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THE SAM AND IRENE BLACK SCHOOL OF BUSINESS

SUSTAINABLE DEVELOPMENT: A STUDY OF SMEs AND MNCs WITHIN THE MANUFACTURING SECTOR IN ERIE, PENNSYLVANIA

MADELINE TUSHAK
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Reviewed and approved* by the following:

Ozgun C. Demirag
Associate Professor of Operations & Supply Chain Management
Thesis Supervisor

Michael Brown
Professor of Management
Honors Adviser

* Signatures are on file in the Schreyer Honors College.
ABSTRACT

The concept of sustainable development has gained momentum among academics and practitioners and is only expected to rise as consumers continue to demand products that are sustainable in every stage of the products’ life cycle. Due to this, enterprises within the manufacturing sector have begun to take an interest in sustainable development in their own enterprises as well as within their supplier selection and evaluation strategies. Adoption of sustainable development has typically been seen within large, multinational corporations (MNCs), but what about the efforts in small and medium enterprises (SMEs)? And are these efforts affecting the rest of the supply chain? This exploratory research attempts to explain these questions through an analysis of the results obtained from a survey distributed to SMEs and MNCs within the manufacturing sector in Erie, Pennsylvania.
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I would also like to thank the target participants that partook in this research. I would like to express my appreciation to them for taking the time to fill out the survey presented in this research. Without their contribution, this research would not have been possible.
Chapter 1: Introduction

The concept of sustainable development has sparked the interest of academics and practitioners around the world and is only expected to flourish in the future. This rising interest can be attributed to the scarcity of resources as well as the perceived competitive advantage that accompanies the adoption of sustainable development. This conclusion is supported by recent academic literature as well as two industry reports that focus on sustainability within enterprises. These reports include results from a sustainability survey conducted by MIT Sloan Management in collaboration with the Boston Consulting Group (MIT Sloan Management and the Boston Consulting Group, 2012) and a UN Global Compact-Accenture sustainability study (Lacy et al., 2010). Both reports suggest that enterprises have increased, and will continue to increase, their sustainable development strategies as consumers continue to demand more sustainable products. This observation can also be verified after an analysis of KLD STATS, a statistical tool for analyzing trends in social and environmental performance (RiskMetrics Group, 2010). KLD data includes scores for the largest three thousand United States enterprises by market capitalization in the corporate social, governance, and environmental dimensions. Focusing solely on the environmental dimension, the total number of strengths for enterprises from 1991 to 2011 can be seen in Figure 1. As shown in this figure, there is an increasing trend in the total number of strengths that enterprises have relating to their environmental performance. These strengths include specific areas such as pollution prevention, recycling, clean energy, hazardous waste, ozone depleting chemicals, emissions, and non-carbon releases.
The manufacturing sector has seen immense application of sustainable development in their business models by addressing the social, economic, and environmental dimensions as well as the technology dimension. This increase in sustainable development has mainly been witnessed in European Union countries, and to some degree in the United States, within large, multinational corporations, but what about the efforts within small and medium enterprises? And, are these efforts affecting the rest of the supply chain? These are the two main questions that motivated this research. This research provides a better understanding of the behaviors of small and medium enterprises and multinational corporations in the United States regarding sustainable development within their own enterprises as well as when selecting and evaluating suppliers. The remainder of this chapter provides background information and defines terminology relating to this research.

1.1 Sustainable Development and the Triple Bottom Line Framework

In 1987, the World Commission on Economic Development (WCED) instituted the term “sustainable development” in its report, Our Common Future (Bansal, 2005; Gutowski, 2006). As defined by the WCED (1987), sustainable development “is development that meets the needs of the present without
compromising the ability of future generations to meet their own needs.” Balance should be maintained within the system (Jacobs and Chase, 2011).

Sustainable development includes a scope of shareholders as well as stakeholders. Enterprises not only have the responsibility to consider the economic impact on shareholders, but also the societal and environmental impacts on all stakeholders. To describe this, the triple bottom line framework was introduced. The triple bottom line framework consists of three dimensions – social, economic, and environmental – in which an enterprise is evaluated (Jacobs and Chase, 2011). Some of the factors that comprise each dimension are as follows:

i. **Social**: business ethics, safety, community outreach

ii. **Economic**: compensation to shareholders, profit, operating costs

iii. **Environment**: natural resources, emissions, waste

The figure shown below (see Figure 2) illustrates how these dimensions ground sustainable development. Without the incorporation of all three dimensions, sustainability is not achieved. Throughout this research the terms sustainable development and sustainability will be used interchangeably to refer to the same concept.

![Figure 2 – The Triple Bottom Line Framework](image)

Source: Supplier Selection in a Sustainable Supply Chain (Molamohamadi et al., 2013)
1.2 Enterprise, Manufacturing Sector, MNC, and SME Defined

In order to understand the target participants of this research, it is important to provide the definition of an enterprise. For the purpose of this research, the definition of an enterprise provided by the United States Census Bureau (2016) is used. An enterprise is a business organization consisting of one or more domestic establishments that were specified under common ownership or control. In addition, business organizations established in the United States that include foreign establishments are considered to be enterprises. The term “enterprise” is used interchangeably with the terms “business” and “corporation” in this research.

The opinions associated with classifying the enterprises included within the manufacturing sector can be rather subjective. The North American Industry Classification System (2013), associated with the United States Census Bureau (2016), offers a clear explanation as to which enterprises are classified within it and which are not. As designated by this classification system, the manufacturing sector, as a whole, encompasses establishments involved in the mechanical, physical, or chemical transformation of materials, substances, or components into new products and the assembly of component parts of manufactured products. The transformation or assembly processes are performed at establishments that are labelled as plants, factories, or mills, while utilizing power-driven machines and materials-handling equipment. This is the knowledge behind the choice of enterprises within the manufacturing sector for participation in this research.

The manufacturing sector in the United States has been dominant, employing approximately twelve million workers in 2013; 8.8 percent of the total U.S. workforce (Scott, 2015). Employment can be gained through a multinational corporation (MNC) or a small and medium enterprise (SME), but what is the deciding factor between the two types of enterprises? The determination between an SME and an MNC within the manufacturing sector in the United States is reliant upon enterprise size. The Small Business
Association’s Office of Advocacy dictates that enterprises classified within this sector with fewer than five hundred employees constitute an SME, while enterprises classified within this sector with more than five hundred employees form an MNC (U.S. International Trade Commission, 2010). In this research, this size delineation is used to separate target participants.
Chapter 2: Literature Review

The relevant literature is reviewed in this chapter to establish knowledge of the concept of sustainable development. This literature review is comprised of three unique sections that discuss manufacturing, enterprise size, and supplier selection and evaluation as it relates to sustainable development. Aspects of each section are also incorporated throughout the entirety of this literature review. These specific areas associated with sustainable development are addressed here because they are the areas studied in this research.

Manufacturing and Sustainable Development: Sustainable Manufacturing

As the concept of sustainable development continues to mature within societal and business environments, it has become critical for manufacturing enterprises to assess their social, economic, and environmental roles. Today, there is strong evidence that consumers prefer to purchase products that are considered to be “green” throughout the entirety of the manufacturing design and production operation (Kibira et al., 2009). As a result, manufacturers’ concern regarding the adoption of sustainable development strategies within their products, processes, and practices has increased in an effort to improve their competitive position in the market (Gutowski, 2006). A formal term has been derived from the definition of sustainable development to describe this – sustainable manufacturing. Sustainable manufacturing is defined by the United States Department of Commerce as “the creation of manufactured products that use processes that minimize negative environmental impacts, conserve energy and natural resources, are safe for employees, communities, and consumers, and are economically sound.” The achievement of sustainable manufacturing requires a holistic approach to sustainable development that includes not only the social, economic, and environmental dimensions but also a technology dimension.

