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Continual Energy Management Dynamics: Energy Efficiency in U.S. Automotive Manufacturing Industry

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
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2014

Abstract

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MBA, Walden University, 2009

BBA, Temple University, 2004

Doctoral Study Submitted in Partial Fulfillment

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Abstract

Managers at automotive manufacturers are seeking ways to reduce energy consumption, costs, carbon emissions, and waste from production processes. Researchers and practitioners perceive energy efficiency as the least expensive and most effective way to deal with issues related to climate change, but adoption of energy efficiency measures has been slow among industrial facilities. The topic of this research study was the decision-making process for energy efficiency projects in the U.S. automotive manufacturing industry. Flaws in this decision-making processes are preventing changes that can dramatically reduce energy usage, cost, and pollution. The study was grounded in the theories of energy management, organizational learning, systems thinking, and strategic management. Data is from open-ended question interviews and questionnaires of 21 decision makers in automotive manufacturing companies in the United States about their perception and experiences regarding the decision-making process for energy efficiency projects. The data were coded to identify themes. The findings indicated that organizational leaders with responsibility over energy management should include energy management standards and frameworks such as ISO 50001, Six Sigma DMAIC, and Energy Star as guidelines for selecting energy efficiency projects. Decision makers may find these results useful in improving their decision-making processes for evaluating energy efficiency projects. This research has the potential to promote positive social change in the automotive industry by reducing energy consumption and business costs, and it could benefit communities by reducing pollution through increasing energy efficiency in the automotive manufacturing industries.

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Dedication

I dedicate this study to my family who has been there for me through it all. I would like thank my wife Fatima for being the solid rock in my life and for being my friend and biggest supporter through this journey. I love you and I could not have done it without you. I also dedicate this work to my two daughters, Selma and Leila; you are my breath and soul. I wish to watch my children grow and to learn as much as I can on the way, and dedicate this study to them. I promise to pay you back the time I missed spending with you because of the days, weekends, and nights I spent on my study. Finally, I would like to dedicate this paper to my role model – the best international executive I know, my father. My father has taught me the importance of thinking big, thinking long term, and being tenacious about my goals. One of his simple sayings, "If it was easy, anyone can do it", has been my guiding light. My father has coached me to do what is hard and to make the tough decisions – to march down the unbeaten path, and to take the road less traveled.

Acknowledgments

A well-deserved round of thanks goes to my entire dissertation committee for guiding me through the process and helping me to improve my doctoral study. To my exceptional mentor and dissertation chair Dr. Alice Denomme Gobeille, who guided me through the somewhat lonely process of this doctoral journey: thank you for everything you have done. You are a true leader. To my committee members Dr. Michael Ewald, Dr. Robert Hockin, and methodologist Dr. Gene Fusch, I am very grateful for your guidance throughout the process. I would also like to acknowledge and thank the participants who contributed their time and provided me with the insight to complete this research study.

Table of Contents

List of Tables

List of Figures

Section 1: Foundation of the Study

Business managers in the U.S. automotive manufacturing industry have a significant opportunity to increase their companies' performance by evaluating the decision-making process for their company's energy-efficiency (EE) projects in their facilities. Major studies revealed that projects have about 50% or lower implementation rate in the U.S. industrial sector (Aflaki, Kleindorfer, & Polvorinos, 2013; Galitsky & Worrell, 2008; Muthulingam, Corbit, Benartzi, & Oppenheim, 2011; Therkelsen & McKane, 2013). This implementation rate in the industry may be the result of inadequate risk assessment associated with EE projects (Aflaki et al., 2013; Guerrero et al., 2011; Jackson, 2010).

One of the benefits of energy-efficiency is cost reduction in production processes. The financial cost of purchased fuels and electricity in the U.S. motor vehicle industry currently totals about $2.7 billion dollars annually (U.S. Census Bureau, 2011). This cost is not significant when juxtaposed to the $695 billion dollars in value of shipments for this industry during the same year; however, there is significant opportunity for energy performance improvement (U.S. Census Bureau, 2011). The automotive companies have a significant opportunity not only to cut energy costs but also to reduce harmful emissions (Galitsky & Worrell, 2008; Moynihan & Triantafillu, 2012). The automotive manufacturing industry has a significant environmental impact that affects other industries in every region of the world. Energy management has become a strategic issue, especially in the highly competitive automotive sector (Pardo Martínez, 2011; Rudberg, Waldemarsson, & Lidestam, 2013). Unfortunately, the products and the

manufacturing processes of the automotive sector have had a significant negative environmental impact around the world (Nunes & Bennett, 2010). With business as usual, the environmental impact will most likely continue to degrade because production of motor vehicles is increasing worldwide (International Organization of Motor Vehicle Manufacturers [*Organisation Internationale des Constructeurs d'Automobiles*, OICA], 2012).

Broad acknowledgment exists of the importance of decreasing this industry's environmental impact. Researchers have documented that automotive production has a negative environmental impact (Nunes & Bennett, 2010). Lowering the impact of unsustainable practices of automotive companies is important to the business community and the environment (OICA, 2012). Production of automobiles requires intensive energy use; because of the need for energy intensive raw materials and numerous materials used. Energy production and use have environmental implications which account for 65% of global anthropogenic greenhouse-gas emissions (IEA, 2011). By the year 2050, there will be two billion cars on the road worldwide, an increase of 12–15% annually (Nunes & Bennett, 2010.

The business community will need to rely on management system standards to lessen the negative impact of this progress. In order to manage quality and environmental aspects and impacts of business, the global business community collectively relies on voluntary standards such as the ISO 9001 and the ISO 14001. Organizations use these management system standards to meet general customer and specific internal organizational requirements. Leaders of organizations managing global

business processes and seeking to improve the quality and environmental aspects and impacts of their companies have implemented these standards in recent decades (Jong, Paulraj, & Blome, 2014; Searcy et al., 2011). Paulraj and de Jong (2011) stated ISO 14001 is the most widespread global standard to deal with environmental issues. Habidin and Yusof (2012) concluded that automotive companies with ISO 14001 certification have higher operational performance values compared to those that do not have ISO 14001 certification.

The global business community has a concern with how companies use energy in the production processes and facilities to determine where and how efficiencies can be achieved (Rudberg et al., 2013). In June of 2011, the ISO published a new standard for energy management systems in response to a market demand for controlling energy performance within facilities; this new ISO 50001 standard defines proactive management of energy as requiring managing the consumption, usage, and performance of all energy sources (International Organization for Standardization (ISO), 2011). The ISO 50001 energy management standard's structure is similar to the ISO 14001 environmental management standard, so that organizations can integrate the two management systems (Egbue & Barnes, 2013). The objective of this qualitative study was to understand the knowledge needed by automotive manufacturing leaders to select energy-efficiency projects without rejecting profitable projects.

One of the objectives for this study was to expand on the research of management bias in EE decision-making processes conducted by Aflaki et al. (2013) and Muthulingam et al. (2011). In addition, the results of this study could prepare business

leaders for the EE decision-making process. Work on energy management standards by McKane et al. (2009), related to energy management standards, was the basis for expansion in this research. In addition, I explored research by Jackson (2010) related to environmental and financial aspects of energy for a business to gain financial perspective to EE decision-making process. Finally, in this study, I expanded on the research of Nunes and Bennett (2010) related to the adoption of green manufacturing practices in the U.S. automotive manufacturing industry.

Background of the Problem

Automotive companies are responsible for approximately 15% of global carbon emissions (Sherman, 2011). The automotive manufacturing industry, which was the focus of this study, was the starting point for mass production that has negative environmental affects worldwide (Nunes & Bennett, 2010). The Industrial Revolution, during the 18th and 19th centuries, brought many advances to Western civilization, such as factories that created economies of scale with production lines and capture and use of steam power, which created many opportunities for socioeconomic advancement (Senge, Smith, Krushwitz, Laur, & Schley, 2010). Additionally, scientific management, introduced by Frederick Taylor in 1911, was rooted in the proposition that, through job analysis, effective hiring and training, job task planning, and proper compensation, the organizational workforce would prove to be more efficient.

The production levels for automotive manufacturers are on a growth path. A comparison of production numbers of top two automotive manufacturing countries, in the U.S. and China show that, in 2010, the United States produced 7.7 million motor

vehicles, and China produced 18.2 million (OICA, 2012). The percentage of production increased by 35.4% in the U.S. and 32.4% in China; however, the total number of motor vehicles in China was more than the U.S., and production is likely to grow in both countries (OICA, 2012). In 2011, China continued at the same pace of production with 18.4 million vehicles, and the production level in the United States increased 11.5% to 8.6 million vehicles (OICA, 2012). The global increase in the production of motor vehicles, with business practice as usual, will have an irreversible impact on global fossil-based energy resources (Nunes & Bennett, 2010).

Several research teams have explored the impact of industrial energy usage in detail. Many researchers (e.g., Aflaki et al., 2013; Muthulingam et al., 2011) looked at the impact of energy usage in the manufacturing industry and the environmental impact associated with the excessive waste. Aflaki et al. (2013) and Muthulingam et al. (2011) stated that EE projects in the United States with 1-to-2 year payback periods have an implementation rate of around 50%. Hitherto, researchers fell short of looking at the decision-making processes in detail to determine why there was such a low implementation rate of industrial EE projects. Companies may miss opportunities to increase their energy performance and at the same time lower their energy costs and emissions because of this low implementation rate. Jackson (2010) stated that companies bypass EE projects that would save more than they cost. In this study, I focused on the effects of energy management strategies on the day-to-day decision-making processes at the facility and individual levels to explore this common phenomenon.

Muthulingam et al. (2011) posited an extensive review of data gathered by the

Rutgers University Industrial Assessment Center, whose study showed the correlation between the sequence of EE recommendations made by engineering students of the IACs and the rate of implementation of those recommendations by the manufacturers. The research team of Muthulingam et al. concluded that studies of behavioral patterns for EE are not present in operations management literature. Because research on EE is still in its early stages, this study expanded on extant ideas and introduced new concepts that could help leaders prepare for the EE decision-making process. My assessment of Muthulingam et al.'s research revealed the gap in existing literature for a qualitative inquiry in the automotive industry.

McKane et al. (2009) discussed the importance of viewing EE as a strategic investment in future profitability. They indicated that in order to have an effective EE program, there must be a management commitment to conserve energy in the most efficient way. Furthermore, McKane et al. pointed out that managers lack context for understanding the environmental and financial consequences of not having an energy efficient operation. Muthulingam et al. (2011) and Jackson (2010) argued that there are environmental and financial benefits to EE operations. In order to promote EE projects, Jackson introduced a financial calculation tool called energy budgets at risk (EBaR) that may help with the implementation of projects by having a realistic, up-to-date tool for the risk assessment of EE projects. According to Jackson, current financial tools such as short payback calculation used by financial managers are a complete risk-aversion tool. Granade et al. (2009) revealed that EE offers the U.S. economy a vast, low-cost energy resource. Unfortunately, accessing this low-cost energy resource may be in doubt

because a majority of financial managers relies solely on simple payback calculation (risk aversion) to evaluate EE projects (Jackson, 2010).

Granade et al. (2009) estimated that, at full potential, the U.S. economy could reduce annual energy consumption by 23% or equivalent to $1.2 trillion by 2020. This reduction is more than cost savings, the authors estimated that these same cuts would abate a total of 1.2 billion tons of carbon dioxide's equivalent in greenhouse gasses by 2020. Granade et al. described the potential hurdles of reaching the significant savings and reduction of emissions in their study. With these facts in mind, and to contribute to specific academic research, the focus of this study was the EE gap identified in the body of knowledge in the U.S. automotive manufacturing industry.

Current research on EE identifies the high significance of energy efficiency gap in U.S. automotive manufacturing industry (Galitsky & Worrell, 2008; Nunes & Bennett, 2010). Pardo Martínez (2011) noted that there are few empirical studies on EE performance in the motor vehicle industry. Until December 2013, researchers did not explore the EE decision-making process. In order to contribute to management literature with this study, I attempted to discover the hurdles for implementing EE projects, and I explored how corporate strategies and systems thinking affect the decision-making process for approving or denying EE projects.

Problem Statement

The U.S. automotive manufacturing industry has a strong potential to lower costs and anthropogenic emissions by the simple act of improving energy efficiency in the production processes (Cárdenas, Romeral, Garcia, & Andrade, 2012; Nunes & Bennett,

2010). Such a move would be very significant; Sherman (2011) estimated that the automotive manufacturing industry is responsible for 15% of global carbon emission. Energy efficiency is the most cost effective and efficient way to deal with the escalating global financial and environmental problems caused by increasing energy demand (Fleiter, Hirzel & Worrell, 2012; IEA, 2011). Leaders in the automotive industry, thus, have the potential to decrease energy usage with minimal or no capital expenditure by implementing behavioral changes. The general business problem was the flawed decision-making processes that hinder implementation of profitable energy efficiency projects in the U.S. automotive manufacturing industry. The specific business problem was the partial knowledge of some automotive manufacturing leaders on how to select energy-efficiency projects without rejecting projects that might be profitable.

Purpose Statement

The purpose of this qualitative inquiry was to understand the knowledge needed by automotive manufacturing leaders to select energy-efficiency projects without rejecting profitable projects. In order to understand the decision-making process this qualitative study was designed to seek the perceptions and the lived experiences using questionnaires and interviews of a minimum of 20 energy and environmental professionals, business-line managers, and top management in the U.S. automotive manufacturing industry, a number chosen to exceed the threshold of previous studies (Brown, 2012; Rimanoczy, 2010). The study includes participants located in the Midwest and Southern regions of the United States, Illinois, Indiana, Michigan, Minnesota, Ohio, Alabama, Georgia, Mississippi, Kentucky, and Tennessee. The

population for this study was limited to U.S.-based automotive manufacturing and assembly plants that fall within the North American Industry Classification System Code 3361.

The results of this study have a strong potential to facilitate positive social change by increasing energy efficiency, lowering production costs, and reducing pollution associated with industrial activities. The results could provide direct insight about the decision-making process for selecting EE projects, and could help managers to improve their decision-making criteria for selecting EE projects. These changes could help the managers' organizations become more efficient, reduce toxic pollution, and improve competitiveness in the global market. The most important result is the facilitation of managers adopting new decision-making criteria that facilitate their approving EE projects that are both profitable and beneficial to the environment.

Nature of the Study

This qualitative study used open-ended questions on a questionnaire followed by telephone interviews for data collection. Research in the social sciences realm can be quantitative, qualitative, or mixed method. For this study, I used qualitative inquiry to explore a decision process. Qualitative research begins with assumptions, a worldview, and an inquiry into the meaning individuals or groups give to a social or human problem (Denzin & Lincoln, 2011). Researchers use emerging qualitative methods of inquiry to collect data in natural settings from people who have experienced phenomena (Denzin & Lincoln, 2011). In this qualitative study, I used an inductive inquiry that went from a general to a specific problem exploring the decision-making process. Denzin (2012)

concluded that qualitative research scholars have an obligation to change the world in a positive way through ethical research.

In contrast, the use of quantitative method would not explain the behavior of the individuals responsible for the decision-making process, which I sought in this study. For this study, I initially considered a mixed-methods approach; however, the focus of this study was on behavioral aspects for a decision process that a qualitative study could address appropriately. From designs that are available for qualitative research such as ethnography, grounded theory, case studies, or narrative, I chose a questionnaire and interview design because of its proven utility in exploring similar phenomenological issues (Brown, 2012; Hoskins, 2009; Rimanoczy, 2010).

For this study, I evaluated the designs available for qualitative research before making my decision to use a combination of questionnaire and interview type inquiry via open-ended questions and follow-up telephone interviews with participants. Marshall and Rossman (2011) asserted that the phenomenological research design helps to explore, describe, and analyze the perceptions and lived experiences of individuals by using interview data. Although this study observes the perceptions and experiences of individuals, the design of this research extended beyond interview data and included a questionnaire. Therefore, I did not choose phenomenological design for this study. Ethnographic study focuses on a particular cultural group to understand a phenomenon (Paechter, 2013). Although this study observes general culture in organizations, the primary goal of this research was not to study a specific culture in an environment in detail, as is the case with ethnographic design. Therefore, I did not choose an

ethnographic research design for this study.

Grounded theory is an inquiry method wherein the researcher generalizes a theory of a process in view of participants (Denzin & Lincoln, 2011). In addition, the researcher of grounded theory expands on or creates new theory, which was not the intent of this doctoral study. The product of grounded theory design is a sampling of multiple groups and maximization of similarities and differences. Case studies help researchers to understand complex social phenomena; however, case study design provides insignificant data for scientific generalization (Denzin & Lincoln, 2011). Finally, a narrative approach focuses on an individual's life stories. According to Makkonen, Aarikka-Stenroos, and Olkkonen (2012), a narrator who puts the pieces together of an incoherent story generates a narrative. The product of narrative research is a combination of the researcher's and the participants' life experience. The focus of my research was on a decision-making process that involves multiple participants in organizations. As such, I did not use a narrative design for this study.

For this study, I used questionnaire and interview design to gain a rich understanding of the breadth and depth of influence of corporate strategy on the decision-making process for EE projects. Qualitative research allows the researcher to explore a process by way of conducting interviews with individuals who participated in a process or who have deep knowledge and understanding of the subject. From the number of designs that are available for qualitative research such as ethnography, grounded theory, case studies, or narrative, I chose questionnaire and interview design for collecting data via open-ended questionnaire followed by telephone interviews (Brown, 2012; Hoskins,

2009; Rimanoczy, 2010; Senko, 2010).

For this study, a qualitative method using a questionnaire and interview design was ideal because I sought perspectives from individuals in the industry participating in the process at different organizational levels (e.g., energy managers, energy engineers, and facility managers). In a qualitative study's final report, a researcher establishes patterns and themes, including the perceptions of the participants, a description of the study, and potentially a call to action. I derived the theme for the conclusion of this research based on the participants' detailing of their personal experiences. The goal of this study was to understand a consensus about the decision-making process for EE projects in the U.S. automotive market.

Research Question

The central question for this study was: What knowledge do automotive manufacturing leaders need to select energy-efficiency projects without rejecting profitable projects? In order to answer this question, this study included open-ended questionnaire and follow-up phone interview results from individuals with automotive manufacturing industry and decision-making process experience to support a generalization in the industry. Furthermore, the questions listed in Onus Inquiry of EE Project Selection Process (see Appendix A) are from an exhaustive review of the current body of knowledge and are for gathering data about the central research question:

1. Explain your experience with the decision-making process for energy efficiency projects in your company.
2. What is your perception of energy efficiency in the automotive manufacturing

industry?

3. Explain your experience with organizational learning, as it pertains to selecting energy efficiency projects in your company.
4. What is your perception of organizational learning, as it pertains to selecting energy efficiency projects, in your industry?
5. Explain your experience with systems thinking, as it pertains to selecting energy efficiency, in your company.
6. What is your perception of systems thinking, as it pertains to energy efficiency, in the automotive industry?
7. What is your perception of interconnectedness of departments (e.g. connection among facilities, procurement, and finance) in your company in relation to energy efficiency projects?
8. Explain your experience with strategic management, as it pertains to selecting energy efficiency projects, in your company.
9. What is your perception of strategic management in relation to selecting energy efficiency projects in your company?
10. What is your perception of strategic management, in relation to selecting energy efficiency projects in the automotive industry?
11. What additional information would you like to add that is not in the questionnaire?

Conceptual Framework

This study's conceptual framework was business concepts linked to energy

management, organizational learning, systems thinking, and strategic management. Although there are many management concepts, these four concepts are the most relevant to this research. The aim of the central question of this study was to understand the human behavior during the decision-making process. Accordingly, scholars and practitioners have used concepts such as organizational learning and systems thinking to study how people behave in organizations (Bui & Baruch, 2010). Figure 1 is an illustration of the conceptual framework for this study. All four of the concepts are relevant to the U.S. automotive manufacturing industry, however; this qualitative study was the first to illustrate the idea of continual energy management dynamics.

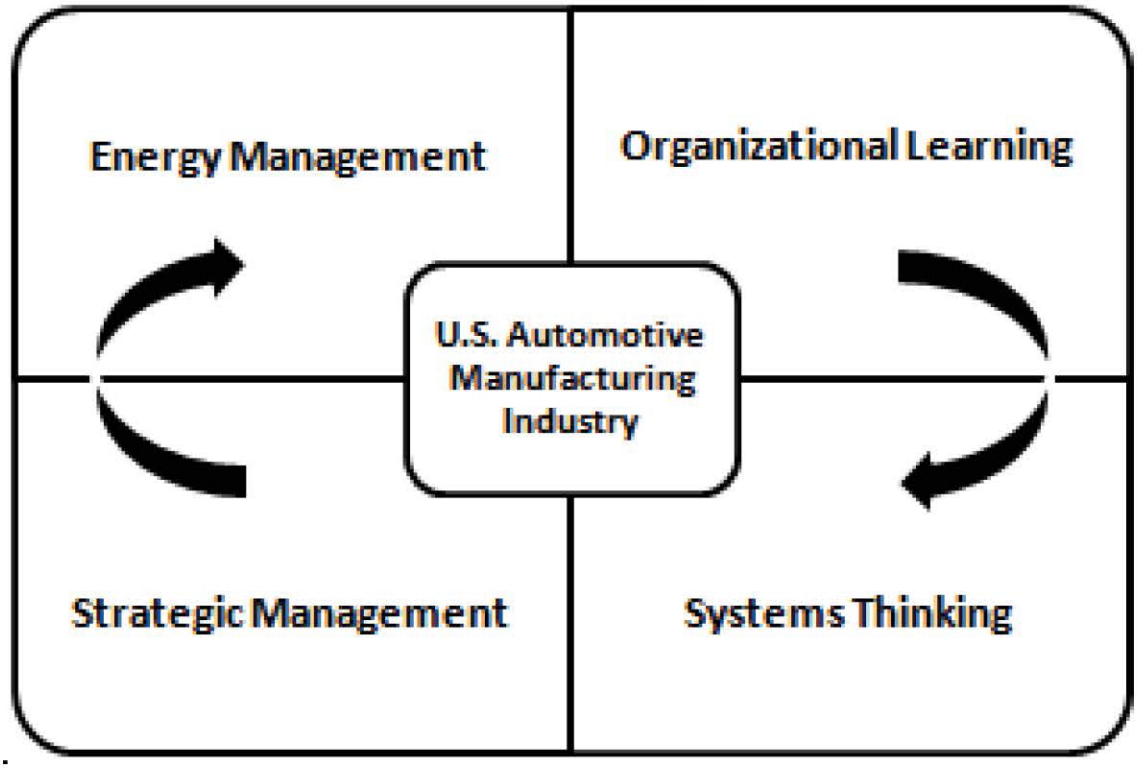

Figure 1. Schematic drawing of the continual loop of concepts covered in this study.

