classified as the most fraudulent industry worldwide," due to "bureaucracy and government policy," and other factors, including the substantial capital amount involved in each project, prompting the temptation to engage in unethical behavior. This phenomenon negatively influenced the ethical decision-making of managers and engineers, the quality of products and engineering projects, and the global economy. This phenomenon was demonstrated by Murray and Meghji (2008), who reported that $390 billion is wasted annually on engineering projects claiming, "the abuse of public office for private gain" (p. 7) as the reason.

Engineers' Charter List

The American Society of Civil Engineers (ASCE, 2015) encouraged serious global action against corruption, fraud, and enticement in engineering and construction. ASCE established the "Engineer's Charter" in 2007, for the purpose of "Combatting Corruption in Engineering and Construction." About 234 engineers worldwide signed a

still-open list to form a charter with one voice to dispute corruption in the engineering field. The article included a claim that corruption takes several forms: It destroys the economy; negatively affects businesses and communities; ruins the engineering profession's reputation; and weakens engineers' image in society, which leads to loss of female engineers' civil and professional rights.

The charter clearly states that engineers should comply with professional ethics and conduct and be free of outside influences and politics (ASCE, 2015). Many local and global organizations joined the Charter in its effort and mission; engineers on the list vow to adopt honesty and clarity in dealing with public officials and private owners who should practice transparency in discussions with engineers, including women engineers. It is a surprise that the list was ended for political reasons (Engineer's Charter, 2007). This closure is in line with Juran (1995), who asserted that legal and political systems reject social change aimed at eliminating corruption because they have a vested interest in it. Arguably, counter efforts should be made to extend this mission and cause political and legal reform, per the US Chamber of Commerce Summit mission and legal reform (US Chamber of Commerce, 2015)

The Political and Legal Environment

Juran (1989), an engineer, expressed concern over the effect of the political and legal system on ethical decision-making, products, and the economy. Similarly, Bright (1997), a law professor, stated that "little attention is paid to the fairness and reliability of the process" in the justice system in the United States (para 1). Bright (1997) asserted that there was a loss of citizens' trust in the court system because a vast number of citizens

"sentenced to death were actually honest," according to Supreme Court Justice John Stevens' statement (para 3).

Bright (1997) added that a defense attorney was sleeping most of the time while sitting beside his client during the trial. The attorney replied, "it is boring" when he was asked about it later. The judge was also asked why he did nothing about the attorney 'sleeping' during the trial, claiming that "[t]he Constitution does not say the lawyer has to be awake" (Bright, 1997, p. 420, para 1). Concerns have arisen within the legal and political systems, and within engineering construction and among engineers. These concerns are regarding the lack of ethics, the dearth of ethical decision-making, the low quality of court rulings, and deficiencies in the quality of management and their judgments. These shortcomings negatively affect the society's morale, gender safety, and the global economy (Juran, 1998).

Gaps in Literature

Legal abuse syndrome and abuse of power in the court system caused fear in society and among scholars and professionals (Huffer, 2011). This phenomenon is measured by many complaints during decades by theorists and authors of journal articles (Juran, 1998; Caught.net, 2015). There is a lack of peer-reviewed articles related to the factors affecting ethical decision-making in the U.S. engineering construction. Although authors of selected literature recommended that someone should conduct research on the problem of corruption in engineering construction (Ekici & Onsel, 2013; Juran, 1989, 1995), there is still a scarcity of peer-reviewed articles in the U.S. academic literature.

Also, most peer-reviewed articles on the phenomenon of quality vs. corruption are found in other countries, *not* in the United States literature. There are credible articles published by faculty, engineers, and attorneys, and websites arguing the existence of the phenomenon of corruption. However, they are not peer-reviewed. This absence of professional literature may be due to fear of facing retaliation or litigations (Caught.net, 2015; Cross, 2015). Huffer (2011) addressed the same fear repeatedly and called it "legal abuse syndrome" as explained in the section above. This shortage of articles constitutes a large gap in the literature research industry. This phenomenon resulted in false documentation and hiding facts while future studies would build on invalid, false, or missing information (Ekici & Onsel, 2013; Juran, 1995-1989; Chirot, 1977). This gap needs to be resolved academically and professionally.

Furthermore, the theorist engineer Juran (1995) traced the phenomenon of quality and found that deficiencies in leading-for-quality and decision-making have increased and harmed the American culture. Juran noted that the reason was the legal and political intimidation dominated the system in America contrary to other countries (Juran, 1995). Also, Goffman (1959) referred to this legal and political intimidation, named it as a "mask" (p. 18), and described it as a misuse of power and words to intimidate audience and called it as -- the Mask Concept. After a lengthy period of inquiry, observations, and consideration, Juran determined that the reason for the lack of peer-reviewed articles in the United States was the influence of the legal and political system. The impact was not only on the quality of the work, but also on the ethical decision-making of management

and engineers, scholarly work, and rulings in courts. As a result, Juran (1995) further recommended immediate changes to the legal system.

Later, Ekici and Olsen (2013) recommended the same changes after conducting their research directly targeting the effect of the legal and political systems on the ethical behavior of firms, and found that no research had been produced to "clarify [the legal and political systems] role" (p. 27) in firms and among engineers. Ho (2011) also confirmed that the phenomenon that is the legal and political system have an influence on ethical decision-making within the engineering construction industry, with an eye on the conflict and the need to maintain quality of management in a cost-effective manner (p. 533). Chirot (1977) noted that human tragedy is due to political problems.

Total Quality Management

Total quality management (TQM) ought to be implemented in the construction-engineering field, its organizations, and its personnel for the sake of social and cultural change (Juran, 1995). Components of the construction engineering industry are such as the Board of Engineers, private engineering consulting firms, design and construction divisions, governmental engineering companies, union organizations, SPB and its administrative judges and staff. Also, the components include the internal management and control of employees and supervisory personnel, personnel offices and official documentation, EEO/DFEH offices and management, women engineers' concerns and the adequacy of their official documents, production of each individual, adequacy of engineering design, and legal personnel attorneys and judges. It is crucial to understand

the intertwined nature of these components. This is mentioned for the record here, but the precise connection is not detailed in this paper.

The engineering field is the backbone of any society. It produces houses where people live, school buildings in which students and teachers meet, hospitals where doctors and patients shelter, courts buildings where judges and attorneys conduct their meetings and hearings, bridges and roads for all the public to travel, cars and airplanes to travel the world, and so on. As such, the engineering field should be conducted ethically and adequately; but as it is now, it is dysfunctional and causing problems for societies.

Decision-Making for Quality Management

Decision-making is a common aspect for all professional industries, such as engineering, medical, military, and judicial ruling. In civil engineering, for instance, decision making is crucial for all phases such as design, planning, and construction. Elms and Brown (2012) focused on civil engineers' responsibilities and the importance of their interaction with other decision-makers involved in the projects, such as owners, stakeholders, legal and political system, contractors and the public (para 1). Similarly, the legal and judicial rulings should reform its behind-closed-doors courtroom system activities, as mentioned earlier in this research (Huffer, 2011; Juran, 1995). Elm and Brown noted in their research focuses on improving engineering decision-making and that poor decisions can result in destruction and major failures of structures (Elms & Brown, 2012).

Although each engineering project is unique, standards of codes and practice are common and limited. Therefore, experienced engineers should broaden their knowledge

and add to those standards to accommodate each structure uniqueness, and adhere to their role and responsibilities as engineers (Elms & Brown, 2012). Elms and Brown (2012) noted that responsibility involves titles and actions, and stressed that the professional responsibility of engineers is inseparable from the moral and humanistic responsibility. For engineers to undertake quality decision-making requires skills and ethical attainment. Upon the interaction between engineering and legal/political industries as noted by Elms (2012), Huffer (2011), and Juran (1995), I further investigated the statistics of engineers and legal personnel in the American society to have an idea of the quota and the level of influence on each other.

Engineers Statistics in the USA

It has been difficult to find statistics about the number of engineers in the United States, as information is scattered and overlapping, and no numbers regarding licensed or non-licensed engineers are available in pubic databases. According to Kelly Services in Ng (2014), there are four major fields of civil engineering, "civil, mechanical, industrial, and electrical engineering," that constitute 51% of the total number of engineers (about 2 million) currently working nationwide across the United States. This figure of 2 million engineers "represents about 1 percent of the country's total labor force" (Ng, 2014, para 5). Kelly Services forecasts that the United States will employ 250,000 more engineers during the next decade.

Schwinger (2008) stated that some recently graduated engineers go to work lacking basic knowledge of mathematics, algebra, and calculus and engineering language. This suggests that it would be wise to adjust engineering educational programs first to

rectify these deficiencies, rather than continuing to graduate and hire engineers who lack fundamental knowledge. As part of this research, I tried to understand the reason behind this phenomenon.

Female Engineers Status

Del Medico (2003) noted that female engineers comprise a very small percentage of the total population of engineers (9%). This discrepancy may be due to the undisclosed ways female engineers are treated on the job, such as being excluded from engineering training, and paying them less than male engineers for the same work. The AAUW (2013) reported gender pay gap statistics of $0.74 for each dollar of the male counterpart.

However, these statistics do not represent all instances, where the discrepancies are even larger in some cases. For example, in structural engineering offices there was an average of only one female engineer among 35 male engineers, or 2.89% of the total. Nor do these statistics represent a first female engineer president-elect of the Union in its 36-year history (statistics would be about 0.000001). In addition, those statistics do not represent ceasing overtime of women engineers, and causing forced suspension to collect women salary (the statistics would be $0.0 payment unless one filed a complaint and got into litigation).

With legal actions and losses, statistical data reaches way less than ($0.0) compared to male engineers' counterpart because attorneys and the legal proceeding collect the proceeds as legal fees per Juran’s (1989). "Only a minority of the award money goes to the injured parties. The majority goes to lawyers and to pay administrative expenses" (Juran, 1995, pp. 577- 578). Dainty et al. (2010) noted that female engineers

face obstacles and discrimination on the job and that this situation would continue unless a cultural change occurs in the engineering construction field.

In addition, judges' misuse of power, intimidation, and influence sways retained attorneys of 'female plaintiff' who have no rights within the system either, as in the case of Lilly Ledbetter (2011). The courts and controversial laws willfully denied her civil rights and compensation for pay discrimination and defamation. In the end, although Ledbetter was not awarded her monetary losses, she was named a hero, and had a law passed in her name called "The Lilly Ledbetter Equal Pay Act" (p. 1) while her large legal office with group of attorneys who worked hard to win her case and the jury awarded her $3.2 million, but after a year during the appeal the entire compensation was ceased by the higher court, which is a proof of double standard in court process (Huffer, 2008, 2011).

Lilly's attorneys received *no* legal fees for their legal service either. This unfair decision/ruling is a common fact of ceasing female compensations in court that discourages attorneys from representing female in the courts due to misuse of power of judges and misapplication of the law and the constitution. This court outcome of Lilly Ledbetter confirms the injustice against women as reported by Del Medico (2003), ceasing women's monitory compensation for an award that men would not accept as an alternative for money, and resulted in denial of current women's civil rights while hoping for future-women's rights of higher income, as AAUW (2013) reported women earn $0.74 for each one dollar of their male counterpart.

Attorneys Statistics in the USA

Leichter (2015a) is a writer and attorney licensed in Wisconsin and New York, he earned his law degree in 2008. He taught the English language in Japan. During his unemployment period, he created a website to be perpetuated and regularly updated as a unique statistical record of the number of attorneys in America and as "contribution to society and to keep records of his legal industry" (Leichter, 2015a). Leichter was discontent about false information reported in the market about attorneys' statistics and the over-quota of attorneys' numbers.

Leichter (2015b) reported interesting, unique information and conflicts about the numbers and percentages of attorneys in his field—the legal system. This article in its entirely is a great contribution to this research, as attorney Leichter is honest and takes his role seriously. He noted that the count according to the American Bar Association (ABA)'s *National Lawyer Population by State* (NLPS) does not report the number of "inactive or nonresident attorneys," while the *Lawyer Statistical Report* published 4.8% inactive attorneys and 6.1% nonresident attorneys (Leichter, 2015b). Leichter provided an example of conflicting numbers that give the public surprising impression about the legal field statistics in the following statement:

> For the 1.3 million attorneys on the rolls in 2014, between the years 1970 and 2014, the ABA conferred just over 1.6 million law degrees and state bars issued nearly 2 million lawyer licenses… According to the Current Population Survey, 1.1 million attorneys were working in the United States in 2012, but the Labor

> Department's Employment projections program places the figure at 759,800. (para 2)

Leichter (2015b) expressed that some university administration and others intended to misuse his data to alter the fact of statistics and to claim that there is "attorney shortage" in some states. He replied, "This is very, very, very wrong" (para 3). He added:

> There is no evidence of a general shortage of lawyers anywhere in the United States. If you use these data to argue that, you are deliberately misleading your audience by failing to understand that having a law license and working as an attorney are not the same thing…You should be honest with your audience by conveying the entire page as presented. (para 3).

Leichter (2015b) explained further that the lower number of attorneys in some regions is due to economic and business activities that result in "lower lawyer densities" (para 3), he also expressed that the "mandatory pro bono work should be investigated in the future" (para 6). The table shows the State of California as having the highest population in the U.S.A., with a population of 38,802,500 in 2014 (38,041,430 in 2012). California also has an unexpected highest number of active lawyers, at 163,327 in 2014 (87,400 in 2012). New York has about half the population of California, with a population of 19,746,227 in 2014 (19,570,261 in 2012), but shockingly the number of active attorneys is 169,756 (82,220 in 2012) higher than those in California in 2014 and highest in the USA (Leichter, 2015b).

Finally, Leichter (2015b) initiated the term "Idle" Attorneys and defined it as "licensed attorneys who are not directly employed in the profession" (para 8). About "*one*

third of idle attorneys live in New York and California" (Leichter, 2014, para 9). Members of this category are identified as "judges, legislators, or businesspeople whose careers advanced due to their law degrees," or attorneys who chose to work in different fields, and those who are unemployed, but have kept their license active (para 8). The author intended to explain "the difference between *lawyers on the roll* and *the number of employed lawyers*" (para 8). The table can be found in the article, but I have noted a few comparisons here: In California in 2012, number of lawyers active is 159,824, employed 87,400, idle 72,424. The idle lawyers percentage made up 45.3% of the population. In New York in 2012, they were 163,798 active attorneys, 82,220 employed attorneys, and 81,578 idle lawyers, and 49.8% of the lawyers were idle (Leichter, 2015b).

Supporting Leichter (2015), Olson (2016) reported that a graduate law student complained that her law school willfully announced misleading employment statistics for graduate law school students working in the market in order to tempt citizens to enroll. After graduation, Anna carried a student loan debt of $150,000.00. The loan was continuously increasing with added interest and reached $170,000.00 by the time of publication. Anna and other graduates of law schools could not find employment. Anna she sent resumes to more than 150 law firms and received only one job offer reply that she called "less favorable than non-law-related jobs" (para 28).

The concern expressed by all law graduates was that judges did not accept the claims they filed against law schools. A Supreme Court judge in New York dismissed lawsuits brought by nine former students who asked for "$225 million in damages" (para 14) in 2012. Anna Alaburda faced rejection and closure of her filing, which the court

called “meritless” (para 19) in several states. Only recently has a California judge agreed to accept cases of law graduates, and only with some restrictions.

Foreign Societies

Chirot (1977) asserted that the basic framework of social change might fall within social stratification, the distribution of power, and international relations. Chirot said: “I hope to demonstrate that no contemporary society is independent of the rest of the world and that studying social change without studying its international context is both theoretically unsound and dangerous” (Chirot, 1977, p. ix). Chirot affirmed that American students had lost interest in studies of foreign societies, which may have an adverse impact on understanding their cultural and build indifferent feelings towards others. Chirot referred to neo-Marxist condemnation and criticism of liberal theories of development as primarily a condemnation of the United States, reasoning that liberal views would cause more internal problems than comparative studies, Chirot (1977) noted:

> It is evident that Americans care to hear only a certain amount of derogatory information about their country; beyond this, they experience a feeling of a pathetic futility. Certainly, it is much more difficult to sustain interest in negativism than in positive, hopeful theories. (p. 5)

Similarly, Dr. Mead (1949), a celebrity and one of the most influential female thinkers of her day, was a “vocal commentator on contemporary American life” (Library of Congress, 2015). Mead testified before congressional committees, and worked for the United Nations through various non-governmental organizations. She explored the issue

of faith, and explained that others believe that her country is a “morass of sin and wickedness” (p. 322- 326). She responded that she agreed with this criticism and believed that America should improve its system and clear up the misunderstandings projected among other nations (Mead, 1949, pp. 322-326). Mead (1949) rejected the adverse comments of some reviewers by saying, “I am not one of those authors who responds cheerfully to reviewers,” who are unconcerned about “those natives,” primitive peoples whom “anthropology,” describes as history that can stand forever (Mead, 1949, p. xiii).

This notion of indifference expressed by Chirot (1977) and Mead (1949) is the main point that guide this research. As I demonstrated history of management, legal, manufacturing, and education in Greece and other countries that are free from legal deficiencies that are causing unethical decision-making in management, in engineering construction, and in the gap discovered hiding corruption off the research market while other countries expressed it. Juran (1995) noted that the legal system rejects changes because they interest in keeping defected current system as is in the United States instead of solving problems approach. This notion is spread among the society from which judges are assigned to rule on individuals, businesses, female engineers, and so on, as Dr. Huffer (2011) noted the "Legal abuse syndrome" that has negatively affected health of her clients.

Judiciary Institutions

Many argued that the law can adjust and control government, but the integrity of judicial institutions is lacking, and that the traditional legal system affects the corruption in several ways (Golden & Mahdavi, 2014). The authors stressed that “judicial independence does not reduce corruption” but further it “increase[s] political corruption” (Golden & Mahdavi, 2014, p. 8), and described this notion by claiming, “independent judges may demand bribes for their verdicts" (P. 8). The section below and the following cases demonstrate this notion.

Legal Abuses

Huffer (2008) addressed the phenomenon of “legal abuse syndrome” and discussed her research and observation of litigants who became disturbed and acquired health problem after attending court hearings. She determined that their illnesses were caused by the lies and alterations of fact that arose during court processes, which caused anger and stress to her clients, especially women. During her years of researching the issue, Dr. Huffer sought peer reviews and presented 200 speeches about the abuse of power in the court. Her point is well illustrated by her statement, “you get in with an apple…they try to convince you it is an orange by the end of the court hearing” (Huffer, 2008; Huffer, 2011).