The technology dimension within the concept of sustainable development has grown traction within the manufacturing sector. The technology dimension has recently become significant because it is a
dimension that has the capability to be improved in order to decrease environmental impact. The connection between technology and the environment is key due to the colossal environmental footprint of manufacturing enterprises. This logic can be explained through the Ehrlich equation – EI = P * A * T – where P, A, and T represent population, affluence, and technology (Population Matters, 2011; Rosen and Kishawy, 2012). Enterprises within the manufacturing sector do not have an influence over population or affluence, but they do have power over the technology employed within their products, processes, and practices (Nazzal et al., 2013). Specifically, more efficient technologies used within products, processes, and practices lead to a deduction in the consumption of resources and the reduction of waste without affecting the benefits felt economically or societally (Conversation US, Inc., 2016). An example of this type of technology innovation is Industry 4.0, where enterprises within the manufacturing sector will be able to “gather and analyze data across machines, enabling faster, more flexible, and more efficient processes to produce higher-quality goods at reduced costs” (Rühlmann et al., 2015). A second example is Manufacturing Execution Systems where data is utilized to guide, initiate, respond to, and report on facility activities as they occur, resulting in more effective operations (Rockwell Automation, 2009; Grzelak, 2012). Some of the ways that manufacturing enterprises have sought to incorporate the technology dimension in their sustainable development strategies to reduce their environmental impact are as follows:

i. **Products:** design for environment (Zubir et al., 2012), design for sustainability, life cycle analysis, product flexibility (Rosen and Kishawy, 2012)

ii. **Processes:** renewable energy sources (Gutowski, 2006), reuse of wastes or by-products (Kibira et al., 2009), material flexibility (Rosen and Kishawy, 2012), optimization of equipment/machinery (U.S. Department of Commerce, 2011), lean manufacturing (Zubir et al., 2012).

iii. **Practices:** compliance to regulations, (Gutowski, 2006), obtainment of certifications (Rosen and Kishawy, 2012), consideration of the extended producer responsibility principle (Rosen and Kishawy, 2012), adoption of sustainability indicators (Rosen and Kishawy, 2012), adoption of concrete tools (Zubir et al., 2012), benchmarking (Nazzal et al., 2013).

Although the positive effects of innovations in technology are predominantly seen in the environmental dimension, they do trickle down to the social and economic dimensions as well. For example, this can be
in the form of a reduction in employee turnover, resulting in a lower unemployment rate or a decrease in 
operating costs, resulting in an increase in profitability (Manufacturing Skills Australia, 2008). In order to 
verify that all the dimensions are acting toward sustainable manufacturing, it is necessary to have an 
established sustainability indicator set to measure and assess performance.

Sustainability indicator sets are essential in the measurement and assessment of sustainable 
manufacturing. Sustainability indicators reflect the interconnectedness of the economy, environment, and 
society, point to areas where triple bottom line relations are weak, and alert enterprises to sustainability 
issues before they become severe (Sustainable Measures, 2010). Rosen and Kishawy (2012) also express 
the importance of this multi-dimensional approach and suggest that sustainability indicators aid in 
monitoring progress and prioritizing actions to be taken in the resolution of sustainability issues. 
Sustainable Measures state that for sustainability indicator sets to be effective within manufacturing 
enterprises, it is crucial that the individual sustainability indicators hold the characteristics of being (1) 
quantifiable, i.e., they must be numerically measurable; (2) relevant, i.e., they must fit the purpose of 
intended measurement; (3) understandable, i.e., they must be easily understood by both experts and non- 
experts; (4) reliable, i.e., they must provide trustworthy information; and (5) based on accessible data, i.e., 
they must be based on information that is available and information that can be collected in a timely 
fashion so there is time to act. These indicators should also share a sense of familiarity within an 
enterprise, as most enterprises use them almost every day for tracking (Organization for Economic 
Cooperation and Development (OECD), 2011). Sustainability indicator sets are fused into decision 
making practices depending on certain factors including the management, culture, information, and 
procedures of the enterprise (Rosen and Kishawy, 2012); therefore, no two indicator sets developed by 
outside organizations or manufacturing enterprises themselves may be the same. The OECD (2011) has 
introduced a Toolkit that provides adoption advice on eighteen of the most important and commonly 
applicable sustainability indicators relating to the environmental dimension of the triple bottom line 
framework, specifically for use within SMEs (see Figure 3 for an overview).
Further, General Motors (Dreher et al., 2009) has proposed sustainability indicators within all the dimensions of the triple bottom line framework after conducting a thorough literature review, defining sustainable manufacturing, and determining which sustainable development indicators were appropriate (see Figure 4 for an overview).
Lastly, Ford (2012) has developed its own set of sustainability indicators, specifically for its Focus product, that encompass the social, economic, and environmental dimensions (see Figure 5 for an overview).
The development and adoption of sustainability indicator sets is an important aspect in sustainable manufacturing becoming the way of the future.

Based on the evidence from practice and academia, one could claim that the future of the manufacturing sector is sustainable manufacturing. As the realization that resources are scarce and non-renewable and emissions and waste are high, and as pressures continue to increase from fundamental stakeholders, e.g., customers, regulators, and NGOs, enterprises within the manufacturing sector will be forced to adopt and manage sustainable solutions that involve all the dimensions of the triple bottom line framework (Manufacturing Skills Australia, 2008). It will be required to adopt sustainable development strategies within products, processes, and practices in order to remain competitive in the market. This may come sooner than some expect. In a research study led by Kibira et al., (2009) it was discovered that some authors believe that there will be a limit in manufacturing and economic growth that is attributed to constraints associated with resource use and emissions during the twenty-first century, while consumers
already prefer products that were sustainably manufactured in every stage of the products’ life cycle. With the adoption of sustainable manufacturing continuing to grow, this research complements the current body of knowledge by providing data concerning not only existing sustainable development strategies within manufacturing enterprises but also the way these sustainable development strategies may change in the future.

Size and Sustainable Development: Does Size Matter?

Traditionally, sustainable development has solely been a theme practiced within large, multinational corporations, supporting the notion that enterprise size is a contributing factor when considering the adoption of strategies related to sustainable development. Put simply, this can be attributed to the fact that MNCs possess the human and financial resources necessary to successfully adopt formal sustainable development strategies in their business models (Baumann-Pauly et al., 2013). Further, as mentioned by Lüthold (2010), MNCs hold a higher bargaining power due to experiencing bottom-up pressure from consumers and transferring top-down pressure to their smaller business partners through expectance of compliance to their sustainable development initiatives and procedures. SMEs have, historically, not been considered when discussing the concept of sustainable development, but current research (e.g., Lüthold, 2010; Baumann-Pauly et al., 2013; Đžupina and Mišūn, 2014; Mousiolis et al., 2014,) has indicated that SMEs participate in an informal version of sustainable development that complements their business size.