Energy Management

According to the IEA (2011), systematic energy management is one of the most effective ways to advance energy efficiency in the industrial sector because it allows companies to put processes and procedures in place for continual improvement of energy performance. This concept is important to automotive manufacturing because the automotive sector is ubiquitous and one of the largest manufacturing sectors in the world, and its industrial energy use accounts for one third of global energy demand (IEA, 2011; Wells & Nieuwenhuis, 2012).

Organizational Learning

The concept of organizational learning began in management literature with the work of Argyris and Schon in 1978 (Bettis-Outland, 2012). Contemporary writers, such as Senge (2006), expanded on the organizational learning concept in his book, *The Fifth Discipline: The Art and Practice of Learning Organization.* With this study, I determined the level of organizational learning in U.S.-based automotive companies, especially for EE decision-making process. In addition, I looked for evidence of systems thinking among U.S.-based automotive companies.

Systems Thinking

Systems thinking has its roots in biology; however, systems thinking moved into management discipline by Checkland in 1981 with soft systems methodology, by Beck and Cowan in 1996 with spiral dynamics, by Morecroft and Sterman in 1994 with systems dynamics, and by Sterman in 1994 with business dynamics (Schiuma, Carlucci, & Sole, 2012; Zexian & Xuhui, 2010). Systems thinking moved in to the engineering field as a control mechanism for complex machinery. As a management concept,

systems dynamics is an approach to studying complex systems, such as an organization. According to Senge (2006), system dynamics deals with how organizations change through time. The U.S. automotive manufacturing industry is constantly changing, and organizations that make up the industry are in a constant state of flux; therefore, this concept was an important element to study in this industry. Senge expanded on the idea of systems dynamics under the label of *systems thinking*. Senge described system thinking as a discipline for managers for visualizing organizations as a whole. Senge attributed system thinking to tools and techniques found in feedback concepts of cybernetics, and servomechanism of engineering theory.

For this study, I include the concept of systems thinking because the dissemination of this concept in the U.S. automotive manufacturing industry could make a significant impact. Managers in the industry may benefit from understanding the interconnectedness between their decisions and the relevant impacts on the systems. Because of this study, managers in this industry may broaden their perspective about the impact of the decision-making process for EE projects.

Strategic Management

Modern day businesses, with global competition pressures, use strategic management concepts to defeat the competition (in military terms, the enemy). This study covered strategic management as it relates to business management, not the military aspects. For this study, I included this concept because energy efficiency is a core issue under sustainability matters in business, and managers should approach it with a strategic view under the corporate sustainability umbrella (Schrettle, Hinz, Scherrer-

Rathje, & Friedli, 2014). According to Kiron, Kruschwitz, Haanaes, and Von (2012), most managers believe sustainability strategy is a competitive necessity. Strategic management of energy efficiency will require top-level management commitment to energy performance improvement. In terms of systems thinking, Figure 2 illustrates the causal loop diagram for continual energy management dynamics under the scope of strategic management.

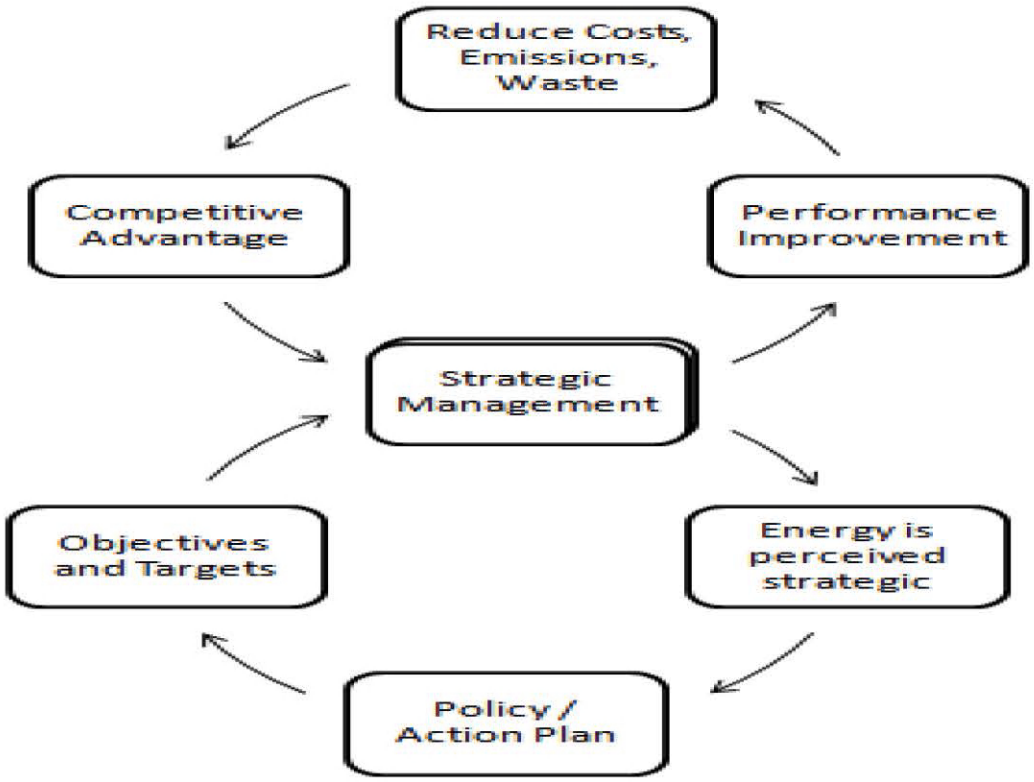

Figure 2. Causal loop diagram for energy management dynamics.

The four concepts for this study are energy management, organizational learning, systems thinking, and strategic management. These concepts are relevant to the U.S. automotive manufacturing industry because these concepts may steer how the industry collectively approaches EE in this important industrial sector. The decisions made by

automotive manufacturers have a trickle down affect in other major sectors such as steel, plastics, and chemicals. To achieve competitive advantage, top-level managers of energy intensive companies should perceive energy management as strategic, have the will to push for organizational learning, and think in terms of systems.

Definition of Terms

This study includes terms specific to the topic study. Some of the definition of terms in this study is as follows. There may be other definitions for each term, however; I list the relevant definitions pertinent to this study.

Energy budgets at risk: Energy budgets at risk is a financial analysis that applies historical energy use data, weather data, engineering-based efficiency savings analysis and other factors to quantitatively determine the risk associated with any efficiency investments (Jackson, 2010).

Energy efficiency: Energy efficiency is the ratio between output of performance, service, or goods and an input of energy (ISO, 2011).

Energy efficiency gap: Also known as the industrial energy waste, the EE gap is the difference between actual energy use and optimal energy use in industry (Muthulingam et al., 2011).

Energy paradox: Energy paradox is a management decision to bypass profitable EE investments or reject investments that provide more in savings than they cost (Jackson, 2010).

International Energy Agency (IEA): The IEA (2011) is an autonomous organization that works to ensure reliable, affordable, and clean energy for its 28 member

countries and beyond.

North American Industry Classification System Code 3361: The industry group includes establishments engaged in one or more of the manufacturing activities: automobile and light duty motor vehicle or heavy duty trucks (U.S. Census Bureau, 2013).

Payback analysis: Payback analysis is a basic financial tool that provides an easy to apply and intuitive decision process that is calculated by investment cost over annual savings (i.e., i/s= y) to show the number of years (y) required by an investment to pay for itself (Jackson, 2010).

Sustainable development (sustainability): An ability to meet the needs of the current generation without any waste and not jeopardizing future generations to meet their needs (Brown, 2012)

Systems thinking: An ability to see things as a whole rather than individual parts of a system. The interconnectedness of decisions and the resulting impact on the system is an ability to think in systems terms (Senge, 2006).

Value-at-Risk (VaR): Value at Risk is a financial analysis that provides an estimate of the greatest likely loss of a portfolio of investment over a period (Jackson, 2010).

Assumptions, Limitations, and Delimitations

In this section, I address general assumptions about the topics covered in this study and my personal assumptions based on experiences in the field and through assessment of the current body of knowledge. In the second part, I address the

limitations and weaknesses of this research paper. In the final part of this section, I cover the delimitations of this study by identifying the scope, boundaries, and exclusions of the study.

Assumptions

For this study, the first assumption was that to explore the decision-making process for EE projects, in the U.S. automotive manufacturing industry, the best way was to use a qualitative method with a questionnaire and interview design compared to any other method and design. In a qualitative study, the researcher views reality as a construct of individual's experiences and interaction with their social world. A key concern for a qualitative study researcher is to understand the phenomenon from the participants' points of view, and not the researchers. The second assumption was that the participants will answer truthfully to the open-ended questions. Participants of this study are all volunteers. Anonymity and confidentiality of participants was very important for the success of this doctoral study. The participants will know their option to withdraw from the study if they want to opt out. The third assumption was that participants would provide rich substance about their experiences of the decision-making process for EE projects. The objective for this study was to gain participant perception and experience through the research instrument including the open-ended questions. Unless participants provide this contextual data, the research cannot progress.

Based on the literature review, academics perceive that changing behaviors of decision-makers involved in EE projects can lead to significant improvements to their company's bottom-line. In order to explore this assumption, with this study, I explored

the decision-making process for EE projects to gain the perspective of the participants. The results from this study could prepare managers for the decision-making process on EE projects.

Limitations

This research was limited to the time allotted to a researcher by Walden University under the guidelines of the University for the accredited DBA program. The duration for achieving a DBA degree from Walden University was approximately 3 to 4 years; the time allotted to complete this study was in tandem with completing all degree requirements. Additionally, this research has a limitation by the availability of the research participants. As the researcher, I made every effort to schedule, confirm, and obtain commitment to a questionnaire and the follow-up interview with participants. The questionnaire and interview protocol required each participant to commit 30 minutes of uninterrupted time for the questionnaire and 30 minutes for the follow-up interview. This protocol was the guideline for each questionnaire with participants.

Delimitations

The scope of this research has two delimitations. The first delimitation was the geographical coverage, and the second was the population of the study. The geographical focus of the study was in the United States, specifically five states in the Midwest region of the United States, limited to Illinois, Indiana, Michigan, Minnesota, Ohio, and five states in the Southern regions of the United States, limited to Alabama, Georgia, Mississippi, Kentucky, and Tennessee. The population was specific to participants with experience of EE decision-making process in the U.S. automotive manufacturing

industry. The scope of this research did not cover geography outside of the United States, and specifically the scope excluded any states that are not in the midwestern or southern parts of the United States. In addition, the scope of this research excluded individuals with no experience of the EE decision-making process in the U.S. automotive manufacturing industry.

The general assumptions, limitations, and delimitations of this study covered above provide information on my personal assumptions, limitations of the study, and delimitations of the scope of the study. My personal assumption for this study was that using a qualitative questionnaire and interview study for collecting data by open-ended questionnaire followed by telephone interviews was the best approach to study the central research question of this study. The limitations of the study were the research method, time limit for the study, automotive manufacturers in the U.S. Midwest and Southeast, and finally the honesty of the participants. The delimitations of the study are geographic coverage and the population.

Significance of the Study

The significance of this study was that it was pioneering in the field of strategic business aspects of energy management in the U.S. automotive market, specifically focusing on the EE decision-making process. The results of this study could contribute to the current body of knowledge by presenting the value to business and social impact of the EE decision-making process. In addition, the results of this study could contribute to effective business practice. I aimed to make significant social change by preparing the business community for the EE decision-making process.

Value to Business and Social Impact

The current body of knowledge on business management and EE in the U.S. automotive manufacturing industry highlights the importance of resource utilization and the competitive nature of the U.S. automotive manufacturing industry (Niebecker, Eager, & Moulton, 2010). In addition, the current body of literature highlights the limited deployment of EE projects in the U.S. manufacturing industry (Aflaki et al., 2013; Muthulingam et al., 2011). The business community will benefit from understanding the decision-making process for EE projects because currently managers reject profitable projects that can help their company's long-term sustainability objectives (Jackson, 2010).

In order for businesses to be effective in the 21st century, decision makers must be knowledgeable about the use and consumption of energy in their business environment. The results of this research will prepare the business community for the depth and breadth of the decision-making process for EE project in the U.S. automotive manufacturing industry. As a result, the business community can make a proper evaluation of EE projects and align overall corporate strategy with individual decision-making processes.

The results of this study may trigger a social impact by shifting the mental models of decision makers in the automotive manufacturing industry to think about EE as a strategic and competitive advantage. Energy efficiency is the thread of all environmental sustainability issues; therefore, improving EE is an important aspect to reducing environmental impact. The positive social impact due to improvement of EE in the

automotive manufacturing industry is significant because this industry is the largest in the world, and it has ripple effects in other industries (Nunes & Bennett, 2010).

Contribution to Effective Business Practice

In order to compete globally, companies investigate opportunities to increase levels of quality and sales, lower costs and waste, and maintain sustainable operations with little or no impact on the environment. This challenge is not easy because the existence of a company requires it to consume natural resources such as energy. According to the IEA (2011), energy production and use have environmental implications, such that 65% of global anthropogenic greenhouse-gas emissions are a result of energy consumption. The IEA pointed out that reducing toxic emission from the environment must start with actions that promote reduction of emissions from fuel combustion.

Implications for Social Change

The implication for social change of this study was the pioneering investigation of behavioral aspects of the decision-making process for EE projects in the U.S. automotive manufacturing industry that could lead to changes in business practices related to EE. In addition, in the study I aim to understand the hurdles that may impede the implementation of profitable EE projects on an ongoing basis. The social impact for companies is paramount because by reducing energy consumption through energy performance improvements they can produce fewer toxic emissions, cut their energy costs, and become truly sustainable (Kashmanian, Wells, & Keenan, 2011; Moynihan & Triantafillu, 2012). Pardo Martínez (2011) stated that EE investments are the largest,

fastest, and cheapest ways to reduce energy costs and environmental impacts and increase productivity in the industrial sector. According to Galitsky and Worrell (2008), companies may have better predictions of earnings if they are able to control energy related costs. The U.S. motor vehicle industry is the second largest in the world, and as a result of this study small changes in the industry could make a significant impact on the daily lives of millions of people (OICA, 2012).

The significance of this study was the value it could add to business and the social impact realized by the benefit. The results of this study could prepare future decision makers on the depth and breadth of EE decision-making process and the alignment of corporate strategy to day-to-day decision making. The aim of this study was to contribute to effective business practice by highlighting the importance of strategic energy management to promote the reduction of emissions from fuel combustion. This study was pioneering in the sense of examining the behavioral aspects of the decision-making process for EE projects in the U.S. automotive manufacturing industry. The next section includes an exhaustive review of the current body of knowledge on energy management, organizational learning, systems thinking, and corporate strategy with the focus on the U.S. automotive manufacturing industry.

A Review of the Professional and Academic Literature

The purpose of this qualitative inquiry was to understand the knowledge needed by automotive manufacturing leaders to select energy-efficiency projects without rejecting profitable projects based on the personal experiences of energy and environmental managers, business-line managers, and top management in the U.S.

automotive manufacturing industry. The central research question was: What knowledge do automotive manufacturing leaders need to select energy-efficiency projects without rejecting profitable projects? My review of associated professional and academic literature followed these major themes.

The main keywords used in the search process included *energy efficiency*, *energy management*, *automotive*, *manufacturing*, *finance*, and variations of these words as listed in the researched literature. I used online databases to search for journal articles and books related to the topic. These databases included EBSCO, ProQuest, and Science Direct to locate and access research papers and dissertations related to the topic. I also used public information from U.S. automotive companies where it was available, including material such as annual financial reports and sustainability reports. In addition, I sought out germinal and recent books related to these research topics.

The literature review comprised research-based peer reviewed journals, dissertations, germinal and contemporary books, and websites. A breakdown of my reference counts by category, based on aging less than or greater than 5 years, is on Table 1.

Table 1

Synopsis of Sources in the Literature Review

		Age	
Reference Type	Total	Less than 5 years	Greater than 5 years
Research-based, peer-reviewed articles	103	100	3
Dissertations	6	5	1
Germinal and contemporary books	8	6	2
Government data	2	2	0
Academic papers, not peer reviewed	9	1	8
Websites	1	1	0
Total references	129	115	14

This study includes a synthesis of the literature based on the conceptual framework: energy management, organizational learning, systems thinking, and strategic management in the U.S. automotive manufacturing industry. This framework identifies a continual loop of concepts surrounding the U.S. automotive manufacturing industry and the fundamental concept of continual energy management dynamics (CEMD) within the study scope. A graphic illustration of this framework appears as Figure 1.

Ultimate EE during production processes provides a competitive advantage in the U.S. automotive manufacturing industry. Companies that apply EE best practices can benefit from traditional business concepts such as organizational learning, and systems thinking to construct corporate strategies that will enhance deployment of EE projects, which may be beneficial to long-term sustainability of organizations. The literature review highlights the most important concepts relevant to this research in each section to inform the reader in depth about each topic; a graphic illustration of its organization appears in Figure 3.

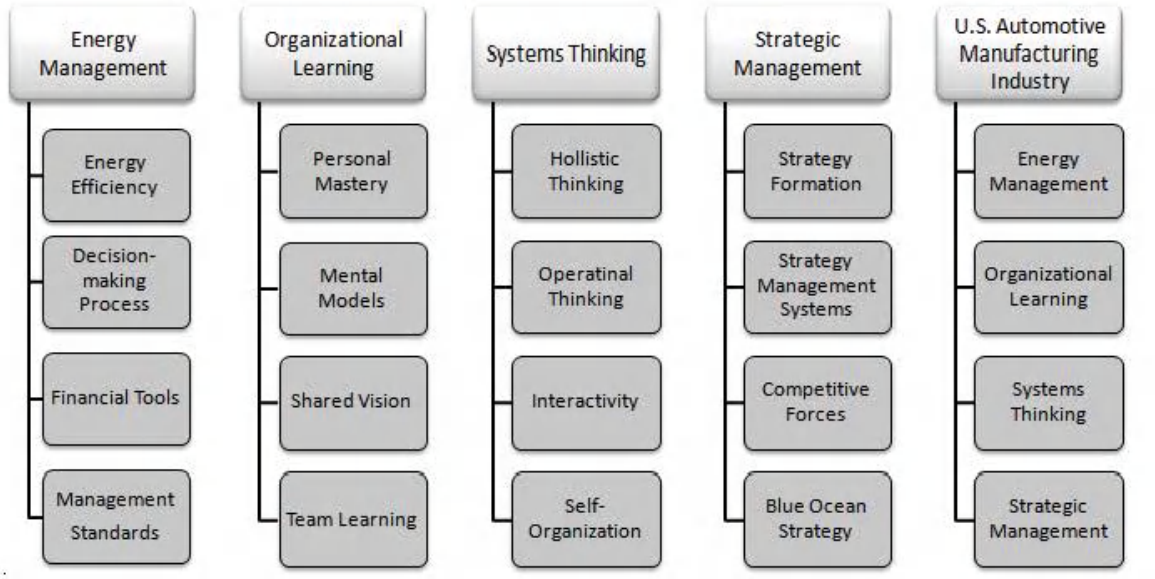

Figure 3. Tree diagram of literature review organization by concept.

Energy Management

The literature review for energy management focused on the proactive management of energy sources such as electricity, fuel, and natural gas in industrial facilities for use in production processes. Industrial manufacturers in the United States face volatile energy markets, stiff competition, the threat of increasing regulation of greenhouse gases, and are considering energy management as a way to gain competitive advantage and risk management (Backlund, Thollander, Palm, & Ottosson, 2012; Jones & Thompson, 2012; Melo & Garrido-Mogado, 2012). Practitioners worry about the energy availability and price of energy (Menzel, Smagin, & David, 2010).

Despite the fact that energy efficiency of a system or a process is essential to the control of energy consumption and energy costs, many industrial companies lack appropriate methods to effectively address energy efficiency in a comprehensive manner (Giacone & Mancò, 2012). According to Mehta (2010), even plants with energy

management programs can still save 10% to 15% more by implementing best practices to increase their energy efficiency. Many organizations implement problem-solving techniques to increase performance based on best practices, the idea that whatever works for a particular company must be the best approach (Marksberry, Bustle, & Clevinger, 2011). Industry-wide adoption of best practice approaches is far off; however, information about energy management can give companies a competitive advantage.

The key concepts on energy management explored in the literature review include energy efficiency, decision-making processes, financial tools, and standards. This exploration focuses on energy management in industrial facilities and for business aspects rather than technological advancements surrounding this topic. This section of the literature review on energy management first explores topics that are more general and ends with an exploration of links in energy management to the U.S. automotive manufacturing industry.

Even though energy is one of the primary sources for a company to stay in business, business managers frequently lack incentives to manage energy use. Granade et al. (2009) estimated that at full potential, the U.S. economy could reduce annual energy consumption by 23%, a percentage equivalent to $1.2 trillion by 2020. In addition, beyond the cost reduction from EE, Granade et al. estimated the abatement of 1.2 billion tons of CO2 equivalent of greenhouse gasses by 2020. Companies that implement standardized energy management systems reap additional nonenergy benefits such as productivity gains, improved product quality, lower nonenergy operating costs, longer equipment life, reduced maintenance costs, less waste generation, and better resource

efficiency (IEA, 2011). Despite this broad range of potential benefits, there is strong evidence in recent literature of an energy management gap in the U.S. industrial sector (Aflaki et al., 2013; Muthulingam et al., 2011; Thiede, Bogdanski, & Hermann, 2012).