Political Institutions and Government Branches

Golden and Mahdavi (2014) of the University of California, Los Angeles (UCLA), noted that the construction industry is invaded by bribery and corruption. Furthermore, they said that this has been going on for a long time and that “exposing corruption, helps reduce it” (p. 9). They suggested that quantitatively assessing the costs

and consequences of corruption, and the impact on education and income, would not only have a positive impact on the academic and social life of citizens, it might also decrease corruption. They further discussed that “little research…exists” regarding how political parties’ approach corruption and how conflicts among them would influence the corruption (Golden & Mahdavi, 2014, p. 21). Golden and Mahdavi (2014, p. 6) further noted that Treisman (2000) was the first author to study the interconnection between “federalism and corruption" and his finding was that corruption existed in countries using the federal system more than those using the unitary system.

In same context, Dincer and Johnston (2014) conducted a survey about corruption in American states; they went into extensive details, state by state, measuring the corruption in all three government branches, identifying two primary forms of corruption: legal and illegal. They defined the illegal corruption as “private gains…by government official, in exchange for providing specific benefits to private individuals or groups” (para 6). The legal corruption is an increasing phenomenon in the united states, the authors defined it as “political gains in the form of campaign contributions or endorsement by government officials, in exchange of providing specific benefits to private or individuals or groups” (para 6).

In Dincer and Johnston (2014)'s survey, although the State of California has the unique features of warm weather and long shoreline, the survey findings ranked California and its judicial branch the highest “very common” in illegal corruption. “Florida, Illinois, New Jersey, and Texas” (para 10) followed California. It was unexpected to learn about illegal corruption in any American judicial branch, which is,

the branch that citizens rely upon for justice (Dincer & Johnston, 2014, para 10, 15). It should be noted that Florida and Indiana states recorded the highest rank in the judicial branch to be 'free of illegal corruption' "not at all common" (Dincer & Johnston, 2014, para 10). On the other hand, Dincer and Johnston's survey found that 'legal corruption' to be common in all branches of government (para 17). The remaining states' statuses can be reviewed in the figures in this article.

The questions of concern are regarding how society effectively measures corruption within judicial branches and why should society depend on ruling by such judicial corruption to affect its life, children, education, business, and economy? Golden and Mahdavi (2014) concluded in their research that more scholarly study and research is needed to "show that democracy reduces corruption" (p. 21). The authors stated that theoretically it was thought that federalism would "reduce corruption." However, democratic parties have failed to demonstrate this phenomenon locally and in developing countries around the world. Instead of reducing corruption, federalism caused disruption in many instances. Finally, they noted that the "empirical evidence" is still lacking and what exists is "ambiguous" (p. 21).

Forensic Construction Engineering and the Forensic Cloud

Forensic engineering is the inspection or investigation of failed structures, collapsed bridges, or damaged products that do not perform or operate as intended and caused personal injury or property damage; and then analyzing these failures by applying engineering codes and principles by expert engineers; and then create well organized documents, sketches, and findings; and finally, in most cases a required testimony and

witness experts called to testify and present the findings in court of law or before a judicial forum, or law of product liability (ASCE, 2016). In general terms, Merriam-Webster Dictionary (2015) defined *Forensic* as "The art or study of argumentative discourse...relating to or dealing with the application of scientific knowledge to legal problems... and, relating to…a court of law."

Forensic engineering has always been relied on decision and expertise of expert engineers in the field, not based on academic courses nor professional practice. In recent decades, new technology emerged in engineering construction, few researches started to emerge, and few universities started to establish courses related to forensic education as expressed by Columbia Engineering University (2016) that there is "an increasing expression of interest, from both this country and abroad, about a graduate program in Forensic Structural Engineering" (Columbia Engineering, 2016, para 2).

According to engineer Kessler's (2011) research on how the courts deal with the forensic cases of construction engineering, judges have limited knowledge about forensic information and computer technology. As a result of this lack of knowledge, judges cannot recognize whether the electronic documents presented in courts are valid or fake, which may cause conflict and injustice. As inferred from this analysis, there is no academic courses regarding forensic engineering industry and judges have no knowledge about engineering neither the computer technology, this is what this research attempts to address and investigate.

Similarly, Almulla, Iraqi, and Jones (2014) studied Cloud and Digital Forensics in depth and classified them in three categories: 1) survey-based, 2) technology-based, and

3) forensics-procedural-based (p. 7, para 1). Almulla et al. expressed these categories in mind maps, and noted that cloud forensics involve challenges that may impact the "theoretical and practical aspects of digital forensics" (p. 7, para 3). The authors warned that the data/evidence are scattered on the cloud, and time is of concern "to collect, examine, and analyze the evidences" (p. 25, para 2). All researches demonstrated above expressed lack of adequate education and practice in engineering and legal industries, all of which may cause conflicts in construction for decision-making by engineers and rulings in courts. This is the point of research that this study is concerned about.

Conflicts & Disputes in Construction

Whitfield's (2012) book contains a history of statistics about construction conflicts/disputes. He is an expert witness in engineering and construction projects around the globe and a Director at Hill International. The statistics he reported support the claim of this dissertation proposal point of research that the factors affecting ethical decision-making in construction engineering projects and the environment of this industry are not well research per Ekici and Onsel (2013). Whitfield reported 250 writs of construction disputes filed in 1960 and increased "five-fold" and questioned the cause of the severe increase in legal disputes.

Whitfield (2012) stated that construction projects "are beset with disputes" (p. 1). Merriam-Webster's Online Dictionary (2015) defined 'beset' as "to cause problems or difficulties for (someone or something)" and as "inflation besets the economy" (Beset, 2015). Per the definition, deliberate intention to cause a problem or disturb the economy is a clear indication that some factors willfully beset the industry and inflated the

economy as engineer Juran (1989, 1995) described in his book more than 20 years ago that the legal system disturbed the economy, but this factor still noted by recent literature. Whitfield (2012) pointed out that 250 legal cases as writs were filed in 1960 for construction disputes; then 30 years later the number of legal cases filed increased by five times and has continued growing to date. Whitfield further asserted that conflicts and disputes can be resolved before getting escalated “into situations that are difficult, expensive and time-consuming to resolve” (Whitfield, 2012). However, this advice would conflict with legal personnel and judges' business that is the lawsuits cases that mandate client to retain attorneys with high legal fees and on the other hand the courts process incur burden on the global economy.

This assertion refers to the fact that management can solve conflicts but is willfully obstructed by other ‘factors' that Whitfield referred to in a lengthy statement as “situations…difficult, expensive and time consuming" (p. 1), instead of clearly stating it that it is the legal and political systems. As Juran (1989, 1995) said, the legal and political systems are major factors contributing to the conflicts and corruption in the construction engineering industry, its environment, and for female engineers in this environment. Whitfield confirmed all concerns by reporting statistics and data for numbers of the writs/legal cases filed through the years and how they are increased to date to the extreme. How long should citizens wait after all these complaints before taking action to save the construction industry and the economy?

According to Mroszczyk (2015), the construction sector is fatally and unsafe and can even lead to fatalities. He provided statistics that described that each year 83 out of

every thousand workers in the construction sector are killed (p. 56). His research described several reasons for the high fatality rate, all of which were due to lack of ethics and decision-making by all parties involved in engineering and legal/political arena. He listed lack of training, unsafe site condition, lack of safety equipment, fatigue, language barriers, stakeholders' responsibility to exist on the location, and the liability of design professionals, general contractors, subcontractors, and owners to reduce factors causing the hazards (p. 67). The author did great job listing all parties involved but did not mention the laws and regulations that guide all of them. There are legal requirements and authorized personnel for each party should monitor the site and make sure safety enforced before the fatality occurs.

Prioritizing Social Change

The engineering and legal sectors are intertwined, and the engineering business and products cannot achieve improvement unless the legal system—its quality, ethics, and service— is adjusted first. This assertion is supported by Singh and Rathore (2012) in their article titled "Engineering mixes with politics." Singh and Rathore noted factual issues in support of this research topic, where they stated that "many non-engineers and attorneys at the top," although they are expert in leadership, public policy, speeches, communication, and political aspects, they were unsuccessful in conducting their industry or making ethical decisions (p. 128). On the other hand, Singh and Rathore (2012) criticized engineers of lack of global leadership skills to lead nations and stated, "engineers without political knowledge are like machine parts without lubrication" (para 4).

In their research project, Singh and Rathore (2012) selected 60 MBAs from an Indian and Chinese Engineering University and 60 junior-level undergraduate students at a US university. They asked the groups if they would be interested in studying politics and undertaking leadership posts in the future, he was surprised that *no* student from U.S. group replied affirmatively, while Indian and Chinese students were willing to do something to help their country (para 6). Singh and Rathore also added that most of the U.S. government cities and departments, that require engineering skills and expert engineers are instead "headed by a bunch of attorneys" (para 7). They described their impression of the environment as that engineers "'dance' to the attorneys" (para 7). Singh and Rathore decried the lack of leadership and weak decision-making style that wastes billions of dollars due to deficiencies in projects (para 7), and undermines the image of engineers in the society.

As an example of this wastage occurred in a Bay Area bridge project that was headed by an attorney who mismanaged contractors and harmed engineers. In the end, the bridge cracked and ended up in litigation due to contractors' mistakes. To secure the cover up, the project manager 'attorney' and the state 'banished' nine expert engineers because they refused to accept low quality false work that was not up to specifications (Piller 2014). Singh and Rathore (2012) noted, "It is more likely that engineers are predominantly left-brained rather than right-brained; that engineers find it unable to see the big, holistic picture that great visionaries and thinkers can" (para 9)! This quote is wake up call for engineers in America. It demonstrates the engineers' weakness in handling their role and authority in managing their field of industry adequately.

From an international perspective, American engineers need to acquire the independence, respect, and control of their engineering construction industry and its education and licensing in order to compete with systems and respects of engineers abroad as Singh and Rathore stressed that engineers in America are at the mercy of attorneys and the legal system. Politicians and the legal system 'adopted hidden notion' of guiding the practice of engineering and its economy and education whether engineers agreed or not, while engineers face a threat of life if one speak up against corruption as in Piller (2012). Moreover, a legal reform group in California, "The Committee for the Rule of Law (2016)" stated the following: “The law is so inconsistently applied that the Chief Justice of California has publicly said: ‘You’d have a hard time telling the wheat from the chaff’ when reviewing Court of Appeal decisions” (para 3). It is notable that the higher chief in the court disputed his own system and pointed for the need of reform.

Remedy Attempted

In recent years, structural engineering firms have adopted QA programs that resulted in higher quality of design, well-prepared contracts, fewer request for information (RFIs) and change orders (COs), improved products for clients, and increased revenue for engineering firms (Schwinger 2008, p. 2). Schwinger provided six components required for successful implementation of QA, summarized as training young engineers with greater responsibility, challenges, computerized software design, written design standards to maintain consistent design process, reduce errors, and CAD drafting knowledge.

Schwinger (2008) stated that schools and colleges used to teach mechanical drawing courses in the past, but he noted that newly hired engineers in the profession lack such basic skills. Those skills are essential to perform their design adequately and "[communicate] their design intent to others" (p. 4). Schwinger also expressed concern about the new trend in engineering education. He went on to comment on a lack of knowledge among CAD operators about laying out framing plans, symbols, and dimensions details (Schwinger, 2008, p. 4).

Schwinger (2008) suggested establishing drafting and CAD standards and a library that contains typical structural engineering details. Schwinger also suggested project delivery systems in the form of a library that contains forms, checklists, procedures, and correspondences that cover the history of the entire project (Schwinger, 2008, p. 5). He supported the adoption of a knowledge base—a single source for all engineers in the office to consult with about structural engineering details and inquiries while maintaining quality assurance. This would enable the engineers to work together, relying on their experience and judgment rather than their computers.

Schwinger's (2008) article is a great contribution to engineering education and practice in the 21st century because it is an honest effort to analyze QA management. He communicated clearly and honestly "many engineers now arrive in the profession with no training in a skill that is essential" (Schwinger, 2008, p. 4). He indicated a decline in the education and knowledge offered to new undergraduate engineering students.

Factors Affecting Ethics and Decision-Making

Kamal, Bigdeli, Themistocleaous, and Morabito (2014) explained that decision-making is influenced by several factors: individual context, decision context, and organizational context. "Individual context" refers to the personality/character of the decision-maker, and his or her assertiveness toward ethics, values, and risk taking. "Decision context" refers to the nature of the issue decided upon by managers, or members of local or federal government. "Organizational context" comprises multi-culture, environment, and political views, or policymaking influence.

The research of Kamal et al. (2014) relates to the proposed research because it involved an exploration of higher management behavior and decision-making. It addresses thein rigidity and inflexible attitude of stakeholders, the bureaucratic nature of the top management, and their effect on managing an organization for social change as an "under-explored area of research" (p. 148). The purpose of this study by Kamal et al. was to improve the process of top management decision-making. The research method they used was two case studies. Their finding was that some managers take risks when making decisions, while others do not.

On the other hand, Goel and Nelson (2014) investigated the whistleblower laws to encourage public employees to freely report misconducts, and they examined the effect of these laws on corruption in the United States. Goel and Nelson asserted that while the whistleblower laws are known, they found that there is a lack of studies that examine the effect of these laws on the wrongful behavior of employees (p. 2332). The authors found no theoretical model to help them link the whistleblower to the corruption, so they relied on the literature to combine the phenomenon and the whistleblowing. They discovered

that marketing the whistleblower laws using internet awareness resulted in more corruption reported, and that the internet awareness about corruption was found to be more effective than enacting several laws.

Han (2015) conducted some interesting research applying positive psychology to moral education in the United States. Han noted that research of ethics-education based on psychology is lacking in the field of science and engineering. Moreover, Han stated that the most significant phenomenon in the field of science and engineering is the conflict between responsibilities and moral values. He asserted that scientists, engineers, and students encounter this conflict during their research. Han's main suggestion was to develop new education within his planned framework. This new model would include positive psychology in the ethics-education of the science and engineering field (p. 456). Han noted that his model has some limitations, it has not been verified or confirmed because his research was only theoretically and explored the conceptual framework, and he did not conduct an empirical study. He suggested future researchers conduct such a study (Han 2015, p. 457).

Ethical dilemmas exist in nursing field also, as discovered by Mallari and Tarima (2016), who conducted research in nursing practice for ethical decision-making. Nurses encounter several moral issues, including but not limited to "refusal of treatment, disagreement with caregivers, treating patients with impaired decision making, end of life decisions, sexual reassignment, terrorism, hurricanes, and earthquakes" (p. 1). In each circumstance, nurses' decisions are influenced by their beliefs, personality, and values. For example, some consider abortion to be murder and face an ethical dilemma in making

a decision of whether to serve the patient. Nurses assume roles and obligations as "providers, clinicians, researchers, public health specialists, administrators, patient advocates, and health policy analysts" (p. 1).

Mallari and Tarima (2016) adopted the research study design using qualitative, quantitative, and explorative study along with literature reviews, and theoretical, and conceptual journal articles (p. 3). The literature included nursing ethical conduct as "respect for persons, beneficence and justice" (p. 6), and the research ethics that "[comply] with specific federal regulations, state laws and facility bill of rights" (pp. 6-7). Nursing is guided by the national and international code of ethics, authors suggested that nurses should "understand national code of ethics first" (p. 7) because nursing practice and ethics along with medical technology and research advance at a fast pace.

The nursing practice and research found to be similar and using "Nuremberg Code, Declaration of Human Rights and Declaration of Helsinki" (Mallari & Tarima, 2016, p. 9) where 82% of the public voted that nurses are most ethical and trusted professionals (p. 1, para 2). Mallari and Tariman utilized research questions as:

> (a) what are the ethical frameworks found in literature pertains to decision making in nursing practice? --- Dignity, trust, nurses should be able to spearhead process of decision-making. Framework of ethical decision: recognize a moral issue, get the facts, evaluate alternative actions, make a decision and test it, act and reflect on the outcome.
>
> (b) what are the ethical frameworks found in literature pertains to decision making in nursing research? -- Canadian Code of ethics for registered nurses. safe ethical

care, health plan, confidentiality, justice, accountability-- research ethics standards: Social and scientific and clinical value, respect for participants. (Tables 3, 4).

The suggestion of Mallari and Tariman's (2016) research study was to provide nurses with basics of ethical frameworks that they can use in their practice or research. This research provided a new view of study about ethics and decision making in-depth analysis. As nurses encounter ethical dilemmas, they have to learn how to distinguish between the correct or incorrect decision-making while considering the accuracy/ truthfulness and proficiency to conduct just and fair decision that may affect human relations (Mallari & Tariman, 2016, p. 10).

A depiction of phenomena of ethics and laws has been of concern for theorists for a long time, as demonstrated above in a variety of industries and the decision-making of management. In some industries, such as in construction engineering, researchers are concerned about "mixed lens" of "'ethical-legal' perspective" (Fuster & Gutwirth, 2014, para 1) . Researchers fear that this conflict may affect the quality of participants' answers and the research findings regarding their point of views that in turn would influence their decision making.

Fuster and Gutwirth (2014) at the Vrije University in Brussels, Belgium-- emphasized that ethics and the law always contradict each other in concepts and "remain uncoupled" and "separated by a gap" (Fuster & Gutwirth, 2014, para 1). Similarly, Ferrero and Scotti (2014) referred to inconsistency in the definition of 'professional ethics'. They stated that people must follow the state-of-the-art knowledge and principles

while some professions such as "forensic metrology" engineering and law adopt very contradicting beliefs/policies/laws. This contradiction may result in violation of the professional ethics (Ferrero & Scotti, 2014).

Summary and Conclusions

Chapter 2 included a literature review on ethical decision-making, thus updating readers on the status of the field and establishing a basis for the proposed study of ethical decision-making in the U.S. construction engineering industry and its direct interconnection with the legal and political systems. The literature review involved identifying and discussing significant ideas and knowledge in the area of the research topic and demonstrated the expertise and credibility of the researcher. The literature review also showed the readers the explicit connection between this study and the previous studies in the field of ethics, integrated it in the area of construction engineering, and evaluated this integration through the examination of related grounded theory research.

Major themes examined in Chapter 2 included the search strategy process, a conceptual framework for multidisciplinary study, related methodology, research questions, actual projects, the Engineers' Charter list, and statistics related to the political and legal industry. Also included in the literature review was a history of quality of ethics in the United States and in Greece, and discussions of a multitude of topics, such as the sociological theory for change, the mask concept, the legal abuse syndrome, juvenile court, engineering statistics, foreign societies, judiciary institutions, and conflict and disputes in construction.

Chapter 2 included the theoretical framework lens that shed light on the conceptual argument that tells readers how the researcher ideas, analysis, and expertise in the area has contributed to the industry and discovered gaps in this research. The theoretical framework and grounded theory were utilized to design the proposed study.. The following chapter includes information on the research tradition for this study and a description of the plan for applying it.