MNCs are characterized by formality and measurement, while SMEs are characterized by informality and flexibility; therefore, it is difficult to assume the same approach to sustainable development will be effective for these varying cases. The adoption of sustainable development associated with SMEs and MNCs, when examining sustainable development strategies, have been found to be quite different. This conclusion can be made after examining three case based research studies piloted in the European Union. The three research studies reference the term corporate social responsibility (CSR) to describe social, economic, and environmental responsibility. Lüthold (2010) focused on two case studies, one on a Swiss
SME and one on a Swiss MNC, to support the idea that conventional CSR strategies are designed for multinational corporations, resulting in disconnect when small and medium enterprises are expected to adopt these same strategies. Baumann-Pauly et al. (2013) utilized a theoretical assessment framework to analyze seven Swiss SMEs and five Swiss MNCs on a set of size specific CSR dimensions – Commitment to CSR, Internal Structures and Procedures, and External Collaboration – in order to explain differences in CSR implementation patterns. Džupina and Mišún (2014) identified dimensions and sub-dimensions within CSR definitions by using an open coding scheme to analyze the traits of the dimensions in mission and vision statements of SMEs and MNCs on the Trend Top 2012 annual report with the purpose of detecting the relationship between the size of an enterprise and the rank of CSR dimensions. To summarize, the authors agree that enterprise size is a factor that contributes to the adoption of social, economic, and environmental responsibility.

As shown, there is limited comparative research available relating to sustainable development within SMEs and MNCs. The comparative research that is available has been conducted in the European Union and concentrates on the concept of CSR as opposed to sustainable development itself. Bansal and DesJardine (2014) offer a defined line between corporate social responsibility and sustainable development by stating that corporate social responsibility aims to “balance current stakeholder interests,” while sustainable development strives to “meet the needs of the present without compromising the ability of future generations to meet their own needs.” The difference is in the aspect of time. The existing body of knowledge supplies this research with a foundation for the size versus adoption explanation. This research further contributes by providing insights into the adoption of sustainable development within SMEs and MNCs in the United States.

Supplier Selection and Evaluation and Sustainable Development

The increased emphasis on sustainable development has begun to not only affect enterprises themselves, but their upstream supply chains as well, especially their suppliers. This increased emphasis can be
attributed to the business environment witnessing a rise in outsourcing of raw materials, components, and services to suppliers, resulting in the spend of an average United States manufacturer being equivalent to approximately half of its revenue (Beil, 2010; Azadnia et al., 2014). Further, Gyöngyi (2005) and Alspach, (2011) explain that this increased emphasis has also come from the realization that enterprises cannot solve sustainability issues themselves, but through supply chain collaboration with their large and small business partners. Due to these points, enterprises have started to make the connection between their success and their suppliers. In the conventional sense, supplier selection and evaluation strategies focus on business and economic sub-criteria, such as price, quality, and delivery (Beil, 2010; Molamohamadi et al., 2013; Chaharsooghi and Ashrafi, 2014; Cao et al., 2015), but some suggest that this is not sufficient. Bai and Sarkis (2009) support this suggestion by stating that this type of supplier relationship is no longer adequate as emphasis on societal and environmental concerns continue to cultivate, bringing light to the idea that it is necessary for supplier selection and evaluation criteria, sub-criteria, and methods to be sustainable and strategic.

Establishing sustainable criteria and sub-criteria for selecting and evaluating suppliers is vital in the process of assessing the sustainability efforts of enterprises’ suppliers. Liu (2010) discusses that these criteria and sub-criteria are used to build more effective relationships with suppliers and to strengthen enterprises’ selection and evaluation strategies. The criteria and sub-criteria, as described by Molamohamadi et al. (2013) and Bai and Sarkis (2009), have evolved to include all three dimensions of the triple bottom line as well as the technology dimension discussed earlier in this literature review, while Chaharsooghi and Ashrafi (2014) expanded the scope of their analysis to account for risks. This research compares to the research of Chaharsooghi and Ashrafi (2014) in the way that it has incorporated the dimensions of the triple bottom line and risks, but it differs in the sense that this research is of empirical nature as opposed to theoretical. Molamohamadi et al. (2013) includes (1) business criteria and sub-criteria; (2) economic criteria and sub-criteria; (3) social criteria and sub-criteria; and (4) environmental criteria and sub-criteria (see Table 1).
### Table 1 – Sustainable Supplier Selection and Evaluation Criteria and Sub-Criteria

<table>
<thead>
<tr>
<th>Business Criteria</th>
<th>Economic Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of the Products</td>
<td>Initial Price</td>
</tr>
<tr>
<td>Time of Delivery</td>
<td>Financial Stability</td>
</tr>
<tr>
<td>Commitment to Continuous Improvement</td>
<td>Credit Strength</td>
</tr>
<tr>
<td>Information Sharing</td>
<td></td>
</tr>
<tr>
<td>Product Development</td>
<td></td>
</tr>
<tr>
<td>Flexibility in Changing Product Volume</td>
<td></td>
</tr>
<tr>
<td>Launching New Products</td>
<td></td>
</tr>
<tr>
<td>Using New Technologies</td>
<td></td>
</tr>
<tr>
<td>Warranty and Insurance</td>
<td></td>
</tr>
<tr>
<td>Geographic Location</td>
<td></td>
</tr>
<tr>
<td>Social Criteria</td>
<td>Environmental Criteria</td>
</tr>
<tr>
<td>Discrimination in Employment</td>
<td>Management Systems for Pollution</td>
</tr>
<tr>
<td>Child Labor</td>
<td>Resource Consumption</td>
</tr>
<tr>
<td>Flexible Working Arrangement</td>
<td>Recycling</td>
</tr>
<tr>
<td>Satisfactory Working Environment</td>
<td>Animal Rights</td>
</tr>
<tr>
<td>Health and Safety of Staff and Customers</td>
<td></td>
</tr>
<tr>
<td>Customer Privacy</td>
<td></td>
</tr>
<tr>
<td>Cultural Properties</td>
<td></td>
</tr>
</tbody>
</table>

Source: Supplier Selection in a Sustainable Supply Chain (Molamohamadi et al., 2013)

Bai and Sarkis (2009) address similar criteria and sub-criteria but include more separation within each dimension of the triple bottom line (see Tables 2 – 4).
### Table 2 – Business and Economic Criteria and Sub-Criteria

<table>
<thead>
<tr>
<th>Strategic Performance</th>
<th>Organizational Culture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td></td>
</tr>
<tr>
<td>Low Initial Price</td>
<td>Feeling of Trust</td>
</tr>
<tr>
<td>Compliance with Cost Analysis System</td>
<td>Management Attitude/Outlook for the Future</td>
</tr>
<tr>
<td>Cost Reduction Activities</td>
<td>Strategic Fit</td>
</tr>
<tr>
<td>Compliance with Sectoral Price Behavior</td>
<td>Top Management Compatibility</td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td></td>
</tr>
<tr>
<td>Conformance Quality</td>
<td>Supplier Organizational Structure</td>
</tr>
<tr>
<td>Consistent Delivery</td>
<td>Technology</td>
</tr>
<tr>
<td>Quality Philosophy</td>
<td>Technological Compatibility</td>
</tr>
<tr>
<td>Prompt Response</td>
<td>Assessment of Future Manufacturing</td>
</tr>
<tr>
<td>Time</td>
<td>Supplier Speed in Development</td>
</tr>
<tr>
<td>Delivery Speed</td>
<td>Supplier Design Capability</td>
</tr>
<tr>
<td>Product Development Time</td>
<td>Technical Capability</td>
</tr>
<tr>
<td>Partnership Formation Time</td>
<td>Current Manufacturing Facilities Capabilities</td>
</tr>
<tr>
<td><strong>Flexibility</strong></td>
<td></td>
</tr>
<tr>
<td>Product Volume Changes</td>
<td>Long-term Relationship</td>
</tr>
<tr>
<td>Short Set-Up Time</td>
<td>Relationship Closeness</td>
</tr>
<tr>
<td>Conflict Resolution</td>
<td>Communication Openness</td>
</tr>
<tr>
<td>Service Capability</td>
<td>Reputation for Integrity</td>
</tr>
<tr>
<td><strong>Innovativeness</strong></td>
<td></td>
</tr>
<tr>
<td>New Launch of Products</td>
<td></td>
</tr>
<tr>
<td>New Use of Technologies</td>
<td></td>
</tr>
</tbody>
</table>