According to the IEA (2011), the implications of not having proper energy management practices in place are significant. This is especially true in light of the strong likelihood of rising energy costs and growing scrutiny of environmental impacts in the United States. The IEA stated that there was a significant impact on society from energy-related emissions and the effects of emissions on the global climate change. Nunes and Bennett (2010) supported this argument, pointing out that energy-related emissions from the automotive manufacturing sector are a source of negative environmental impact.

One way that companies in the United States can realize energy savings through energy management is by participating in performance-based contracts with an energy service company (ESCO) (Larsen, Goldman, & Satchwell 2012). According to Larsen et al. (2012), the U.S. ESCO industry grew by 7% per year between 2006 and 2008. Larsen et al. concluded that a typical ESCO project generated $1.5 dollars of direct benefits for every dollar of customer investment. The benefits of investing in energy management are clear, especially with this type of return on investment results.

Energy efficiency. According to Croucher (2012), EE is cost effective, clean, and creates numerous jobs. Conserving energy was widely regarded as an untapped energy resource (Chai & Yeo, 2012). Industrial energy use accounts for about one third of global energy demand; therefore, optimizing EE is essential to industrial competitiveness and an important element in mitigating climate change (IEA, 2011;

Tanaka, 2012). Hopkins et al. (2011) stated that companies in all industries agree that sustainability through operational change was essential to remain competitive. In order to improve energy performance, companies need data to analyze usage trends to establish baselines and establish objectives and targets leading up to an action plan. One component metric is EE, the ratio of a unit of energy input per product (ISO, 2011) – in other words, the amount of energy used for the production of a product. Systematic energy management is as one of the most effective methods for improving EE in industry (IEA, 2011; McKane et al., 2009; Mey, 2011).

The increasing ecological awareness of customers have combined with global warming and rising energy prices to raise energy efficiency to the top of manufacturing companies' agendas (Bunse, Vodicka, Schönsleben, Brülhart, & Ernst, 2011; Linares & Labandeira, 2010). Brown (2011) surveyed 2,100 mechanical engineers with 20 or more years of experience and found 62% of survey respondents said their organizations were interested in designs that use less energy. The current body of knowledge points to significant benefits of EE; however, there are still many barriers for EE improvement (Fleiter et al., 2012). When discussing the barriers to EE investing in the US, Abadie, Ortiz, and Galarraga (2012) identified insufficient information, the principal-agent problem, difficulties in gaining access to capital, and the difference in private and social discount rates as the primary hurdles. Allcott and Greenstone (2012), and Chai and Yeo (2012) stated that imperfect information was the most important form of investment inefficiency that could cause the EE gap.

Bassi, Yudken, and Ruth (2009) studied climate policy impacts on the

competitiveness of energy-intensive manufacturing sectors using a systems dynamics model. Bassi et al. concluded that energy price changes resulting from different carbon-pricing policies would have a severe impact on the competitiveness of the U.S. energy intensive industries. Bassi et al. pointed to higher production costs, profit declines, potential threats to production capacity, and market share losses because of carbon-pricing policies. Bassi et al. specified EE gains needed for energy-intense industries to avert higher production costs. For example, the iron and steel industry would need to increase energy efficiency in the use of fuels by 41%, in the use of electricity by 8%, and in the use of feedstock (coal, coke) by 49% by 2020 to offset the rise in the costs of these energy supplies (Bassi et al., 2009). Producers of primary aluminum would need to make energy efficiency improvements of 17% in fuel use and 8% in electricity to maintain cost levels in the event that carbon-pricing policies take place.

Energy savings Limaye and Limaye (2011) explained that state and federal legislation that uses private-sector financing encourage development of EE projects. ESCOs provide a variety of financing options for EE projects. Limaye and Limaye stated that energy savings performance contracts (ESPC) provide a mechanism to overcome some of the barriers hindering and discouraging the large-scale implementation of EE projects.

Decision-making process. Mintzberg, Raisinghani, and Theoret (1976) defined *decision* as a specific commitment to action and *decision process* as a set of actions that begin with the identification of stimulus for action and ends with specific commitment to action. In companies, typically top management bears the responsibility of making

decisions on resource utilization. In order to connect the strategic and cultural dimensions of EE investments Cooremans (2011) explored the behavioral aspects of the decision-making process for EE investments.

Strong evidence exists of financial and nonfinancial benefits of EE in the current body of knowledge. Despite the plethora of advantages inherent to investing in EE, companies fail to implement recommended EE projects 30–50% of the time (Aflaki et al., 2013; Cooremans, 2011; Muthulingam et al., 2011). Cooremans (2011) stated that a decision is only an element in a process influenced by the individual, organizational, and contextual factors, and by the characteristics of the investment itself. These factors determine what type of a decision-making situation arises. In order to promote EE projects companies should review the decision-making processes to determine if they avert risk completely by using the wrong evaluation techniques.

Financial tools. Decisions on EE projects require financial tools to evaluate their profitability. In addition to its environmental, security, and competitiveness benefits, EE delivers a return on investment that contributes to the profitability of enterprises (IEA, 2011; McKane et al., 2009). The savings potential in the U.S. automotive manufacturing industry is significant because of the size and scope of the industry and its potential negative impact on the environment. Muthulingam et al. (2011) stated that behavioral aspects to the adoption of EE initiatives in an industrial context are unexamined. In addition, evidence in the academic literature highlights simplistic payback decision tools to evaluate EE projects, whereby profitable investments are rejected (Jackson, 2010).

Management behavior on which tools to use during the decision-making process

has a significant impact on the outcome. Jackson (2010) posited that the EE gap is potentially the result of companies' failure to evaluate profitable investments. In order to promote EE, Jackson compared simple payback with the financial risk management tool EBaR, which is a variation of the financial portfolio risk-management tool VaR. According to Jackson, VaR provides an estimate of the highest loss potential of a portfolio of investments over time. Financial institutions use VaR to evaluate investment portfolios; financial managers compare and act on irregularities to the predetermined investment thresholds to maintain a level of confidence. Jackson expanded on financial tool VaR, and for the first time applied to analyze risk and returns of EE investments. According to Jackson, in order to determine the risk associated with any efficiency investment or a menu of efficiency investments, EBaR analysis uses historical energy use data, weather data, and engineering-based savings analysis.

Managers need new tools to evaluate proper EE decisions. Jackson (2010) argued that EBaR or a similar VaR approach can provide a single, easy to interpret decision variable that directly measures risk in a more efficient way than the commonly used simple payback method. According to Jackson, using short payback periods is a form of complete risk avoidance, whereas EBaR allows potential return and risk analysis simultaneously to make better decisions about EE investments. Jackson stated that financial decision makers do not use the VaR approach because they lack technical understanding of EE investment options while energy engineers and facility managers who do understand the technical aspects do not typically possess the financial analysis tools to undertake and present risk management analysis results to financial decision

makers. Educating decision makers about benefits of approaching a problem, in this case EE investment hurdle, with a different perspective, such as EBaR, may help them make better-informed decisions. Summarizing the benefits from the institutionalization of a VaR approach, Jackson listed the elevation of efficiency investment decision making to a better financial basis, reduction of energy use, and contribution to environmental goals as the major potential outcomes. Finally, ISO 14001 certified companies have a higher return on equity, and companies benefit from cost reductions through production efficiencies (Jong et al., 2014).

Management standards. Many organizations adopt formal management systems standards such as ISO 9001 and/or ISO 14001 (Delmas & Montes-Sancho, 2011; Paulraj & de Jong, 2011; Psomas, Fotopoulos, & Kafetzopoulos, 2011). Organizations use this framework to pursue continual improvement of quality and environmental objectives. According to Delmas and Montes-Sancho (2011), adoption of management system standards such as ISO 14001 improves productivity, competitiveness, and business profitability, and can give companies a green image. The American National Standards Institute's (ANSI) published management system for energy (MSE), as part of a national energy management standard in 2000 as the first national energy management standard, ANSI/MSE 2000, but by 2009 there was less than 5% market penetration (McKane et al., 2009).

Many management concepts exist, such as Total Quality Management, Kaizen, and Six Sigma, but the developers of ANSI/MSE 2000 had ISO standards in mind with the long-term goal of seeking ISO recognition (McKane, Perry, Aixian, Tienan, &

Williams, 2005). The energy management standard ANSI/MSE 2000 was republished in 2008, and ANSI, DOE, and UNIDO presented to the ISO committee to adopt it as a framework for an international standard, hence the publication of ISO 50001 (ISO, 2011) energy management systems requirements with guidance for use. Numerous standards exist for energy efficiency for component systems such as ASME EA-1 2009 for process heating systems and ASME EA-2 for pumping systems; however, these or similar component standards are not sufficient to tackle systematic issues underlying a corporate structure (McKane et al., 2005). According to Crane (2010), the intent of energy assessment standards is to assist plant personnel to identify cost-effective projects, often ones that require limited capital requirements. McKane et al. (2005) stated that the management system standards build industrial energy efficiency from both a top-down and bottom-up approach. McKane et al. stated that their objective for seeking an international standard for energy efficiency was nothing less than a permanent change in corporate culture using the existing ISO management systems standard's structure. The ISO 50001 (ISO, 2011) standard is a framework for continual energy performance improvement. This international energy management standard is a tool for organizations to design and implement a structure of consistent processes and procedures for sustainable energy performance improvement.

The current literature presented in this study on the concept of energy management result in two questions to add to the research instrument used in this study. Question 1: Explain your experience with the decision-making process for energy efficiency projects in your company? Question 2: What is your perception of energy

efficiency in the automotive manufacturing industry?

Organizational Learning

In the future, organizational learning may be the only competitive advantage for firms (Srivastava & Gary, 2011). Academically, organizational learning has expanded through the fields of economics, change management, and strategic management research (Saka-Helmhout, 2010). Peters, Johnston, Pressey, and Kendrick (2010) discussed the importance of expanding traditional understanding of networks of companies and including the nature and purpose of the interaction between firms as well as the participants in the networks.

Typically, those individuals and organizations that adapt the best to their environment reap benefits. Smith (2011) posited that organizational learning is a productive approach to removing organizational and cultural barriers to progressing sustainability. Contemporary writers, such as Senge (2006), expanded on the organizational learning concept.

Senge (2006) broke down the learning organization to components of: personal mastery, mental models, shared vision, team learning, and systems thinking. In this section, I explicate the first four concepts in detail, leaving systems thinking to the next section to break it down into additional components. According to Senge, the fifth component or discipline, systems thinking, is the piece that integrates the other four.

Personal mastery. *Personal mastery* is a term coined by Senge (2006) to refer to the personal growth and learning of those individuals who continually expand their ability to create the results they seek. Individuals learn to enhance themselves, their

organizations, and their communities. Organizations learn by individuals who learn, but individual learning does not guarantee organizational learning (Senge, 2006). Senge stated that learning is not how much information one obtains, but the expansion of ability to produce the results needed to achieve personal objectives on an ongoing basis.

Personal values, motivation, individual learning, personal vision, and development and training characterize personal mastery (Bui & Baruch, 2010). According to Bui and Baruch (2010), organizations would benefit in the long-term from investing in personal development. They stated that employees with high personal mastery often perform better.

Mental models. A mental model is the deeply rooted thinking about a particular topic by individuals, and close-knit organizations or groups (Senge, 2006). According to Senge (2006), implementing new, brilliant strategies may not happen because individuals fall back to familiar ways of thinking and acting rather than the will and drive of a new and innovative vision by an individual or a group. According to Argyris (as cited in Senge, 2006), people may not always do what they say, but they do what they think (according to their mental models).

Organizational commitment, leadership, and organizational culture (Bui & Baruch, 2010) characterize mental models. According to Bui and Baruch (2010), when mental models are developed and learned in an organization, one of the outcomes is high-level knowledge sharing and knowledge creation. They argued that shaping appropriate mental models would improve overall job performance. Bui and Baruch stated that the communication and learning environment in organizations is the fundamental basis for

shaping mental models and sharing a vision.

Shared vision. A shared vision is vital to organizational learning because it focuses and energizes learning (Senge, 2006). According to Senge (2006), where there is a common aspiration, individuals in an organization share a vision. Sharing the same vision as a group is a result of personal drive of individuals who are part of an important undertaking. With shared vision comes courage; however, without a shared vision to connect and undertake a great dream, pettiness prevails (Senge, 2006). According to Avery and Bergsteiner (2011), having a company vision statement on a piece of paper that employees are not aware of and not work with every day does not justify calling it a shared vision. Srinivasan (2014) defined the intentions of a vision to be a) broad, all-inclusive, and forward-looking, b) aspirations of the future, c) a mental image of the future of the organization that leadership communicates across the entire organization.

Personal vision, values, leadership, and organizational culture characterize shared vision (Bui & Baruch, 2010). According to Bui and Baruch (2010), shared vision brings benefits to individuals and organizations. They argued that shared vision is a key to organizational sustainability and growth. Bui and Baruch suggested that organizational size and communication are critical components to achieving a shared vision. They argued that it is difficult for large and highly complex organizations to share a vision compared to smaller less complex organizations that can share a vision.

Team learning. Team learning is the process of aligning and developing a team to achieve each member's common goal (Senge, 2006). Personal mastery and shared vision are components of team learning because talented teams are composed of talented

individuals with a common goal. According to Senge (2006), talented individuals with a shared goal are not enough because a team must be able to play together.

Team commitment, leadership, goal setting, development, training, and organizational culture characterize team learning (Bui & Baruch, 2010). Bui and Baruch (2010) posited that improved team performance and knowledge sharing are the potential outcomes of team learning. They argued that benefits of team learning include an increase in workplace productivity, improvements to service quality, reduction of management structure, low level of absenteeism, and reduction of employee turnover. Bui and Baruch suggested that team learning plays a critical role in knowledge creating as team members generate new ideas through dialogue and discussion.

The current literature presented in this study on the concept of organizational learning resulted in two questions to add to the research instrument used in this study. Question 3: Explain your experience with organizational learning in your company. Question 4: What is your perception of organizational learning in your industry?

Systems Thinking

Systems thinking is a way of looking at objects, such as the human body or an organization, in a holistic manner (Senge, 2006). According to viable systems model (VSM), developed by Stafford Beer in 1972, an organization is viable if it features five functions or subsystems (Neumann, 2013). According to Neumann (2013) the five functions of a viable organization is that the organization has to do what it does, it needs a functioning communication system, it needs control mechanisms, its leaders need to monitor the environment and never lose sight of the future, and the leaders need to decide

about the course of the future. System thinking is a discipline for managers for seeing organizations as a whole (Senge, 2006). Senge (2006) attributed system thinking to tools and techniques found in feedback concepts of cybernetics, and servomechanism of engineering theory. According to Senge, system dynamics deals with how organizations change through time. For this study, I will present systems thinking in four components of holistic thinking, operational thinking, interactive design, and self-organization (Skaržauskiene, 2010).

Holistic thinking. A classical viewpoint of a system is a combination of two or more elements, wherein every element in a system influences the behavior of other elements and the behavior of each element has a direct effect on the behavior of the whole (Senge, 2006). According to Skaržauskiene (2010), holistic thinking involves process orientation, where managers focus on the whole system instead of the components. Skaržauskiene argued that seeing the whole requires managers to understand the structure, function, process, and context.

Conti (2010) supported the idea that according to systems thinking the global behavior and performance of a system is the combined result of its components and the mutual relations among the components. Conti argued for a shift in management paradigm to solve the challenges of businesses today. Reviewing the management paradigms of past decades, Conti stated that academics always interpreted the needs of their current social situation and argued that we need a sharp paradigm change based on systems view of organizations.

Operational thinking. Operational thinking (dynamic thinking) refers to the

principals of systems dynamics such as multi-loop feedback systems, identification of the delay effect, and barriers to growth (Skaržauskiene, 2010). Analytical thinking helps organizations to be good at the specializations, whereas systems thinking help organizations to be good throughout the organization. Through dynamic thinking, managers gain the perspective of internal and external organizational barriers. Real advantage for management in situations is to understand dynamic complexity, not detail complexity (Senge, 2006).

Interactive design. According to Skaržauskiene (2010), interactive design is both the art of finding differences among similar things, and the science of finding similarities among different things. Interactivity is a leader's ability to have a vision of a desirable future state and the planning to achieve that future state (Skaržauskiene, 2010). According to Skaržauskiene, interactivity is a step process of defining a problem, gathering information to solve the problem, formulating a hypothesis, checking correctness of findings, and constructing a solution.

Self-organization. The foundation of new business architecture is the ability of the managers to match the internal competencies with the external market opportunities (Skaržauskiene, 2010). Organizations, similar to organisms, must learn to adapt to their environment and continually react with offensive or defensive mechanisms in order to sustain. According to Skaržauskiene (2010), self-organization is a movement toward a predefined order.

The current literature presented in this study on the concept of systems thinking resulted in three questions to add to the research instrument used in this study. Question

5: Explain your experience with systems thinking in your industry. Question 6: What is your perception of systems thinking in your industry? Question 7: What is your perception of interconnectedness of departments (e.g. connection among facilities, procurement, and finance)?

Strategic Management

The concept of strategic business management emerged in the 1960s and 1970s with the works of Alfred Chandler, Kenneth Andrews, and Igor Ansoff (Lazonik & Teece, 2012). According to Lazonik and Teece (2012), Ansoff defined strategy as the determination of long-term goals and objectives of an enterprise and the allocation of resources to take action for reaching those goals and objectives. Lazonik and Teece stated that Andrews outlined business strategy as a way for a company to describe its future position, its objectives, its purpose, goals, policies, and plans to guide the organization from its current position to the future position. In addition, Lazonik and Teece pointed out that Ansoff defined strategy as the common thread among the activities of the organization and market it serves, which defines what type of company it is now and plans to be in the future.

Contemporary scholars like Hamel and Prahalad (2010), Kaplan and Norton (2008), Kim & Mauborgne (2005), Mintzberg (1987), Porter (1996, 2008), have written extensively on this topic since the inception of strategic management in business practices and expanded on the works of Chandler, Andrews, and Ansoff (Lazonik & Teece, 2012). According to Eccles, Perkins, and Serafeim (2012), growing number of companies consider sustainability-related strategies necessary to be competitive

(Ramachandran, 2011). In order to maintain sustainability organizations must embed corporate sustainability activities and strategies in organizational culture (Garza, 2013). According to Weijermars et al. (2013), energy strategy research is an emerging and holistic research discipline, and therefore I next review the general seminal and contemporary literature on strategic management, with a focus on strategy formation, decision-making process, competitive forces, and blue ocean strategy. Each of the sections here ties into strategic management and its impact on societal issues.

Strategy formation. In the field of strategic management research there was congruence on the importance of social and culture influence on strategic decisions (Delmas & Montes-Sancho, 2011). Mintzberg (1987) stated that *strategy* is one of those words people define in one way but use in a different way without even realizing it. He argued that strategies could form or be a result of formulation. He explained this process by using the analogy of a salesperson developing a new product for a client, which then opens new opportunities in a new market to sell the product. According to Mintzberg, managing strategy is the ability to detect patterns and help them take shape in an organization. The internal and external organizational factors influence these patterns.

Prior to designing or planning a strategy, managers must have an ability to conceptualize a future for the organization. Hamel and Prahalad (2010) defined strategic intent as the obsession with winning at all levels of the organization and sustaining this obsession for 10–20 years for global leadership. According to Avery and Bergsteiner (2011), BMW is an example of a firm operating on sustainable practices for several decades. They stated that Western companies often limit their ambitions to the available

resources, in contrast to Japanese firms that accelerate organizational learning to reach for the seemingly impossible goals. According to Hamel and Prahalad, creative strategy formulation is difficult where strategy formulation is only an organizational elitist ritual. They argued that creative strategies seldom emerge from the annual planning ritual, where usually the starting point of next year's strategy is this year's strategy and that improvements are only incremental at best. Hamel and Prahalad provided the example of Cannon's entry into the personal copier business, which came from a sales subsidiary not from the corporate planners in Japan. They concluded that financial targets and vague mission statements could not provide the direction companies need to reach global leadership. They stated that developing faith in the organization's ability to reach tough goals, motivating it to do so, and focusing its attention long enough to internalize capabilities is the challenge for becoming a global leader.

Porter (1996) argued that operational effectiveness is not strategy. He stated that managers focus on tools and techniques that stray them from viable, competitive positions. According to Porter, the roles of leadership during strategy formulation are clear. First, the leader must provide the discipline to decide on which external pressures to react to while maintaining competitive position. Second, the leader must teach the organization's strategy and know to say no when necessary. Porter argued that strategy clarifies choices about what not to do and is as important as what organizations should do. Finally, Porter concluded that one of the most import functions of a communicated strategy is to guide employees in making choices in their day-to-day decision-making process that is in line with corporate strategy.

Strategy management systems. In order to attain goals set with strategic management, managers must understand the management cycle that links strategy and operations and know what tools they have to apply at each interval of the process (Kaplan & Norton, 2008). Strategy, as a process, is a way of thinking about business, assessing its strengths, diagnosing its weaknesses, and envisioning its possibilities (Pugh & Bourgeois, 2011). Kaplan and Norton (2008) identified management systems as the integrated set of processes and tools that a company uses to develop its strategy, translate it into actions and measure, and monitor for performance toward objectives. According to Kaplan and Norton, creating closed loop management systems increase the success ratio for companies. They proposed a five-stage management system to help companies reach their strategic goals.