Chapter 3: Research Method

The purpose of conducting this qualitative, grounded theory study was to identify the factors that affect ethical decision-making in construction engineering projects in the United States. Data collected from interviews with a purposive sample of 12 civil engineers with 15 to 45 years of forensic and managerial experience with construction engineering projects enabled the identification of these factors and the development of a theory interrelating them to explain ethical decision-making in U.S. construction engineering projects

The purposive sampling also called "judgment, selective, or subjective sampling" (Research Methodology, 2016, para 1). The purposive sampling is a non-probability sampling method and often used in qualitative studies. I selected experts suitable to the objective of the research topic based on my high level of expertise in this area. This study has the potential to initiate positive social change practically and academically to improve the quality of engineering management and products, and guide engineers to make effective/ethical decisions when dealing with stakeholders. The study findings yielded insights into how to overcome the deficiencies of the legal/political systems that hinder U.S. economy when competing with other countries per Juran (1995), and added to the academic literature on ethical decision-making.

Chapter 3 comprises several sections as demonstrated below. Those sections include the research design, central concepts of the study, role of the researcher, methodology used for participants' selection, data collection and analysis, ethical procedure and trustworthiness of the process such as credibility, reliability, and so on.

Research Design and Rationale

This section includes an overview of the research design, the methodology, the population sampling from selected entities, the data collection from participants, and data analysis and coding; in addition to issues of ethics, measures, and trustworthiness, such as credibility, reliability, transferability and confirmability.

The research study focused on understanding the factors that affect ethical decision-making in the U.S. engineering construction. The aim was to develop a theory to explain the phenomenon. The following three general research questions defined the focus of the study and guided the design of the study:

RQ1. What factors affect ethical decision-making in U.S. construction engineering projects?

RQ2. What initiatives based on these factors could be implemented to improve the quality of ethical decision-making in U.S. construction engineering projects?

RQ3. What would be the impact of these initiatives on the cost and quality of U.S. construction engineering projects?

Qualitative vs. Quantitative Methods

This section contains the research tradition and the rationale for the chosen research method. It also contains an explanation of how qualitative research may differ in concepts and processes from quantitative research and conclude with the selection of the best-fit method to this proposed research.

The qualitative research goal is to understand human experiences and focuses on the exploration of elements and their quality, while quantitative research focuses on measurement and quantity of the variables under research and "preconceived hypothesis" (Charmaz, 2006, p. 101). From the philosophical point of view, qualitative research favor subjectivity over objectivity to interpret and construct findings from human experiences, while quantitative research based its concept on objectivity (Charmaz, 2006, p. 149).

The design of each type is different and suited to its method and goal; so the qualitative research design is "flexible, evolving and emergent" but rigorous, legitimate, and well-designed scholarly qualitative research study, while quantitative research design is "structured and predetermined" Charmaz, 2006, p. 101). The data collection approach differs as well. In qualitative research, the primary instrument that collects the data is the researcher who composes, interprets, and analyzes the data, while quantitative research depends on tests, statistical tools, and surveys to quantify the phenomenon (Charmaz, 2006).

Comparison of Three Research Strategies

To provide a rationale for the chosen tradition, I examined and analyzed three research strategies of three theorists. The work of each theorist was studied separately in this section, and then their methods were compared to select one theoretical method that best fits the proposed research topic regarding the factors that affect ethical decision-making in construction engineering projects. This theoretical base guided the research and became the foundation upon which to examine the research in Chapter 2, and eventually informed the interpretation of the findings and the new theory.

Grounded Theory

The grounded theory emerged from the teamwork of two sociologists, Glaser and Strauss, who studied patients who were dying in hospitals Strauss and Glaser (1965, 1967, 1970; as cited in Charmaz, 2006, p. 4). In those days, medical workers seldom talked to their sick patients about death, and the researchers studied how mortality approached in a variety of different settings, how dying patients and their families told about their terminal illness, and how they reacted to the news.

Glaser and Strauss (1967) conducted the research in a qualitative, analytic fashion by closely observing the phenomenon and analyzing shared notes. They extended the first study on death into analytic methodologies – which they later called 'grounded theory' – that Glaser and Strauss suggested that researchers could apply to other studies. Glaser and Straus (1967) turned conventional research on its head by proposing that scientists could first generate assumptions via intensely factual observations and qualitative research and that these assumptions could then be used as the basis for quantitative methodology (Charmaz, 2006, p. 6).

In other words, Glaser and Strauss suggested that inference could lead to deduction instead of the conventional method of deduction spurring induction. As Charmaz (2006) put it, "Glaser and Strauss [suggested] *developing* theories from research grounded in data rather than *deducing* testable hypothesis from existing theories" (p. 4). This pioneering idea of Glaser and Strauss emerged in an era that was ready for it, but Charmaz criticized them, as the original founders of grounded theory, because they did not include the power level in society within their studies. Charmaz noted that not

attributing the authority in the method may constitute significant weakness that she perceived as the macro forces may dominate the micro sphere and obstruct any change (p. 134). Charmaz pointed out that theorists in China used the grounded theory to study power and asserted that considering this study may lead to “fresh insights in social justice inquiry” and a “new twist” to the old grounded theory (p. 134).

Charmaz (2006) asserted that flexibility is a major strength that categorizes grounded theory. It allows researchers to integrate the tools of grounded theory with their particular epistemology as long as the flexibility is closely aligned to the grounded theory methodology (p. 178). Epistemology is the theory of knowledge, which “studies the nature of knowledge, in particular its foundation, scope and validity” (Encarta Dictionary, Thesaurus Microsoft Words). It is also a "branch of philosophy that investigates the origin, nature, methods, and limits of human knowledge" (Dictionary.com, 2015).

Charmaz noted that over the years since its establishment in 1967, grounded theory had undergone many complications and misunderstandings in distinguishing its method and theory. She wrote, “The method as a process and the theory as product of that process” (p. 177). The method as a process relies on philosophical perspective as “logic of inquiry, a set of procedures, or flexible guidelines” (p. 178), constant comparative methods, and researcher involvement. The theory is a product emerges from the analysis of data collection from several sites, data witnessed and lived by participants and researchers (p. 178).

Charmaz (2006) did not think that ground theory could escape the challenge of subjectivity that is inherent in the qualitative approach because she believes it is

impossible for researchers to avoid their personal subjectivityFor her, one of the greatest advantages of grounded theory is its ability to combine empirical with abstract, factual with theoretical, and to generate new theory. Charmaz (2006) explained:

> Grounded theory involves taking comparisons from data and reaching up to construct abstractions and simultaneously reaching down to tie these abstractions to data. It means learning about the specific and the general – and seeing what is new in them – then exploring their links to larger issues or creating more important unrecognized matters in entirety. An imaginative interpretation sparks new views and leads other scholars to new vistas. (p. 181)

In this way, Charmaz (2006) concluded, "Grounded theory methods can provide a route to see beyond the obvious and a path to reach imaginative interpretations" (p. 181). A successful study of grounded theory, however, has to follow certain criteria, which include credibility, originality, resonance, and usefulness (Charmaz, 2006, pp. 182-183). For the study to be credible, strong links between observation and theory must exist, and the researcher must make sure all conclusions are based on absolute fact. In order to be deemed original, the research should move in new directions, adding something valuable to the existing body of literature and refining current practice. Resonance questions whether the study and conclusions resonate with the participants and whether they can be extended to further research in similar situations.

Finally, the question of usefulness asks whether the study makes meaningful social contributions that are useful to the everyday lives of people. Grounded studies that follow these criteria have the potential to generate valuable research. Grounded theory

operates according to three steps, each of which is built solidly on the other. They are data collection and analysis, coding, and the development of categories.

Phenomenology

Moustakas (1994) asserted that phenomenology is based on the concept of eliminating prejudgment, threat of traditions/laws, beliefs of rational science, and prior experiences of researchers (p. 41). Moustakas also emphasized that the researcher acquires knowledge through the process of "epoche, transcendental-phenomenological reduction, and imaginative variation" (p. 33) and that the aim is to get the story as the participant sees and feels it rather than from interpretation of others or prejudgments. This notion is known as "the Epoche process" (p. 22), in which the researcher brackets his assumptions and personal interpretations by describing and reflecting instead of explaining, this may eliminate any presumption or bias or fixed ideas.

Although the concept of transcendental asserted the importance of personal involvement and insights, Moustakas (1994) noted, "My own perception is primary; it includes the perception of the other by analogy" (p. 37). This concept is because the researcher establishes the research about a particular topic of concern in her professional field. As such, the questions must reflect the researcher's curiosity of the particular matter of research, must be relevant and understood to the sampled population who have experienced the phenomenon under investigation; and the researcher must also use broad questions to elicit more meaning and depth and ask what and how (Moustakas, 1994, p. 114).

Case Study

The case study focuses on specific cases to understand them through immediate observation to the phenomena, in another term, it focuses on contemporary events, as opposed to historical events (Yin, 2014, p. 9). Yin (2014) explained that case study can be classified into three types of studies: exploratory study, descriptive study, and explanatory study. While phenomenology deals with the how and the what of issues, the detailed case study focuses on an individual case and answers the how and the why of situations (Yin, 2014, pp. 8-9). Case study research may also be practiced when researchers have limited or no control over case events, or when they wish to investigate ongoing, rather than historical, situations (Yin, 2014).

The following five conditions must be met for a case study to be effective and exemplary (Yin, 2014, pp. 201-205):

1. Significant – It must deal with an important case or situation that concerns a sizeable number of people and an important issue.
2. Complete – The researcher must ascertain that his or her question is answered, that much data accumulated and that thorough analysis of the case made.
3. Consider alternative prospects – The researcher should explore other external, relevant cases to see whether they correlate with his or her own conclusions and whether concluded observations make sense.
4. Display sufficient evidence – Evidence must be compelling enough for the researcher to feel that he or she has arrived at accurate and sufficiently valid

conclusions. The researcher may not be able to use the case to generalize but can use it as a basis for exploration of similar cases.

5. Engaging – The case study should be conducted and written up in an engaging, attractive manner so participants feel satisfied, and readers can understand results.

Yin (2014) created an operational definition and purposes to use case study such as exploratory, descriptive, and explanatory studies (pp. 5-9, 23). Three stages formulate the case study (also called case reviews). They define the unit of analysis used in design, develop theory to guide the case study and to generalize the findings, and finally test the design against some criteria to verify the quality of the research design and its tactics (Yin 2014, p. 45).

Literature for Comparison and Selection of the Best Fit Methodology

Phenomenology studies are used to explore how people approach and justify their experience in life. Grounded theory induces and generates new ideas and theories by constant comparison of data for social sciences, events, and processes. Case study comprises of one or multiple cases that have examples to serve as the basis for the researcher to arrive at a more in-depth understanding of the situation and is useful to ongoing research rather than historical circumstances (Yin, 2014). In comparison: grounded theory generates theory, while the phenomenology method focuses on understanding the phenomenon, and the case study spotlights incidents and multiple

cases. In differentiation: Exploring a life (phenomenology) is different than innovating a theory (grounded approach) or exploring a particular group or program (case study).

Table 1, adapted from Creswell (1997), contains significant similarities and differences between the three approaches (p. 67).

Table 1

Contrasting Characteristics of the Three Qualitative Approaches

Characteristics	Grounded Theory	Phenomenology	Case Study
Focus	Developing a theory grounded in data from the field	Understanding the essence of experiences about a phenomenon	Developing an in-depth description of a case or of multiple cases.
Discipline origin	Sociology	Philosophy, sociology, psychology	Political science, sociology, evaluation, urban studies, other social sciences
Data Collection	Interviews with 10-30 individuals to 'saturate' categories and detail a theory	Long interviews with up to 10 people	Multiple sources – documents, archival records, interviews, observations, physical artifacts
Data analysis	Open coding, axial coding, selective coding, conditional matrix	Statements, meanings, meaning themes, and general descriptions of the experience	Descriptions, themes, and assertions
Narrative form	Theory of theoretical model	Description of the 'essence' of the experience	In-depth study of a case or cases

Comparison

Grounded theory, phenomenology, and case study are all related in their attempts to study individual humans or cases and arrive at innovative theories. In each case, the researcher tries to distance himself to see the observed as it is. However, scientists believe that qualitative researchers are unable to avoid their inherent bias (Charmaz, 2006; Mehra, 2002).

These three qualitative approaches differ in data collection, focus, and analysis. Case studies utilize multiple forms of collection; phenomenology interviews a few individuals for a close-up perspective; and grounded theory extends its sample. The analysis is conducted differently as well. Grounded theory employs categories of coding; phenomenology seeks the core or essenceof phenomena; and case study analyses with cross-comparison. Their differences summarized in Table 1.

Rationale for Choosing Grounded Theory as Dissertation Method

Grounded theory creates/generates new theories using a diligent approach that works "bottom-up" (Charmaz, 2006, p. 11). Although grounded theory may be problematic in that it rests on subjective assumptions, it is more rigid and bias-avoidant than case study and phenomenology (Creswell, 1997). The study, therefore, involved the use of grounded theory because it provides the opportunity to generate creative innovation that a quantitative approach cannot. At the same time, grounded theory accomplishes this with greater scientific reliability than many other qualitative approaches.

This essay is not the first to choose such a method for engineering. Zhou et al. (2015) used grounded theory followed by a quantitative assessment to investigate incident avoidance and enhance safety management. Two years prior, Looso et al. (2011) conducted a method engineering process that based on a grounded theory study. Researchers saw grounded theory as a useful tool for generating new ideas from empirical data. The observations of Looso et al are especially prescient to this study. They noted that method engineering is a mature field that "is commonly based on literature reviews and follows a deductive, construction-oriented engineering process" (p. 19) and that its "constituent elements of methods (such as activities and techniques) are seldom grounded in empirical data" (p. 19).

Looso et al. (2012) wanted to enrich method-engineering research while simultaneously grounding innovation on scientific credibility. Looso et al. stated that they used grounded theory in order to "improve a method's quality before an application or configuration takes place by anchoring its constituent elements in empirical data" (p. 19). I also intend to enlarge the domain scientifically using techniques found in grounded theory.

In short, grounded theory is preferable to phenomenology and case study in that it captures complexity and proceeds in an organized manner by examining basic data before coding and analyzing it. It also links well to practice as generated data is worked on by an alternate approach before it is accepted as authoritative. Finally, grounded theory forms an opening for innovative theories that can be explored before being conclusively accepted. Hunter et al (2005) recommend that researchers be as innovative as possible in

forming this approach. However, if success is the ultimate goal, the researcher is advised to closely base theory on studied data. The theory has to be "grounded" for it to be effective.

According to Bryant and Charmaz (2010), "Grounded theory is ... currently the most widely used and popular qualitative research method across a wide range of disciplines and subject areas" (p. 1). It provides explicit, sequential guidelines for conducting qualitative research; offers specific strategies for handling the analytic phases of inquiry; and streamlines and integrates data collection and analysis. The grounded theory also advances conceptual analysis of qualitative data; and legitimizes qualitative research as scientific inquiry (Charmaz, 2009, p. 210). Grounded theory, therefore, seems to possess the best of both qualitative and quantitative research.

In order to avoid limitations associated with grounded theory, problem statements need to be clearly and thoroughly conceptualized; interview protocols need to be in place; and researchers need to have an extensive review of the literature (Bryant & Charmaz, 2010, p. 20). The author of this essay also realizes that induction does not necessarily always lead to the valid conclusion (Rennie et al, 1988). Requirements for an efficacious grounded theory study are so strict that few manage to employ them perfectly.

The essayist is aware that even through the collection of "limitless number of seemingly identical observations," there is no guarantee that "generalizing from these observations produces a valid conclusion" (Bryant & Charmaz, 2010, p. 45). Hunter et al. (2005) experimented with various grounded studies and pointed out that researchers can diversify their methods. Grounded theory methodologies can vary considerably, but if an

individual wants to be successful, she has to adhere to the fundamental premise that theory should be grounded in data. That is what this essay intends to do. As a result, grounded theory chosen as the most suitable method for the proposed research of this paper.

Selection of Methodology

The above demonstrated that grounded theory is the most suitable and qualified method for the proposed research of construction engineering industry and its forensic construction. Constant comparative methods and researcher participation are at the core of grounded theory, from which a methodological technique developed to form 'grounded method engineering' (Charmaz, 2006; Juran, 1995). This qualitative concept combines empirical data with methodology; it is newly established and is a crucial fit for the engineering construction forensic. Construction engineering forensic involves engineering knowledge, human education, political involvement, observation activities, knowledge management, solving problems with critical thinking methodology, ethical engineering, engineering mathematics deficiency in society, and dealing with construction obstacles for the industry, for its economy, and for female engineers in it. All the above components would synthesize theory with practice and lead to social change in the industry and its social justice to fill a significant gap in the construction engineering literature.

Role of the Researcher

My primary role in this study was as the interviewer. Participants consisted of a purposive sample of 12 civil engineers with 15 to 45 years of experience at the

managerial level with construction engineering projects. Because each participant offered data for 2 to 3 hours in each interview, in-depth data were collected and data saturation was achieved. Data saturation means that data collected from additional participants would not have changed the findings of the study (Charmaz, 2006).

Charmaz (2006) asserted that "neither data nor theories are discovered" (p. 10), as Glaser and Strauss assumed. Charmaz justified her standing by explaining that data the researcher collects existed and are part of the life, history, experiences, and societies of participants and the researcher, not separate or discovered. Data are merely collected and grounded theory "constructed" (p. 10). Charmaz (2006) suggested practices and procedures for grounded theory study that starts with collecting data and ends with writing analysis and uitilizing the process summarized as follows:

1. preparing research questions,
2. data collection and initial coding,
3. initial memos, raising codes to tentative categories,
4. data collection and focus coding,
5. advanced memos, refining conceptual categories,
6. theoretical sampling, seek specific new data,
7. refining theoretical concepts and memo-writing, including reexamination of earlier data,
8. sorting memos,
9. integrating memos, diagramming concepts,
10. writing the first draft,

11. further theoretical sampling if needed. (p. 11)

In following these procedures, I also strived to maintain an open mind and to interpret the multiple perspectives and opinions while keeping an objective position. Also, while conducting interviews, I encouraged the participants to speak openly about their ideas/views, elaborate wherever necessary, and provide honest and comprehensive answers by creating a supportive climate.

I recorded the interviews, and performed the transcriptions for privacy reason. Following transcription, I assessed each transcription to ensure that it was accurate and truly captured the essence of each interviewee's response. After reading each response, I determined thematic commonalities among the interviewees. In addition to assessing themes, I took note of discrepant responses and irregularities. This activity ensured the accuracy and unbiased finding and contributed to the saturation of qualitative data.