Source: Supplier Selection Sustainability: A Grey Rough Set Evaluation (Bai and Sarkis, 2009)

### Table 3 – Environmental Criteria and Sub-Criteria

<table>
<thead>
<tr>
<th>Environmental Practices</th>
<th>Environmental Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pollution Controls</strong></td>
<td></td>
</tr>
<tr>
<td>Remediation</td>
<td>Consumption of Energy</td>
</tr>
<tr>
<td>End-of-Pipe Controls</td>
<td>Consumption of Raw Material</td>
</tr>
<tr>
<td><strong>Pollution Prevention</strong></td>
<td></td>
</tr>
<tr>
<td>Product Adaptation</td>
<td>Consumption of Water</td>
</tr>
<tr>
<td>Process Adaptation</td>
<td></td>
</tr>
<tr>
<td><strong>Environmental Management System</strong></td>
<td></td>
</tr>
<tr>
<td>Establishment of Environmental Commitment and Policy</td>
<td>Production of Polluting Agents</td>
</tr>
<tr>
<td>Identification of Environmental Aspects</td>
<td>Production of Toxic Products</td>
</tr>
<tr>
<td>Planning of Environmental Objectives</td>
<td>Products of Waste</td>
</tr>
<tr>
<td>Assignment of Environmental Responsibility</td>
<td></td>
</tr>
<tr>
<td>Checking and Evaluation of Environmental Activities</td>
<td></td>
</tr>
</tbody>
</table>

Source: Supplier Selection Sustainability: A Grey Rough Set Evaluation (Bai and Sarkis, 2009)
Table 4 – Social Criteria and Sub-Criteria

<table>
<thead>
<tr>
<th>Social Criteria</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Employment Practices</strong></td>
<td><strong>Local Community Influence</strong></td>
</tr>
<tr>
<td>Disciplinary and Security Practices</td>
<td>Health</td>
</tr>
<tr>
<td>Employee Contracts</td>
<td>Education</td>
</tr>
<tr>
<td>Equity Labor Sources</td>
<td>Housing</td>
</tr>
<tr>
<td>Diversity</td>
<td>Service Infrastructure</td>
</tr>
<tr>
<td>Discrimination</td>
<td>Mobility Infrastructure</td>
</tr>
<tr>
<td>Flexible Working Arrangements</td>
<td>Regulatory and Public Services</td>
</tr>
<tr>
<td>Job Opportunities</td>
<td>Supporting Educational Institutions</td>
</tr>
<tr>
<td>Employment Compensation</td>
<td>Sensory Simuli</td>
</tr>
<tr>
<td>Research and Development</td>
<td>Security</td>
</tr>
<tr>
<td>Career Development</td>
<td>Cultural Properties</td>
</tr>
<tr>
<td><strong>Health and Safety</strong></td>
<td>Economic Welfare and Growth</td>
</tr>
<tr>
<td>Health and Safety Incidents</td>
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<td>Health and Safety Practices</td>
<td>Social Pathologies</td>
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<td>Grants and Donations</td>
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<td>Supporting Community Projects</td>
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<tr>
<td><strong>Contractual Stakeholder Influence</strong></td>
<td></td>
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<td></td>
<td>Procurement Standard</td>
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<td></td>
<td>Partnership Screens and Standards</td>
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<td></td>
<td>Consumers Education</td>
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<td><strong>Other Stakeholder Influence</strong></td>
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<td>Decision Influence Potential</td>
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<td>Stakeholder Empowerment</td>
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<td>Collective Audience</td>
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<td>Selected Audience</td>
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<td>Stakeholder Engagement</td>
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Source: Supplier Selection Sustainability: A Grey Rough Set Evaluation (Bai and Sarkis, 2009)

The criteria and sub-criteria expressed by Chaharsooghi and Ashraft (2014) are comprised of not only the triple bottom line dimensions of social, economic, and environmental, but also what are described as “complementary criteria” as in risk management, transparency, and culture and strategy (see Table 5).
The criteria and sub-criteria discussed are typically paired with a method for effective and efficient supplier selection and evaluation pertaining to sustainable development.

There have been a variety of methods researched and developed to aid in the sustainable selection and evaluation of suppliers. According to Bai and Sarkis (2009) and Liu (2010), there are a variety of methods used in supplier selection and evaluation such as analytical hierarchy process, case-based reasoning approaches, rough set approaches, matrix approaches, normalization, technique for order performance by similarity to ideal solution, cluster analysis, statistical analysis, grey rational analysis, etc. These methods are theoretical in nature; therefore, many enterprises may not actually consult them during their selection and evaluation processes, but instead utilize simpler, more universal methods including audits and scorecards. Specifically, many enterprises have begun to incorporate supplier scorecards into their sustainable development strategies. NCR Corporation (2010) has adopted a supplier scorecard to evaluate...
suppliers’ performance, determine the relationship level with suppliers, and influence the selection of suppliers. Procter and Gamble designed a supplier scorecard that relies on worldwide accepted sustainability standards, including protocols from the World Resources Institute, the World for Business Council for Sustainable Development, and the Carbon Disclosure Project to enhance collaboration with its suppliers and to ensure that it is delivering more sustainable products to its consumers (Shacklett, 2011). Philips established standards and behaviors within the areas of labor, health and safety, ethics, environment, and management systems in which the company requires compliance from its suppliers outlined in its Supplier Sustainability Declaration (Philips, 2015) and worked with seven pilot suppliers during 2014 to develop scorecards in order to evaluate performance at their individual facilities (Philips, 2014). Walmart introduced a Sustainability Supplier Assessment where suppliers are asked questions within multiple sections, e.g., energy and climate, material efficiency, nature and resources, and people and community, about their sustainability performance according to the dimensions of the triple bottom line and given a score for each section (Walmart, 2009; Bayat et al., 2011). After analyzing enterprises’ sustainable development methods, many seem to have adopted methodologies where scorecards in a survey, questionnaire, or assessment format are completed by suppliers and then scored by the enterprises to determine how well each supplier adheres to their sustainability criteria and sub-criteria. This research will examine this idea in more detail in order to decide if there is frequent use of scorecards within enterprises to select suppliers and evaluate their sustainable development performance. This method for selecting and evaluating suppliers is making its way down the supply chain.