Strategy management system, according to Kaplan and Norton (2008), is composed of five stages. First, develop the strategy. Kaplan and Norton recommended that top-level management meet and review existing strategy to come up with a new strategy or to enhance the current strategy. Hamel and Prahalad (2010) argued this method of strategy creation was ineffective. Kaplan and Norton suggested that during strategy creation companies should have stretch goals, a difficult to reach target from the current position. The concept of stretch goals is similar to the strategic intent introduced by Hamel and Prahalad. Second, translate the strategy. Kaplan and Norton stated that once the strategy is set, managers have to translate the strategy to objectives per business unit and communicate the objectives and targets to the business units and employees. Third, plan the operations. Kaplan and Norton suggested that managers should monitor

operational tasks on an ongoing basis with dashboards to track performance. Fourth, monitor and learn. Kaplan and Norton suggested that managers should have three types of meetings. First, is operational review, second is strategy review, and finally comes strategy testing and adapting. The final stage of a strategy management system is to test and adapt the strategy. Kaplan and Norton referred to this step as *closing the loop* on the management system because they suggested that managers should review assumptions underlying a strategy and see if there are any flaws; if they find any flaws, they should reexamine the entire strategy and either find incremental changes or come up with transformational strategy. Kaplan and Norton concluded that companies could have the best strategies, but if they do not connect the strategies with day-to-day operational plans, the strategies will be unsuccessful.

Competitive forces. In order for leaders of companies to complete the strategy formation process by managers, they should consider a broad spectrum of internal and external factors. The structure of an industry drives competition and profitability (Porter, 2008). Porter (2008) outlined five competitive forces as the threat of new entrants, bargaining power of buyers, threat of substitute products, bargaining power of suppliers, and rivalry among competitors. According to Porter, managers should evaluate industries in terms of the five forces to understand the industry competition and profitability.

New entrants to an industry bring capacity, and an ambition to gain market share that puts pressure on prices, costs, and rate of investment necessary to compete (Porter, 2008). According to Porter (2008), threat of new entrants puts a cap on potential profitability of an industry. The threat of entry is dependent on the level of barriers to

entry, and the intensity of the reaction from the incumbents. If both are low, then the profitability of the industry is likely to be moderate.

Powerful customers have the ability to drive up competition by forcing down prices, they demand better quality and more service, and generally, they play industry participants against each other at the expense of industry profitability (Porter, 2008). According to Porter (2008), customers are powerful if there are few buyers, or if each buyer procures large volumes relative to the size of its vendors. The level of power customers hold is a determinant of the level of profitability in an industry.

Substitute products are those products that are the same or similar to an industry's product (Porter, 2008). Porter (2008) stated that when the threat of substitutes is high, profitability of an industry suffers. Strategic managers must evaluate current competitors, and potential future competition to their products and services. According to Porter, substitution of products can be a significant revenue generator if a company's products are now a substitute to an alternative.

Powerful suppliers can capture profitability of an industry by increasing costs, lowering quality, and charging higher prices (Porter, 2008). According to Porter (2008), an industry suffers from loss of profitability unless the increase in costs passes through to the end users. If an industry is too profitable, there is a high chance for suppliers to enter the market (Porter, 2008).

Price competition due to rivalry among competitors is destructive to profitability because price competition transfers profits from an industry to its customers (Porter, 2008). Porter (2008) explained that rivalry is intense when industry growth is slow, exit

barriers are high, and rivals are highly committed. Porter explained that price competition is likely to occur when products or services are identical, switching costs are low, fixed costs are high, and marginal costs are low.

Blue ocean strategy. Blue ocean strategy implies not competing with one's rivals but making them irrelevant (Kim & Mauborgne, 2005). Kim and Mauborgne (2005) stated that companies should design a strategy that defines their environment instead of an environment that defines their strategy. Unlike Porter (2008), Kim and Mauborgne proclaimed that a company's competitive environment does not determine the performance of the company. They claimed that there are two types of strategy: structuralist strategies that assume what the competitive environment is and reconstructionist strategies that seek to shape the environment.

The current literature presented in this study on the concept of strategic management resulted in three questions to add to the research instrument used in this study. Question 8: Explain your experience with strategic management in your company. Question 9: What is your perception of strategic management in relation to energy efficiency projects in your company? Question 10: What is your perception of strategic management in your industry?

The U.S. Automotive Manufacturing Industry

The manufacturing of automobiles and automotive products in the Unites States dates back to the end of 19th century. Woodcock (2012) posited that sustainability is at the top of the global political agenda, and that the automotive industry is getting the most attention to develop a low carbon strategy. The automotive manufacturing industry and

its suppliers are a key component of the U.S. economy. Sherman (2011) argued that the automotive manufacturing industry is responsible for 15% of global carbon emission. Consequently, top management in automotive manufacturing industry face issues about corporate citizenship due to the impact of cars and trucks they manufacture and its impact on climate change (Sherman, 2011). An extensive analysis of global corporate citizenship, via sustainability report examination, of automotive corporations, revealed that disclosures are complex and nuanced, and institutional norms, stakeholder pressures, cultural values, and corporate strategy shape these disclosures (Shinkle & Spencer, 2011).

According to Couch, Burton, Malone, and Black (2011), more than half the cars Americans buy are foreign. The domestic manufacturers, also known as the Big 3, face difficult financial troubles. The scope of this study includes American as well as non-American automotive companies that manufacture in the United States. According to Ameer and Othman (2012) companies that have superior sustainability practices have superior financial performance measured by return on assets, profit before taxation, and cash flow from operations compared to those without such commitments. Automotive companies are taking measures to improve their operational sustainability (Manna, Marco, Khalil, & Meier, 2011; Zahler & Iglauer, 2012). In order to contribute to this movement in this study I expanded on the current body of knowledge by exploring the decision-making process for EE projects.

Until the year 2008, the US held the position as the leading global producer of motor vehicles; however, that year China took the leading position (OICA, 2012). Traditionally, the U.S. automotive manufacturers were uncontested in the global realm

for production. According to Chu and Su (2010), the U.S. automotive manufacturing industry is poised for a slow recovery from the recessionary slowdown that started in 2007–2008. During this recession, demand for cars fell sharply; however, global motor vehicle production rose 3.2% from 2010–2011 (Chu & Su, 2010, OICA, 2012). Based on the numbers published by OICA (2012), the production level of motor vehicles in the United States rose 11.5% during the same timeframe. Chu and Su stated the recovery of the auto industry is inevitable and that it will once again be an important driver of the U.S. economy; however, they concluded that it would be a slow recovery because there is slow recovery in employment and housing, and because of the high cost of energy. Chu and Su concluded that, after 40% decline in sales and 50% decline in production levels, the U.S. auto industry is in position for a comeback to contribute to the U.S. economy.

As the industry gets back to full production, top-level management should look at opportunities available by implementing EE production practices to tackle the waste of energy in production processes. According to the U.S. Census Bureau (2011), in 2010 the U.S. motor vehicle industry spent $2.7 billion on electricity and fuel for energy. Global energy prices are on an upward trajectory for fossil-based energy resources such as coal and oil, and political and economic tensions around the world may boost these prices on an ongoing basis. Today competition is eroding the Big 3's (GM, Ford, and Chrysler) market share, and the automotive manufacturers to gain and maintain a competitive advantage, carefully evaluate every resource allocation, including use and consumption of energy.

High operational costs hinder American automakers, and with this in mind the

focus of this research was the EE decision-making process, which is an enabler of cost cutting through an increase of energy performance improvement (Bergenwall, Chen, & White, 2010). One of the primary aims of managers during the manufacturing process is to have a sustainable manufacturing activity, which is the creation of manufactured products that use processes that are nonpolluting, conserving energy, and using fewer natural resources (Gaussin et al., 2011; Mittal & Sangwan, 2014).

Energy management. The production processes during automotive manufacturing is energy intensive (Zhai, Cao, Zhao, & Yuan, 2011). During the manufacturing process, automotive companies aim to reduce their carbon emissions through eco-friendly product designs and energy efficient process improvements (Cortez & Cudia, 2010). Energy saving technologies are attractive from a business perspective, both as a way of cutting costs and as a hedging strategy. Studies have shown that through modeling the automotive assembly line in advance and including energy considerations, manufacturers can save energy and costs (Fysikopoulos, Anagnostakis, Salonitis, & Chryssolouris, 2012). Galitsky and Worrell (2008) stated that most of the motor vehicle companies in the U.S. have teams and programs dedicated to energy efficiency; however, they stated that in this industry opportunities exist to reduce energy consumption while maintaining or enhancing activity at the plant. Pardo Martínez (2011) concluded that one of the strategies for energy efficiency in the automotive manufacturing industry is the alliance between customers and suppliers, which is a way to communicate productive needs to work toward continual improvement in quality, environment, security, and social performance.

Galitsky and Worrell (2008) identified categorically the areas of opportunities by utility system or processes. While discussing EE opportunities, Galitsky and Worrell concluded that participation in programs such as Environmental Protection Agency Energy Star or gaining ISO14001 certification can help companies track and implement EE measures. According to Galitsky and Worrell, GM's management team claimed that using energy management programs in combination with the ISO program has had the largest effects on conserving energy at their plants. According to Delmas and Montes-Sancho (2011), Big 3 automotive manufacturers formally requested their suppliers to adopt ISO 14001 by 2003, and by July of 2003 24% of the automotive suppliers located in North America adopted ISO 14001. Galitsky and Worrell indicated behavioral and attitude change as having a great impact on energy conservation measures, which could be achieved by the adoption of the new ISO 50001 standard for energy management. Galitsky and Worrell called for further research "on the economics of the measures" (p. iii) at the individual plant level as part of an energy management program in order to assess the impact of selected EE advancements. Additionally, Galitsky and Worrell pointed out that a gap exists in the literature that focuses on the behavioral aspects of EE in the U.S. automotive manufacturing industry.

Organizational learning. According to Mirkamali, Thani, and Alami (2011), organizational manager's style of leadership plays a critical role in developing organizational learning. In response to this shift in managerial thinking, academics posited that organizational learning is a viable strategy for the automotive industry, in order to manage the continually changing environment (Omar, Mears, Kurfess, &

Kiggans, 2011). Omar et al. (2011) posited that organizational learning in the automotive industry is a strategy to provide the OEMs with sustainable resources for innovation, and to respond to the changes in the operating environment. Continual learning is a strategic choice for OEMs to gain and maintain a competitive advantage (Omar et al., 2011). According to Marksberry et al. (2011), Toyota's problem-solving methodology is successful because it utilizes the plan-do-check-act (PDCA) cycle and continually improves the processes by repeating the learning cycle.

In order to understand the role of national and organizational culture, Ijose (2010) studied how practices are adapted in the U.S. automotive sector. According to Ijose, social norms of a county will aid or constrain the successful transfer of knowledge. Ijose argued that national and organizational culture plays a significant role in molding a company's values and behavioral norms. Organizational culture is a facilitating factor and an essential condition for organizational learning to occur (Rebelo & Gomes, 2011). Ijose stated culture has a major role in employee and managerial behavior, and he identified the three main cultures that operate in the U.S. automotive manufacturing industry: a national culture, an organizational culture, and a company subculture. Ijose concluded by proposing that future research should include cultural influences in adoption of practice, and the correlation of this adoption to performance matrices such as market share, customer satisfaction, quality, and brand awareness. Around the world, individuals and organizations realize the negative impact of human activity on our environment. Therefore, it is a matter of time for this information to disseminate across cultural and organizational barriers.

OICA (2012) stated that climate change due to human activity is probably the greatest challenge facing society in the 21st century. Public acknowledgement of the role of human-caused climate change by international organizations such as the OICA is a great start; however, as pointed out by Ijose (2010), companies should look to change their culture in order to learn and take action toward solving problems. Collective action by organizations and companies must start now to tackle the universal waste of natural resources during production processes.

Advances in business practices and knowledge of the managers in the U.S. automotive manufacturing industry are vital to the economic strength of the country. The body of knowledge I reviewed points to gaps in management practice and knowledge about benefits of EE in the U.S. automotive manufacturing industry such as cost and toxic emissions reduction. Nieuwenhuis, Beresford, and Choi (2012) acknowledged that for handling costs and carbon dioxide emissions in automotive manufacturing, using established operations management techniques would enable managers to make decisions that are more informed. Knowledge and practice of current business concepts by management in the U.S. automotive manufacturing industry may enhance deployment of EE projects, which in turn may help sustainability objectives for these companies. Lozano (2012) studied a major automotive manufacturer and concluded that orchestrated organizational systems changes, for sustainability initiatives, that are planned and labeled offer the most proactive options for companies to initiate sustainability options. Wells and Nieuwenhuis (2012) argued that such transformation of organizations structures, economic relationships, social and cultural attitudes is fundamental to create new

sustainable mobility.

Systems thinking. Mass production emerged out of the automotive manufacturing industry in the beginning of 20th century. Systems thinking simplifies decisions by allowing managers to see the deeper patterns lying behind the events and the details (Senge, 2006). According to Palaima and Skaržauskiene (2010), systems thinking by managers is especially important in manufacturing organizations that must react to global pressures. Palaima and Skaržauskiene argued that modern conceptions in manufacturing organizations stress the importance of a new perspective, which is different from mass production. They stated that this new perspective requires flexible reaction of management to changes and orientation toward integrated solutions is very important (Palaima & Skaržauskiene, 2010). The aim of this study was to explore the level of systems thinking in the U.S. automotive manufacturing industry, especially in the decision making process for EE projects.

Strategic management. In order to maintain a competitive advantage, automotive manufacturing companies face a challenge of constant adaptation by configuring their manufacturing network, capacities, technologies and resources at the manufacturing sites and adapting the complex structures of complex strategic planning tasks (Löffler, Westkämper, & Unger, 2012). Henry Ford was the first blue ocean strategy implementer in the automotive manufacturing industry. In 1908, there were about 500 automotive manufacturers in the US when Ford introduced Model T, which revolutionized the automotive manufacturing industry (Kim & Mauborgne, 2005). Niebecker et al. (2010) stated that in the automotive manufacturing industry cross-

company project development and implementation happens without clear goals that are connected to the company's strategy and objectives. According to Niebecker et al., the automotive manufacturing industry is under pressure to ensure the reduction of costs. Niebecker et al. argued that open and transparent collaboration among team members who have specific objectives and targets creates an atmosphere for successful projects that align with the company's strategy.

Transition and Summary

In the first section of the study, I concentrated on the problem statement, the purpose, and the relevant literature review pertaining to the central research question of this study. I explored the problem statement and the decision-making process with the support of academic literature hitherto further in this study. Although other research approaches such as quantitative or mixed methods are an option for this study, I applied a qualitative inquiry with a questionnaire and interview design including open-ended questionnaire followed by telephone interviews, which I detail in Section 2. In addition, in Section 2, I outline the data collection techniques, the population, and the sample for this study.

Section 2: The Project

This section includes the rationale for this study on the energy-efficiency gap in the U.S. automotive industry. The project detail of Section 2 starts with the purpose for this study. In addition, this section covers topics such as researcher bias, purposive sampling of target participants for this study, ethical research, and qualitative research method with a questionnaire and interview design. Finally, in this section I cover in detail the data collection for this study. Also in this section, I cover data collection instruments, data collection techniques, data organization and analysis techniques, and reliability and validity for this study. This section serves as the guideline for conducting the qualitative research on the energy-efficiency gap in the U.S. automotive industry. I used the data collection instruments identified in this section after receiving approval from Walden University's Institutional Review Board (IRB).

Purpose Statement

There is currently a significant energy efficiency (EE) gap in the U.S. industry. Thus far, researchers have not explored the U.S. automotive manufacturing industry to determine why the EE gap exists. In order to explore this phenomenon, I examined the decision-making process for EE projects in the U.S. automotive manufacturing industry. The purpose of this qualitative inquiry was to understand the knowledge needed by automotive manufacturing leaders to select energy-efficiency projects without rejecting profitable projects. I did so by exploring the personal experiences of energy and environmental managers, business-line managers, and top management officials in the U.S. automotive manufacturing industry. This project has a strong potential to inform

industry managers, aiding them in making investment decisions with strong long-term profit potential, in place of damaging investments that are more lucrative in the short term. The potential social impact of this research project is an understanding by decision makers of the decision-making process wherein managers reject profitable investments, although the potential benefits of these investments could lead to future profitability for those organizations.

Role of the Researcher

In qualitative research, the role of the researcher as the primary data collection instrument requires the researcher to identify personal values, assumptions, and biases toward the research project (Sinkovics & Alfoldi, 2012). Qualitative researchers collect data through the examination of documents, observing behavior, conducting interviews, or using questionnaires among many other data collection techniques. My roles as the researcher was to collect, organize, and analyze the perceptions of people who have experienced the EE decision-making process. I am a professional involved in supporting the dissemination of international management system standards such as ISO 9001 for quality, ISO 14001 for environmental, and most recently, ISO 50001 for energy management. I am professionally and academically involved in the business community to support and promote management practices by the application of an internationally accepted framework. From a professional perspective, I had contact with potential participants through my work as a business development professional for the ISO 50001—Energy Management Systems training and certification services standard (ISO, 2011).

This background informed but did not significantly bias my data collection. My position involves strictly commercial contact with our clients, and does not entail my personal services influencing the client to obtain certification or professional development opportunities. My professional employment is in business development, sales, and marketing of services for the company where I work. I purposively invited these contacts to participate in this study, but I did not pressure anyone to participate. Since 2008, I followed the development of the new ISO 50001 standard for energy management systems. My firsthand experience of this standard's development and the launch of the new standard by ISO in July 2011 gave me a unique perspective to see how individuals and companies react to this new management system framework. For this study, one of my goals as a researcher was to curb and suspend my assumptions in the field and to report on actualities in the U.S. automotive manufacturing industry where decision-making criteria may or may not have an impact on the EE gap in the industry. My study assumptions were that I had a professional bias towards management systems and an academic bias from exposure to pertinent academic literature on EE and energy management.

I brought both my professional experience to this study and my existing personal relationships with some of the participants of this research. For this study, I planned to invite existing contacts I had established in the U.S. automotive manufacturing industry to participate in this research and to invite other participants through purposive sampling. In addition, I sought recommendations from current contacts to introduce new participants with similar experience of the decision-making process.

The role of the researcher involves maintaining the integrity of the research at the highest level. My goal was to follow the prescriptive process for obtaining approval for the research participants, and maintaining the records of the questionnaire and the interview records for at least 5 years from the completion of this study. The participants of this study had the opportunity to contribute through responses to questionnaire and the follow-up interview.

Participants

The population for this study was professionals from the U.S. automotive manufacturing industry with experience of the decision-making process for EE projects. Qualitative studies exploring the decision-making process for EE projects are absent in the current body of knowledge, but recent similar qualitative studies used sample sizes (*n*) of 13, 16, and 16 respectively (Brown, 2012; Rimanoczy, 2010; Senko, 2010). For this study, my goal was to achieve a sample size of 20 participants, exceeding the sample size of similar studies. I was ultimately able to recruit 21 participants, from whom I collected data using questionnaires and telephone interviews in order to triangulate the data results.

I invited potential participants via email to participate in the study with an invitation instrument that included the consent form titled Participant Consent Form Onus Doctoral Study (see Appendix B). I invited individuals who met the participation criteria through my existing professional contacts. I asked participants to recommend others to participate in the study, which is a snowballing technique (Rimanoczy, 2010). I met the minimum criterion of 20 participants by using this technique, and achieved 21

participants. In order to check for data saturation, I checked the questionnaire data and interview results on an ongoing basis. Periodic checks for new themes continued until reaching data saturation, which was when no new themes emerged from additional interviews and questionnaires. Data saturation began with Participant P018, after which the new data became redundant. The data collection resumed until 21 participants completed the online questionnaire to ensure data saturation assumption made with P018 is accurate. By including the participant criteria on the invitation, the invitation became an instrument for confirmation of the participant meeting the participation requirements for this study. In addition, demographic questions were on the questionnaire to confirm the participants met the criteria for participation.

The invitation process includes making initial contact. The initial contact to those in my professional network was through telephone. I then used the snowball technique to invite additional participants using references from my professional network. In addition, I invited potential participants from the members list of the Suppliers Partnership for the Environment (a Washington, D.C.-based nonprofit organization that I am a member of) until the sample size reached the minimum requirement of this study. This organization consists of professionals from the automotive manufacturing industry who fit the criteria for this study; I have contact information for all members due to my own membership.

The criteria for participants ensured that only knowledgeable persons participated in this study. The participants were required to have experience with the decision-making process for selecting EE projects at an automotive company in the United States bounded by the geographical boundary of this study, which were the Midwest and the

South. Researchers using qualitative methods face the dilemma of not being able to attract participants to meet requirements of a study, requiring a secondary plan (Brown, 2012; Rimanoczy, 2010; Senko, 2010).

For this study, I invited participants until reaching the sample size of 21. If a potential participant decided not to participate, I invited a replacement from the same population. Through my professional network, I sought out recommendations for participants in this study. In order to develop and maintain a working relationship with the participants for this study I used the telephone for first contact to gain oral agreement to participate and emailed the consent form (see Appendix B) in the second contact to gain written agreement to participate. Furthermore, I sent the participant the questionnaire instrument via email. Finally, I contacted the participants via telephone to conduct follow-up interviews.

Throughout the process of inviting and evaluating participants for this study, I took utmost care to protect the identities of the potential or current participants of this study. In order to protect confidentiality I did not reveal personal names and company names of the participants to anyone. Additionally, each participant needed to sign a consent form titled Participant Consent Form Onus Doctoral Study (see Appendix B), which I will store and save in digital format on an external drive, Hitachi Touro hard disk drive, and hard copy forms in a fireproof safe box for a minimum of 5 years from the time of the study.

Research Method and Design

The objective of this qualitative study was to understand the knowledge needed

by automotive manufacturing leaders to select energy-efficiency projects without rejecting profitable projects. For this study, in order to explore the decision-making process for EE projects at the participants' company I used a qualitative method that consists of inductive inquiry to obtain data. The qualitative open-ended questionnaire and follow-up telephone interview design for this study helped me to understand the decision-making process for EE projects from the participants' points of view. In the next two subsections, I give detail to the method and design of this study.