I have no relationship, professional, or otherwise with the selected participants. Thus, participants of the study should not have had any reason to provide data, which would deviate from a natural, honest, and comprehensive response. I had no power over the study participants, and I utilized all means possible to provide a comfortable and open interview atmosphere in which all the participants' immediate needs were met.

Careful selection of the research participants eliminated the need for control measures concerning power relationships or any ethical considerations regarding this facet of the research. I maintained an open mind to all opinions and viewpoints using the technique of in vivo code that is: I made sure to preserve participants' own words, viewpoints, and meanings of their speech (Charmaz, 2006, pp. 55-57). This technique

helped to curtail or restrict the effect of possible bias, and ensure the analysis was written in the "research participants' worlds" (Charmaz, 2006, p. 57), and that these codes were incorporated in the theories produced (Charmaz, 2006, p. 55). Furthermore, it should be noted that the theories are "interpretation" (Bryant, 2002; Charmaz, 2000, 2002a; in Charmaz, 2006, p. 130). The interpretation indicates the voice and views of the researcher (Charmaz, 2006, p. 130).

Methodology

Participant Selection Logic

The population for this study was civil engineers. The participants in this study were recruited from the American Society of Civil Engineers, from Linkedin, and from a construction conference. Purposive sampling was utilized in the study. In purposive sampling, the participants are chosen based on whether they can help in achieving the purpose of the study. Purposive selection was effective because it permitted me to intentionally select participants who could provide rich information about their experiences, as suggested by Maxwell (2012).

I sent letters of the request to all potential participants by e-mail. The e-mail sent to each participant provided a detailed description of the research and a request to participate, as well as a consent form (Appendix B). I did not know the participants, and I had no influence on them. Interviews with all participants were conducted by phone to ensure all parties were in their own comfortable location and incurred no expense.

Creswell (2012) recommended a sample size of between one and 25 participants. There is no explicit rule in the sample size in qualitative studies. A purposive sample of

12 civil engineers with 15 to 45 years of forensic and managerial experience with construction engineering projects were included in the final sample, which was sufficient to achieve saturation.

Saturation was achieved by obtaining most or all perspectives, point of views, perception, angles, in the area of research (Charmaz, 2006, pp. 96-97). In quantitative research, increases in sample size result in a decrease in error; however, this is not always the case in qualitative research. Often in qualitative research, the goal of the researcher is to obtain saturation, although it is not always achieved. Saturation occurs when adding more participants to the study does not always result in additional perspectives or information.

However, saturation is not just a matter of the addition of new themes, but also the introduction of new relationships among the themes (Corbin & Strauss, 2008). The researcher must examine each theme on various levels and in great depth to obtain saturation. In qualitative studies, Glaser and Strauss (1976) recommended allotting special consideration to the concept of saturation to achieve an appropriate sample size. New findings may be unveiled at any point in the process, and new insights may replace the old. Sufficient sampling has occurred when the major themes show depth and variation and the understanding of the case has grown to considerable lengths (Corbin & Strauss, 2008).

Instrumentation

In the proposed research, one instrument was utilized, the interview protocol (Appendix C). This document was used as a rough outline for the researcher to follow

while conducting open-ended interviews. The interview protocol was created as a guide for the open-ended interviews. Asking open-ended questions helped to assure credibility, facilitated data analysis, and reduced researcher bias (Patton, 2001). This qualitative interview protocol included questions that were open-ended and flexible enough to allow new meaning to emerge from the generated information (Willig, 2013). Semistructured interviews, consisting of initial open-ended questions followed, as necessary by more direct, probing questions, were used.

The interviews began with a brief social conversation to foster a comfortable environment. Moustakas (1994) maintained that even though a research may use specific interview questions, the interview should begin with a social conversation to help foster a relaxed and trusting environment. He stated, "The interviewer is responsible for creating a climate, in which the research participant will feel comfortable and will respond honestly and comprehensively" (p. 114). This ensures participants are at ease and trust the process, encouraging them to share confidential information.

Interviews are considered as one of the most important sources of data collection in qualitative research (Yin, 2009). The interviewer must follow the correct line of inquiry while asking conversational questions without leading the interviewee (Yin, 2009). Open-ended questions free participants from the experiences of the interviewer (Creswell, 2006). Interviews allow for follow-up questions, which affords the interviewer a full exploration of the given topic wherever further exploration is due. The participants had the opportunity to elaborate on their personal experiences (Salkind, 2003).

Participants were encouraged to be honest when providing all responses. Data was collected in the form of recorded interviews, which were transcribed later. The interviews themselves were expected to take no more than 1 hour of the participants' time, but they went far beyond the agreed on open time (averaging 2 to 3 hours) due to the importance of the topic under discussion. The time and resources of the research participants are of utmost importance. Therefore, I took the necessary steps to avoid wasting participants' time. Time management included scheduling around the participants' available time slots, reminding the participants that they could choose to leave at any time, and maintaining a focused and directed interview while still maintaining an atmosphere of comfort and relaxation.

Each participant was interviewed only once, but each interview, although scheduled for 1 hour, lasted from 2 to 3 hours. I explained the process, informed the interviewee that the conversation was being recorded, and asked if the participant had any questions. Once this information was established, the recording device was activated and then I asked the participant to state their name and willingness to participate in the interview and confirm that they understood that if they need to stop, they could do so at any time. Following the interview, the participants were reminded that auditory data were collected and recorded via a recording device.

Procedures for Recruitment, Participation, and Data Collection

The first step for the data collection process was to obtain an IRB approval letter from the university. Once IRB approval had been secured, I then prepared all the materials needed for the data collection. I contacted the ASCE, UCLA, and Linkedin to

conduct an email blast regarding the invitation for members to participate in the study. The email contained a short description of the study as well as the inclusion criteria. My contact information was indicated in the email.

Interested participants contacted me and I in turn sent them a copy of the informed consent form. The consent form contained the description of the study, its purpose, risks, and benefits of the study, and my contact information. The data was collected from the participants using semistructured interviews. I asked permission to record the interviews. The interviewees were told that the interview would last 1 hour, or more as necessary, and that I might call for follow-up interviews to reach saturation level if necessary.

Data Analysis Plan

Grounded theory method uses theoretical sampling or purposive sampling, which is emergent and includes criteria that the researcher creates to select participants; per Charmaz (2006) stating that theoretical sampling starts with the data, helps to refine the theoretical categories, and discovering gaps (pp. 102-104). Data collected regarding the factors that influence participants' decision-making process in construction engineering projects was categorized per each field in themes through careful analysis of the patterns evolved from the responses of participants.

I used a Microsoft word document to assist in the data analysis; however, as the researcher, I was the primary instrument in the analysis of the data to make sure themes and codes conformed to the purpose of the research and related to the research questions. Recurring codes became main themes of the study. A detailed description of the process

used to identify the main themes follows. After the themes were established, I interpreted this information to provide information about the perceptions of participants regarding the factors that influence their ethical decision-making process.

Research questions. To examine the engineering construction industry as it pertains to ethical decision-making and quality of management in the field, the following three research questions helped me to explore the problem and guided the scope of analysis within the study:

RQ1. What factors affect ethical decision-making in U.S. construction engineering projects?

RQ2. What initiatives based on these factors could be implemented to improve the quality of ethical decision-making in U.S. construction engineering projects?

RQ3. What would be the impact of these initiatives on the cost and quality of U.S. construction engineering projects?

Grounded theory. Grounded theory operates according to three steps, each of which builds solidly on the other. They are data collection and analysis, coding, and the development of categories (Charmaz, 2006).

Step One: Data collection and analysis. Once I had generated the literature review and project idea, I recruited the sample from the target population. Theoretical sampling is a sampling method by which participants are recruited according to criteria specified by the researcher and based on the proposed study. They can be used early in the research and any time during the analysis of data (Charmaz, 2006). Charmaz (2006)

defined theoretical sampling as data collected to develop categories that emerge theories and then refine them by further inquiry and data until saturation of data is reached; in other words, when no new information or categories emerged from new data. This sampling may be an ongoing process that is informed by the existent study as it develops. Charmaz stated that recruiting and data collection are inescapably formed by the researcher's epistemology (pp. 97-107) that is "the study or a theory of the nature and grounds of knowledge especially with reference to its limits and validity" (Merriam Webster Dictionary, 2015).

Sample recruitment was followed by unstructured or semistructured interviews that delved below the surface of the research problem. Interviews, defined as structured conversations with "in-depth exploration of a particular topic or experience" were conducted with participants who have experienced the phenomenon (Charmaz, 2006, p. 25). Per the constant comparative method, data collection and analysis proceeded in cycles, with each cycle informing the next. In this way, interviewees provided raw data that was then conceptualized and developed by the researcher. The interview structure was as open-ended as possible in order to encourage participants to elaborate on their input.

Some grounded theory studies may also involve textual analysis that the researcher use to analyze elicited texts, such as journal reports or surveys and data generated from research participants. In contrast, extant texts (i.e. organizational texts, government/legal records, or media and biographies) may also be studied for nuances that are "very slight difference in meaning, feeling, tone, or color" (Encarta Dictionary,

Microsoft Word). Charmaz (2006) recommended that researchers situate all texts and interview data within the appropriate social context (pp. 35-37). The researcher then summarizes interviewees' contributions and extracts relevant data for analysis. This process is called "coding." Several codes can be categorized into a network of abstract data, which the researcher then uses to generate theory.

***Step Two: Coding*.** The process of coding is split into two phases. During the first phase, each line, word, or "large amount of data" is named, and opened to new emerging theory. In the second phase, the researcher uses code to sort, synthesize, select, and extrapolate a large amount of data (Charmaz, 2006, p. 46).

Grounded theory uses a hierarchy of coding strategies to analyze interviewees' experiences at each stage of the process. Initial coding involves detailed and meticulously-recorded code which that is applied to almost every statement. Participants' words are sometimes recorded in their literal formation, or "in vivo" (Charmaz, 2006, pp. 47-55). The constant comparative method is employed during this process to help the researcher compares multiple pieces of data to identify similarities and differences,

The second level is known as focused or selective coding. This step involves the further breakdown of data into selected themes that the researcher considers to best represent the interviewee's thoughts (Charmaz, 2006, pp. 57-60). Axial coding is employed next to clarify and "relate categories to subcategories" (p. 60). Axial coding ads depth and structure to previously collected data while contributing meaning and order. It also provides a frame for researchers to follow as it gives coherence to the whole. Charmaz (p. 62) suggested that axial coding is most effectively performed when

the researcher reflects on and draws links between categories and subcategories discovered in raw interview data. Finally, theoretical coding is employed to finalize the coding process and forge connections between categories and subcategories. This concept helps to make sense while assessing the general accuracy of researcher inferences3e

***Step Three: Developing categories*.** Categories are created from codes, ideas, actions, events, and procedures when writing memos (Charmaz, 2006, p. 91). Charmaz aimed to consider the moral status of participants and how the mood and suffering can affect their behavior; this is reflected during writing the memos (p. 75). She elaborated a working definition for the "suffering status" as adverse changes could affect the person and the society in an unwanted result, as some participants expressed "devaluation…felt demeaned, disbelieved, or discriminated against" and she noticed the connection between participants' perception of concepts, beliefs, and injustice with both "suffering and moral" (p. 75).

Several interview transcripts were coded to identify the issues in the whole body of data. I extracted from these abstracts, points of interest, or *themes* that were then coded into conceptual labels or concepts. Related concepts were pooled together to determine the major themes/core categories. All related concepts were pooled and connected to the core categories, which were the most frequently occurring in the data. It is this constant reduction of data into increasingly abstract tiers of coding gives the researcher the analytic power to predict and generate a thesis (Charmaz, 2006, p. 72).

To maintain objectivity, Glaser recommended that researchers constantly evaluate their subjective engagement in the material when recording results. As this is qualitative

research driven by human interpretation, objectivity is never guaranteed. Researchers should keep a "theoretical memo" to reflect on experiences and to note projections and insights throughout the process (Charmaz, 2006, p. 72). Journaling may also help researchers review a study as it progresses, helping to generate further inquiries or insights. All of these steps lead the researcher to the final result—a theory developed according to the particular epistemological learning of the research topic (Charmaz, 2006, p. 208).

Issues of Trustworthiness

Credibility

In qualitative research, credibility refers to how congruent the findings are with the actual experiences (Charmaz, 2006, p. 182). The credibility of the study was improved with the implementation of several processes. Prior to participation, participants were asked if they would like to participate in the study, informed that no one approached was required to participate. Participants were notified that they could leave or withdraw at any time. Participants were encouraged to provide open, honest answers to all interview questions, and informed that there are no right or wrong responses. The participants were encouraged to openly speak of their experiences and were asked to elaborate on their responses.

To ensure the credibility of the study, all participants' interviews were recorded, and participants were informed that this is taking place. Once the interviews were completed, I transcribed them. Additionally, I assessed and reported any discrepant findings as well. Any irregularities among the responses was presented so that all angles

were reported. I utilized bracketing to disregard personal experiences to the greatest possible extent, and take an unbiased perspective toward the phenomena to be explained (Moustakas, 1994).

On the other hand, I clearly noted any researcher bias issue, if any, in a separate section, as well as any personal professional-experiences. This information needed to be added for the purpose of covering gaps, as Mehra (2002)'s finding that "bias and subjectivity" of experienced researchers are inevitable and valuable to share in the academic research.

Transferability

In order to establish transferability, I provided clear explanations of about the data collection procedures and data analysis process. Moreover, the researcher provided a thick description to ensure that future researchers can replicate the study. There was also variation in participant selection regarding gender.

While qualitative researchers do not usually attempt to generalize their results, they are sometimes transferable to other contexts or settings as mentioned above. The responsibility of assuring transferability rests primarily with the researcher; I endeavored to enhance the study's transferability through thoroughly describing the context of the research, as well as the central assumptions therein (Trochim, 2006).

Dependability

The concept of dependability, in qualitative research, highlights the importance that the researcher accounts for the always changing context within which research occurs (Trochim, 2006). Dependability of this inquiry required me to succinctly describe

the continuous changes that occurred in the engineering construction environment. Because this environment is continuously changing, my approach was to allow the participants to describe personal experiences that help convey this experience.

Confirmability

In qualitative research, confirmability refers to the ability of others to corroborate similar results and recreate the research (Trochim, 2006). Each researcher provides a distinct perspective, and the confirmability of this research was enhanced by implementing several strategies. For example, procedures were implemented for checking the data multiple times throughout the study. This included actively seeking out and describing unique statements to convey various perspectives of the phenomenon, so that as many potential perspectives could be represented.

Data Discrepancies

Some data were expected to be misaligned with the purpose of the study. This lack of alignment might have arisen from bias or intimidation or for valid reasons; they were indicated and categorized as such. I considered further investigation to minimize data discrepancies impact, but their existence enhanced and clarified other factors that may affect the decision-making of managers in construction engineering and the political setting.

Ethical Procedures

Agreement and permission to gain access to participants was acquired after filing the application with Institutional Review Board (IRB) and receiving IRB approval number. Ethical considerations regarding interaction with human beings while

conducting this research was based upon the Belmont Report and adhered to the principles of justice, beneficence, and respect. This research might have posed ethical issues regarding equity in the data collection due to the potential for a unique interview venue for each participant selected, but every attempt was made to ensure that all members of the population possessed an equal opportunity to participate in the study. Potential issues of beneficence and respect during the interview process were also a potential concern; however, every effort was made to ensure the understanding, comfort, and safety of the participants.

Agreements to gain access to participants or data. I used an informed consent document as the discussion framework for obtaining verbal and or written consent from interview subjects. In establishing the relationship with the interview subjects, the researcher introduced the study by explaining its purpose, describing the procedures, outlining the risks and benefits, establishing the subject's role, and estimating the time involved. I informed all subjects that participation was voluntary. Confidentiality was of utmost importance, so subjects were informed that no identifiable data would be used in the study. The subjects were also informed that they could freely drop out of the study at any time without penalty.

Protections for confidential data. Following interviews, I transcribed the data in a Microsoft Word document. These recordings and the documents are stored on a thumb drive and a secure server. I am the only person who can access these files. These files will be maintained and locked. Any indication of a participant's name or identification was removed from the data, and numerical identifiers used in their place.

When reporting the results, participants were indicated as "Participant". Throughout the management, analysis, write-up, and presentation process every effort was made to ensure the protection and confidentiality of all data. Both the records of the participants' responses will be kept for 5 years under the same strict security guidelines, at which point they will be destroyed and disposed of.

Summary

Chapter 3 contained an examination of the research design methodology, conceptual framework, data and participant collection procedures, role of the researcher, and finally the action plan regarding data analysis. The issues of ethics and issues of trustworthiness were also addressed with special consideration to potential methods. The grounded theory methodology was found most suitable for this qualitative study to identify, analyze, and clarify the gap that exists between construction engineering industry and legal/political systems, and develop a theory of ethical decision-making in U.S. construction engineering projects.

I have adhered strictly to these procedures in gathering and analyzing data in order to clearly and efficiently address the issue of ethical decision-making in the field of engineering construction. I focused on the problem utilizing a ground-up approach, and described the factors of ethical decision-making, as well as initiatives based on these factors, and the subsequent impact of these initiatives on engineering project costs. The collected data enabled the development of a grounded theory of these issues and their impact on the field of engineering as seen through the lens of industry professionals' (i.e., civil engineers') experiences.

Chapter 4: Results

The purpose of this qualitative, grounded theory study was to identify the factors that affect ethical decision-making in construction engineering projects in the United States. Data came from interviewing by phone expert civil engineers in managerial levels in locations around the United States. The interviews provided the data necessary to answer the three research questions:

RQ1. What factors affect ethical decision-making in U.S. construction engineering projects?

RQ2. What initiatives based on these factors could be implemented to improve the quality of ethical decision-making in U.S. construction engineering projects?

RQ3. What would be the impact of these initiatives on the cost and quality of U.S. construction engineering projects?

Chapter 4 has several sections. The first contains a description of the setting and circumstances that might have influenced participants during the interviews, followed by a section on the demographics and characteristics of the participants. The next section includes a description of the data collection process, number of participants, duration of each interview, data recording, whether there was any variation from the plan previously presented in Chapter 3 or unusual circumstances during the data collection period. The data analysis section includes a description of how this inductive process moves from coded units to larger representations, which include categories and themes that emerged from the data.

I describe the qualities of discrepant cases and how they factored into the analysis. Subsequent sections address evidence of trustworthiness: credibility, transferability, dependability, and conformability considering any adjustments made during the data collection and analysis process to strategies stated in Chapter 3. A results section, organized by research question, includes the findings for each question separately, supported by quotes from transcripts, as well as a discussion of discrepant cases or nonconforming data. And, finally, a summary provides a transition to Chapter 5.