Consultants who specialize in sustainable supply chain management have expected sustainability scorecards in the form of surveys, questionnaires, and assessments to move throughout the supply chain to smaller suppliers in the future (Alspach, 2011). Recently there has been evidence to support the notion that this has already started to happen and will continue to foster, as a consultant from Massachusetts said he “expects sustainability to be an increasingly important factor when contracts are being negotiated” (Alspach, 2011). This research will obtain thoughts on the future trend associated with the adoption of
sustainable development as a criterion in supplier selection and evaluation as well as the effect of enterprises’ own commitment to sustainable development on the adoption of sustainable development as a criterion for supplier selection and evaluation from the perspective of both SMEs and MNCs. Enterprises that are equipped to answer these types of inquiries set themselves apart from competitors that may be lagging behind when undertaking sustainable development.
Chapter 3: Research Questions

The literature review reveals that there is an increasing interest in the adoption of sustainable development relating to enterprises within the manufacturing sector and their suppliers. Many MNCs have expressed participation in the dimensions of the triple bottom line framework within their own enterprises including Nestle and Toyota (Baumann-Pauly et al., 2013; Zubir et al., 2012) and within their supplier selection and evaluation strategies including Walmart and Philips (Walmart, 2009; Philips, 2015), but there is limited research related to this participation, or lack thereof, in small and medium enterprises. Further, research is narrow regarding the comparison of the adoption of sustainable development and supplier selection and evaluation strategies related to sustainability within SMEs and MNCs within the manufacturing sector. Links between the adoption of sustainable development and the adoption of supplier selection and evaluation strategies related to sustainability are not explained nor expanded. In addition, when sustainable development has not been adopted within enterprises, there is a lack of clearly reported reasons behind this decision. To address these gaps in the existing literature, the following research questions were developed:

i. Does the size of an enterprise have an impact on the extent to which sustainable development is adopted within an enterprise?

ii. Does the size of an enterprise have an impact on the extent to which sustainable development is considered in supplier selection and evaluation?

iii. What is the effect of an enterprise’s own commitment to sustainable development on the adoption of sustainable development as a criterion for supplier selection and evaluation?

iv. If sustainable development is not adopted within an enterprise, what is the most significant reason hindering the lack of advancement?

In a business model in which sustainable development is highly infused, to identify, evaluate, and select suppliers (Molamohamadi et al., 2013), it is necessary to have defined sustainability criteria, sub-criteria, and methods to measure performance. Currently, research has leaned toward specific theoretical methods for the selection and evaluation of suppliers based on the sustainable development dimensions of the
triple bottom line framework (Cao et al., 2015; Azadnia et al., 2015; Bai and Starkis, 2009, Chaharsooghi and Ashrafi, 2014) as opposed to examining the method in which most enterprises appear to be using in practice – scorecards. The following questions will develop this idea:

v. If sustainable development is considered as a criterion in supplier selection and relations, what metrics are most commonly used to select and evaluate suppliers’ sustainability performance?

vi. If sustainable development is considered as a criterion in supplier selection and relations, which method is most commonly used to select and evaluate suppliers’ sustainability performance?

Despite an increase, and expected future increase, in interest pertaining to the adoption of sustainable development, a sustainability survey conducted by MIT Sloan Management in collaboration with the Boston Consulting Group (MIT Sloan Management and the Boston Consulting Group, 2012), a UN Global Compact-Accenture sustainability study (Lacy et al., 2010), and KLD STATS (RiskMetrics Group, 2010) are three of the only published comprehensive reports that provide data driven insights into observed and expected trends. For this reason, the following research questions were established:

vii. What is the observed trend in the adoption of sustainable development during the preceding five to ten year time period?

viii. What is the expected trend in the adoption of sustainable development within the proceeding five to ten year time period?

ix. What is the expected trend in the adoption of sustainable development as a criterion in supplier selection and evaluation within the proceeding five to ten year period?
Chapter 4: Methodology

Research can often be classified in terms of its purpose. The purpose of this research is to develop a better understanding of the behaviors of small and medium enterprises and multinational corporations regarding sustainable development within their own enterprises as well as when selecting and evaluating suppliers. This purpose explicitly describes this research as exploratory. An exploratory research study is a valuable means of finding out “what is happening, to seek new insights, to ask questions, and to assess phenomena in a new light” (Robson, 2002). It is flexible and can address research questions of all types – what, why, and how (Babbie, 2007). As a first step in conducting this exploratory research, an extensive search of the literature has been performed and presented in Chapter 2. In the next step, an expert survey is developed to generate further insights. Individuals who are knowledgeable about sustainable development and supplier selection and evaluation within SMEs and MNCs within the manufacturing sector in Erie, Pennsylvania were sought for conducting the survey.

Survey Development

In order to explore the research questions presented in Chapter 3, a survey was developed. To aid in the development of the survey, Qualtrics Survey software was utilized for proper survey structure, online survey distribution, and storage of results. The survey consisted of five unique sections that provided necessary information as well as addressed different areas of research interest. The first section was the introduction where the principle investigator was introduced and the motivation for the research was described. The second section contained the informed consent form where the target participants were informed about the procedure and duration of the survey, provided a statement of confidentiality and voluntary participation, and reminded of their right to ask questions. If a target participant made the decision to move forward with the survey, it was implied that it was voluntarily consenting to participate in this research. The final three sections, titled Company Profile, Sustainability Efforts within the Enterprise, and Sustainability Efforts relating to the Suppliers, are self-explanatory via their titles and
contained questions that were specifically linked to the research questions. The development of effective survey questions was essential to the success of this research.

The questions throughout the survey were designed with the research questions in mind, while ensuring they possessed clarity, comprehensiveness, and acceptability. This was done to ensure the target participants could effectively understand each question and the results could be successfully analyzed. The twenty-nine questions within the survey were a combination of close-ended and open-ended questions. This combination allowed for more comprehensive answers to the questions as well as a more detailed analysis. The closed ended questions were presented in a variety of formats including multiple choice, rank order, and matrix table, while the open-ended questions were presented in a text entry format. The response choices associated with the questions were categorized as nominal, ordinal, and interval. Further, to avoid bias in the data set, the response choices were balanced. Skip logic was applied to certain questions; therefore, if target participants had not adopted sustainable development, non-applicable questions were omitted. To view details relating to the survey developed for this research, refer to Appendix B.

**Participants**

There were a number of specific characteristics that were required for target participants to qualify for participation in this research. First, the target participants must have a facility location in Erie, Pennsylvania where business activities are conducted. Second, the target participants must be considered an enterprise as defined in Chapter 1. Third, the target participants must be operating within the manufacturing sector as defined in Chapter 1. Fourth, the target participants must employ at least one employee. These characteristics are important because they are the factors that shape this research.
**Survey Distribution**

The survey was initially distributed to a faculty test group within Penn State Erie, The Behrend College. The faculty test group was comprised of three professors within the Project and Supply Chain Management Department of the Black School of Business that have extensive experience in supply chain management and/or survey development. This was done to gain feedback on the content, structure, and time-frame of the survey before distributing it to the target participants. After feedback was received, appropriate revisions were made to the survey questions. It was important to include this step because it offered a valuable second opinion of the overall survey before its final distribution.

The next step in the process was interaction with the target participants to acquire the appropriate contact information for survey distribution. Contact information, specifically an enterprise email address, was obtained through website visitation and cold calling. Contact information of an employee within upper level management, the purchasing/procurement department, or the sales department was desirable as it was assumed they would have the functional knowledge to be able to best answer the survey questions. This information was recorded in a table format within an excel spreadsheet.