Method

In order to collect, analyze, and interpret data, researchers face a decision to conduct their study as quantitative, qualitative, or mixed method. Traditionally, for research designed to investigate perceptions about a phenomenon or an experience, researchers use qualitative methods rather than quantitative ones. Marshall and Rossman (2011) explained qualitative inquiry with the analogy of creating a montage in which the researcher, similar to a filmmaker with cinematography, takes bits and pieces from a variety of participants and puts together a new image or story that was obscure before. For this study, I focused on putting together the themes resulting from my exploration in the field for this study. According to Denzin and Lincoln (2011), qualitative research is a method for understanding what individuals or groups attribute to a social or human problem. My goal was to take particulars from participants of this study and connect the instances to a general theme. This study was an exploration of human behavior during a particular important process in a business setting. In order to probe, explore, capture, and interpret the decision-making process and the views held by the participants of this

research, I employed a qualitative inquiry method for this study.

Those who support quantitative research generally consider qualitative research subjective in nature. In order to understand human behavior in a specific business process, in this study I employed a qualitative inquiry method. Koro-Ljungberg (2010), characterized qualitative inquiry as complex, situated, fragmented, and changing. Researchers using quantitative research methods, by looking at statistical measures with a broad brush, could miss the opportunity to understand why and how things happen a certain way. My goal for this study was to explore why and how managers make decisions with regard to EE projects in the U.S. automotive manufacturing industry; therefore, I did not choose a quantitative method for this study. Initially I considered a mixed-method approach for this study; however, the focus of this study was on behavioral aspects for a decision process that a qualitative study can address. Therefore, I did not use mixed-methods methodology for this study.

Brown (2012) employed a qualitative method while studying the topic of leader's decisions on business sustainability. Brown stated that qualitative methods address deeper structures to find meaning. Additionally, Rimanoczy (2010) applied qualitative method to studying the topic of processes and steps that business leaders go through as they implement sustainability initiatives, specifically how business leaders learn and apply knowledge to their companies. Finally, Jenkins (2012) applied qualitative inquiry to studying a decision-making process of networked public-private partnerships in government and nongovernmental business setting.

Researchers must decide on an appropriate method for conducting their research

based on their own worldview and the central questions of their studies. For this research, I chose to use a qualitative inquiry via online questionnaire with telephone interviews to study the decision-making process for EE projects in the U.S. automotive manufacturing industry (Brown, 2012; Hoskins, 2009, Senko, 2010). My decision to apply qualitative research to this topic is in line with similar studies by researchers studying a topic in similar business setting (Brown, 2012; Hoskins, 2009; Rimanoczy, 2010; Senko, 2010).

Research Design

For this study, I employed a questionnaire and interview research design, which consisted of online open-ended questionnaire followed up with telephone interviews (Brown, 2012; Hoskins, 2009; Rimanoczy, 2010). According to Denzin and Lincoln (2011), the primary objective of qualitative knowledge is the understanding of meaningful relations from original description of experience in the context of a particular situation. Denzin and Lincoln argued that researchers' own thinking, intuition, reflection, and judgment are the scientific investigation. Denzin and Lincoln argued that a scientist identifies the underlying structure of an experience by interpreting the original description of a situation by the participant. My goal for this study was to describe the decision-making process for EE projects for companies in the U.S. automotive manufacturing industry.

The qualitative strategy of inquiry is the depiction of experiences and perceptions from the participant point of view. Qualitative inquiry seeks to present and clarify phenomena of behavior as the participants present their experience from their perception.

In addition, qualitative study describes the meaning several participants give to shared concepts. This study consisted of 21 participants from companies in the U.S. automotive manufacturing industry. According to Denzin and Lincoln (2011), the aim of a qualitative study is to capture the meaning participants give to experiences from their description of it. In accordance to similar studies by Brown (2012), Hoskins (2009), and Rimanoczy (2010), I used a questionnaire and interview design that included open-ended questionnaires and telephone interviews for this study to attempt to answer the central research question: What are automotive manufacturing leader's perceptions and lived experiences when selecting energy efficiency projects?

For this study, I evaluated various designs such as ethnographic, grounded theory, case studies, phenomenological, and narrative approach before deciding on questionnaire and interview inquiry. Ethnographic study focuses on a particular cultural group, and the researcher observes this group to capture data over a period (Sangasubana, 2011). Although this study observes general culture in organizations, the primary goal of this study was not to study a specific culture in an environment in detail, as is the case with ethnographic design. Therefore, I did not choose an ethnographic research design for this study. Grounded theory is an inquiry method wherein the researcher generalizes a theory of a process in the view of participants (Denzin & Lincoln, 2011). The product of grounded theory design is a sampling of multiple groups and maximization of similarities and differences. For grounded theory, the researcher expands on current theories or generates new theories, which was not applicable to a DBA applied study. As such, I did not use grounded theory for this study. Case studies focus on people or organizations

(Marshall & Rossman, 2011). The focus of this study was the perceptions and experiences of leaders in many organizations; therefore, case study design is not appropriate for this study. Phenomenological study design is for evaluating the perceptions and lived experiences of participants by collecting data from participant interviews (Marshall & Rossman, 2011). The design of this study includes interviews of participants; however, the design also includes a questionnaire to collect data. Therefore, a phenomenological design was not appropriate for this study. Finally, a narrative approach focuses on an individual's life stories. The product of narrative research is a combination of the researcher's and the participants' life experience (Marshall & Rossman, 2011). The focus of my research was on a decision-making process that involves multiple participants in organizations. As such, I did not use a narrative design for this study.

My decision to use qualitative inquiry is in line with similar research studies by Brown (2012) and Rimanoczy (2010) that used the same method. Based on evaluation of various research designs, questionnaire and interview type inquiry is the most appropriate design to obtain behavioral data about experiences. While studying the broad topic of sustainability and leadership attributes, both Brown and Rimanoczy applied questionnaire and interview type inquiry with in-depth interviews and open-ended online questionnaire to study the topic in detail. Both researchers stated that qualitative inquiry is necessary to add to a body of knowledge in order to prepare future empirical quantitative research. In addition, Senko (2010) applied qualitative inquiry to study leadership perspectives, which was similar to the methodology of this study. Therefore, I chose a qualitative

questionnaire and interview design to study the decision-making process for EE projects in the U.S. automotive industry (Brown, 2012; Hoskins, 2009; Rimanoczy, 2010; Senko, 2010).

The research design determines the method of inquiry to explore the central research question. After investigating research design options of ethnography, grounded theory, case studies, and narrative, I decided not to use these research designs, but to use questionnaire and interview research design via open-ended online questions followed up with telephone interviews. This decision is in line with the work of other researchers who used qualitative inquiry (Brown, 2012; Hoskins, 2009; Rimanoczy, 2010; Senko, 2010). Figure 4 illustrates the design procedures used to collect data for this research.

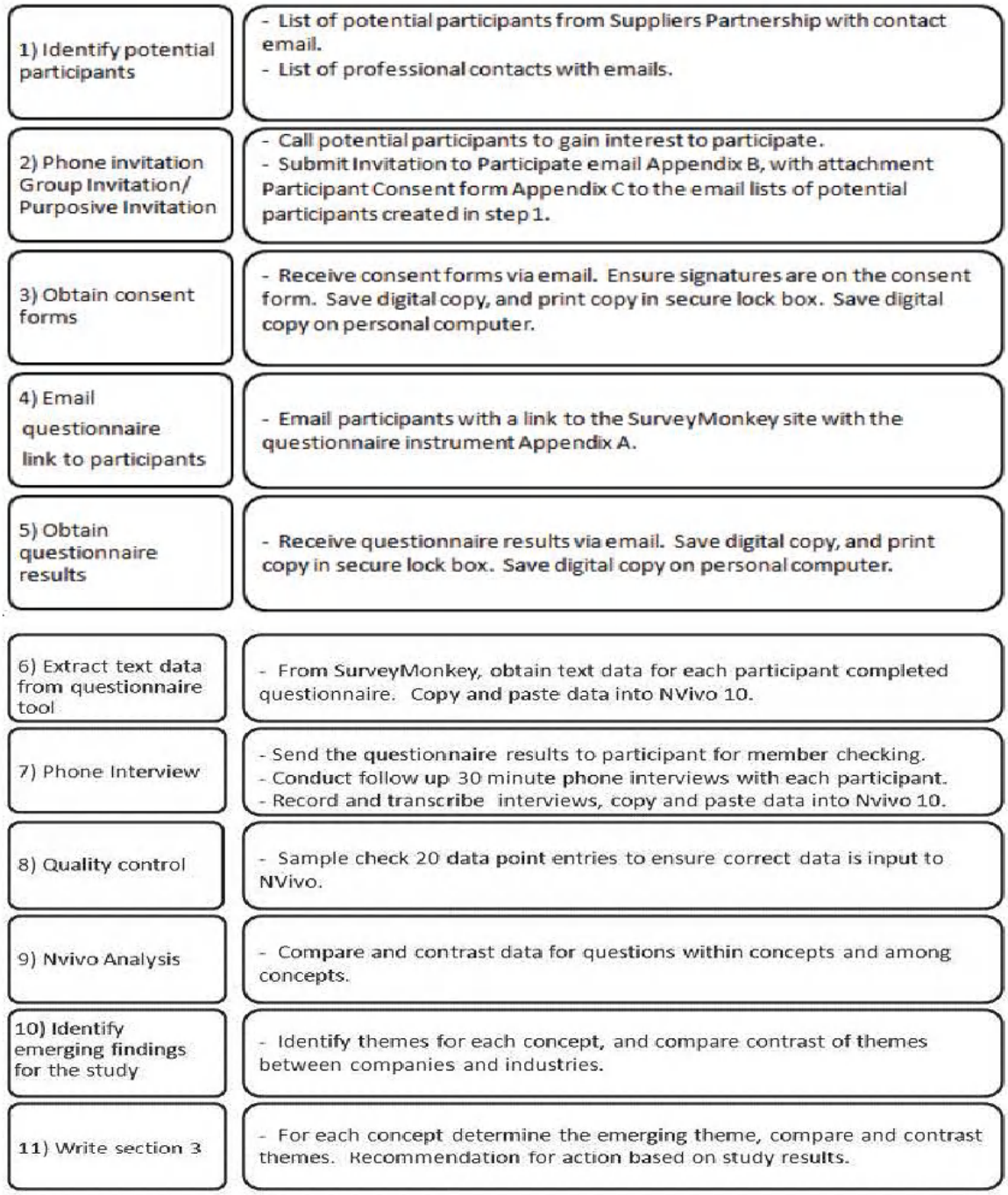

Figure 4. Procedures for the study's questionnaire for data collection and processing.

The central question of the study drives the research method and design. For this study, I employed qualitative method with questionnaire and interview design to explore

the decision-making process for EE projects in the U.S. automotive manufacturing industry. In order to explore the experiences and perspectives of the individuals with experience in deploying EE projects, I used a questionnaire and interview type design. Data collection was through employing an instrument containing open-ended questions and following up with telephone interviews (Brown, 2012; Hoskins, 2009; Rimanoczy, 2010).

Population and Sampling

The automotive manufacturing industry in the United States has been historically associated with the Midwestern states. According to Klier and Rubenstein (2010), however, vehicles made in North America now come from a narrow corridor between the Great Lakes and the Gulf of Mexico known as Auto Alley. The recent expansion of the automotive manufacturing industry includes southern parts of the United States, where automotive companies have established manufacturing and assembly plants; therefore, the geographical boundary for this study was set as the Midwest and the South regions of the United States.

The population for this study was individuals from the U.S. automotive manufacturing industry with experience in EE decision-making process. The final sample of participants comprised 21 participants that completed the online open-ended questionnaire, which were in one instance 3 individuals from the same company, and the rest from different companies. For similar qualitative research, Brown (2012), Rimanoczy (2010), Senko (2010) used sample sizes of 13, 16, and 16 participants respectively. For qualitative questionnaire and interview studies, the Walden DBA

advises to include a minimum of 20 participants or until data demonstrates saturation, exceeding the sample size established by Brown, Rimanoczy, and Senko. This study includes responses from 21 participants, of which 16 also participated in interviews by telephone. Data became redundant after 18 participants, demonstrating data saturation.

This study included 21 participants from the U.S. automotive manufacturing industry to meet the criteria for this type of qualitative study. The relevant participants all had experience in the decision-making process for implementing EE projects in U.S. automotive companies. For this reason, I employed a purposive sampling technique to invite participants for this study. I invited participants to participate in the study through my professional network. The sampling method also incorporated the snowball technique to inquire about including additional study participants from the list of purposive targets (Rimanoczy, 2010). In my professional role, I belong to Suppliers Partnership for the Environment, which is a network of automotive manufacturing industry professionals in the realm of environmental management. This membership enabled me to seek participants for this study.

The acceptance criteria for becoming a participant in this study was having experience with the decision-making process for EE project in U.S. automotive companies. Specific criteria for acceptance as a participant for this study includes:

- having experience of the decision-making process for EE projects in the U.S. automotive manufacturing industry,
- consensually agreeing to participate in writing,
- willing and able to respond to open-ended questions, and

- worked or currently working in the midwestern or southern parts of the United States.

In order to distribute the questionnaire, collect data, and store the response to questions, I used SurveyMonkey, a free online tool to conduct surveys and questionnaires. The participants could answer the questionnaire from a personal or public computer and complete the questionnaire at their desired location and time. In order to ensure timeliness for completion of the questionnaire, I asked the participants to complete the questionnaire within 2 weeks from the time that they received the questionnaire. Upon receiving the questionnaire from a participant, I scheduled a call to conduct a follow-up interview.

Depending on the size and complexity of an EE project and hierarchical decision-making process for a company, the job description of participants may have varied significantly. The participants could be, but were not limited to, top managers (e.g., CEO/president, VP, director, or CFO), energy managers, facility managers, energy engineers, certified energy managers, or corporate strategy managers. Because people holding any of these titles could be part of the decision-making process, I did not limit the participant pool by title. The broad spectrum of potential participants mentioned here helped me to fulfill data saturation with the minimum number of participants. Depending on the size and complexity of the hierarchical decision process for EE projects, this participant pool was subject to participate in the decision-making process for EE projects. For some companies the decision to approve or deny an EE project may be incumbent on one individual, whereas for others the decision may be a group effort.

In order to realize the findings of this study, I used a population of individuals from the U.S. automotive industry in the midwestern and southern United States. These regions are the target of this study because of the presence of automotive manufacturing companies in these regions. The sample size of 21 for this study was sufficient to conduct a qualitative study in order to make generalization of the market.

Ethical Research

Social science researchers follow ethical principles concerning human research. The goal of a researcher in social science, similar to other branches of research, is to establish a transparent and honest agreement with the participants. In order to protect confidentiality and to provide assurance of consensual agreement between the participant and me, the agreements need to be documented and stored. I outline the process for acquiring consent, confidentiality, data storage, incentives, and questionnaire exit. For this study, I completed a certificate course, Protecting Human Research Participants, from The National Institutes of Health Office of Extramural Research and have a certificate on file number 597402.

Participation in this study was consensual, because according to Kumaran and Bordia (2011), a researcher can analyze consensual qualitative data. In order to participate in this study, participants must have given full consent by agreeing to the terms of the Walden IRB-approved consent form titled Participant Consent Form Onus Doctoral Study (see Appendix B). Prior to contacting the prospective participants for the study, I received approval from Walden University's IRB (IRB Approval Number: 06-20-13-0064181). Based on the purposeful sampling method for this study, target

participants who met the participation requirement for this study received the consent form via email from me. For this study, I used my Walden University email account for all research-related communication. In order to store the email data, I backed up the data to a storage device in order to save a digital copy of the communication for a minimum of 5 years.

Confidentially is an important part of research, therefore, I adhered to Walden University's IRB guidelines and policies throughout this study (Isaac, 2011). I have an obligation to protect the confidentiality of the participants and their organizations. For this study, my goal was to use a process of data coding to protect the confidential information of the participants such as personal and organization name, company, and geographic location. I maintained impartiality to personal aspects of the participant throughout this research.

Data is the core of any research (Denzin & Lincoln, 2011). I used a digital backup device, Hitachi Touro, to protect and save the data for this study residing on my personal computer. The storage device is kept locked in a fireproof box at my residence. I am the only person who has access to this lock box. As I worked on my study, I kept the digital backup device current with weekly backup scheduled for Saturday morning every week. Upon completion of the study, I saved all of the data for the study from my computer on to the Hitachi Touro device, and erased all data from my computer. I will store the data for this study for a minimum of 5 years.

No participant received monetary or other incentives. The opportunity for the participants is to tell a story from their point of view and potentially make an impact on

an important topic. I provided an executive summary of the research results to each participant. Finally, all participants had the option to exit the questionnaire process or decline to continue their role as a participant. None of the participants requested to exit from the study. A participant could have exited the process at any given time for any reason.

Ethical research is a serious matter, and ethical standards, in accordance to the guidelines of the National Institute of Health Office of Extramural Research is standard guideline for this research. I acknowledged the importance of protecting human research participants during the research processes. The same ethical principles apply to the data collection process for this research.

Data Collection

Instruments

Research is dependent on data. Qualitative data require a researcher to collect, interpret, and analyze the data and then reach a conclusion based on the researcher's perceptions. The data collection instruments for this study comprised of 11 open-ended questions (see Appendix A) and semistructured telephone interviews with the participants. In a similar study, Warren-Myers (2012) used a questionnaire to study the behavioral attitudes of building owners and their perception of sustainability while conducting a qualitative study. While studying business leaders, Rimanoczy (2010) used open-ended interview questionnaire. In addition, Brown (2012) used semistructured telephone based interviews while studying leaders on sustainability initiatives. One of the concerns with data collection instruments is whether the instrument measures the

intended content of the research question. The results of this qualitative research were dependent on the data I collected from the questionnaire, and the follow-up interview results from participants.

In order to collect data for this study I sent a questionnaire using the instrument Onus Inquiry of EE Project Selection Process (see Appendix A) via email to potential participants, which included a list of 11 open-ended questions, and followed up with a phone interview to obtain perceptions and lived experiences of the participants. According to Denzin and Lincoln (2011), data collection for qualitative inquiry includes sources such as open-ended questionnaires. The participants who received the instrument via email clicked on a hyperlink Internet address to answer the questions online. Once they clicked on the hyperlink, the participants' Internet browsers directed them to the instrument on the SurveyMonkey website, a free online tool to conduct surveys and questionnaires. The participants saw instructions on how to complete the online questionnaire. Once they completed the online questionnaire, they had the option to review their answers for accuracy and had the option to submit their answer by clicking a submit button on their browser.

Each participant who completed the online questionnaire also had an opportunity to schedule a follow-up semistructured telephone interview. The telephone interviews provided a way for member checking the data. I asked the participant the same questions that were on the online questionnaire, and for an explanation of the meaning of some of their answers, and gave them the opportunity to share more in depth comments. Rubin and Rubin (2012) posited that semistructured interviews enable researchers to obtain

large amount of data quickly. Rimanoczy (2010) used semistructured interviews to explore the processes and steps that business leaders go through as they champion sustainability initiatives. Likewise, Brown (2012) used semistructured interviews to explore how leaders design and engage in complex change initiatives related to social and environmental sustainability. Rubin and Rubin (2012) argued that semistructured interviews are ideal for examining the complexity of the real world by exploring multiple perspectives of an issue. For this study, I designed the questionnaire with open-ended questions and followed up with semistructured telephone interviews to obtain perspectives from the participants who have experience with decision-making processes for EE projects in the U.S. automotive manufacturing industry. The results of the questionnaire and the follow-up interviews for this study were the source data that I analyzed for the concepts covered in this study. Upon request, I will provide the raw data for this research to interested individuals or organizations.

The open-ended questions of this study are a research instrument for extracting data from participants. The data from the questionnaire for this study gave directionality to me about the themes surrounding each conceptual framework, which in turn allowed me to analyze and reach conclusions. Thick description of the questionnaire and the follow-up phone interview results in Section 3 of this research support validity with specific quotes from participants.

Data Collection Technique

In preparation to collect the data for this study, I conducted a pilot study to test the procedures for collecting the results using a research questionnaire with

semistructured telephone interviews. In a similar research, Rimanoczy (2010) used 12% of the sample size as the number of pilot studies. For this study, I conducted a pilot study with three participants, or 15% of the sample population, to test the procedures set forth in this research proposal (Rimanoczy, 2010). I used the pilot study to validate the list of questions used for the questionnaire and the follow-up interviews, to ensure the questions when answered by the participants, answered the central research question for this study. The questions on the online questionnaire and the follow-up interview were the same questions. The follow-up interviews allowed me to ask the participants to clarify or elaborate their answers where needed. For continual improvement of my research instrument, I asked for feedback from the participants, in addition to the questions:

1. What could I have done to improve the questionnaire process?
2. What other questions should I ask?
3. Is there anything I should add to the questionnaire?
4. Is there anything I should remove from the questionnaire?
5. How can I improve the questionnaire to answer my research question?
6. List any questions that were not understandable.

My objective for the pilot study was to gain knowledge from this feedback on the validity of the questions, understand participants' concerns about the questionnaire process, and have a chance to improve the main research instrument for this study. There were no changes necessary for the study after the pilot study; therefore, I did not need obtain new approval from the Walden University IRB.

In order to conduct robust qualitative research, 21 participants provided data for

this research through online questionnaire and follow-up semistructured interviews. The purposive sampling technique helped me to identify and invite new participants for the study. Individuals in my professional network were my first point of contact to invite to participate in this study. Snowball technique helped me to gain access to potential additional participants. This technique, according to Rimanoczy (2010), is asking the purposefully selected participants to recommend other individuals who have experienced the phenomenon to participate in the study. A minimum of 20 participants who experienced the decision-making process was the target sample for this study to meet the requirements of a qualitative questionnaire and interview type study (Brown, 2012; Rimanoczy, 2010). This study included 21 participants.