Research Setting

The setting at this stage of selecting participants was difficult because engineers, by nature of their profession, are conservative. Given the confidentiality of the information or data of the engineering construction projects, engineers cannot share with unknown people. For example, engineering faculty, in the institution that I selected, did not respond at all considering me (the researcher) as stranger because I did not contact them through a known professional organization; as this was my first experience in conducting academic interviews, I was unaware that such reaction could happen. In a social media forum, engineers did not participate in the survey; however, those who replied hoped that it might result in a job opportunity. I replied courteously to each of these job searchers on social media or by e-mail explaining that the objective was for participants to voluntarily participate in a dissertation research.

American Society of Civil Engineers (ASCE)

Being a doctoral student member of the ASCE for many years facilitated the situation when the organization published an announcement of the study to all ASCE

members (Appendix D). Interested participants replied to me by e-mails. The research requirement for participants was to have more than 5 years of experience in engineering construction and/or forensic engineering. I received many replies from engineers with experience ranges 15 to 45 years' experts in managerial and forensics, who qualified for the study. I felt that engineers were at ease, frank, not under any influence, and their concerns faded by my promise to ensure confidentiality. I had not expected this positive reaction. I appreciated their participation in my research and the valuable information they provided. All interviews were conducted by phone to match participants' schedules and time zone around the United States of America. Each interview, assumed to last about an hour, but they extended to 2 to 3 hours each upon participants requests to continue the discussion.

Demographics

Participant civil engineers selected from around the United States including California, Florida, Colorado, Pennsylvania, Minnesota, Georgia, Texas, Kansas, and Washington with range of professional experience between 14 to 45 years. Selection based upon some criteria for participants to be eligible for the study: They were located within the United States; majored in civil engineering, structural engineering, construction engineering, and/or forensic engineering; male and female; with more than 5 years of experience in managing construction sites, and/or acted as expert witnesses in forensic cases.

Table 2

Demographics of Participants

Category	*Quantity*
Male	9
Female	3
Major	Civil Engineering
Specialization	Structural, Architectural, Mechanical, Law
Years of Experience	15-45
Location	United States of America: California, Florida, Colorado, Pennsylvania, Minnesota, Georgia, Texas, Kansas, and Washington
Duration of Interviews	Varied between 2 to 3 hrs. per participant
Transcripts	Varied between 7 to 18 pages per participants

Data Collection

In-depth data were collected from 12 participants. Interviews were conducted by phone, the location of each participant was at their comfort whether in the office or at home or in their car parked away from anyone to hear, and so on. The duration of each interview planned to be 1 hour, but the actual duration of each interview lasted between 2 to 3 hours. The interviews recorded on two tape recorders for safety reason, using the

speaker of the phone while I was in my office with no one around. The transcription of each recorded interview ranged between 7 to 18 pages. The intensive inquiry with 12 participants for more than 1 hour each resembles 24 participants with duration of one-hour interview. This extensive inquiry helped the data to reach saturation. Data were recorded, and consent forms and invitation to the interviews sent by e-mails to each participant. There are some variations and unusual circumstances encountered in data collection differ from the plan presented in Chapter 3 as described below.

Obstacles

Given the obstacles discussed in the research setting, the purposive sample of 20 engineers mentioned in Chapter 3 could not be met. Given the circumstances of participants, interviews conducted by phone only, not by Skype as noted in Chapter 3. Another obstacle is lack of participation of female engineers; only two replied assuming it was a survey on paper, when I asked for their resume and they learned it would be oral interviews, they did not follow up. This would be a big gender gap in the research and does not represent the actual society. I was interested to learn the reason of this phenomenon. I decided to attend an engineering construction summit conducted by ASCE locally for few days to meet female engineers.

Female engineer participants. An unusual circumstance encountered in the data collection process was that not one female engineer responded to the ASCE Ad. As a result, I made an in-person announcement in the Summit Conference of Engineering Construction that many male engineers had replied, but not one female engineer had replied to the published ad by ASCE. A laugh erupted because the male engineers

thought that primarily female engineer would have answered the ad, rather than male engineers. As a result of that announcement, many female engineers came forward and gave me their business cards to contact them, but when later I called them, they disappeared again. Only one from the Summit Conference replied to my call. Fortunately, I was able to secure another one female engineer participant from Linkedin after contacting many of them. Later, another female engineer replied to the ASCE ad, and said, "I think you will have problem getting more women because they do not want to talk about it."

The obstacles I observed were that while some engineers, men and women, who were ASCE members were willing to participate in the study, very few responded to social media, only one male and one female from Linkedin. Only three female engineers participated, one from ASCE announcement, one from Linkedin, and one from the Construction Summit.

Male engineer participants. Another unusual circumstances and observation was the level of experience of male engineers participated in the research. No younger engineers with 5 to 15 years of experience participated. This may be due to lack of experience, or fear of discussing conflicts that might have adversely affect their employment. Most participants who are eager to share their experience and facilitate social change had experience of 15 to 45 years in construction and forensic engineering. Male engineers are very challenging and acquire large knowledge, experience, and multi-disciplines that met the requirements of this research topic. However, because I have similar experience, the discussions with both male and female engineers who participated

were easy and very informative and I was able to collect the data needed for the research study.

There was no influence of any kind on participants, as I made sure they were talking in total private locations at their comfort, and they were comfortable sharing their experience with the goal in mind to cause social change. To my knowledge, nothing influenced the interpretation of the study results. The only effects that could negatively influence the finding of this research are the obstacles noted above.

Discrepant Cases or Nonconforming Data

There were no discrepant cases or nonconforming data. There was much agreement among the participants regarding the answers to the research questions. For ease of the writing without conflict, I decided to eliminate the numbers of participants (such as PPT1., PPT2.), I refer to them and cite the data as (Participant, 2017). Participants shared much valuable information, some of which were not included in the analysis because they went beyond the scope of the study.

Data Analysis

Grounded theory methods encompass flexible guidelines and principles that allow the researcher to collect and analyze qualitative data; and then "construct theories 'grounded' in the data themselves" (Charmaz, 2006, p. 2). Unlike the quantitative methods that depend on preconceived categories or testing theories, grounded theory enables a researcher to generate original codes and categories and formulate theories inductively, and closely observing the phenomenon and analyzing shared notes (Charmaz, 2006; Glaser & Strauss, 1967). First analytic step is the coding of segments or lines of the data

collected in order to define what those data means. Coding is major step that connects the data collected to the constructed theories. Below I describe the specific codes, categories, and themes that emerged from the data using quotations from the data.

Line-by-line Coding

This is the first step in the coding process. It is especially applicable for detailed data such as "interviews, observations, documents, or ethnographies, and auto biographies" (Charmaz, 2006, p. 50, para 4). The researcher names each line or a paragraph with a key idea that the participant mentioned. The researcher has to pay attention to the concern of each participant and the way the participant handled the situation, how one agreed or disagreed on the ethical decision-making they encountered or observed, the factors that affected their decisions, what is their reaction, in what capacity, with which authority levels they interacted, what assumptions they made, and what changes or initiatives they think could be implemented for social change goal in their industry under research, in this particular research study, it is the engineering construction and forensic industry.

After the line-by-line or paragraph coding, researchers must compare incident to incident whether similar or dissimilar actions or events and create a categories and focused coding (Charmaz, 2006, p. 53), this comparison brings new ideas and visions. Charmaz noted the importance that the researcher should note his/her views and beliefs about the data in case they differ from participants' views. She said, "Do not dismiss your own ideas if they do not mirror the data" (p. 54), she explained that the objective is to create "analytic sense" to challenge the "taken-for-granted understandings" (p. 54) and

make the researchers think of new approaches different from participants' views. On the other hand, using words of participants called "in vivo codes" (p. 55) helps to preserve participants' views, actions, and interpretations.

The incredible amount of data and ideas collected strengthens “the foundation of [the] study" (Charmaz, 2006, p. 51, para 1), as is evident from the participants interactions with me. I was impressed with the insights participants shared openly and honestly. I thanked each of them for their valuable time, which was far more than the time requested for the interview (2-3 hrs. vs. 1 hr.). Furthermore, they kindly asked me to call any time if I had more questions and to keep in touch in the future, which I will do.

Regarding the incredible amount of data collected, I made a list of codes by identifying important words, repeated ideas or language or patterns of thoughts (O'Connor & Gipson, n.d., p. 68). Some examples, of participants' sharing that forms the codes in the initial coding for factors affecting ethical decision-making, are as follows:

1. Most frequently mentioned factors related to the legal system and court processes included "lawyers get in the way and make it legalistic," "union uses strikes, not negotiation," "legal system pressure and dishonesty," "judges willfully misuse their authority and commit misconduct in order to lead to appeal," and "unethical decision-making (ruling) by judges in court process."

2. Second most frequently mentioned issues related to management and business, such as pressure of time, pressure of budget; pressure of higher management; culture, peer, foreigners’ differences, conflict of thinking between engineers and attorneys in forensic cases, engineers overruled by attorneys, undermining engineers and building

codes in courts, and subjectivity vs. objectivity. One noted, "Your research is Nobel" (Male Participants, 2017). Furthermore, female engineers reported that gender was a major issue. One participant, who was the first woman engineer in the highest position in her district quit because, as she said, “I did not enjoy it.'"

A female engineers who did not volunteer to participate in the study said to one of the female participants "we have no accomplishments to share as male engineers, what are we going to tell her, we hate to complain on academic record or lose our jobs;" a female participant said "women are hard on each other, I hired two women but they turned against me;" other said, "I tried to be conservative because I have large breast, but they complained why I wear jacket all the time;" "gender perception, favoritism, men can drink and talk and had party, you feel isolated, you do not know what decision made on site or outside the site;" "single woman, married women during interviews" one participant said "They asked me during the interview 'why should I hire you, when you get pregnant, you get a baby and leave?'" she said, "I felt offended;" "I have a lot of respect for women who speak up, good luck with your paper. I would like to see how you will change men's perspective" (Female Participants, 2017).

Other male Participants shared these data, "attorneys lie in courts and influence or humiliate engineers;" "penalties exist but not enforced;" "expert witness engineers have no training;" "most cases settled outside courts;" "contractors' greed;" and regarding "Board of Engineers Liability," a Participant (2017) said "scam rules using engineering to make money;" "there are flaws in PE exam, I don't know how to improve the Board system. There is Catch 22, connection, politics and power;" "I respect your study for such

a social change" (Participants, 2017). Moreover, others shared that the "Legal system devastating, affect the cost, need change;"

"Economy affected by judges' bias & unethical practice" as "'kids for cash' affect economy and taxpayers and family;" "Legal process more important than the fact of the case results in loss of the business & the economy, and affect the cost of the project;" "All government are attorneys, cannot solve problems. Attorneys like to write rules and laws to find ways to make more rules to figure out how to justify things to make more money" "Attorneys write 6-page document in six lines;" "I am glad you take it on, it is a major challenge to improve it [the legal system]" (Participants, 2017), when we addressed social change.

Focused Coding

This is a conceptual phase of coding, the second phase in the process of coding, in which the researcher selects the most frequent codes shared by all applicants and synthesize larger data (Charmaz, 2006, p. 57). The focused coding examples include: "Legal system concerns," "forensic engineering," "safety," "ethics," "technology and education," "Board of Engineers liability," "social system," "minority system obsolete," "quality control," "improve ethics," "Enforce laws and rules" Participants asserted that laws existed but not enforced properly. They recommended "combined initiatives," social change because "legal system causes most losses," "alternatives for reform," "Education is going backward and if corrected takes years to produce quality graduates," "focus on inherent rules than making new rules," "enforce penalty to improve system and stop lies in courts [by some engineers, attorneys, judges], and so on.

As described above, the *'focus coding'* system has a unique process and strength because it allows the researcher to condense the data. It checks the researcher's "preconceptions about the topic" (Charmaz, 2006, p. 59), by analyzing and acting upon the data, not only reading them. Focus coding derives new perspectives, interactions, and initiatives. It synthesizes the main themes of the data; compares participants' interviews, observations, experiences, and interpretations; and also compare codes to each other. Through these steps and comparing data to data and codes to codes, focus coding develops.

Some examples of focused coding such as, "Lack of trust in the court system;" "Jury system not helpful;" "extensive legal lawsuits as 7 lawsuits for one construction project in 90 days is outrageous and affects the budget or closure of the project, engineers ask for solution;" "making profit for contractors conflicts with ethics, contractors asking for solution;" "contractors greedy and connection with government authority create problem to large owners." They also compared system with abroad system saying "low bid system in the united states contrary to European system causes big conflict and unjust and fraud among bidders and during construction process, then they turn and file lawsuit to recover their losses;" "radical change in politics needed due to broken whistleblower system and employees engineers fear loss of job as happened to many already." They extended the social change concern to education as well, saying, "technology and education reform;" "legal reform," "minority system and the economy reform;" "Board of Engineers and conflicts of service to engineers, to engineering codes and licensure, and to forensic investigation"; and so on.

Memo Writing

Memo-writing is the phase between data collection and writing the drafts (Charmaz, 2006). It allows researchers to write informal analysis of the data and codes, to explore the qualitative codes and develop researchers' ideas about those data. Memo-writing allows comparing data with data or data with codes or categories, while progressing with the constant comparison method that is the general method of data collection and analysis and helps to determine when data saturation reached. Charmaz (2006) noted that memos for "formal business communication" (p. 80) such as rules, policy, or proposals differ from grounded theory memos, which aim to produce analytic actions, process, or categories for the data collected, and look for patterns and identify gaps.

Memo-writing takes several forms, flowing or short or freewriting with natural voice and proceed to focused freewriting that elaborate on the data, categories, concepts, in vivo vocabulary (Charmaz, 2006) or "'catch phrases' embedded in the data" (Participant, 2017). The focused freewriting is more coherent and involves comparison between data of several research participants. The goal is that the researcher is free to explore and discover ideas and gaps. In grounded theory, Glaser and Strauss (1967) define a category as a "conceptual element in a theory" (Charmaz, 2006, p. 91). By assessing the codes that best represent the data, they become conceptual categories within the analytic framework, where researcher consider a conceptual definition for the conceptual categories that explain and explore ideas, or events, or processes observed in the data.

Categories include themes and patterns in the codes that best represent the data called as 'in vivo codes' taken directly from participants words; examples such as "legal system concerns" and its subcategories as “extensive legal lawsuits,” "misuse of the system" (for example, seven legal lawsuits in one construction project within 90 days (Participant, 2017), this affects the budget and may lead to closure of the project), "pressure of attorneys," "pressure of union," "pressure of process and time," "judges' favoritism, bias to a party, misuse of authority, and extend cases to the appeal level;" another category such as "Technology and Education" and its sub-categories as "being influenced by lawsuit, ethics training needed" and others presented in the tables below.

Memo-writing is the core of the grounded theory. Comparing the participants descriptions and data of the incidents and the events they encountered in different timing from consecutive interviews results in responses and stories re about *recent* events and practice instead of *past* incidents. After completing memo-writing and comparison between analytic categories, researchers discover gaps and holes, incomplete ideas, they can use to strengthen the analytic categories (Charmaz, 2006, pp. 91-94). The theoretical sampling process and theoretical framework help to clearly define the categories and their properties.

Theoretical Coding

Theoretical coding follows the focused coding and adopts strategies of the grounded theory such as theoretical sampling, saturation, and sorting. The reason for this selection is that, I acquired this level of experience locally and internationally, which has benefited the research and the interview data; I could compare systems, ask

participants related informative questions, challenge corruption within the legal system and its deep involvement within engineering construction in America contrary to other countries, question the silence of female engineers, and inquire about the trend and inability of the American engineering projects to meet the schedule and the budget.

The purpose of theoretical sampling is *not* to represent the population, but to obtain data to enrich the categories/theoretical categories and "pertains only to conceptual and theoretical development" (Charmaz, 2006, p. 101), and to develop properties for the categories. Through the process of constant comparative method, theory developed inductively and refined through comparing data gathered from participants interviews. The method of conducting theoretical sampling varies and entails reviewing documents, interviews, and observations focusing on the theoretical categories This means elaborate on the meaning and differences in the categories, discover and define gaps among them through comparative method, and filling them. The result is complex, precise, and analytic thoughts and memos, which reaches saturation of the theoretical categories.

Sorting is inferred from constant comparative analysis between categories and data and raising the categories to a conceptual level from which to theorize. Charmaz (2006) noted that positivists defined theory as connection between abstract concepts and actual observations (p. 125). The objective of this definition is "*explanation* and *prediction"* (p. 126), and she quoted Glaser (2001) describing grounded theory as "theory of resolving a main concern" (Charmaz, 2006, p. 133) and produce theories. “Theory must fit the situation being researched, and work when put into use” (Glaser & Strauss, 1967, p. 3).

Evidence of Trustworthiness

Trustworthiness depends on the quality, richness, and relevance of the data that researchers collect (Charmaz, 2006, p. 18). I am proud of the participants sharing of information and their willingness to support the social change in their industry, engineering construction and forensic. Sound results, strong arguments, and other methods mentioned below are all evidence of trustworthiness. Below, I elaborate further on the methods of credibility, transferability, dependability, and confirmability discussed in chapter 3.

Credibility

According to Charmaz (2006), the institution or the person who is "at the top of the hierarchy" or carry a distinguished title like "Nobel Prize winner" is more "believable" (p. 137) or credible. This research study includes both notions of Charmaz, "the top hierarchy" of civil engineers, as the study participants had 15 to 45 years of experience in the area of the research study; and I "carry [the] distinguished title 'Nobel Prize winner'" as I received two Nobel Prize Medallions, 14 years ago, and later named Minister of Culture on International Level, for the purpose of dedicated study and Professional Engineering experience in Civil/Structural engineering, same field of the research study locally and internationally. This combination of strong standing between me and the participants brings trustworthiness to the research as Charmaz has noted.

As a result, I have enjoyed interviewing all of the participants as I have a similar experience locally and internationally. I knew what to ask and how to target some gaps in the American system for social change reason. This has added great deal to the credibility

of the study. The participants' contribution of the unique and valuable data they shared with me is greatly appreciated. I also thanked each participant for the valuable and quality time they used out of their precious time, which extended over the one hour specified in the interview protocol to 2 or 3 hours per interview or a second interview with no compensation. I would like to return the favor later. The living experiences and critical encounters the participants shared have enhanced the credibility of the research study with the goal of social change.

All participants, male and female, were eager to cause social change and make engineering construction a better industry with new technology, reform, and respect to engineers in America. Their reaction is contrary to Ekici and Onsel' s (2013) research findings that there were forces behind the scenes that influenced their participants responses in the academic survey not to say the truth out of fear. However, this notion is still valid in female engineers who declined to talk due to being worried of getting fired, the few who participated, they did so because they were out of work, either retired, or just resigned from their job. In qualitative research, credibility is measured as how congruent the findings are with the actual experiences (Charmaz, 2006, p. 182). This relationship achieved through few steps, as data collection, analysis, coding, and the development of categories.