Once the appropriate contact information was acquired and the survey was finalized, the survey was distributed to the target participants. Survey distribution took place through Penn State Webmail, an email interface that is only accessed by students and faculty of The Pennsylvania State University. This was done in order to assure the target participants that the research was legitimate and the results would be used in an academic nature. A detailed email was prepared that included an explanation of the research and a direct link to the survey hosted via Qualtrics (see Appendix C). The survey was opened on Thursday, February 18, 2016 and closed on Thursday, March 3, 2016, giving enterprises two weeks to complete the survey. Within these two weeks, two additional reminder emails were sent on Tuesday, March 1, 2016 and Thursday, March 3, 2016. During this period of time, the survey was received by fifty-
five enterprises. Of those fifty-five enterprises, thirty-seven enterprises began the survey, while nineteen enterprises completed the survey in its entirety, resulting in a 35% effective response rate. The partial responses were excluded from the final data set.
Chapter 5: Discussion of Results

The survey questions (see Appendix B) have been connected to the research questions (see Chapter 3) in order to analyze the empirical results obtained from the survey. Here, the analysis of the results is accompanied by a discussion to explore the purpose of this research and provide insights. The format of this chapter consists of five sections including enterprise demographics as well as enterprise sustainable development, sustainable development relating to supplier selection and evaluation, enterprise sustainable development and sustainable development relating to supplier selection and evaluation relationship, and trends.

Enterprise Demographics

To determine the demographics of each enterprise, the enterprise size, the enterprise industries/markets served, and the region(s) in which the enterprise conducts business were analyzed. Data from a total of nineteen enterprises were analyzed consisting of fifteen SMEs and four MNCs. The SMEs and MNCs surveyed were found to serve a variety of industries/markets. Figure 6 describes the industries/markets that are represented by SMEs, MNCs, and both surveyed in this research. When asked about conducting business globally (e.g., in three or more regions) it was discovered that one hundred percent of MNCs conduct business globally, but only twenty-seven percent of SMEs conduct business globally. The majority of SMEs were found to be strictly conducting business within North America at sixty-seven percent, while seven percent conduct business in two regions (e.g., Europe and North America).
In this research, sustainable development was analyzed within the target participants by examining the enterprises’ commitment, communication, and internal structures.

Commitment to sustainable development is present within the majority of SMEs and MNCs. The majority of SMEs have embedded sustainable development in their enterprises’ culture by sharing a strong commitment to sustainability as well as by expressing that sustainable development is permanently considered by top management with thirteen percent deeming it a core strategic consideration. MNCs also displayed integration of sustainable development in their enterprises’ culture. The majority of MNCs exhibit a strong commitment to sustainable development and express that top management permanently considers sustainable development with twenty-five percent describing it as a core strategic consideration. The commitment on behalf of SMEs and MNCs was very comparable.
The level of internal and external communication relating to sustainable development within SMEs and MNCs varied. Seventy-five percent of MNCs and sixty percent of SMEs have clear internal communication of responsibility for sustainable development, resulting in a higher performance on behalf of MNCs. However, within the area of external communication, SMEs appear to be performing better. Fifty-three percent of SMEs have published an environmental policy statement, as opposed to fifty percent of MNCs, and thirteen percent of SMEs report their sustainability activity, as opposed to zero percent of MNCs. These results are surprising because the literature review has expressed the opposite is true. A possible explanation for these results could be that SMEs have experienced pressure from their MNC customers to adopt more external communication because it is an expectation from the shareholders and stakeholders of MNCs.

The internal structures present within MNCs lack a sense of advancement that is present within the internal structures of SMEs. Although the majority of SMEs have fully or somewhat adopted sustainable development within multiple functions of their enterprises, thirteen percent have designed a separate sustainability function whereas zero percent of MNCs have done this. Further, forty percent of SMEs have developed and adopted separate tools, policies, processes, and procedures for sustainable development and created a link between sustainability performance and financial incentives, while twenty-five percent of MNCs have taken these steps. In addition, sixty-seven percent of SMEs have established key performance indicators related to sustainability as opposed to twenty-five percent of MNCs. Also, SMEs (87%) have adopted more sustainable development initiatives related to the triple bottom line – social, economic, and environmental – in their business models compared to MNCs (75%). Refer to Figure 7 for a graph that describes the initiatives that have been adopted within the enterprises.

As shown in Figure 7, most of the sustainable development initiatives that are currently adopted within both groups of enterprises relate to the social dimension of the triple bottom line.
There were a few target participants that do not currently participate in sustainable development. Twenty-five percent of MNCs reported no current participation in sustainable development along with twenty percent of SMEs. One of the SMEs explained the main reasons as to why it has not adopted sustainable development in its business model. Refer to Table 6 for a description of these reasons in rank order.

Table 6 – Reasons for Non-Adoption of Sustainable Development

<table>
<thead>
<tr>
<th>Reason</th>
<th>Rank</th>
</tr>
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<tbody>
<tr>
<td>Initiatives Are Not Considered Necessary for the Specified Industry</td>
<td>1</td>
</tr>
<tr>
<td>Lack of Resources</td>
<td>2</td>
</tr>
<tr>
<td>Initiatives Are too Costly</td>
<td>3</td>
</tr>
<tr>
<td>Lack of Commitment by Top Management</td>
<td>4</td>
</tr>
</tbody>
</table>

The analysis of size compared to enterprise adoption of sustainable development suggests that size does not impact the extent to which sustainable development is adopted within an enterprise.
Sustainable Development relating to Supplier Selection and Evaluation

In order to determine if the target participants consider sustainable development to be a criterion within supplier selection and evaluation, the areas of the enterprises relating to their criteria and sub-criteria, methods, and processes were analyzed.

Many of the enterprises have not fully adopted criteria and sub-criteria related to sustainable development within their strategies for supplier selection and evaluation. Only twenty-five percent of MNCs have achieved full adoption. With that being said, the majority of the enterprises that have adopted some criteria and sub-criteria related to sustainable development within their supplier selection and evaluation strategies are SMEs. Forty percent of SMEs have established business, social, economic, and environmental criteria along with associated sub-criteria. The following are some of the sub-criteria that have been adopted within each criterion:

i. **Business**: risk mitigation, legal compliance, partnerships, innovation, responsiveness

ii. **Social**: human rights, health and safety, geographic location

iii. **Economic**: financial stability, quality, delivery, price

iv. **Environmental**: environmental policies, recycled content of material, compliance to ISO standards

The method of scorecards is popular within SMEs and MNCs to aid in the selection and evaluation of suppliers. Forty-seven percent of SMEs and seventy-five percent of MNCs use scorecards to score either all their suppliers, their suppliers that are the most significant with the highest annual spend, or their suppliers that operate in a highly competitive market. The scorecards are comprised of the criteria and sub-criteria discussed earlier in this section, and therefore address all three dimensions of the triple bottom line framework. The enterprises also use other means to select and evaluate suppliers. Refer to Figure 8 and Figure 9 for two graphs that display the methods used and the frequency of their use by SMEs and MNCs.
The majority of SMEs and MNCs are still selecting and evaluating suppliers based on the traditional business and economic sub-criteria of price, quality and delivery. MNCs have indicated that their choice of supplier for a particular work order is either always or most of the time chosen based on the supplier’s price (25%), quality, (75%), and delivery (50%). SMEs also indicated this same process when choosing a supplier for a specific work order with price (73%), quality (93%), and delivery (73%) being chosen always or most of the time. Despite this, the concept of sustainable development according to the triple bottom line framework is gradually making its way into the process of selecting and evaluating suppliers. This insight is supported by the results showing that fifty-three percent of SMEs and one hundred percent of MNCs sometimes base their supplier choices on suppliers’ sustainability position.
This analysis of size compared to enterprise adoption of sustainable development as a criterion in the selection and evaluation of suppliers suggests that size does not impact the extent to which sustainable development is adopted as a criterion in the selection and evaluation of suppliers within an enterprise.