For this study, I collected primary data through qualitative open-ended questions and semistructured telephone interviews. After receiving a response to the open-ended online questionnaire, I sent the results of the questionnaire to each participant prior to the interview. During the semistructured telephone interviews, each participant had the opportunity to explain the meaning of their answers, which is a way for member checking (Buchanan & Hvizdak, 2009; Carlson, 2010; Harper & Cole, 2012; Sinkovics & Alfoldi, 2012). Member checking is an opportunity for the participant to check whether the answers they provided to a question are interpreted correctly (Carlson, 2010). In order to analyze the full questionnaire and transcribed interview data I imported the responses to NVivo 10 for analysis. The questionnaire records will reside in digital copy on my personal computer and on back-up device for a minimum of 5 years after the research completion.

Data Organization Techniques

This study contains primary data from open-ended questionnaires and phone interview recordings with the participants. The questions, for online questionnaire and the follow-up telephone interviews, are on the research instrument Onus Inquiry of EE Project Selection Process (see Appendix A). I created a file for each participant that contains, at a minimum, email communication, the completed and signed or digitally accepted consent form Participant Consent Form Onus Doctoral Study (see Appendix B), pilot questionnaire, questionnaire, and phone interview records. I assigned all participants a number between P001 and P021 in the order each participant joined the study, such that the first participant was P001 and the last participant was P021. I will protect the data for a minimum of 5 years upon completion of this study per the regulations of Walden University's IRB (Jenkins, 2012). All of the data for this study are in digital files and hard copies that I will store in a lock-box that only I have access to.

Data Analysis Technique

Qualitative data is raw descriptive information (Denzin & Lincoln, 2011). The results of this research comprise text data such as from the current body of knowledge, private questionnaire responses, and from the follow-up telephone interviews with participants. I used the software tool NVivo 10 to analyze the data collected from the open-ended questionnaires and the follow-up interviews to extract themes. In order to determine themes I read all answers from participants' online questionnaire responses and follow-up interviews, and then coded the answers by themes within NVivo 10. In order to ensure that the data was correct once it entered into NVivo 10, the data was

checked through a review all 247 data points. The following is an explanation of the complete process for data analysis for this study.

I sent out the questionnaire to potential participants, and then I scheduled follow-up phone interviews with each participant. For this study, I asked questions to explore the decision-making process with the U.S. automotive manufacturing industry for EE projects:

1. Explain your experience with the decision-making process for energy efficiency projects in your company.
2. What is your perception of energy efficiency in the automotive manufacturing industry?
3. Explain your experience with organizational learning, as it pertains to selecting energy efficiency projects in your company.
4. What is your perception of organizational learning, as it pertains to selecting energy efficiency projects, in your industry?
5. Explain your experience with systems thinking, as it pertains to selecting energy efficiency, in your company.
6. What is your perception of systems thinking, as it pertains to energy efficiency, in the automotive industry?
7. What is your perception of interconnectedness of departments (e.g. connection among facilities, procurement, and finance) in your company in relation to energy efficiency projects?
8. Explain your experience with strategic management, as it pertains to selecting

energy efficiency projects, in your company.

9. What is your perception of strategic management in relation to selecting energy efficiency projects in your company?
10. What is your perception of strategic management, in relation to selecting energy efficiency projects in the automotive industry?
11. What additional information would you like to add that is not in the questionnaire?

The questions helped to answer the central research question: What knowledge do automotive manufacturing leaders need to select energy-efficiency projects without rejecting profitable projects? The initial data analysis comprised of the pilot study results for the first three participants, who evaluated the open-ended questions in the online questionnaire, and the follow-up interview. Based on my inquiring from participants for feedback to evaluate the questions and the instrument; all three participants replied that the questions were appropriate, well designed, and covered sufficient angels to address the central research question. Based on the results of the pilot study of the instrument, no changes applied to the inquiry process. For the pilot study, I used NVivo 10 software to analyze the data. The analysis of the open-ended questions of the pilot study provided the answer to the central research question. In order to maintain reliability of data, following the receipt of each additional questionnaire and the transcribed telephone interviews, I imported the content into NVivo 10 for all data collected. I read each questionnaire and telephone interview responses for this study to understand each respondent's experience.

For qualitative research, analysis of data starts with coding the transcript of data.

The process of coding is a way to dissect the text into sections according to its relevance to the code. Participant coding is sequential numbers, 1, 2, 3. . . n. Concepts were coded by sequential numbers, 1 was energy management, 2 was organizational learning, 3 was systems thinking, and 4 was strategic management. Number coding for questions were sequential: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11. An example of this coding scheme for Participant 1 for each question respectively would be 1.1.1, 1.1.2, 1.2.3, 1.2.4, 1.3.5, 1.3.6, 1.3.7, 1.4.8, 1.4.9, 1.4.10, and 1.4.11.

Based on the coding list above, I aimed to identify themes to address the conceptual framework for this study. From these themes, I analyzed the participants' meanings about their experience. From the participants' responses, I analyzed the themes emerging about the concept. I also compared the results within a concept. For example, I compared themes emerging from Question 1 to the themes emerging from Question 2 to understand the experience and perceptions for energy management. The coding helped me get a better understanding of which data in the questionnaire addresses each conceptual framework for this study.

Through the coding and analysis of data for this study, I determined themes in an unbiased way with the help of computer software NVivo 10. For this study, I derived the results from my interpretation of the data by applying the rules of research methodology to substantiate the results. Questionnaire and interview type studies have the flexibility to evolve in progression and improve upon the study with each account of a participant.

The computer software NVivo 10 is a robust tool to analyze rich text for research. According to Sinkovics and Alfoldi (2012), NVivo 10 provides procedural advantages for

text analysis compared to traditional means. They stated that NVivo 10 also helps with the formalization of processes to enhance reliability of research findings (Sinkovics & Alfoldi, 2012). NVivo 10 software is a tool for qualitative or mixed-methods research. The software allows a researcher to collect, organize, and analyze content from open-ended questionnaires and follow-up semistructured telephone interviews, which was the form of data that I collected for this study.

According to Marshall and Rossman (2011), data triangulation involves the use of multiple data sources. In order to enhance this study, I used data triangulation by using two collection techniques, online questionnaire, and telephone interviews using the same set of questions (Denzin & Lincoln, 2011; Fielding, 2012; Marshall & Rossman, 2011). In addition, member checking which involved having the participants review each questionnaire answer prior to the telephone interviews and during the telephone interviews each participant had an opportunity to explain the meaning to their answers and share more in depth comments, ensured interpretive validity of the study data.

Reliability and Validity

In essence, reliability and validity of research helps the reader and the academic community to determine the value of this study, ranging from invaluable to irrelevant. According to Sinkovics and Alfoldi (2012) there can be no validity without reliability; moreover, establishing validity satisfies establishing the reliability of a research study. Reliability of a study concerns the extent to which the repeated procedures of a study provide the same results (Denzin & Lincoln, 2011). Validity of research concerns the utility of the instrument that measures it, and the interpretation made by researcher from

sample data to support the claim (Denzin & Lincoln, 2011). In a qualitative study, reliability means that the research procedures are consistent among participants and can be replicable under similar circumstances, and validity means that the researcher applies certain procedures to check for accuracy (Denzin & Lincoln, 2011). To ensure reliability and validity, data collection and analysis techniques supported the aim of this study to explore the decision-making process for EE projects in the U.S. automotive manufacturing industry by using a questionnaire, synthesizing, and interpreting the responses using research qualitative data analysis tool NVivo 10.

Reliability

According to Denzin and Lincoln (2011), qualitative research is reliable if another researcher can replicate the results. In order to establish a framework for reliability that other researchers can replicate, this study included a research instrument used for an online questionnaire and follow-up semistructured telephone interviews. Walden IRB approved the procedures for conducting this study. The data collection commenced upon approval in the same manner from each participant.

In order to enhance the reliability, this study included a pilot with three participants. In order to protect the reliability of the data collected in the questionnaires, I copied the data from the questionnaire tool and interview transcripts and pasted to the NVivo 10 software. In order to protect for threats to reliability of data each participant received the questionnaire answers prior to the telephone interviews. Section 3 includes an unbiased analysis of the questionnaire and interview results with recommendations for action in the conclusion of this study.

Finally, member checking enhanced the reliability of this study. Carlson (2010) argued that member checking gives participants the opportunity to determine if the interpretation of their answers by the researcher are correct. Participants of this study received a copy of their questionnaire answers prior to the interview. During the telephone interview, the participants had the opportunity to explain meaning to their answers, elaborate on their answers, and to share more in depth comments.

Validity

Validity of a study is an indication that trustworthy conclusions are the result of a well-executed and completed analysis that captures, identifies, locates, or represents participants' positions and perspectives (Koro-Ljungberg, 2010). According to Koro-Ljungberg (2010), validity in qualitative research involves concepts such as authenticity, credibility, conformability, internal coherence, transferability, reliability, and significance. The responsibility of a researcher is to protect the integrity of a study by proper validation of the content used for the research study. Numerous ways exist to ensure that the output of a research paper is valid, and the following represent the rigor used in this study to achieve trustworthiness.

This study incorporated validity methods of data triangulation and member checking. Data triangulation is a research method for ensuring validity of a study by using two or more data collection techniques (Denzin & Lincoln, 2011; Fielding, 2012; Marshall & Rossman, 2011). Carlson (2010) posited that member checking is a research method to enhance a study by giving the participants an opportunity to review their answers for correct interpretation. In addition, Carlson (2010) argued that member

checking could be a discussion with the researcher for the verification of transcripts or early interpretations. To ensure validity, this study included at least two questions per concept, and data from 21 participants. Mason (2010) argued that, as qualitative research progresses additional data might not contribute new information to the study, hence reaching a point of saturation. For this study, data became redundant after collecting data from 18 participants, thus demonstrating data saturation. In addition, data triangulation via compare and contrast of themes emerging for corresponding questions for each concept ensured validity. After collecting online questionnaire responses, and prior to telephone interviews, each participant received a copy of the online questionnaire results for review and confirmation of the answers they provided. As part of member checking for interpretive validity, the follow-up interviews gave the participants the opportunity to elaborate and explain their answers and I reviewed the answers with them. Finally, I also checked for validity to ensure that the themes emerging from the questions answered the overarching research question. According to Sinkovics and Alfoldi (2012), procedures for qualitative studies should be public so that scholarly community can judge the rigor of the study.

In order to achieve the data saturation, this study included 21 participants from various automotive manufacturing companies in the U.S. midwestern and southern regions (Brown, 2012; Hoskins, 2009; Rimanoczy, 2010). Mason (2010) argued that sample size in qualitative studies should follow the guideline of saturation, when the new data collected does not provide new information on the issue under investigation. For this study, data became redundant after 18 participants, thus achieving data saturation.

For this study, my goal as the researcher was to act as responsibly as possible to ensure reliability of the data I present in this study and to ensure that the validity of the data and its interpretations was tested. In order to ensure reliability, I transferred data from the questionnaire tool, SurveyMonkey, to the qualitative data analysis tool, NVivo 10, by copying and pasting the text. In addition, I transcribed the data by listening to the recorded interviews and reviewing each transcription twice to ensure proper transfer of data. To ensure validity I used data triangulation by including two questions per concept, collecting data by questionnaire and telephone interviews, and I invited participants from disperse geographic locations, which resulted in 21 participants for this research. In addition, the participants received the questionnaire responses prior to telephone interviews to validate the interpretation of their answers during the interview process as member checking for interpretive validity.

Transition and Summary

Section 2 includes the role of the researcher, participants, research method and design, population and sampling, ethical research, data collection, data analyses, and finally reliability and validity. In Section 2, I describe the role I played in the research study, the population of the study, and how I planned to sample that population. Section 2 includes the details for each step of data collection and analyses to ensure the rigor and quality for this study. In addition, in Section 2 I address the research method I used for this study and why I selected qualitative questionnaire and interview type study over ethnographic, grounded theory, case studies, phenomenological, and narrative. Finally, in Section 2 I provide details on reliability and validity of this study. Section 2 serves as

the manual for the research procedures I used for answering the research question. Section 3 includes the presentation of findings, application to professional practice, implications for social change, recommendation for action and future studies.

Section 3: Application to Professional Practice and Implications for Change

This study provided an exploration into the decision-making process for EE projects in the U.S. automotive manufacturing industry. The results were significant in describing subjective experiences and perceptions of the concepts covered in this study on energy management, organizational learning, strategic management, and systems thinking in the U.S. automotive manufacturing industry. The study identified several ways that leaders in the U.S. automotive manufacturing industry can improve the decision-making process for selecting energy-efficiency (EE) projects.

This section contains the results of this study. The results reflect the participant experiences and perceptions about the decision-making process for selecting energy efficiency projects. This section also contains evaluation of the results as they relate to the conceptual framework. In addition, this section includes the implications of the results from the participants' point of view. Recommendations and conclusion in this section provide insights to enhance the decision-making process for EE projects for future business leaders. Business leaders should implement the five key points presented in this study to enhance the decision-making process for energy efficiency projects.

Overview of Study

The purpose of this study was to explore the lived experiences and the perceptions of 21 participants who have experienced the decision-making process for selecting EE projects in the U.S. automotive manufacturing industry. I collected open-ended questionnaire data and interview data from a diverse set of participants. Participants' job titles included:

- Global or Corporate Energy Managers (5),
- Global Environmental, Health, Safety Compliance, and Sustainability Managers (4),
- Energy Managers, Energy Engineers, Specialists, or Advisors (11),

and Research and Development Staff of National Laboratory (1).

All participants had previously experienced the decision-making process for selecting energy efficiency projects in the U.S. automotive manufacturing industry.

Of the 21 participants, 13 had experience working at an automotive OEM, and 8 had experience working at a Tier 1 automotive supplier. The years participants have been with their organization ranged from less than 5 years (8), 5 to 10 years (1), 15 to 20 years (5), 25 to 30 years (5), and greater than 30 years (2). The participants had automotive experience work in the states of Indiana (4), Kentucky (1), Michigan (10), Ohio (1), and Tennessee (5). The participants acknowledged, in writing via consent form, of their right to refuse information, to withdraw from the interview at any point, and that participation was voluntary.

In this study, the qualitative research method incorporated open-ended questionnaire and follow-up telephone interviews for data triangulation to explore the main research question. It specifically addressed a gap in current social science literature regarding the decision-making process for EE projects in the U.S. automotive manufacturing industry. By design of the study, the open-ended questionnaire and telephone interviews sought the participants' lived experiences and perceptions to explore energy management, organizational learning, systems thinking, and strategic

management, from the participants' point of view.

Presentation of the Findings

In this section, I detail the findings surrounding the central research question of this study: What knowledge do automotive manufacturing leaders need to select energy-efficiency projects without rejecting profitable projects? The participants' open-ended questionnaire answers and telephone interviews resulted in the findings and the conclusion of this research. For this study, participants recruited have experienced the decision-making process for energy efficiency projects, and I evaluated their perceptions and experiences to identify emerging themes. The first three participants were part of a pilot to evaluate the open-ended questions, online questionnaire tool, and the follow-up interview. All three participants replied that the questions were appropriate, well designed, and covered sufficient angels to address the central research question. Based on the results of the pilot study of the instrument, no changes applied to the inquiry process. I used NVivo 10 software to analyze data in accordance to the research guidelines.

Research Question and Conclusions

The objective of this qualitative study was to understand what knowledge is necessary for automotive manufacturing leaders to select energy-efficiency projects without rejecting profitable projects. The research question for this study was: What knowledge do automotive manufacturing leaders need to select energy-efficiency projects without rejecting profitable projects? The results of the data analysis provided the basis for the conclusions:

1. Leaders in U.S. automotive manufacturing industry can improve the decision-making processes for selecting energy efficiency projects by implementing better return on investment criteria and holistic analysis, which includes safety, quality, and environmental improvement opportunities.
2. Energy management is pervasive, robust, and a major part of doing business for automotive companies. Good energy management can significantly help improve a company's financial status.
3. Systems thinking and interconnectedness among departments in automotive companies are weak.
4. Organizational learning, as it pertains to energy efficiency, can have an impact on the decision-making process.
5. Strategic management affects energy efficiency projects during the decision-making process.

Findings and Collected Evidence

The problem addressed in this research was the EE gap in industry, which I studied by examining the decision-making process for selecting EE projects. I conducted the research by asking participants questions about their experience and perceptions about the decision-making process for energy efficiency projects in the U.S. automotive manufacturing industry. The interview questions address the conceptual framework of this research, which revolves around decision-making process, energy management, organizational learning, systems thinking, and strategic management, in the U.S. automotive manufacturing industry. The themes derived from the findings and examples

of the supporting data are in Appendix D: Identified Themes and Supporting Statements From Participants.

Energy Management

The concept of energy management in this study covered the decision-making process, energy efficiency, financial tools, and management standards. In order to explore the concept I asked the participants to respond to two open-ended questions, 1 and 2, via online questionnaire and followed it by a telephone interview. The open-ended questions explored participants' experiences and perception.

Q1: Explain your experience with the decision-making process for energy efficiency projects in your company. The first open-ended question was a general inquiry about the participants' experience with the decision-making process. This question was to explore the participants' thoughts about the decision-making process while selecting energy-efficiency projects. The data collected from this question informed my conclusion that *decision-making processes for evaluating energy efficiency projects among U.S. automotive manufacturers can be improved by better return on investment criteria and holistic analysis which includes safety, quality, and environmental improvement opportunities.*

The conclusions from question 1 expanded on the perceptions of the decision-making process of other researchers. Aflaki et al. (2013) and Muthulingam et al. (2011) posited that there are management biases of myopia and improper discounting of project savings during the decision-making process for selecting energy efficiency projects. Jackson (2010) stated that managers bypass profitable investment options because they

lack understanding of financial evaluation criteria for EE projects. In continuation of this path to explore EE gap in industry I focused this study on the decision-making process for selecting EE projects.

In order to explore this criterion for return on investment, also referred to as payback, I analyzed from the data collected, references to return on investment, and payback by participants. Of the 21 participants, 66% explicitly stated that return on investment or payback was a criterion for the decision-making process. The portion of respondents who used this criterion may be higher because this question did not specifically ask whether the participants company used this criterion or not. Participant P010 explained the variance of thresholds by stating,

> The threshold for payback period during good old days before auto-meltdown was 2 to 4 years. We were selecting energy efficiency projects based on long-term impact on the overall energy and environmental portfolio. After 2009, the vision shifted to more 6 months or less payback period due to limited budget. That means the focus is more on low hanging fruit, and easy to implement energy projects with less capital.

In support of findings by Aflaki et al. (2013) and Muthulingam et al. (2011), the return on investment criteria for energy efficiency projects for majority of participants in this study was 1 to 2 years. Of the respondents that explicitly mentioned return on investment as a criterion, 49% stated that their organization requires between 1 to 2 years of payback in line with the findings by McKane et al. (2009). Participant P018 stated, "Most energy projects are a challenge to gain management approval if the ROI [return on investment] is

not less than 12 months. This short sightedness can lead to higher energy usage." Of the respondents that explicitly mentioned return on investment or payback as a criterion, 32% stated that their organization requires between 2 to 5 years of payback or that they did not have a specific criterion. Participant P015 explained that "return on investment for energy efficiency projects are 3 years. It becomes much harder to implement if it is above 3 years."

In alignment with the findings of Galitsky and Worrell (2008) and Jackson (2010), the development in management thinking in the automotive industry are to consider projects with return on investment greater than 12 months, Participant P018 stated,

> I would like to say that the focus is shifting to be more accepting of other project benefits to overcome the standard 12-month ROI threshold. We are evaluating more projects for longer payback because it is the right thing to do for sustainability.

The findings of Ameer and Othman (2012) support the statement made by P018 that evaluating projects in various angles is the right thing to do for sustainability. Participant P009 also supported this shift in thinking by stating,

> Typically, 5 years is the threshold that we consider for an energy efficiency project. Most of the ones we look at are less than that. Usually in a 2-year range or less than that, 5 years is the maximum we would consider an energy project.

A participant working for an automotive supplier, P017 stated, "There are a lot of projects out there with 12-month payback, so until that pile of projects are depleted that

continues to be the ones we are going after." Participants also showed agreement on the notion of incorporating safety, quality, environmental, and energy in the decision-making criteria.

An important theme arose because of this investigative inquiry in to the decision-making processes in the U.S. automotive industry. The theme of *holistic analysis of energy efficiency projects to include safety, quality, and environmental improvement* persisted among participants. Participant P009 stated,

> I take this as inclusion of other positive benefits that might come, other positive strategic benefits that might come from an energy efficiency project, not just the MMBTU reduction, you know there is other cost, environmental, energy security, projects that all need to be considered within our strategic vision for the company and increasing profitability and there are certainly many aspects of energy projects so it could be beneficial to different strategic missions to the company, so I think we do a good job on considering those aspects but there is always opportunity to improve. Energy projects are good for the environment, and also good for our business.

To support the idea of holistic approach, by incorporating production quality to selecting EE projects, Participant P003 stated,

> By far the best strategy is to implement energy efficiency are those projects that also improve production quality and / or quantity. An example of this is, in our paint booths where we installed new VFD motors that had much better control of downdraft speed, as a result the slower speed allowed for better paint adhesion.

> We saved on electrical energy, but we also reduced paint overspray due to better conditions, which resulted in less wasted paint (sludge) to be hauled away. Finally, we also improved paint quality on the vehicle.

A major revelation of this inquiry into energy efficiency projects was that safety-related projects in the automotive industry have an advantage in the prioritization for implementation. Participant P010 stated, "As an example, in the organization I used to work in, safety was number one priority, so if I wanted to accelerate an energy efficiency project, I would select a project that has a safety component built in." Among other participants who agreed with the notion that safety takes priority in the automotive industry, Participant P004 also supported this argument by stating,

> There will have to be some other initiatives that would push it as well. So if we're just doing it as an energy project, just for the sake of energy project and we have other projects competing against that 5-year payback we're going to go by the business case at that point. If there is a safety concern, let us say its insulating some steam pipes and you have the safety factor that kicks in plus the savings from the energy project, we will do that project because of the other initiatives that are driving it.

Decision-making processes in the U.S. automotive industry seems to vary based on business conditions with no specific criteria for energy efficiency projects. Researchers concluded that energy efficiency projects are profitable investments for business (Jackson, 2010; McKane et al. 2009, Muthulingam et al., 2011). Leaders in U.S. automotive manufacturing industry should evaluate the decision-making criteria for

energy efficiency projects to determine if profitable investments get rejected by faulty decision criteria.