Transferability

Transferability established in the clear explanations that I provided above about the data collection procedures and data analysis process. I also provided a thick

description to ensure that future researcher can replicate the study. There are variety of selection regarding gender and length of experience and specializations.

While qualitative researchers do not usually attempt to generalize their results, they are sometimes transferable to other contexts or settings as mentioned above. The responsibility of assuring transferability rests primarily with the researcher; I propose to enhance the study's transferability through thoroughly describing the context of the research, as well as the central assumptions therein (Trochim, 2006). However, in the engineering construction and forensic, the findings are transferable between engineering and legal for being intertwined.

Dependability

The concept of dependability, in qualitative research, highlights the importance that the researcher accounts for the always changing context within which research occurs (Trochim, 2006). For the purpose of dependability of this inquiry, I succinctly described the continuous changes that occurred in the engineering construction environment by interviewing the participants thoroughly in what is going on with their current projects and their experience as expert witness engineers in the courts and how attorneys and judges dealt with engineers in closed court room. Motivation within this environment is also continuously changing and the approach of this research is to allow the participants to describe their personal experiences and visions of how they perceive the social change in their field of practice that help convey this experience.

Confirmability

In qualitative research, confirmability refers to the ability of others to corroborate similar results and recreate the research (Trochim, 2006). As the researcher, I provided a distinct perspective. The confirmability of this research was enhanced by implementing several strategies. Procedures were implemented for checking the data multiple times throughout the study. This included member checking, which may be used to ensure the accuracy of the interviews conducted, but it was waived due to time consuming and busy schedule of participants as some has expressed. I also actively seek out description of unique statements to convey various perspectives of the phenomenon such that as many potential perspectives may be represented.

Study Results

The three research questions are the organizing concept for this section. Each section includes patterns and themes from the analysis as well as participants own words. The following three research questions guided the exploration of what causes the problem, what could be done to mitigate the effects of the problem, and how these changes might impact the engineering construction industry. The goal for this research was to create and formulate a theory based on the data collected from literature and from participants based on the three research questions.

RQ1. What factors affect ethical decision-making in U.S. construction engineering projects?

What follows is a brief discussion of each of the top five factors mentioned by the participants in order of importance:

Factor 1 - The legal system and forensic engineering. This factor includes the judges, attorneys, court hearings, forensic expert witness appearance in the courts, and the jury. Engineers expressed total dissatisfaction with attorneys and judges' attitudes and disrespect to engineers inside the court, and in public. Participant (2017) said, "The judge was biased to the other side and limit my ability to explain to the jury the nuances of the question that has been asked," "Nothing gets resolved in the court of law," "I had several frustrating experiences! Categorically? It is very difficult to give a testimony in the court where the judge is biased towards one side or the other.?"

> The judge will allow the opposing attorney that hold the same attitude as the judge does, allow him a lot of latitude more than allowing your attorney, in another word, if I try to give a complete answer, the judge will not allow me, he allows him to give complete answer when the opposing attorney ask question, and you have to answer yes or no, it gives wrong impression with the jury. If you say yes (but), the judge comes back and say, 'sir you cannot answer that question' your attorney will talk to you later. (Participant, 2017)

Another participant expressed that there are major factors that may hold engineers from performing their role effectively and efficiently, he said, "I had an occasion in my project where the attorney wanted me to say something that is not quite right. I explained to them that it is not in best interest for me to say that" (Participant, 2017). The phenomenon of disrespect expressed by many engineers being undermined in public while they could not defend themselves in the court because they could be accused in contempt of the court. Participants observed many malpractices and controversies and

said, "Attorney aware about the bribing and illegal issues...illegal business... they can play ignorant." On the other hand, they did not expect altering facts of their testimony in courts and said, "Legal process overrule facts of the case in courts" (Participants, 2017). Legal cases extend unreasonably, Participants called it "extensive legal lawsuits," "Judges can cause suppression of information, so attorneys who lose the case can appeal, the appeal is based on legal ground NOT facts. This is misrepresentation or misconduct on the part of the judge" (Participant, 2017) exhausting the economy and business resources inappropriately. The Board of Engineers does nothing about it.

Factor 2 - Lack of concern for safety and ethics. A Participant (2017) noted, "Ethics differ by culture" due to his experience locally and internationally. Safety of the public and structures depends on the ethics in design and construction. A participant (2017) warned of "Contractors scam in design-build projects" involving "greedy and cheating." Another participant pointed out to "Conflict in professional insurance" and asked, who should carry it, engineers or contractors? Another Participant express concern regarding the conflict between the construction profession and the ethics saying, "Ethics with social responsibility and business profit are hard to separate" (Participant, 2017), while another participant detailed the concept as "US goes with low bid, lower pay, cut corners, use cheap products, then turn and sue everybody to get their losses" (Participant, 2017) different than European concept that goes with the average bid.

In another setting of business environment, one Participant (2017) owner detailed this phenomenon by saying, "minority system obsolete," "I have to pay 12% of the contract and pay them while I am doing all the work but I pay them 12%. The gov. call it

that I am helping minority." He further commented, "I am not helping, I am doing all the work," "they have to be trained and do the work or eliminate the program." He added, "if they are qualified, we hire them, but to enforce a program under specific title and force businesses to pay fees by force is inappropriate" (Participant, 2017).

Participants (2017) said, "Lawyers make engineering ethics legalistic", "Lack of conformation with building codes, public law, and public health" inside the court; they described it further as, "The attorney is not under oath and can tell the sky is green and the glass is blue, in the court." Apparently, the Board of Engineers have no role or interest to protect engineers' dignity and quality of products, as a Participant noted that "Forensic expert witnesses lack of education, lots of money." Board of Engineers seem to be careless of the ethics, education, or safety and dignity of engineers.

When conflicts escalated to legal lawsuit, the unethical decision making/rulings by the courts derail the outcome of the case while engineers are helpless inside the court. with no support, while misleading and swaying the jury results in wrong outcome of the case. Another participant (2017) said, "Multiple lawsuits, as 7 legal cases in 90 days for one project can affect the budget and possible closure of the project"

Factor 3 - Deficiencies in engineering education. Participants (2017) expressed concern about recent trends of engineering education, students depend on calculators, eliminating their minds and ability to memorize, other materials eliminated and said, "Engineering education is going backward" and "Forensic expert witness lack of education, lots of money." A proof that Board of Engineers careless about lack of education, unethical attitude, and sacrifice safety and quality of products (such as

construction, bridges, decision-making/rulings in courts). A Participant summarized it as, "Lack of conformation with building codes, public law, and public health" need to be addressed and considered. But obviously the Board of Engineers have no positive role; problems occurred in the past, carelessly still carried until now.

Factor 4 – Board of Engineers actions. Engineers are concerned because attorneys, and judges ignore/misinterpret the engineering codes related to damaged buildings, they said there is, "Legal misinterpretation to engineering codes", "legalistic ideology" (Participants, 2017). Participants also noted, "Engineers and building codes overruled and undermined by attorneys in courts", and "Engineering too technical for Jury" (Participants, 2017), but judges do not allow engineers to explain, as detailed in Factor 1 above.

The Board of Engineers ignores numerous incidents, dos not support its engineers nor the engineering codes; the Board also violates its mission and vision: "to protect the public's safety and property, and promote the ethical engineering, gender equality, and professionalism in engineering practice and licensing" (CA.Gov, 2012). Although those concepts are the Board's mission, but the Board violated them all per participants (2017) data. Female engineers have big problem in the industry and silent. A Participant (2017) noted, "I do not know how to improve the Board of Engineers system."

Factor 5 – Women engineers sabotaged. Although few female engineers reached higher level and ranking, but my experience during searching for participants revealed women engineers in total silence and dissatisfaction, going with the wave, not paid equally, and under fear and worry. Female engineers collectively declined to talk,

contrary to male engineers who showed willingness to participate, shared their voice, and are interested to cause a reform. A female participant said, "I think you will have problem getting more women because they do not want to talk about it"; I asked, "why?"; she said, "I talked to some of them, they are afraid, they are submissive, we live in men's world. They want to be quiet, women taught to be quiet and don't make wave" (Female Participant, 2017). She noted in another statement, other female engineers declined to participate stating, "we have no accomplishments to share equal to that of male engineers, what are we going to tell her, we hate to complain on academic record or lose our jobs." She feels bad and disagrees on this concept but does not know how to solve the problem, so she told me, "I have a lot of respect for women who speak up, good luck with your paper, I would like to see how you will change men's perspective" (Female Participant, 2017).

In order to eliminate excuses, I have to note that the first female is a Caucasian, born in America, with no accent, and currently working outside engineering. She looks forward for better opportunity for her daughter; in the 21st Century women are still complaining. She noted that whenever she faced problems at work she moves away, "I was not trained properly, I was told 'why you are not siting at your desk' while I was doing my job. I am not a kid, I just move to another job without complaining, I do not want problem" this is in order to avoid lawsuits as other women experienced when pursuing their rights and did not get their right anyway. By adapting this attitude, she avoided conflicts, but on the other hand, she never learned her role and authority as an engineer, she will not go up the ladder or hold high position, she admitted so; but she did

not know what to do, she hopes for the system to improve. For my probing question about legal issues at work, she said, "I have no experience with the legal system, only one project was subpoena but they told me not to talk about it."

Another female engineer Participant (2017) reached highest position with recommendation (she requested not to mention where), she expressed frustration saying, "there is favoritism, men can drink and talk and have party at night, you feel isolated, you do not know what decision made on site or outside the site" If women colleague join for social interaction, they be called names and other social issues interfere as well; this Participant is a married Asian. She said, "women in higher position controlled", "Women are hard on each other, I hired two women but they turned against me" (Participant, 2017).

The third female engineer Caucasian born in America with no accent noted that her reaction to the ethical decision making was based on her age; when she was young, she did not challenge superiors in unethical decision making because she wanted to keep her job and future recommendation. But later in advanced age, she was stronger and declined to participate in unethical decision making by delegating the issues and did not care too much if she loses her job as she will retire anyway soon. A male engineer participant stated same idea and that he quit the job and started his own business. When I asked about legal issues at work, she said, "Attorney aware about the bribing and illegal issues...illegal business... they can play ignorant"

The phenomenon that I observed in the participants female engineers is that they are either retired or quit their job or work in another environment, but those who are still

working have declined to talk on academic record; however, during the conference, few shared with me their concerns in person, but I cannot include in the research.

RQ2. What initiatives based on these factors could be implemented to improve the quality of ethical decision-making in U.S. construction engineering projects?

What follows is a brief discussion of each of the top five initiatives mentioned by the participants in order of importance:

Initiative 1 – Reform the legal system. This is the first initiative in order of importance. A Participant noted legal system should "focus on inherent rules than making new rules", another recommended to, "enforce penalty to stop lies in courts by [some engineers, attorneys, and judges] in order to improve system" (Participants, 2017). A participant said, "There is a scam that rules, I have seen it, they use engineering to make money" (Participant, 2017). This is unethical phenomenon unexpected in the justice system. It is a call for the entire system to be reformed. Another Participant noted, "when he [attorney other side] lost that part of the case, the attorney turned around and talked about how he embarrassed me so badly. I thought it was inappropriate.

“That attorney who defamed me knows I am competent, I was deposed by him to testify numerous times. I have 24-year experience as forensic expert witness" (Participant, 2017); they all ask for respectful image of the engineering profession, protection of their reputation in society, and their dignity that is undermined by attorneys and judges. Participants seek a reform but do not know how to improve or reform the legal system or at least be respected in court and in public.

Initiative 2 - Reform engineering education. Most participants are concerned of the current education in engineering undergraduate, in math level in college, and in forensic education for the practice. They said, "Expert witness forensic work lack of education, need improvement, lots of money cause corruption & greed, unethical beliefs", "Education and ethics training needed" (Participants, 2017). They expressed that "ethics and engineering education exist, but not adequate" (Participant, 2017). Engineer Participants (2017) stressed on the need to enforce the engineering codes, the administrative enforcement, and penalty in construction and in courts because judges and attorneys misuse their authorities and abuse engineers as mentioned above.

Initiative 3 – Emphasize ethics in engineering education. Participants suggest engineering ethics education as most important in order to keep the business going smoothly and eliminate corruption. A participant compared learning the ethics as "the initiative -- to wear a seat belt... from the ground up." “As the kids when learning to wear seat belt from childhood, it became a habit in their mind and behavior; ethics should be learned early in life, from ground up.”

Initiative 4 – Emphasize quality control. The quality control addressed by all participants as most important aspect in construction and in the courts. For example, a participant noted, "a judge was really against an attorney; the attorney was frustrated and asked the judge, 'Judge do you want me to continue?'" (Participant, 2017). This scenario is during the court hearing in closed court room, without quality control over the judge behavior and bias, even targeted attorneys by the judge.

As one Participant stressed on the need for quality control in form of "Administrative enforcement to control money and corruption" (Participant, 2017). Furthermore, the *kids for cash* by corrupt judges ruined more than 2000 lives of teens after sending them to jail for no reason but for exchange of cash, a participant said, "the judges sent the kids for minor infraction..., if they get fight at school thy sent them to jail," participant noted that in same tone in engineering there are cases of "land development cases...where attorneys and judges were in cahoots and made millions of dollars" (Participants, 2017).

Initiative 5 – Enforce engineering codes. Improving and enforcing the engineering codes and administrative enforcement will ensure safety of the engineering projects design and construction. Participants stated the need of, "Administrative enforcement to control money and corruption", ceasing the "legal misinterpretation of engineering codes", requested alternative system because "Engineering too technical for Jury." Dissatisfaction with the role of Board of Engineers and expressed concern that, "Engineers and building codes overruled & undermined by attorneys in courts" with no support or protection by any entity, they demanded changes.

RQ3. What would be the impact of these initiatives on the cost and quality of U.S. construction engineering projects?

What follows is a brief discussion of each of the top five cost and quality impacts mentioned by the participants in order of importance:

Impact 1 – Reforming the legal system. Participants' most interesting data collected confirm that there is total loss of trust in the ability of attorneys and judges in

conducting business, taking care of society's safety, economy, ethics, business, education, justice, and respect to engineers. As participants noted, "All government personnel are attorneys, cannot solve problems" (Participants, 2017) they just send people to courts and ask them to hire an attorney. "Attorneys like to write rules and laws to find ways to make more rules to figure out how to justify things to make more money" (Participants, 2017). There is English destruction where legal documents are altered and facts eliminated, a Participant noted "attorneys write 6-page documents in six lines" (Participants, 2017). The reform could produce a future society in which judges make more ethical rulings.

Impact 2 - Reforming engineering education. This impact could ensure the adequacy and effectiveness of the design and construction of engineering projects. Participants (2017) concerned said, "Education is going backward and if corrected will take years to produce quality graduates." This is the reason the reform should start soon. The impact of the reform could improve the quality of products and services, reduce mistakes, and eliminate causes of failure of bridges, structures, and other issues, and finally could provide competency of products among worldwide technology and innovations and ensure better ethical decision-making.

Impact 3 – Emphasizing ethics in engineering education & business. Improving ethics in the reform could have great impact on all facets of engineering business, courts, and society including ethical decision-making. Government programs are not ethically adequate; a Participant (2017) says, "Minority program is obsolete, I pay 12% of the contract and I am doing the work. If they are qualified, I give them the work but they are not."

Eliminating unethical acts in courts could ensure respect of engineers and litigants within the legal case, and eliminate corruption; Participants (2017) comment "Judges favoritism and bias in the court process", "Judges can cause suppression of information, so attorneys who lose the case can appeal, the appeal is based on legal ground NOT facts. This is misrepresentation or misconduct on the part of the judge" (Participant, 2017); the Board of Engineers does not protect the profession or engineering codes. The reform should include the Board of Engineers function. Participants (2017) noted, "Legal process overrule facts of the case in courts", "Lawyers make engineering ethics legalistic." Eliminating fear of engineers from getting "extensive lawsuit" could instill the ethics in their behavior, reduce or possibly eliminate corruption in education, construction, and in the legal industry, which is supposed to be the place for justice; but currently it is destructing court. The reform will include this concept.

Impact 4 – Emphasizing quality control. The quality control is most important aspect in every engineering project, construction, manufacturing, the courts, and the education. Many codes and regulations existed but not implemented. Participants (2017) pointed that there is, "Lack of conformation with building codes, public law, and public health." The system/court initiated the 'Bargaining Union' but it is obsolete, creates problems instead, as Participants (2017) remarked, "Union strikes instead of negotiating." It is supposed to be an entity for quality and justice to rank & file employees, but it is not. The union composed of attorneys and judges, influences the Board of Engineers. "There is Board of Engineers liability", "politics and power, connection", "Do you know what is catch 22?" (Participants, 2017). Quality Control ensures the production is safe, the project

done upon specifications, instructions given to jury and the rulings should be fair to the best interest of society and the projects. Although quality control exists, it is not applied adequately and sometimes ignored. The reform will include quality control.

Impact 5 – Enforcing engineering codes. This is of a big concern to engineers and expert witness engineers. They expressed that the education is lacking and no codes to follow, "Forensic expert witness lack of education, lots of money" (Participant, 2017). Engineers "uphold the honor, integrity, and dignity of the engineering profession" (Appendix A, ASCE, Canon 6), but engineers and the building codes overruled by attorneys and judges inside the court without protection. The Board of Engineers and the union are silent; Participants (2017) stated "When I did the PE exam, there was flaws", "I do not know how to change the Board of Engineers." This change will be included in the reform.

Summary

Participants are expert engineers with experience ranges between 15 to 45 years, business owners, expert witnesses in forensic construction court cases, and others study law. The purpose of this information is to build credibility for the wealth of information collected, the seriousness of the problems, and the legitimate finding reached.

Participants answered three major questions in a qualitative grounded theory research. The first question inquired about the factors that affect ethical decision-making in engineering construction in the Unites States. The major factor was the legal/forensic pressure, where expert witness engineers and the building codes are overruled in courts

and shoveled among courts levels generating unexpected legal costs loaded on the engineering construction projects.

The second question inquired about what initiatives could be implemented to improve the legal/forensic factors deficiency and further the ethical decision-making. Participants suggested ethics education, quality control, and administrative penalty in courts for misuse of authority of attorneys and judges, but participants noted that those initiatives already existed and not applied, and suggested new initiative or a reform.