**Enterprise Sustainable Development and Sustainable Development relating to Supplier Selection and Evaluation Relationship**

A relationship between the adoption of sustainable development within an enterprise and the adoption of sustainable development as a criterion for selecting and evaluating suppliers has emerged. It is more likely that an enterprise will adopt sustainable development as a criterion for selecting and evaluating suppliers if the enterprise itself has adopted sustainable development in its business model. On average, if SMEs and MNCs have fully adopted sustainable development in their business models then they have fully adopted or somewhat adopted sustainable development as a criterion for selecting and evaluating suppliers. Further, if SMEs and MNCs have somewhat adopted sustainable development in their business models then they have somewhat adopted or have not adopted sustainable development as a criterion for selecting and evaluating suppliers. Lastly, if SMEs and MNCs have not adopted sustainable development in their business models then they have not adopted sustainable development as a criterion for selecting suppliers. As shown, there are different stages of adoption. Refer to Figure 10 and Figure 11 for a visual representation.

**Figure 10 – Sustainable Development Adoption Relationship in MNCs**

![Pie chart showing adoption relationship in MNCs](image-url)
It has been observed that there has been an increase in the adoption of sustainable development within SMEs and MNCs during the preceding five to ten year time period. The majority of SMEs and MNCs indicated that the status of sustainable development on the agenda within their top management either significantly increased or moderately increased. Further, both SMEs and MNCs displayed a significant increase or a moderate increase in their commitment to sustainable development pertaining to the attention paid and the investment made. Many of the SMEs and MNCs that have adopted sustainable development have done so as a result of a requirement from non-governmental organizations, customers, etc., suggesting that, in the past, enterprises were more inclined to adopt sustainable development when it was compulsory. In the comparison of SMEs and MNCs, the trend is very similar when examining past commitment and motivation relating to sustainable development.

It is expected that there will be an increase in the adoption of sustainable development within SMEs and MNCs in the proceeding five to ten year time period. This can be attributed to three different reasons. First, SMEs and MNCs express that different stakeholders will have an impact on the way they manage sustainable development in the future. Refer to Figure 12 for a graph that explains the stakeholders that are predicted to have the greatest impact on the way enterprises manage sustainable development.
expectations. Second, SMEs (93%) and MNCs (75%) believe that pursuing sustainable development strategies are either extremely necessary in the present, necessary in the present, or necessary in the future in order to be competitive within their industries. Third, SMEs (73%) and MNCs (75%) think that addressing sustainable development issues are either extremely important or somewhat important to the future success of their enterprises. This trend can be deduced from the responses regarding the enterprises’ future plans within the areas of commitment, communication, and internal structures.

The majority of SMEs and MNCs expect their commitment to sustainable development to significantly or moderately increase. Forty percent of SMEs indicated that sustainable development will significantly increase within their enterprises in the future, while zero percent of MNCs will significantly increase sustainable development within their enterprises in the future. Further, forty percent of SMEs and seventy-five percent of MNCs will somewhat increase sustainable development within their enterprises in the future. This increase can also be concluded due to thirty-three percent of SMEs and twenty-five percent of MNCs that do not currently share a strong commitment to sustainable development stating that they will in the future. From this, the determination can be made that SMEs are more committed to increasing sustainable development within their enterprises in the future compared to MNCs.

Communication is expected to increase within a small portion of the SMEs and MNCs. When examining internal communication, thirty-three percent of SMEs that do not have clear communication of the responsibility for sustainability have indicated that this communication will be adopted in the future, while twenty-five percent of MNCs that do not have clear communication of the responsibility for sustainability do not expect this to change in the future. Regarding external communication, twenty-seven percent of SMEs designated that they had future plans to publish an environmental policy statement as well as report their sustainability activity. However, of the fifty percent of MNCs that do not currently have an environmental policy statement and of the one hundred percent that do not currently report their sustainability activity, none were found to have future adoption expectations. It can be concluded that
SMEs are making more extensive efforts to effectively communicate sustainable development internally and externally compared to MNCs.

There is also an anticipated increase in evolvement regarding the internal structures of SMEs and MNCs. Thirty-three percent of SMEs and twenty-five percent of MNCs that do not have a separate function for sustainability expect to adopt one in the future. Additionally, SMEs (36%) and MNCs (33%) are expected to develop separate tools, policies, processes, and procedures relating to sustainable development for adoption in their business models as well as create a link between sustainability performance and financial incentives (SMEs = 26%, MNCs = 3%). SMEs (20%) and MNCs (75%) that do not have key performance indicators related to sustainability do not expect to adopt them in the future. The majority of SMEs and MNCs that have already adopted sustainable development initiatives in their business models expect to increase adoption through additional initiatives. It appears that the future internal structures of SMEs will involve sustainable development to a greater extent compared to MNCs.

![Figure 12 – Stakeholder Impact on Management of Sustainable Development Expectations](image)

It is expected that there will be an increase in the adoption of sustainable development as a criterion in supplier selection and evaluation within the proceeding five to ten year time period. As shown in Figure
there are multiple stakeholder groups that are expected to have an impact on how management within SMEs and MNCs deals with future sustainable development expectations. The top stakeholder groups for both SMEs and MNCs consist of customers and governments. The requirements of enterprises, from the preceding stakeholder groups, to incorporate sustainable development into their products within every stage of the products’ life cycle, especially during the selection and evaluation of suppliers, will only escalate. SMEs (67%) and MNCs (50%) are noticing this impact and expect to adopt sustainable development as a criterion in supplier selection and evaluation. It can be concluded that more SMEs will consider sustainable development when selecting and evaluating suppliers than MNCs in the future.
Chapter 6: Conclusion

This study has focused on sustainable development according to the triple bottom line framework within SMEs and MNCs and within their supplier selection and evaluation strategies. To investigate these topics, exploratory research, including an extensive literature review and expert survey, has been conducted. The main observations and insights generated by this research are summarized in the following. The adoption of sustainable development within the enterprises and within their supplier selection and evaluation strategies does not appear to be directly correlated to enterprise size. There is a relationship between the adoption of enterprise sustainable development and the adoption of sustainable development as a criterion for selecting and evaluating suppliers. This can be suggested after an analysis of sustainable development within the commitment, communication, and internal structures of SMEs and MNCs as well as within their criteria and sub-criteria, methods, and processes related to the selection and evaluation of suppliers. The majority of SMEs and MNCs that are represented in the survey have adopted sustainable development in their business models and most expect to increase adoption in the next five to ten year time period. This is important as the concept of sustainable development is only predicted to grow in the future as consumers continue to require products that incorporate sustainable development within every stage of the products’ life cycle. This research can be used as a resource to aid in sustainable development decision making for enterprises within the manufacturing sector. Enterprises can also use this research to gauge their advancement against other enterprises and spot trends pertaining to sustainable development within the manufacturing sector. Further research can be conducted by expanding the survey focus area from Erie, Pennsylvania to cover the entirety of the northeastern United States, e.g., formerly known as the Manufacturing Belt. This larger scope can be expected to lead to a larger sample size, which will also enable formal hypothesis testing.
APPENDIX A

NOT HUMAN RESEARCH

Date: February 9, 2016

From: Joyel Moeller, IRB Analyst

To: Madeline Tushak

<table>
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<th>Type of Submission:</th>
<th>Initial Study</th>
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<tr>
<td>Title of Study:</td>
<td>Sustainable Development: A Study of SMEs and MNCs within the Manufacturing Sector in Erie, PA</td>
</tr>
<tr>
<td>Principal Investigator:</td>
<td>Madeline Tushak</td>
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<tr>
<td>Funding:</td>
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The Office for Research Protections determined that the proposed activity, as described in the above-referenced submission, does not meet the definition of human subject research as defined in 45 CFR 46.102(d) and/or (f). Institutional Review Board (IRB) review and approval is not required.