Q2: What is your perception of energy efficiency in the automotive manufacturing industry? The second open-ended question explored participants' perception of energy efficiency resulting from energy management. This question was an exploration of the participants' broad perception of energy efficiency in the automotive manufacturing industry. The data collected from this question informed my conclusion that *energy management was pervasive, robust, and a major part of doing business that helps improve company's financial status.*

Companies that implement standardized energy management systems reap additional nonenergy benefits such as productivity gains, improved product quality, lower nonenergy operating costs (IEA, 2011). In order to explore the responses, I focused on participant responses that gave an overview of their perception about the industry. In alignment with the findings of Niebecker et al. (2010) on competitiveness and resource utilization in the automotive industry, Participant P002 stated,

> By nature the auto industry is probably one of the most competitive sectors of business, not only in the US, but worldwide. Given the cost of a new vehicle, every vehicle manufacturer is doing everything they can to maintain the current vehicle price from year to year, or as we did in 2010, actually lower the price of the vehicle. This can only happen by maintaining all areas of expense, from the price of the parts, to the manufacturing process, to being more efficient in other areas. This is where energy efficiency can play a big part. Cost reduction

opportunities catch everyone's eyes, especially upper management.

Participant P001 supported the concept that automotive manufacturers are progressive in energy efficiency by stating, "To the best of my knowledge all major auto manufacturers have been implementing some kind of energy improvement activity." In support of energy efficiency being a major part of business in the industry, Participant P007 stated, "Energy efficiency is a major part of our industry now. It has a direct effect on cash flow and may soon have a much larger affect in carbon taxes." Participant P009 stated,

> My perception is that energy efficiency is improving across industry as a whole, with some corporations leading the way. Companies are becoming increasingly concerned with sustainability in general, and reducing energy footprint is a major component of that. Additionally, energy costs often represent a significant portion of expenses, and corporations are realizing that additional focus on efficiency can yield great benefits and strong returns.

The participant's perceptions indicate that all companies in the industry are doing something about energy efficiency, but some are doing more than others. Participant P007 stated,

> Everyone that I deal with, they are doing the same things we are. They are trying to reduce their energy costs. Whether that is reducing idling loads, reducing needed loads where possible, demand shedding, load shedding activities, they are looking at energy efficient products, maybe not necessarily going to the extremes that we may be going with LEDs or changing out drives, but everybody is trying

> to do something. Everybody is worried about how much we are going to end up paying for C02 emissions.

The industry representatives who participated in this research were concerned with costs, potential future carbon taxes, and making sure their company's investments have an appropriate return on investment. Energy management has taken precedence in the automotive industry, but the rigor and framework used fluctuates. Participant P009, an automotive supplier, explained energy efficiency and its benefits in the automotive industry eloquently by stating,

> You know; the major foreign automotive manufacturers have a pretty robust efficiency program, at least that's my perception of it. I feel that they are doing a pretty good job. Focusing on energy efficiency is absolutely correlated to financial returns. Most companies won't do them fully for just reducing the energy or environmental footprint, there is typically some payback associated with it so, and it is usually very good payback, so yes financial benefits are considered or should be considered with every energy project, these are not only good environmental projects but they also help the company's bottom line.

Energy management in the U.S. automotive industry is pervasive, robust, and a major part of doing business that helps improve company's financial status. The participants articulated the importance and demonstrated by examples that all of the automotive companies are taking some action toward energy efficiency in the production processes. Leaders should evaluate what frameworks are currently in place, and how implementing the recommendations of this study can improve the decision-making

processes.

Organizational Learning

The concept of organizational learning in this study covered personal mastery, mental models, shared vision, and team learning. Two open-ended questions explored participants experience with organizational learning, Questions 3 and 4. The participants' responses show that organizational learning as it pertains to energy efficiency has potential for improvement.

Q3: Explain your experience with organizational learning, as it pertains to selecting energy efficiency projects in your company. The third open-ended question was an exploration of participants experience with organizational learning. The third question was intended to explore the participants' experiences about how people learned about selecting energy efficiency projects within their organization. The data collected from this question informed my conclusion that *organizational learning, as it pertains to energy efficiency, can have an impact on the decision-making process.*

According to Omar et al. (2011), organizational learning in the automotive industry is a strategy to provide the vehicle manufacturers with sustainable resources for innovation, and to respond to the changes in the operating environment. In alignment with these findings, Participant P009 stated,

> Organizational learning and sharing best practices is incredibly important to speed up widespread implementation of good projects and reduce duplicative efforts across various business units and facilities. We have a cross-functional steering committee in place to enhance organizational learning, and we have developed a

best practice energy manual for distribution across all facilities.

Participant P010 supported this idea by stating, "Organizational learning is a critical aspect in selection and marketing of energy efficiency. We need deep understanding of the culture of the organization and the business priorities."

Q4: What is your perception of organizational learning, as it pertains to selecting energy efficiency projects, in your industry? The data collected from this question informed my conclusion that *organizational learning, as it pertains to energy efficiency, can have an impact on the decision-making process.* Participant P004 stated, "The perception of organizational learning is that it is a cultural issue that takes time to get across all facilitates. Leaders in organizations have to continue to emphasize the importance of energy efficiency projects across the organization." In one particular case, the participant stated that leaders did not consider energy-related topics to be important enough for continual organizational learning. White and Noble (2013) stated that organizational learning is dependent on an organization's willingness to change, and that change is often brought on because of crisis or failure. In addition, White and Noble stated that change and learning in organizations is a slow process. Participant P015 was concerned with the lack of energy topics in organizational learning "I think there still is room for improvement that energy is not always included in organizational learning efforts. Most times we focus on labor, or material costs, but many times energy is not included in this."

Organizational learning is in essence a competitive advantage. How individuals in organizations learn from and with colleagues to tackle internal and external business

problems can add value to the organizational as a whole. Organizational learning about energy efficiency seems to be lacking in the U.S. automotive manufacturing industry; however, participants of this study agree that organizational learning can have a positive impact on the rate of EE project implementation.

Systems Thinking

The concept of systems thinking in this study covered holistic thinking, operational thinking, interactivity, and self-organization. Three open-ended questions explored participants' experience and perception with systems thinking, Questions 5, 6, and 7. The participants' responses show that systems thinking, as it pertains to energy efficiency varies considerably.

Q5: Explain your experience with systems thinking, as it pertains to selecting energy efficiency, in your company. The data collected from this question informed my conclusion that *systems thinking among departments varies considerably.* The concept of systems thinking was very challenging to most participants. According to system thinking discipline, managers should be able to see things such as organizations as a whole (Senge, 2006). In the realm of energy management and energy efficiency *systems* are thought to be related to equipment or network of equipment such as a HVAC system. Some participant responses suggest that the concept has limited reach in the automotive industry. Participant P004 stated,

> I want to say that in the realm of energy or environment in the industry, in the US, I believe that we have a gap of continuous improvement thinking, systems thinking. We look at opportunities, we look at technologies, we look at

> equipment, we're oriented more to do audits. Audit is part of the system, audit is not the system, what are you going to do next.

Participant P014 supported this concept by stating, "I think that it is not very common…systems thinking is very limited. Unless you have a central group looking at these systems level issues in a more connected way, you are not going to be able to do it." However, the answers to the additional questions on this concept also exhibited very strong presence of systems thinking and interconnectedness.

Q6: What is your perception of systems thinking, as it pertains to energy efficiency, in the automotive industry? The data collected from this question informed my conclusion that *systems thinking among participants varies considerably.* In contrast to participants' experiences of systems thinking presented above, Participant P019 stated, "Within the auto industry the systems approach is widely accepted with quality systems, EMS / SMS and even building management systems being very well accepted." Participant P001 stated,

> When you implement any project, you have to think in terms of systems. Energy efficiency projects are not an exception. Decisions made during project meeting affect all departments involved. Each department must understand its unique role to make that project a success. My section promoted that systems thinking. We constantly looked for loose interconnections and try to improve relationship among departments. Interconnections become loose when each department looks at the projects with the philosophy of what's in it for me.

Participant P001 continued by stating "All our energy efficiency projects are

linked to overall business planning. They are reviewed periodically by the top management to evaluate the efficiency and effectiveness of the projects and their contribution to overall business plan." Participant P002 stated, "The auto industry lives and breathes management systems, but not necessarily to the same degree for energy as it does for quality or environmental." According to Participant P004, "Implementing systems thinking was completely new when we developed this global program. We have long history of conducting individual projects with no systematic approach that ensures that the effort remains sustained."

Q7: What is your perception of interconnectedness of departments (e.g. connection among facilities, procurement, and finance) in your company in relation to energy efficiency projects? The data collected from this question informed my conclusion that *interconnectedness among departments varies considerably.* The definition of interconnectedness given by Senge (2006) stated the interconnectedness of decisions and the resulting impact on the system is an ability to think in systems terms. Participant P004 stated, "Interconnectedness is done at both the regional levels and also within the facilities. All departments work together to achieve the targets desired to complete the approved energy projects."

In support of this concept Participant P005 stated, "Integrating energy into your business model involves all departments in a business. Having company energy goals gets everyone involved." Participant P007 also added to this finding by stating, "After beginning the ISO50001 process and having early successes, we have had excellent working relationships between departments. And when obstacles became present, we

were able to engineer a work around." Participant P009 explained interconnectedness by stating,

> Our company has good cross-functional collaboration between some departments (engineering, environmental, purchasing) and most of our business units, but there is always opportunity to improve. We have a cross-functional energy steering committee that includes personnel from each of the business units and multiple departments. We also maintain other communication avenues (frequent conference calls, in person conferences, plant visits) between corporate and the facilities to facilitate interconnectedness. Finance supports energy projects through a strategic energy fund.

Participant P021 supported Participant P009 by stating, "The best energy management programs have a cross-functional steering committee."

In support of the finding that systems thinking and interconnectedness varies considerably Participant P009 stated, "Finance in general is an island apart. Production, procurement, and energy work hand in hand." In addition, Participant P013 stated, "There is not necessarily interconnectedness amongst the departments." Participant P016 stated, "Interconnectedness is the weakest link currently." Participant P019 added, "Perception is that companies exist to satisfy customers by providing a product or service and that the support sections are not as connected as they should be."

System thinking in the U.S. automotive industry varies considerably. The majority of participants struggled with the concept and relied on the technical definition of systems as it pertains to HVAC or compressed air systems, although a definition of the

term was on the online questionnaire and repeated during the telephone interviews. Leaders in the automotive industry should evaluate the penetration of this concept to ensure that horizontal integration and breaking down of departmental silos take affect to reach the company's long-term strategic objectives.

Strategic Management

The concept of strategic management in this study covered strategy formation, strategy management systems, competitive forces, and Blue Ocean strategy. Three open-ended question explored participants experience and perception with strategic management, Questions 8, 9, and 10. The participants' responses show strategic management plays a significant role is energy efficiency projects, however; financial decision-making criteria for EE projects need alignment with strategic objectives.

Q8: Explain your experience with strategic management, as it pertains to selecting energy efficiency projects, in your company. The data collected from this question informed my conclusion *strategic management does influence energy efficiency projects during the decision-making process.* Participant P009 stated, "Strategic management relates to targeting energy projects in the areas and facilities that will have the greatest corporate benefit (from a cost, environmental, energy security, and PR standpoint). Good energy projects will often have multi-faceted benefits." Participant P010 supported this by stating, "Strategic management is a huge component in auto industry. It allows setting the goals for continuous improvement following the Plan-Do-Check-Act loop. The business won't be able to survive without this essential component and auto industry is no exception." Participant P013 stated, "Strategic management of

our energy program helps lead the, somewhat disconnected, departments to move forward with energy efficiency projects." While responding to Question 9, Participant P017 said that "the significance of strategic management to be greater than 75%" and continued, "Most projects at my company are driven by a strategic focus, i.e. lighting upgrades, steam elimination, compressed air optimization" when answering Question10. Participant P019, while answering Question 8, explained that presence of strategic management is "very extensive. Japanese companies use strategic management as the backbone for the organization."

Q9: What is your perception of strategic management in relation to selecting energy efficiency projects in your company? The data collected from this question informed my conclusion *strategic management does influence energy efficiency projects during the decision-making process.* Participant P006 stated, "Senior management understands the direction and supports long range plans to achieve goals." Participant P007 also felt that strategic management plays a big role in energy efficiency by stating, "Without strategic management, we would not be able to pursue larger projects (Wind Turbines). Because we are a European owned company, the environmental aspect is viewed at a higher level." In addition, Participant P005 stated, "Strategic management is used to plan efficiency projects since the best value is not in retrofits, but during major projects or renovations."

Q10: What is your perception of strategic management, in relation to selecting energy efficiency projects in the automotive industry? The data collected from these questions informed my conclusion *strategic management does influence*

energy efficiency projects during the decision-making process. Aflaki et al. (2013) posited the importance of integrating EE within a framework that connects projects to the strategy and profits of a company. Participant P009 stated,

> I believe that most companies do focus strategically on energy efficiency projects, and these companies evaluating the best projects for improving both environmental footprint and energy costs. More companies are realizing that energy is a variable cost, and by controlling and minimizing that cost they can achieve a competitive advantage.

Participant P012 stated, "I think as corporate social responsibility becomes more in focus, energy efficiency and environmental issues have become a condition of doing business. This is starting to be reflected in the strategic management of automotive companies."

Strategic management in the U.S. automotive manufacturing industry does affect energy efficiency projects during the decision-making process. The participants of this study demonstrated that corporate objectives are in place for energy efficiency goals, and that these objectives have specific action plans to achieve the targets. Leaders in the automotive industry should evaluate how strategic management systems can help align top-level corporate objectives and day-to-day decision-making processes.

Applications to Professional Practice

Decisions for improving processes and procedures often result from top-level management's change initiatives based on market environments. The results of this study focus on five key areas to enhance the decision-making process for energy efficiency projects in the U.S. automotive industry. The five key areas (K) outlined in this section

show the applicability of the findings to the professional practice of business. This section also details why and how the findings are relevant to improved business practice. Figure 5 illustrates the five key areas to enhance the decision-making process.

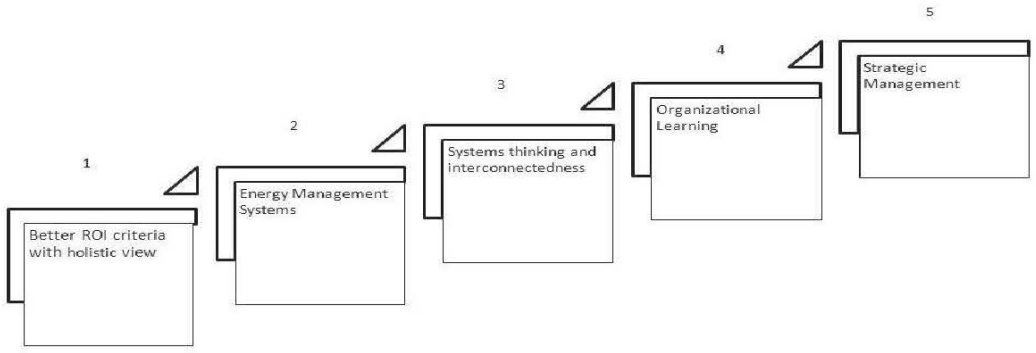

Figure 5. Illustration of five key areas to enhance decision-making process.

K1: Decision-making processes for evaluating energy efficiency projects among U.S. automotive manufacturers can improve by better return on investment criteria and holistic analysis, which includes safety, quality, and environmental improvement opportunities. Leaders should consider incorporating better return on investment criteria for evaluating energy efficiency projects. Although energy management is pervasive in the U.S. automotive industry, there is apparent room for improvement by learning from best practices in the industry. In support of conclusion made by Jackson (2010), the participants of this study indicated that short sightedness of 1 to 2 year payback, bound by general accounting principles; eliminate profitable projects that would otherwise generate positive cash flow.

K2: Energy management was pervasive, robust, and a major part of doing business that helps improve company's financial status. Leaders should consider energy

management best practices that align corporate strategy with day-to-day decision-making processes. Participants of this study mentioned the tools for energy management:

a) ISO 50001:2011—Energy Management Systems
b) Six Sigma tools such as DMAIC (Define, Measure, Analyze, Improve and Control),
c) EPA's Energy Star standard for the automotive industry.

K3: Systems thinking and interconnectedness among departments is weak. Leaders should consider enhancing the practice of systems thinking and interconnectedness among departments. The participants of this study indicated that alignment between corporate objectives and day-to-day decision practices are important. If leaders intent to achieve corporate objectives and targets, interdepartmental objectives must be aligned and this message must be communicated and acted upon from all management levels of an organization in a continual manner.

K4: Organizational learning, as it pertains to energy efficiency, can have an impact on the decision-making process. To improve the decision-making processes, leaders should consider enhancing organizational learning, as it pertains to energy efficiency, by including better return on investment criteria, and holistic view on decision-making process that includes quality, environmental, and safety improvement opportunities related to an energy efficiency projects. Participants of this research helped derive one of the conclusions for this research that energy efficiency projects have higher prioritization when coupled with safety, quality, and/or environmental projects.

K5: Strategic management does influence energy efficiency projects during the

decision-making process. Leaders should consider strategic management of energy efficiency to enhance objectives, targets, and action plans for energy performance improvement. The participants of this study indicated that strategic management is the key to driving continual improvement of energy performance. Strategic management should give organizational direction with policy for achieving objectives, targets, and action plans.

Implications for Social Change

The implication for social change of this research was the pioneering investigation of the behavioral aspects of the decision-making process for EE projects. The results of this study provide leaders five key points to improve decision-making criteria in order to help them collectively become more efficient, reduce toxic pollution, and be more competitive in a global market. Because of this study, I gained new knowledge to contribute to management literature to eliminate the hurdles that may impede the implementation of EE projects on an ongoing basis. The five themes that arose as a result of this study will help future leaders to determine what criteria to consider during the decision-making process for energy efficiency projects to enhance energy efficiency. Since automotive companies are responsible for 15% of global carbon emissions the results from implementing the five key points of this research could help organization achieve significant cost and carbon emission reduction (Sherman, 2011). As a result, energy intense manufacturers such as the automotive manufacturing industry will waste less energy and improve energy performance in addition to reducing carbon emissions related to energy use and consumption.

Recommendations for Action

This study covered conceptual framework of decision-making, energy management, systems thinking, organizational learning, and strategic management. In terms of engineering, the concept of systems thinking was about equipment such as an air compressor or HVAC system. In the sense of business management systems thinking, being the all-encompassing concept, was not well understood in the U.S. automotive industry at the time of this research data collection (June–October 2013). The concept of systems thinking, from the majority of the participants, was in regards to equipment, so they answered the survey question from this perspective. For example, Participant P018 stated, "I see energy management as a part of the facility system in this company not always in the big picture of overall sustainability or cost savings. If it were seen as a whole we would have an energy management group to drive the process." Figure 6, Systems Thinking of Energy Management in an Organization, captures the conceptual framework of this study and the expansion of it because of this study.

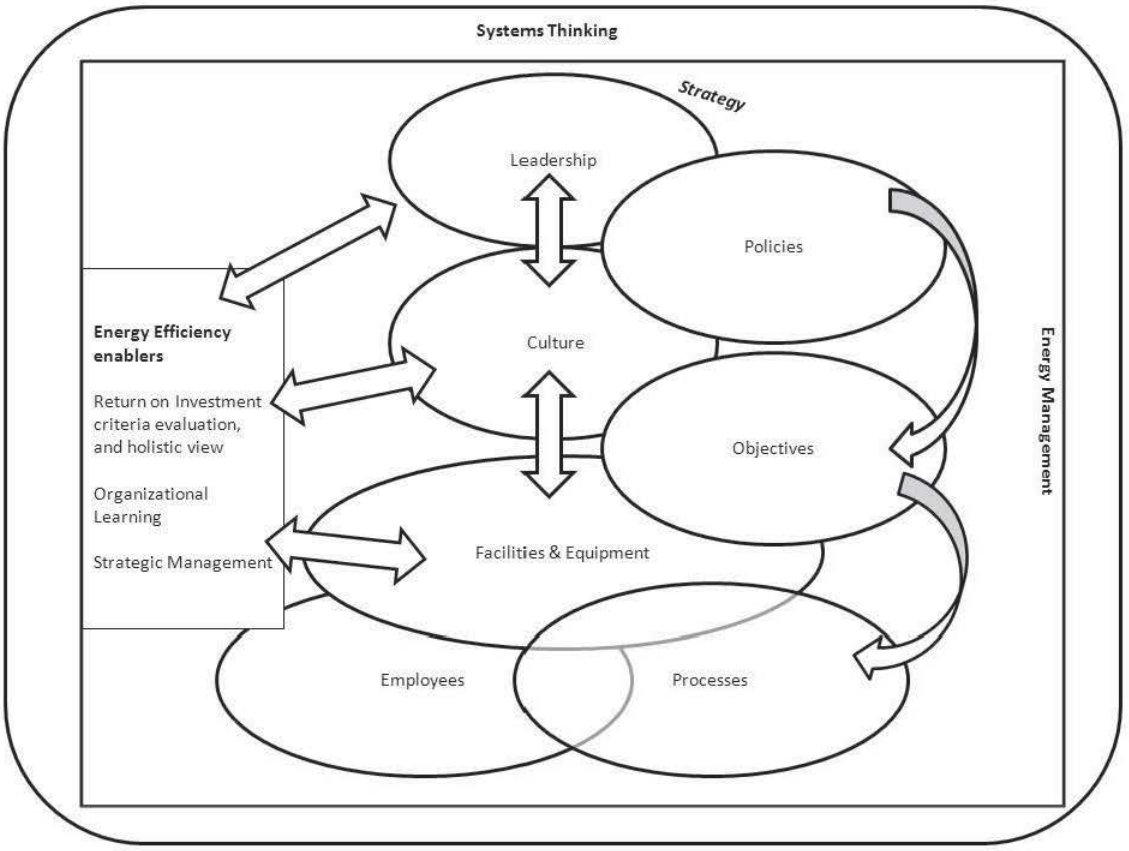

Figure 6. Illustration of systems thinking of energy management in an organization.