The third question inquired about what could be the impact of those initiatives on the cost and quality of the projects in the U.S. construction engineering industry. Participants asserted that the initiatives are not effective because they exist but are not enforced; therefore, there would not be a positive impact. They suggested a new reform with positive result.

Chapter 5 consists of the interpretation of the results that are the findings in chapter 4. Chapter 5 also includes limitations of this study, and recommendations for future engineers to pursue. Finally, Chapter 5 includes implications for practice, theory, and social change.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this qualitative, grounded theory study was to identify the factors that affect ethical decision-making in construction engineering projects in the United States.. The research literature revealed that the following engineers Juran (1995), Ekici and Onsel (2013), Adnan et al. (2012), Kessler (2011), and Medina (1967) have all addressed same concerns as those reflected in the findings of this study, such as deficiency in engineer education and in the quality of products, higher cost, and incompetency with worldwide market, all due to the involvement of legal and political system in the United States. The findings from this study coincided with the literature recommendation for global social change in the government and legal system.

Interpretation of Findings

The factors that affect ethical decision-making are the basis for the diagram in Figure 1. The purpose of this diagram, which is grounded in qualitative data obtained from forensic expert engineers with 15 to 45 years of experience who participated in this study, is to identify a set of changes that, if implemented, could result in a significant improvement in ethical decision-making in construction engineering projects in the United States. The proposed social changes comprise:

1. Legal Reform,
2. Engineering Reform,
3. Education Reform
4. Protected by The Professionals Civil Rights Act

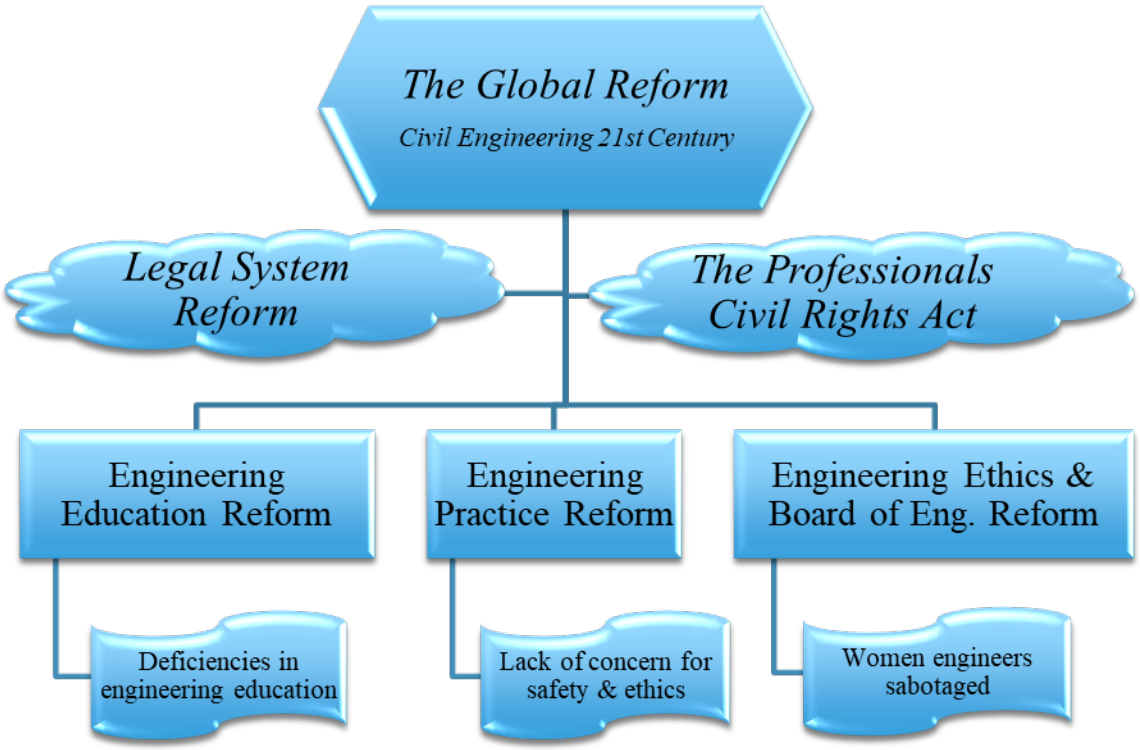

Figure 1. Global reform for civil engineering in the 21st century

Legal System Trend

Analysis of the participants' data revealed that forensic expert engineers have severe concern that the building codes are misinterpreted and ignored during the court hearing of forensic cases, the jury is misled, decisions are pre-planned, high legal fees loaded on the construction projects, and most of the awards go to attorneys; this represents unethical decision-making in the courts by attorneys and judges. Adnan et al. (2012) described the engineering construction industry as "the most fraudulent industry worldwide . . . due to bureaucracy and government policy" (p. 719). The large amount of capital involved in the projects may influence ethical decision-making, which in turn

influences the quality of products, engineering projects, and the global economy. Similarly, Murray and Meghji (2008) reported that $390 billion is wasted annually on engineering projects claiming the reason is “the abuse of public office for private gain” (p. 7) while taxpayers pay these losses in form of taxes.

A legal reform group in California, The Committee for the Rule of Law (2016), stated the following: “The law is so inconsistently applied that the Chief Justice of California has publicly said, ‘You’d have a hard time telling the wheat from the chaff’ when reviewing Court of Appeal decisions” (The Committee of the Rule of Law, 2016, para 3). This notion observed in a court hearing process where the judge did not allow any discussion of the case, stating that the plaintiff addressed issues-- against the system on records, -- pointing to the court reporter who types every word. This creates empty transcripts that cause the second appeal court to deny the appeal of the target party due to lack of information.

The court transcript is the only document used in the appeal court where information of the case is willfully withheld, and the transcript is empty, meaningless, and insignificant, as the Chief Justice of California has publicly said, “You’d have a hard time telling the wheat from the chaff when reviewing Court of Appeal decisions” (para 3). The transcript, which is the only document reaches the Appeals court, is empty; as consequence, the decision is possibly tainted. As the chief justice in the court disputes his own system and pointed for the need of reform and to cause social change in the legal and court systems, the problem is illuminated.

No judge or attorney seemingly knows how to reform the legal system nor is willing to reform it. The U.S. Chamber of Commerce conducted a summit to reform the legal system for 16 years but was not successful, thus reform did not occur (U.S. Chamber Institute for Legal Reform, 2014). To this point, study participants reported that they were stopped and controlled during their testimony and information was conveyed incompletely to the jury. They claimed, "Judges can cause suppression of information, so attorneys who lose the case can appeal; the appeal is based on legal grounds not facts. This is misrepresentation or misconduct on the part of the judge" (Participants, 2017). This scenario is consistent with the one above.

Similarly, gender within the legal system is of high concern, as many female engineers declined to participate in this research out of fear of getting fired because they will not get justice. As a retired female participant noted, when she faced prejudice at work, she did not argue, she quit without asking for her rights as her colleagues did because she observed they did not get their rights neither at work or in courts. This is expressed in the literature in Lilly Ledbetter (2011) case when the courts and controversial existing laws willfully denied her civil rights and the compensation of equal pay, and caused her large defamation. She spent 10 years in courts to fight one piece of law, then a nonsense law was made on her name (The Lilly Ledbetter Fair-Pay-Act, White House, 2009)) while she received no monitory compensation. The law is purported to ensure that future generation will get the justice; which may or may not be applicable.

The above scenario explains why the participant female engineer (2017) relinquished her right at work to learn and go up the ladder; rather, she declined to argue

and quit her job. This is the same as the eight engineers who were fired and banished from the Bay Bridge area project managed by an attorney who disregarded expert engineers' recommendation, so he decided to retaliate against them (Piller, 2014). No one protected the eight engineers, Lily Ledbetter, and participants (2017) from being humiliated in courts and from this injustice and threat of life. Hence, it is time for the global reform.

Participants (2017) noted that judges' misuse of power, intimidation, and influence sways retained attorneys of female plaintiffs who have no rights within the system either, as in the case of Lilly Ledbetter (2011) when the jury awarded her $3.2 million, but after a year during the appeal the entire compensation was seized from Ledbetter, which is a proof of double standard in court process (Huffer, 2008, 2011). This is an example of why some attorneys may choose not to represent female engineers when they seek justice. This may also explain why most female engineers declined to participate in this academic research study.

Engineering and Business Trend

Juran (1989), an engineer, expressed concern over the effect of the political and legal system on ethical decision-making, products, and the economy. Bright (1997), a law professor, stated that "little attention is paid to the fairness and reliability of the process" in the justice system in the United States (para 1). This notion perfectly coincides with the participants (2017) data stating, "engineers overruled by attorneys," "conflict of thinking between engineers and attorneys in forensic cases," and "undermining engineers and building codes in courts." Also, Bright (1997) asserted that there was a loss of

citizens' trust in the court system because a vast number of citizens "sentenced to death were actually honest," according to Supreme Court Justice John Stevens' statement (para 3). This "death sentence" occurred recently in 2014 for the Bay Area bridge project that was headed by an attorney who mismanaged contractors and harmed engineers. In the end, the bridge cracked and ended up in litigation due to contractors' mistakes.

Nine expert bridge engineers were dismissed from the project (Piller, 2014). DeSaulnier (2014) stated that a court report noted that the engineers were dismissed because they refused to accept low quality work that was not up to specifications by the contractor. Mainly, engineers opposed the request of the project manager (an attorney) to accept the low-quality work of the contactor even though it would sacrifice the public safety. This was dual obstruction of justice to cover up on the contractor's malpractice that may cause massive death of citizens on the bridge especially in rush hour (Derbeken, 2014; DeSaulnier, 2014; Piller, 2014). Society has never heard about how engineers are mistreated in the United States.; engineers' life and safety should matter and threats to it should be exposed. This is a big silent gap identified in this research for future social change consideration.

In addition, the Participants (2017) reported that as engineers, they have been undermined in public by judges and attorneys without respect before the jury and even outside the court; they don't know what to do and some noted that the Board of Engineers don't protect the dignity of engineers in society. The literature addressed this phenomenon as well when Singh and Rathore (2012) conducted a research study and selected 60 MBAs from an Indian and Chinese Engineering University and 60 junior-

level undergraduate students at a US university. They asked the groups if they would be interested in studying politics and undertaking leadership posts in the future, they were surprised that *no* student from U.S. group replied affirmatively, while Indian and Chinese students were willing to do something to help their country (para 6).

Singh and Rathore also added that most of the U.S. government cities and departments that require engineering skills and expert engineers are instead "headed by a bunch of attorneys" (para 7). They described their impression of the environment as that engineers "'dance' to the attorneys" (para 7). Singh and Rathore criticized the lack of leadership and weak decision-making style that wastes billions of dollars due to deficiencies in projects (para 7) and undermines the image of engineers in the society.

Decision-making is a common aspect for all professional industries, such as engineering, medical, military, and judicial ruling. In civil engineering, for instance, decision-making is crucial for all phases such as design, planning, and construction. Elm and Brown noted in their research focuses on improving engineering decision-making that poor decisions can result in destruction and major failures of structures (Elms & Brown, 2012).

Education Trend

Participants engineers (2017) expressed concern of the engineering education direction by saying, "Education is going backwards," and "[education reform] takes years to produce quality graduates," but no one acts on it for decades. They observed that improving education is ignored mainly in higher level of the engineering and the engineering license exams; instead it is considered a demonstration of knowledge, exams

became politics and a tool to pilfer engineers' money and discriminate against race and gender, not only in one State but from all around the United States, as participants of this study gathered from several states, participants said, "there are flaws in the PE exam; Catch 22: connection, politics and power."

Participants (2017) asserted that laws existed but are not enforced properly and that the "legal system causes most losses," they recommended a "technology and education reform," "legal reform," "minority system and the economy reform;" a participant noted, "there are scam rules using engineering to make money," while the "Board of Engineers [causing] conflicts of service to engineers, to engineering codes and licensure, and to forensic investigation." Participants expressed gratitude for this research by saying, "I respect your study for such a social change [the legal reform]," and "I am glad you take it on, it is a major challenge to improve it [the legal system]," and "it is Nobel research." Therefore, it is a global reform starting with the legal system reform.

On the other hand, the literature projected same concern about lack of education, when Schwinger (2008) stated that schools and colleges used to teach mechanical drawing courses in the past, but he noted that newly hired engineers in the profession lack such basic skills. Those skills are essential to perform their design adequately and “[communicate] their design intent to others” (p. 4). Schwinger also expressed concern about the new trend in engineering education. He went on to comment on a lack of knowledge among CAD operators about laying out framing plans, symbols, and dimensions details (Schwinger, 2008, p. 4). He suggested establishing in-house quality

assurance (QA) for structural engineering firms to counteract the decline in education that occurred in the undergraduate engineering during the last couple of decades.

Gap Partially Recovered

As noted in the literature review, corruption has not been reported clearly in the past due to fear of engineers to address their civil rights, safety of life, and dignity in society (Ekici & Onsel, 2013). Many live in anxiety. Piller (2014) and the court reporter DeSaulnier (2014) reported the dismissal of eight (8) engineers alone from one project for retaliation purposes. The male engineers participanting in this study participated despite their fears. Many of the female engineers approached, on the other hand, collectively declined to express their concern in academic record, claiming that they do not have accomplishments equal to male engineers or were worried that they would get fired if they spoke on the record. Only three female engineers finally participated, and they are either retired or had recently quit their job. This is one of the gaps that needs to be considered in future research.

Examination of the literature showed that there is a lack of peer-reviewed articles related to the factors affecting ethical decision-making in the U.S. engineering construction. Although authors of selected literature recommended that someone should conduct research on the problem of corruption and the legal system as it is intertwined with the engineering construction (Ekici & Onsel, 2013; Juran, 1989, 1995), there is still a scarcity of peer-reviewed articles on this topic in the U.S. academic literature. In this study, I conducted and investigated the problem, and the corruption in engineering construction from several angles. The Participants (2017) confirmed the phenomenon of

corruption exists, provided data of how they were personally involved as expert witness testifying in the court, and described how they were treated unethically and how engineering codes are altered in the court. Golden and Mahdavi (2014) noted that the integrity of judicial institutions is lacking, and that the traditional legal system affects the corruption in several ways.

Most articles peer-reviewed on the phenomenon of quality vs. corruption are found in other countries, not in the U.S. literature. There are credible articles published by faculty, engineers, and attorneys, and legal websites arguing the existence of the phenomenon of corruption. However, they are not peer-reviewed. This absence of professional literature is probably due to fear of facing retaliation or litigation (Caught.net, 2015; Cross, 2015). This shortage of articles constitutes a large gap in the literature research industry. This phenomenon resulted in false documentation and hiding facts while future studies would build on invalid, false, or missing information (Chirot, 1977; Ekici & Onsel, 2013; Juran, 1995-1989). This gap needs to be resolved academically and professionally. This study shows the gap is partially resolved, which may help in causing social change and adding peer reviewed literature of the cause of the corruption by the defected legal system negatively affecting the quality of products and the economy in the United States. however more future research is needed.

The Conceptual Framework and the Themes

Figure 1 shows how all principal themes interacted, starting with the legal system reform, followed by the engineering education reform, the engineering practice reform, the engineering ethics, the Board of Engineers, within which women and male engineers

are sabotaged, and the Professionals Civil Rights Act , which was created to ensure protection of engineers. The conceptual framework shows no discrepant cases or non-conforming data. There is agreement among participants regarding the answers to the research questions but many discrepancies between the engineering and legal field concepts and direction. Both the literature and this study's participants (2017) recommended reforming the legal system as it inflicts major negative effects on all aspects of the engineering industry and society. This will follow with the engineering education reform along with its practice. The Professionals Civil Rights Act is the supportive unit.

Limitations of the Study

Limitations are conditions, influences, and situations that are out of the control of the researcher. They may affect, restrict, and control research data, analysis, and findings (Simon, 2011). The most influential limitation regarding the unethical decision-making in engineering construction and forensics is the intimidation, disrespect, and fear of the legal and judicial systems. The literature review and the limitations in Chapter 1 noted that there are forces behind the scene influencing ethical decision-making and responses of participants in the academic survey process. Although those forces are known, the participants of previous studies were still uncomfortable to report the truth out of fear, which have affected their findings and they recommended future researchers to convince participants to tell the truth (Ekici & Onsel, 2013; Ho, 2011; Juran, 1995).

This research study covered this gap partially when the Participants (2017) (male engineers who served as expert witness in forensic cases) reported the truth, but female

engineers collectively declined to speak up or participate, out of fear, despite assurances that their identities would be private and protected. Also, inquiries showed that few female engineers act as expert witness to testify for structural damages. These scenarios indicate the lack of ethical decision-making within the legal system by dates. It is perceived as on-going trend of abusive court system from 2002 to 2008, 2011, 2017, and previously theorists Juran (1989) and Medina (1967) recommended that the government and legal system "have to put [their] own house in order" (p. vii).

Participants (2017) are prevented from explaining the codes in the court to the jury and said, "lawyers get in the way make it legalistic", "engineering too technical for Jury," the result is unspoken dangerous life to the degree of threat of life and sending gangs to those who oppose that system, pilfering their income from around the world without engineers consent or knowledge, and finally slaughtering engineers silently (Derbeken, 2014; DeSaulnier, 2014; Piller, 2014), which is anti-constitution and abusive civil rights, judges legalize the illegality, as Caught.net wrote "We want to live with justice, not spend our lives pursuing it" (Caught.net, 2015, para 2). that citizens are getting the run around, not getting justice, as per the case of Lilly Ledbetter (2011) who was paid 3/4 of salary compared with her male counterparts, but no justice rendered; and further, Caught.net (2015) concluded such cases by saying, "We are no longer a country of laws, we are a country where laws are creatively interpreted!" (para 31).

Recommendations

The findings extracted from Participants' (2017) data, the theorists, and the literature are the lack of ethical decision making and the need for a global reform for

social change. This conclusion is grounded in the data of forensic expert engineers, 15 to 45 years of experience, for the purpose of social change. The recommendations for this research are numerous and cover two major interconnected industries of engineering and law in the United States.

Legal Reform

Bright (1997) asserted loss of trust in the court system in the society. The major recommendation for future researchers is to study the phenomenon of disrespecting expert witness engineers and ignoring the building codes in the courts by attorneys and judges. This may alter the jury's decision-making, cause unsafe structures, harm society, and result in loss of projects' budget, particularly in large projects with public funding. The goal of this phenomenon by attorneys and judges is to collect the most money from the budget of the projects while engineers should close ears and eyes and if one dispute it, one becomes target of gangs or is killed (Derbeken, 2014; DeSaulnier, 2014; Piller, 2014). The research literature addressed the loss of projects' funds, and Participants (2017) articulated same concern too and broke the gap partially, while few women engineers participated; so further in-depth research is needed in the legal process. However, not only research is needed but also actual social change is recommended.