The IRB requires notification and review if there are any proposed changes to the activities described in the IRB submission that may affect this determination. If changes are being considered and there are questions about whether IRB review is needed, please contact the Office for Research Protections.

This correspondence should be maintained with your records.
APPENDIX B

1. Which of the following best describes the industries/markets your enterprise serves? Select all that apply.
2. In which region(s) does your enterprise conduct business? Select all that apply.
3. What is the average number of employees within your enterprise over the past twelve months? Include all location operations.
4. In your enterprise, which department (if any) is responsible for sustainable development initiatives? Write “N/A” if this does not apply.
5. Are sustainable development initiatives currently implemented/followed in your enterprise?
6. Which of the following sustainable development initiatives are currently implemented/followed within your enterprise? Select all that apply.
7. Please list any other sustainable development initiatives that are currently implemented/followed within your enterprise. Write “N/A” if this does not apply.
8. Are any of the sustainable development initiatives currently implemented/followed within your enterprise a result of a requirement from a non-governmental organization, customers, etc.?
9. What are the reasons sustainable development initiatives are not currently implemented/followed within your enterprise? Please rank in the order of most important (1) to least important (5).
10. Please explain any other reasons why sustainable development initiatives are not currently implemented/followed within your enterprise? Write “N/A” if this does not apply.
11. Regarding sustainable development initiatives within your enterprise, does your enterprise
   a. Share a strong commitment to sustainability?
   b. Have a separate function for sustainability?
   c. Have clear communication of responsibility for sustainability?
   d. Have an environmental policy statement?
   e. Have separate sustainability reporting?
   f. Have separate tools, policies, processes, and procedures for sustainability?
   g. Have key performance indicators related to sustainability?
   h. Have a link between sustainability performance and financial initiatives?
12. What is the current status of sustainable development initiatives on the agenda within your enterprise’s top management?
13. How has your enterprise’s commitment to sustainable development – attention and investment – changed in the past five to ten years?
14. In the past five to ten years, has the status/importance of sustainable development initiatives on the agenda within your enterprise’s top management increased?
15. How necessary does your enterprise think pursuing sustainable development related strategies or initiatives are to being competitive within your industry?
16. How do you expect your enterprise’s commitment to sustainable development – attention and investment – to change in the following five to ten years?
17. Are sustainable development initiatives expected to be implemented and/or increased within your enterprise in the following five to ten years?
18. How important is addressing sustainable development issues to the future success of your enterprise?
19. Over the next five to ten years, which stakeholder group(s) do you believe will have the greatest impact on the way your enterprise manages expectations relating to sustainable development?
20. How does your enterprise choose to conduct business with a supplier for a given job?
   a. The supplier has the lowest cost
   b. The supplier has the best quality
   c. The supplier is local
   d. The supplier has the best delivery terms, conditions, and time
e. The supplier is the most sustainable according to the triple bottom line  
  f. The supplier has good relations with the enterprise  
  g. The supplier has a written contract with the enterprise, and the material/part can only be purchased from that supplier  
  h. The supplier is the only enterprise in the industry that supplies the material/part required  
  i. Other  

21. Has your enterprise established sustainable development guidelines relating to the selection of its suppliers?  
22. What sustainable development guidelines has your enterprise established to select suppliers? Please list.  
23. Does your enterprise monitor its suppliers’ compliance to established sustainability codes/guidelines? Please indicate the extent to which each mechanism is used.  
   a. Audits  
   b. Documentation  
   c. Evaluations  
   d. Feedback  
   e. Inspections  
   f. Investigations  
   g. Records  
   h. Reviews  

24. Please further explain how your enterprise monitors its suppliers’ compliance to the established sustainability codes/guidelines. Write “N/A” if this does not apply.  
25. Does your enterprise conduct sustainability risk profiles for its suppliers?  
26. What information/metrics are considered when conducting a sustainability risk profile for a supplier? Select all that apply.  
27. Does your enterprise maintain supplier scorecards?  
28. What criteria are included in your enterprise’s supplier scorecards? Select all that apply.  
29. In the next five to ten years, are sustainable development initiatives expected to be increased and/or implemented as a criterion for selection suppliers within your enterprise?
Good Afternoon,

My name is Madeline Tushak, and I am a student majoring in Project and Supply Chain Management at Penn State Erie, The Behrend College. I am conducting research for my thesis as part of my honors studies in the Penn State Schreyer Honors College. The topic of my honors thesis is sustainable development as it relates to supplier selection and evaluation in Multinational Corporations and Small and Medium Enterprises within the manufacturing sector located in Erie, Pennsylvania. In order to answer my research questions, I have formulated a short, ten to fifteen minute survey. The link is below:

https://qtrial2014.az1.qualtrics.com/SE/?SID=SV_41r2lbSQHTqLb0N

Please follow this link to access the online survey. Once your enterprise has completed the survey, a message will appear, and the results will be automatically saved within Qualtrics (a web-based survey tool), without using identifiers. All information will be kept confidential. The survey will close on March 3, 2016.

Participation is voluntary, but I would greatly appreciate your enterprise’s participation in this research.

Thank you in advance!

NOTE: If this email was sent to the wrong location within the enterprise, please forward to an employee within the purchasing or procurement department.

Madeline Tushak
Project and Supply Chain Management
Schreyer Honors College
Black School of Business
Penn State Erie, The Behrend College
mjt5377@psu.edu


ACADEMIC VITA

Madeline J. Tushak

mjtushak@gmail.com  (814) 823-5973

EDUCATION

Penn State Erie, The Behrend College  May 2016
Bachelor of Science in Project and Supply Chain Management
Minor: Management Information Systems
Certificates: Oracle eBusiness Suite, Enterprise Resource Planning with SAP

INTERNATIONAL EDUCATION

The University of Kent, Canterbury, United Kingdom  January 2015 – June 2015

PROFESSIONAL EXPERIENCE

Zeyon Incorporated, Project Manager/Estimator  August 2015 – Present
Lycoming Engines, Integrated Supply Chain Intern – Procurement  June 2015 – August 2015
City of Erie Office of Human Resources, Civil Service Secretary  June 2012 – December 2014

ACADEMIC LEADERSHIP POSITIONS

Project and Supply Chain Management Club President and Founder  January 2014 - Present
Student Leaders Committee Member  January 2014 – Present
Black School of Business Mentor  March 2016 - Present
CapSim Chief Executive Officer  August 2015 – December 2015
FIG Mentor  August 2014 – December 2014

HONORS AND AWARDS

Academic Achievement Award
Beta Gamma Sigma
Schreyer Honors College
Lawrence and Elizabeth Held Scholarship
Schreyer Honors College Study Abroad Grant