In order to prevent the organizational silo effect, systems thinking, could improve the organizational communication. Perceptions of energy management in the U.S. automotive manufacturing industry, during the data collection stage of this study between June 2013 and October 2013 was pervasive. Many examples of progressive initiatives were made in the industry; however, in the realm of continual energy management dynamics, this research contributed to the existing management literature by filling a gap on the decision-making process for energy efficiency projects in the U.S. automotive manufacturing industry.

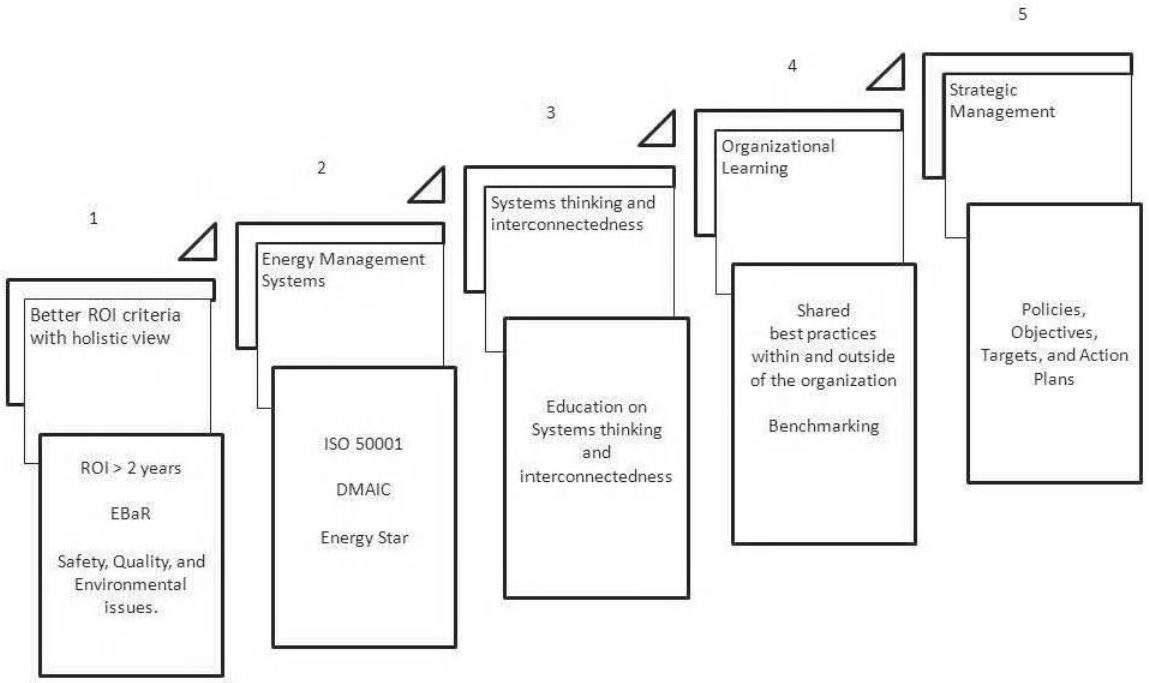

Figure 7. Illustration of recommended action for five key areas.

Based on the results of this study, Figure 7 illustrates recommended action for five key areas. Despite the many benefits of EE, such as cost cutting, waste reduction, and improvement in quality, environmental, and safety areas within organizations, there is room for improvement of the decision-making process for EE projects. To address this gap in management practice, I recommend that leaders should implement these changes to enhance the decision-making process for energy efficiency:

1. Decision-makers should consider energy efficiency projects with return on investment greater than 1 to 2 years, with a holistic approach, and include the concept of EBaR to analyze a portfolio of investments rather than each investment

as a standalone project.

2. Decision-makers should consider energy management frameworks such as ISO 50001, management tools of Six Sigma, and Energy Star for industry to achieve continual energy performance improvement.
3. Decision makers should consider enhancing systems thinking and interconnectedness among departments in order to align corporate objectives.
4. Organizational learning, as it pertains to energy efficiency, should emphasize and support throughout all organizational management layers.
5. Strategic management can drive corporate initiatives to improve safety, quality, and environmental impact. The same emphasis focused on energy efficiency could reduce waste, carbon emissions, and risk associated with energy prices, while cutting costs.

In order to disseminate the information learned in this research, and to contribute to academic literature and management practice, I will share the executive summary of the results with the participants of this research. The findings of the research could benefit audiences at conferences and seminars of professional organizations such as Association of Energy Engineers, Automotive Industry Action Group, and Suppliers Partnership for the Environment. The results published in academic and trade journals, and columns in online professional media outlets such as *Energy Manager Today* and *Sustainable Plant* could reach the intended audiences of business professionals who are responsible for enhancing energy performance improvement for their organization.

Recommendations for Further Study

This study broadens the path for future research on energy efficiency. The study was a questionnaire and interview type inquiry supported by open-ended questionnaire followed up by telephone interviews to study the decision-making process for EE projects in the U.S. automotive industry. Prior to the current study, there was limited information concerning the factors in the decision-making process for EE projects in the U.S. automotive industry. I recommend replication of this study in other energy intense industry sectors such as glass, chemical, pulp and paper, and cement. Future studies could help further understanding of the topic by including quantitative survey questions. In addition, I recommend the specific question for investigation: How do you find, select, and approve energy efficiency projects? This question should provide specific examples of how energy efficiency opportunities arise, how managers select from these opportunities (prioritization and criteria), and what is the approval process (specific criteria).

A quantitative study that evaluates the return-on-investment criteria such as payback period, with a prolonged review of correlation between payback period criterion and energy performance improvement would add value to academic literature. A researcher can investigate moving payback period criteria, and effects on energy performance improvement to determine if there is direct correlation. Based on the research presented in this study, I recommend a study to examine if a positive correlation exists between payback period calculation and energy performance improve metric, where the increase in payback period hurdle rate, the greater the energy performance improvement. Practitioners, especially in the finance, facilities, and energy management

community, would benefit by knowing whether the return on investment criteria has effect on energy performance.

Reflections

The DBA program at Walden University guided me to focus my attention on a current specific business problem. My professional experience in management systems derived me to focus on energy management systems in industry, and to satisfy the DBA program requirements I focused the study on EE in U.S. automotive manufacturing industry in 10 states, with a participant pool of individuals who have experienced the decision-making process for selecting EE projects.

Finding potential participants was relatively easy, based on personal connections and networking organizations; however; getting participants to reply to invitations, emails, and phone calls was not easy. In certain cases, I sent multiple invitations, left voicemails, and invited participants over the phone to take the online open-ended questionnaire. Some potential participants gave verbal agreement to participate, but chose not to take action. The timeframe for recruiting 21 participants ranged from June through October 2013. In order to improve the process future researchers can shorten the questionnaire, and include Likert scale questions to enhance study participation.

For this study, I used an open-ended questionnaire as the data collection instrument and telephone interviews to understand the lived experiences and perceptions of 21 participants who experienced the decision-making process for EE projects in the automotive industry. I did not have any influence over the participants to provide information, as this study was voluntary. I utilized an online open-ended questionnaire

tool to solicit data. I followed up with participants to schedule a telephone interview in order to review the participants' answers, and to give them a chance to elaborate.

The literature review and my professional exposure to energy efficiency professionals prepared me for the construction of the interview questions, and for the results of the study. My personal bias did not hinder with the attainment and analysis of the data in this research because the participants were random and voluntary, and participant responses to questionnaire and interviews supported the data analysis. As with any project, there is always room for improvement. I welcome the next challenge in the realm of energy efficiency.

The findings within the study expanded my mental model about energy efficiency in the automotive industry. I did not expect the holistic approach to energy efficiency projects to be as an emerging theme, where safety, quality, and environmental aspects influenced the decision-making process for implementing energy efficiency projects. I also did not expect to find benchmarking and collaboration among competitors to share best practices.

Summary and Study Conclusions

This qualitative study incorporated questionnaire and interview type inquiry via open-ended questionnaire followed up with telephone interviews to evaluate experiences and perceptions from participants who experienced the decision making process for EE projects in the automotive industry. This study adds to the existing literature on the phenomenon of energy efficiency gap in manufacturing industry. The results indicated that although leaders perceive EE is profitable for business, decision makers often reject

projects. This study was pioneering in the sense of examining the behavioral aspects of the decision-making process for EE projects in the U.S. automotive manufacturing industry.

In Section 1, I concentrate on the problem statement, the purpose, and the relevant literature review pertaining to the central question of this study. Section 1 also includes an in depth review of literature review for the conceptual framework of the study. Section 2 includes the role of the researcher, participants, research method and design, population and sampling, ethical research, data collection, and analyses techniques. Section 2 also includes details on reliability and validity of this study. In Section 3, I include the presentation of findings, application to professional practice, implications for social change, recommendation for action, recommendation for future studies, and reflections.

The five key areas identified in this study will help future decision makers to enhance the decision-making criteria for energy efficiency projects. The participants of this study are leaders who are passionate about changing the future for the betterment of all stakeholders. As management systems mature to include safety, quality, environment, and energy under an integrated management system, the results will pave the way toward a sustainable energy future for all.

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Appendix A: Onus Inquiry of EE Project Selection Process

Questionnaire

Demographic Information

- What is your name and last name?
- Are you 18+ years old?
- What is your job title?
- How long have you been in the automotive manufacturing industry?
- How long have you been with your organization?
- Which U.S. state is or was the automotive company you worked in?
- Do you have experience with energy efficiency decision-making process in the U.S. automotive manufacturing industry?
- For the follow-up interview, what is the best telephone number to reach you for scheduling the call?

Questionnaire Instructions

The following questions are to elicit your experience and perception about the management dynamics of energy efficiency projects in the U.S. automotive manufacturing industry. Please allow minimum of 30 minutes to complete this questionnaire in an uninterrupted environment where you can concentrate. It is very important that you elaborate and provide specific examples where possible. The central question of this study was: What knowledge do automotive manufacturing leaders need to select energy-efficiency projects without rejecting profitable projects?

1. Explain your experience with the decision-making process for energy efficiency

projects in your company.

2. What is your perception of energy efficiency in the automotive manufacturing industry?
3. Explain your experience with organizational learning, as it pertains to selecting energy efficiency projects in your company.
4. What is your perception of organizational learning, as it pertains to selecting energy efficiency projects, in your industry?
5. Explain your experience with systems thinking, as it pertains to selecting energy efficiency, in your company.
6. What is your perception of systems thinking, as it pertains to energy efficiency, in the automotive industry?
7. What is your perception of interconnectedness of departments (e.g. connection among facilities, procurement, and finance) in your company in relation to energy efficiency projects?
8. Explain your experience with strategic management, as it pertains to selecting energy efficiency projects, in your company.
9. What is your perception of strategic management in relation to selecting energy efficiency projects in your company?
10. What is your perception of strategic management, in relation to selecting energy efficiency projects in the automotive industry?
11. What additional information would you like to add that is not in the questionnaire?

Appendix B: Participant Consent Form Onus Doctoral Study

You are invited to take part in a study of the decision-making process for energy efficiency projects in the U.S. automotive manufacturing industry. The researcher is inviting individuals who have experienced the decision-making process for selection and approval of energy efficiency projects in the U.S. automotive manufacturing industry to be in the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by a researcher named Cem O. Onus, who is a doctoral student at Walden University.

Background Information:
The purpose of this qualitative inquiry is to understand the knowledge needed by automotive manufacturing leaders to select energy-efficiency projects without rejecting profitable projects.

Procedures:
If you agree to be in this study, you will be asked to:

- Dedicate 30 minutes for the research questionnaire
- Dedicate 30 minutes for the telephone review of questionnaire material for accuracy. The telephone interview audio will be recorded.

Here are some sample questions:

1) Explain your experience with the decision-making process for energy efficiency projects in your company.
2) What is your perception of energy efficiency in the automotive manufacturing industry?

Voluntary Nature of the Study:
This study is voluntary. Everyone will respect your decision of whether or not you choose to be in the study. No one at Supplier Partnership for the Environment or at your organization will treat you differently if you decide not 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:
Being in this type of study involves some risk of the minor discomforts that can be encountered in daily life, such as stress or feeling of overwhelmed. Being in this study would not pose risk to your safety or wellbeing. Potential benefits of this study are to educate decision makers of energy efficiency projects, and prepare them for the decision-making process. In addition this study may provide insight into gaps in energy efficiency in industry.

Payment:
Participation in this research is voluntary, and it is intended for the benefit of society and business community that you are part of. All participants will be provided with an executive summary of the research findings. Participants will not receive any compensation for participating in this study.

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 a lock box that only the researcher has access to. Data will be kept for a period of 5 years, as required by the university.

Potential Conflict of Interest:
The researcher of this study is in a professional role which may result in current or future business relationship with the participant and his/her company. This research is separate from the researcher's professional work, and the relationship between the researcher's role and the professional work shall be kept separate.

Contacts and Questions:
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via phone 267-968-3589 or email Cem.Onus@WaldenU.edu. If you want to talk privately about your rights as a participant, you can call Dr. Leilani Endicott. She is the Walden University representative who can discuss this with you. Her phone number is 1-800-925-3368, extension ***3121210***. Walden University's approval number for this study is 06-20-13-0064181 and it expires on **June 19, 2014.**

The participant should print and keep a copy of this consent form.

Statement of Consent:

I have read the above information and I feel I understand the study well enough to make a decision about my involvement. By signing below and sending the form back to the research, or by replying to this email with the words, "I consent", I understand that I am agreeing to the terms described above.

Printed Name of Participant

Date of consent

Participant's Signature

Researcher's Signature

Appendix D: Identified Themes and Supporting Statements from Participants

Theme	Participants' supporting statements
1. Decision-making processes for evaluating energy efficiency projects among U.S. automotive manufacturers can be improved by better return on investment criteria and holistic analysis which includes safety, quality, and environmental improvement opportunities.	"It appears that it is typical for the site budgets to be allocated to production activities and then to safety activities, then the budget is typically gone. Focus is on 1 year ROI (and individuals are given bonuses on 1 year targets) instead of 3 or 5 years ROI." "The system in Industry in general is (with exception) stymied with short term thinking looking at 1 year payback. Initial low hanging fruit was easy because of the short payback. Investment projects 3–5 year payback is difficult to get budget for because the first year looks like a loss." "Energy efficiency project decisions are based upon on a number of factors, which include environmental impact (energy footprint, CO2), financial attractiveness, resource availability, ease of implementation." "The paybacks are 12 months because of standard accounting process. What we are trying to do to overcome that here is with the newly formed sustainability group is to try to drive the sustainable impact as an additional factor to outweigh some of the 12 month ROIs to extend to a longer period of time." "Safety was Number 1 priority." "…but if you don't touch on the core buttons, safety, quality, production, environment, if you don't touch these buttons nobody is going to listen to you…"
2. Energy Management is pervasive, robust, and a major part of doing business that helps improve company's financial status.	"Since our company was the first to implement ISO 50001 standard" "We begin implementation of ISO 50001 about three years ago." "There are many automakers that belong to Energy Star and are part of the automotive focus meetings, thing is companies are very willing to share information." "Auto industry has taken a lead in developing energy programs early on EPA's first Energy Star Focus Group was the auto group which met at OEM locations and later in DC as part of the Energy Conference. In our company every plant has an energy engineer and a utility energy manager with

	budget responsibilities and carrying out the initiatives for meeting plant level goals." "We founded our global and regional energy strategies on the Six Sigma DMAIC methodology. This ensures that the program is implemented in a systematic format. We have a team that defines the opportunities; measure and collect the needed data for analysis. The projects following the strategy get approved for implementation and a team is designated to implement it. Projects are tracked and performance is reported."
3. Organizational learning, as it pertains to energy efficiency, can have an impact on the decision-making process.	"Part of our global energy system, we mandated that each facility should have a dedicated energy manager that gets certified. We have more than 25 certified energy managers (CEM) from the Association of Energy Engineers (AEE) globally. The energy managers are responsible to teach the rest of the business units with the knowledge they obtained." "Education of senior management takes time. Rotation actually decreases the implementation rate as new management learns what the energy team does." "Organizational learning and sharing best practices is incredibly important to speed up widespread implementation of good projects and reduce duplicative efforts across various business units and facilities." "Organizational learning is a critical aspect in selection and marketing of energy efficiency. Without deep understanding of the culture of the organization and the business priority."
4. Systems thinking and interconnectedness among departments varies considerably.	"When you implement any projects you have to think in terms of systems. Energy efficiency projects are not an exception." "All our energy efficiency projects are linked to overall business planning. They are reviewed periodically by the top management to evaluate the efficiency and effectiveness of the projects and their contribution to overall business plan." "Implementing systems thinking was completely new when we developed this global program. We have long history of conducting individual projects with no systematic approach that ensures that the effort remains sustained."

	"Systems thinking has played a role in our corporate CO2/energy goals, as it relates to focusing on and implementing projects that will have the most benefit on the whole (based on utility rates, CO2 emissions factors, improvement potential, etc.)." "Interconnectedness is done at both the regional levels and also within the faculties. All departments work together to achieve the targets desired to complete the approved energy projects." "There is not necessarily interconnectedness amongst the departments."
5. Strategic management does influence energy efficiency projects during the decision-making process.	"Following a PDCA or DMAIC continuous improvement methodology is the best way to have a strategic management approach and reduce the risk of having gaps during energy efficiency project implementation." "Incorporating energy efficiency into strategic planning during major projects or renovations is the optimal method to improve efficiency." "Strategic management is used to plan efficiency projects since the best value is not in retrofits, but during major projects or renovations." "Strategic management is a huge component in auto industry. It allows setting the goals for continuous improvement following the Plan-Do-Check-Act loop." "Strategic management of our energy program helps lead the somewhat disconnected departments to move forward with energy efficiency projects."

Curriculum Vitae

Cem O. Onus
Cem.Onus@gmail.com

WALDEN UNIVERSITY Minneapolis, MN
Doctorate of Business Administration–International Business, 2014 (expected)
Research topic–Continual Energy Management Dynamics: Energy Efficiency in U.S. automotive manufacturing industry.

WALDEN UNIVERSITY Minneapolis, MN
Masters in Business Administration–Finance, 2009 GPA 3.69

TEMPLE UNIVERSITY Philadelphia, PA
Bachelor of Business Administration–Marketing, 2004 GPA 3.4 *Cum Laude*
Dean's List: Fall 2001

PROFILE

Sales ~ Business Development ~ Marketing

Results-oriented professional with a demonstrated track record of success in optimizing sales operations and driving revenue growth. Highly-adept at initiating entrepreneurial projects for business improvement and revenue generation. Employs outstanding verbal and written communication skills. Excels within high-pressure, time-sensitive environments. High D (Dominant) on DISC assessment
Additional attributes include:

♦Optimizes Sales Prospects ♦ Generates Revenue ♦ Maximizes Resource Management
♦Networks with Partners ♦ Key Account Management ♦ Briefs Executive Personnel
♦Develops Brand Recognition♦ Conducts Procurement ♦ Exceeds Corporate Objectives

PROFESSIONAL EXPERIENCE

DEKRA Certification, Inc., Chalfont, Pennsylvania 3/2008-Present
Business Development Manager / Regional Sales Manager / Marketing
Key Accomplishments:

- Met and exceeded corporate sales objectives consistently. Personal sales of new business total $4.0M+
- Drove revenue growth by optimizing the sales process and establishing a partner network.
- Established and launched a new product line: *ISO 50001 training*
- Launched new website, managed content and search engine optimization to maintain positioning

Responsibilities:

- Maximize sales opportunities with potential and existing clients.
- Participate in new product development team as the U.S. representation.
- Collaborate with external partners and consultants.
- Conduct extensive research and compiles comprehensive reports detailing market trends,

sales data and consumer demand. Further summarizes strategic sales and marketing tactics to management team.
- Coordinate PR, establishes marketing plans, and executes social media efforts.

Broadview Networks, King of Prussia, PA *8/2006-2/2008*
Senior Account Manager
- Responsible for establishing new business through cold calling and networking, selling highly technical services such as VoIP, VPN, and Broadband Services.
- Managed large implementation projects for multisite service turn ups for Enterprise customers.
- Maintained a customer base with monthly recurring revenue of $100K.

Qwest Communications, Inc. Philadelphia, PA 11/2003-11/2006
Senior Account Executive
- Established new business through cold-calling and networking, selling highly technical services such as VoIP, VPN, and converged broadband services.
- Devised innovative business and networking strategies as well as sold consulting services.
- Managed large scale implementation projects for multisite service turn ups for Enterprise clients.
- Maintained a customer base of clients with $100K monthly spending

C. H. Robinson, Inc. Paulsboro, NJ 11/2002-11/2003
Logistics Sales
- Conducted operational duties of managing large volume of over-the-road freight.
- Established relationship with small and medium size freight carriers to broker customer freight.
- Managed customer accounts with over $250K in annual transportation sales revenue.

Broadwing Communications Inc. Blue Bell, PA 8/2000-4/2002
Account Executive
- Established new business through cold calling and networking, selling enterprise data and telecommunication services.
- Achieved above 100% of quota post training, $3,500 monthly sales quota.
- Prepared and conducted technical sales presentations and proposals for the "C" level executives.

International Aviation Consulting & Supply, Inc. Warminster, PA 04/1998-08/2000
President/Owner
- Established an international export sale and consulting organization generating $100,000+
  in sales. Established the sale of military spare parts & equipment.
- Coordinated full corporate activities such as accounting, insurance, and contract negotiation.
- Managed representatives' activities in countries such as Turkey, Saudi Arabia, and Korea.

Other
Citizenship: US and Turkey
Languages: English and Turkish
Sandler Sales Institute Training (2009–2010)
ISO 9001 Lead Auditor Training (2008)
Advanced Auditing of Management Systems Training (2008)