Engineering Reform

This recommendation is vital to the engineering industry. The Board of Engineers is a major entity for the civil engineering industry; if defected, the entire policy, projects, engineers, ethics, and the codes would not function properly and result in damage and harm to society and the economy as it is now (Adnan et al., 2012; Ekici & Onsel, 2013;

Juran, 1995, 1989). The Board is a serious entity for future researchers to consider as related to involvement of the union in the Board of Engineers' affairs, which is a gap not addressed in the literature due to engineers' fear of retaliation and abusing their license. Moreover, literature shows attorneys manage engineers in large projects, oppose expert engineers' decision-making, when eight engineers stood their ground to protect structure safety, they were fired and banished by State of California, a court report shows the eight engineers slaughtered (Derbeken, 2014; DeSaulnier, 2014; Piller, 2014) while the Board role is totally absent in such incidents; this is a serious gap to be investigated.

Another concern is the *Union* that is a bargaining unit for state engineers. It is a legal entity comprised and managed by attorneys and judges, as described in the literature. Theorist Chirot (1977) wrote, "the large unions hold a key position of power in government policy-making. They can frequently make their political wishes effective; and they can, on occasion, serve as a powerful bloc capable of obstructing policies they do not favor" (p. 193). Misuse of the Union political power combined with the Board of Engineers' lack of protection to engineers, put engineers in status of danger and fear. This fear may inflict negative effect on decision-making of engineers who are reluctant to complain or suggest a solution, especially female engineers who collectively declined to express their views on academic records for social change.

Singh and Rathore (2012) criticized the lack of leadership and weak decision-making style (para 7) that undermines the image of engineers in the society. They also added that most of the U.S. government cities and departments that require engineering skills and expert engineers are instead “headed by a bunch of attorneys” (para 7). They

described their impression of the environment as that engineers "'dance' to the attorneys" (para 7). This scenario describes where the intimidation and fear within the engineering environment coming from. This phenomenon is highly recommended for future research.

Gender Concern

Another unexpected phenomenon surfaced: The few female engineers who participated were retired or recently resigned. They reported concerns of female engineers who are currently working and declined to participate in the research interview because of fear of getting fired and said, "We hate to complain on academic record, we don't have impressive projects as male engineers, and we do not want to lose our jobs" (Female Participants, 2017, on behalf of working women). I had never expected this reaction and fear, in the American environment where rights of women assumed to be guaranteed; this is unexpected gap needs to be researched--a major recommendation.

The phenomenon of fear and silence of female engineers in America, lack of "impressive" projects and accomplishments equally to male engineers (Participants, 2017) is contrary to the high accomplishments and training that I received abroad working as a resident licensed engineer specialized in managing construction sites of hospitals and university buildings from foundation to finish. While hospitals and schools' structures are my specialty, I am surprised that California Board of Engineers bans PE licensed civil engineers from working on school and hospital structures. Only SE license engineers allowed to deal with those structures; however, rarely when engineers acquire the SE license because mainly it is concerned of the legality and codes not the design and construction. There is a conflict and gap in education, licensing, and performance.

Despite the equalization and indigenous historical education and discerned engineering license, but the Board discriminates against women and foreign degrees and licenses that are fully accredited in America and could be a valuable participation to improve the gaps mentioned above. Juran (1995) noted that America lacks competition with worldwide, and Adnan et al. (2012) and Schwinger (2008) commented on lack of education. This is another gap that may cause conflict in the analysis and findings and is greatly recommended for future research to improve some gaps in the American society, mainly for women engineers. Dainty et al. (2010) noted that female engineers face obstacles and discrimination on the job and that this situation would continue unless a cultural change occurs in the engineering construction field.

Education Reform

This study's theorists, literature, and Participants (2017) demonstrated that American engineers need to acquire the independence, respect, and control of their engineering construction industry. Singh and Rathore (2012) stressed that engineers in America are at the mercy of attorneys and the legal system. This notion confirmed when Participants (2017) noted that judges humiliated them in courts during testimony in forensic cases.

Implications

This section contains discussions of the potential implications of the study on practice, theory, and social change of the study findings. These findings, as described in Chapter 4, relate to factors that inhibit ethical decision making, implementable initiatives

based on these factors that could improve the quality of ethical decision-making, and the impact of these initiatives on the cost and quality of construction engineering projects..

Implication of Practice

The study boundary is the ethical decision-making in the U.S. construction engineering projects. This boundary may include, but not limited to the following engineering and legal industries: judges, attorneys, engineers, engineering professors, engineering universities, engineering students in general, and those students in training in the construction sites in particular. Also, potential impact of some organizations within the boundary might affect the industry environment negatively--- such as the Union, Board of Engineers, Human Resources (HR), Administrative Judges, EEO, DFEH, OSHAn, as Participants (2017) noted, "Education is going backward."

Actual incidents of lack of ethical decision-making observed in managerial and higher level of power within engineering and legal systems resulted in negligence of engineers' safety by all functions combined, hence social change is needed. These functions as the legal system might need to be reformed due to altering documents and facts in courts (Huffer, 2012; Juran, 1995). Participants (2017) stated that "Legal misinterpretation of engineering codes," or due to ink on paper documentation, and Board of engineers' codes are not enforced, but rather was harmful to engineers inside the work environment. As Participants (2017) noted, "Board of Engineers liability, engineers and building codes overruled and undermined by attorneys and judges without protection, catch 22 connection with politics and power" (Participants, 2017). In the global society,

the implication and potential impact of this study may extend to families and children and other social functions.

Implication for Theory

This qualitative research study covered several gaps such as, but not limited to, the lack of peer-reviewed articles about the legal system as one of the main causes of corruption in the construction engineering and forensics in the United States. This phenomenon kept many engineers in the past from speaking out. However, Participants (2017) of this study overcame this problem and shared the truth in their interviews. Participants clearly expressed the need to reform the legal system. Additionally, the ethical decision-making in engineering projects is impacted negatively by the legal personnel intimidation to engineers as putting engineers "under pressure" at work and in courts (Participants, 2017). However, participants (2017) have elaborated clearly on the phenomenon of being under pressure has affected their ethical decision-making and the safety and cost of the projects. Their honest testimony has greatly benefited this study, and instilled a sense that the 21st Century will be the Engineers' Era.

Implication for Positive Social Change

The potential impact for positive social change is that the legal system might be reformed as the first step of the global reform upon participants' recommendation, as well as the recommendation in other literature. Participants Engineers (2017) expressed that the legal system, attorneys, and judges' involvement in the construction engineering forensic process are extremely frustrating and humiliating in public, saying, "Legal process overrule facts of the case in courts," "Judges favoritism and bias in the court

process," "willfully extending cases to appeal level," "Judges can cause suppression of information, so attorneys who lose the case can appeal, the appeal is based on legal ground NOT facts. This is misrepresentation or misconduct on the part of the judge." A Participant said, "When I did the PE exam, there were flaws, I do not know how to change the Board of Engineers." This confirms the need of education and practice reform for social change in the PE exam and engineering practice and the education.

Also, female engineers are getting unfair representation by the union, facing injustice in the court process, and they declined to participate in the academic research due to fear of getting fired or due to lack of impressive projects equal to male engineers. Female Participants said, "women in higher position controlled," "I think you will have problem getting more women because they do not want to talk about it," "I talked with them but they declined to participate in the academic research saying, 'we have no accomplishments to share as male engineers, we hate to complain on academic record or lose our job'," "Gender perception, favoritism, men can drink and talk and had party, you feel isolated, you do not know what decision made on site or outside the site."

The economy has been drained with excessive legal process and charges, as Murray and Meghji (2008) reported that $390 billion is wasted annually on engineering projects claiming the reason is "the abuse of public office for private gain" (p. 7) while taxpayers pay these losses in form of taxes. They all stressed that the setup of the legal system impeding their progress and the education and requested social change that this research recommended. Also, the aggressiveness and persistence of attorneys and judges

to keep the system and corruption as is could have a negative influence on social change as Juran (1995) noted.

Recommendation for Practice Based on Existing Phenomena

Chirot (1994) advised that when society decides to create social change, it has to study and analyze several aspects. Some of the aspects, such as new programs, the causes of change, and the consequences that may result must be examined to determine whether they would be beneficial or harmful to the public and the economy. Chirot noted the "social subsystems: economies, political systems, social institutions or organizations, and cultures" (p. 120) if mishandled may negatively impact societies. Chirot said: "I hope to demonstrate that no contemporary society is independent of the rest of the world and that studying social change without studying its international context is both theoretically unsound and dangerous" (Chirot, 1977, p. ix).

Caught.net concluded such cases by saying, "We are no longer a country of laws, we are a country where laws are creatively interpreted!" (para 31). This notion coincides with Huffer's (2011) assertion of the phenomenon of legal abuse syndrome and switching facts inside the court during the hearing process, she noted "you get in with an apple… they try to convince you it is an orange by the end of the court hearing" (Huffer, 2008; Huffer, 2011); and Participant engineer (2017) noted that "The attorney is not under oath and can tell the sky is green and the grass is blue" (2017). A recommendation is to reform the legal system, followed with reform the engineering industry and the education.

Engineers might establish mutual cooperation with lawmakers without infringement on engineers' practice, female engineers' rights, the engineering education,

the ethical decision-making of engineers, and the legal system reform. Those engineers and female engineers who were denied the right, defamed, humiliated, and faced injustice should be satisfied in order to prove that the social change actually in action and that ethical decision-making improved among engineering and legal systems. Furthermore, participants engineers commented on their dissatisfaction with the Board of Engineers function and role being under influence of the union and legal personnel. In conclusion, I propose that engineers be in control of their industry.

Conclusions

The purpose of this study was to develop a theory for the phenomenon of unethical decision-making in construction engineering projects in the united states. The problem of the unethical decision-making can have serious effects on the quality, cost, and safety of construction engineering projects and takes several forms, such as negligence in performance, bias/unjust behavior, conflict of interest by legal involvement, fraud, and bribery, among others (Adnan et al., 2012). For example, the collapse of a dam in California released 12 billion gallons of water, destroying thousands of houses, washing out bridges, and resulting in loss of lives (Nazaryan, 2016; CA.Gov, 2012).

The theorists and the literature asserted the problem of involvement of the legal system in engineering, and Participants (2017) found unethical decision-making in the legal system influencing engineers and the economy. Participants (2017) demanded a global reform for the legal, engineering, and education industries. It was worthwhile

spending years conducting this research that might result in positive social change for a better future society, the economy, and victims of the injustice.

The take home message to all parties involved is to adopt the courage, dignity, respect, ethics, care of society, the economy, and justice to all. *Global Reform for Civil Engineering in the 21st Century* encompasses the interconnection of social change in the legal system, engineering practice, education, and the *Professionals Civil Rights Act* (see Figure 2). There is a necessity for interested legal personnel and engineers to participate in a forum to expose problems and solve them. If they adopt the fear and avoid addressing the problem, they will not be able to solve it and they look bad in the world's eyes, as Singh and Rathore (2012) stressed that engineers in America are at the mercy of attorneys and the legal system and call it that engineers in America *dance to attorneys*. Many engineers believe that engineering industry and its personnel should be independent and authoritative.

In conclusion, the findings confirmed that *unethical decision-making* was found in the legal and political systems undermining image and authority of engineers in their own industry in the United States. The *Global Reform for Civil Engineering in the 21st Century* framework offers a *model of positive social change* for a *global reform* to guide engineers to make effective ethical decisions when dealing with stakeholders and to overcome the deficiencies of the legal and political systems. Implementing the changes indicated by this framework could yield a new era of peace and justice reflecting a high level of ethical decision-making construction engineering projects in the United States.

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Appendix A: ASCE Canons

Canon 1(a). "Engineers shall recognize that the lives, safety, health and welfare of the general public are dependent upon engineering judgments, decisions and practices incorporated into structures, machines, products, processes and devices."

Canon 4(e). "Engineers shall advise their employers or clients when, as a result of their studies, they believe a project will not be successful."

Canon 6. "Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession and shall act with zero tolerance for bribery, fraud, and corruption. (6c): .... in all engineering or construction activities in which they are engaged."

Canon 7(a). "Engineers should keep current in their specialty fields by engaging in professional practice, participating in continuing education courses, reading in the technical literature, and attending professional meetings and seminars. (7c). Engineers should encourage engineering employees to attend and present papers at professional and technical society meetings."

Appendix B: Informed Consent Form

IRB Study #: ----------

You are invited to take part in a research study entitled *Ethical Decision-Making in U.S. Construction Engineering Projects*. Only civil engineers, male and female, at the managerial level with more than 5 years of experience in engineering design, construction management, structural damage inspection, and forensic practice, and who have acted as expert witnesses are invited to participate in this study. This form is part of a process called “informed consent” to allow you to understand this study before deciding whether to take part. A researcher civil engineer named Eng./ Monique Sidaross, who is a doctoral student at Walden University, is conducting this study for positive social change. Thank you for your participation.

Background Information:

The purpose of this qualitative, grounded theory study, is to develop theory to understand and explain effects of factors you experienced regarding ethical decision-making in managing construction-engineering projects in the United States for social change. Engineers with experience in structures' inspection, forensic construction, and who have acted as expert witnesses more than once are welcome to participate.

Procedures:

If you agree to be interviewed in this Research Study 2016, please contact me via e-mail (.....) for top confidentiality reason, and note in the subject area "RS2016".

Voluntary Nature of the Study:

Participation in this study is voluntary. Everyone will respect your decision of whether or not you choose to be in the study. If you decide to join the study now, you can still change your mind later. You may stop at any time.

Risks and Benefits of Being in the Study:

Participating in this study would not pose a risk to your safety or well-being, and it will be entirely confidential. This study requires participants who are willing to provide honest replies that will be kept strictly confidential. Although there may be no direct benefit to you, your participation and the information you provide will be indirectly valuable for your job and workplace and the community in general; a possible benefit from being a part of this study is your safety on the road, sense of conveying your concerns in academic forum that may result in identified problems being solved, guaranteeing your comfort in ethical decision-making in the future, improving the dignity in your managerial position, improving justice system and its process, minimizing litigations and their effect on your business/work/economy/children/family, and saving lives by minimizing structural damage and improving education in mathematics, engineering, law, and so on.

Payment:

There is no compensation.

Privacy:

Any information you provide will be kept confidential. The researcher will not use your

personal information for any purpose outside of this research project. Also, the researcher will not include your name or anything else that could identify you in the study reports. Data will be kept secure in electronic password-protected files, and stored with the researcher in confidential places. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:

You may ask any questions you have now or before the interview take place by contacting the researcher via e-mail at --------. The interviews and all communications will be tape recorded for the purpose of adequate note-taking. The recording will be destroyed after it is transcribed, your name and personal information will be omitted from the transcript texts.

Please print out and save this consent form for your records.

Statement of Consent:

I have read the above information, and I understand the study well enough to make a decision about my involvement and that the interviews will be recorded. By signing below, I understand that I agree to the terms described above.

Date of Consent _____

Participant Electronic Signature _____

Researcher's Electronic Signature _____

Appendix C: Interview Protocol (IP)

Participant Name (number):

Position/Employer:

Professional Experiences (Managing, Teaching, Expert Witness):

How Long in Position(s):

Location:

Date and Time:

Introductory Remarks

I am very grateful for your participation and your precious time to take part in this interview. Please allow me to share some housekeeping notes before we start:

For the purpose of accurate note-taking, the interview conversations will be tape recorded. I will keep the tape recorder and will destroy the tape after information are transcribed. I did receive your signed consent forms and demographic surveys as your acknowledgement and I thank you so much for your valuable time. The period of this interview will be 1 hour during which time I ask you to turn off your phone in order to avoid distractions. During this time, I will ask a few questions to cover issues concerning the research topic. If more than 1 hour is necessary, we can arrange additional time to complete the interview.

I do *not* intend to evaluate your experience or any of your actions or opinions. Rather, it is my intention only to understand the real life around your work environment, whether positively or negatively related to the phenomenon. You are requested to provide both pros and cons related to the phenomenon of ethical decision- making in U.S.

construction engineering projects in order to identify what is working well and to address problems and discover recommendation grounded in your perception of how you think your profession could be improved and its problems resolved.

Interview Questions (IQ)

Interview Question 1. What factors affect ethical decision-making in construction engineering projects?

Probing Question. Tell me about a construction project that you managed in which you encountered major challenges, whether in design, by management, union, superiors, contractors, stakeholders, or others. What role, if any, did ethical decision-making play in this challenging situation?

Interview Question 2. What initiatives based on these factors could be implemented to improve quality of ethical decision-making in construction engineering projects?

Probing Questions. Engineers, as managers and decision makers, are at times confronted by ethical or human rights issues in the construction industry, and have to make a decision and take an action. Please share an instance like this that you were involved in, and give advice to engineers or contractors or others in the loop based on this situation about how to deal with this ethical problem and improve quality of ethical decision-making in construction engineering projects.

Interview Question 3. What would be the impact of these initiatives on the cost and quality of construction engineering projects?

Probing Questions. Based on the phenomenon of ethical decision-making in the U.S. construction industry, and initiatives and innovations that we discussed, what do you think would be their impact on the cost and quality of construction projects, and engineers' work environment? What effect would this have on the profession, the legal system, and society?

Closing Remark

It is now time to end the session in order to respect your time and schedule. So, this will conclude our interview. As you know, I am using a qualitative, grounded theory method for this research, which requires that I transcribe and analyze each interview. During this analysis, more questions may surface. Hence, I may need to ask for your help again for a brief second interview (over the phone or in person). I will notify you by e-mail if this proves necessary to arrange a mutually convenient time. For now, I thank you so much for your time today. I enjoyed meeting with you and much appreciate the information you shared. I am sure it will be very helpful in improving our understanding of the nature of ethical decision-making in the engineering construction industry in the United States and its impact on cost and quality, as well as how to go about improving ethical decision-making while lowering construction costs and improving construction quality for the good of all stakeholders. Thank you again, and have a nice day. I will stop the recording now.

Appendix D: Ad for Academic Research Interviews

ASCE
LOS ANGELES SECTION

Message from Monique Sidaross, ASCE Member:

I am a doctoral student, and received approval to conduct surveys for my dissertation research in Construction Engineering within the United States, for social change.

Civil Engineers with the following specializations are invited to participate in the research.

- Structural, Construction and/or Forensic Engineers,
- 6 to 45 years or more experience managing construction sites and/or,
- Acted as expert witnesses in forensic cases

Please circulate this request to male and female engineers who fit these criteria. Whoever interested and/or have any questions, please email me at vexpo2012@aol.com as soon as possible.

Thank you.

Monique Sidaross, S.M.ASCE
Doctoral Student