12-2017

Symbiotic relationships among innovations and sustainable practices: A supply chain management perspective

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SYMBIOTIC RELATIONSHIPS AMONG INNOVATIONS AND SUSTAINABLE PRACTICES: A SUPPLY CHAIN MANAGEMENT PERSPECTIVE

A Dissertation

by

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Submitted to Graduate College of
The University of Texas Rio Grande Valley
In partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2017

Major Subject: Business Administration

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December 2017

ABSTRACT

Erkul, Muratcan, Symbiotic Relationships among Innovations and Sustainable Practices: A Supply Chain Management Perspective. December, 2017, 148 pp., 22 tables, 5 figures, references, 229 titles.

Sustainability as a business phenomenon has occupied the attention of academicians, practitioners, and consumers for more than three decades. While some firms emphasize on their own internal sustainability initiatives, there is a growing trend to implement sustainability across the supply chain. This increasing interest makes implementation of sustainable supply chain management (SSCM) practices very important for focal firm's sustainability; however, the ability to create innovative products, processes, and ways of operating is crucial if an organization is to be sustainable. Although there have been studies that investigate innovation in the context of sustainability, their scopes are limited to a single perspective which often obscures the big picture of innovation, its creation, and its effects on firm performance. In this study, we will adopt a multi-level innovation perspective to explore the symbiotic relationships between innovation creation and the development of SSCM practices, and resulting sustainability performance. This research will contribute to supply chain management and innovation literature and practice by identifying the different innovation types that emerge when SSCM practices are being implemented and explaining the effects innovation patterns and SSCM practices have on sustainability performance.

We utilized a multiple case design to achieve the purpose of this study. In addition to interviews, company reports and other available secondary data sources will be examined to triangulate the findingsResults showed that macro level of innovations are rare, almost non-existent in current market conditions, and they are currently limited to social aspects of sustainability such as society welfare practices in the markets of developing countries. Implementing sustainability practices has led to the development of diverse innovation mixtures from a multi-level perspective. The influence of organizational learning, absorptive capacity, and an ambidextrous orientation of the firm have significant effects on innovation and SSCM practice implementation and management. As all interviewees clearly stated, innovation and new SSCM practices tend to increase the cost in the short term; however, in the long run they enable the firm to pursue higher sustainable outcomes with financial value. The financial performances of cases also demonstrate that their innovation activities have resulted in meaningful progress after a certain point.

DEDICATION

This dissertation is dedicated to my parents, Tulay and Asim Erkul and my sister Selin. Your unreasonable belief in education immensely contributed to sparking the light that lit the path of this journey. I will be forever grateful for your supports, sacrifices, love, and sense of purpose.

I also dedicate this work to my wife Giselle whose unwavering patience and understanding throughout this journey. Your effective support is greatly appreciated.

I love you all.

ACKNOWLEDGMENTS

I would like to thank my dissertation committee members who were very supportive, patient and also very generous with their time and expertise. A special thank you to Dr. Hale Kaynak, my committee chair for spending many hours of reading, advising and guiding my research. I will always be grateful to Dr. Hale Kaynak. My thanks go to my dissertation committee members: Dr. Michael Abebe, Dr. Ivan Montiel, and Dr. Sibin Wu for their unmatched support and scholarly insights.

I would like to thank to my RGV family, my friends for their endless support in this journey, especially Subhajit for his friendship and support in Ph. D. program. Finally, I would like to thank and acknowledge all respondent who volunteered to participate in this research.

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CHAPTER I

INTRODUCTION

"What pleases me most is that sustainable development is on almost everybody's agenda now."

– Maurice Strong, 1992, Entrepreneur and Environmentalist

"There are no old roads to new directions."

– The Boston Consulting Group

Since the 1960s, the world's population has grown from three billion to seven billion (Population Clock, 2017). A growing population requires more resources to satisfy its needs, and this need for increased resources creates an urgency to finding solutions to the problems that are imposing limits on these resources. Sustainability is one approach to breaching these limits. Resource scarcity, various types of pollutions, unfair labor practices, clean energy needs, climate change, rapid urban development, income inequality, and food security are a few of the factors that have intensified efforts to increase sustainability, and these efforts have in turn motivated the development of new sustainability practices (Ernst & Young Survey, n.d.; U.N. Sustainable development survey, 2013). Sustainability as a business phenomenon hasoccupied the attention of academicians, practitioners, and consumers for more than three decades (Linton, Klassen, & Jarayaman, 2007; Adams, Jeanrenaud, Bessant, Denyer, & Overy, 2016). The World Commission on Environment and Development (WCED) defines sustainability as "satisfying

today's needs without compromising the needs of future generations." (WCED, 1987, p. 43). Sustainability in organizations refers to the optimization of its three dimensions of sustainability: environmental, economic and social (Elkington, 1997; Kaynak & Montiel, 2008; Svensson, et al., 2016). Since the early 1990s, interest in sustainability has been expanding and now, as a result, includes supply chain management (SCM). Both practitioners and academicians have attempted to explain the importance of sustainable supply chain management (SSCM) in organizations (Handfield, Sroufe, & Walton, 2005; Linton et al., 2007; Srivastava, 2007; Carter & Rogers, 2008; Min & Kim, 2012). Surveys show that more than half of executives queried believe that sustainability is extremely important for new product development, firms' reputation, new practices, and as an overall strategy in their organization (Bonini & Gorner, 2011). However, a significant number of organizations still do not know how to implement sustainability (The pain of sustainability, 2012). Some of the main challenges that companies face implementing sustainable practices are the costs associated with sustainability implementation, accurate risk assessment issues, fear of tradeoffs, and changes in corporate priorities (Epstein, 2008).

A review of the literature makes clear that sustainability can be effectively implemented by adopting new approaches to product development, adopting new processes, modifying an organization's structure (Hausten, Luther & Schuster., 2014), and engaging in stakeholder management (Kaynak et al., working paper), but effective implementation also requires consideration of the internal and external factors that can affect firms' supply chains. Competition in the market and the need to improve sustainability forces companies to focus on innovation as well as their research and development efforts. As the Rio Declaration of 1992 states in Principle 9, a focus on developing and adapting new technologies is a must for seeking

the new practices and new implementations that will enable sustainable development in organizations (Rennings, 2000). Implementing new sustainable practices requires that organizations create new eco-innovations in their supply chains, and several studies address supply chain practices that can assist firms in achieving their sustainability goals (e.g., Adams et al., 2015; Wu, 2017). A frequently cited article in the Harvard Business Review (Nidumolu, Prahalad & Rangaswami, 2009) as well as other studies (Seebode, Jenrennaud, & Bassent, 2012; Tohidi & Jabbari, 2012), for example, state that the ability to create innovative products, processes, and ways of operating is crucial if an organization is to be sustainable.

Although there have been studies that investigate innovation in the context of sustainability, their scope is limited. Most address innovation from a single perspective (a micro or macro level). A study by Dangelico and Pujari (2010), for example, focuses on product innovation, whereas Schaltegger, Lüdeke-Freund, and Hansen (2012) emphasize business model innovation, and Elzen, Geels, and Green, 2004 investigate system innovation. A single-level perspective limits the research to a narrow scope, thus it often obscures the big picture of innovation, its creation, and its effects on firm performance.

Despite a vast amount of literature on the creation of innovation and its types, research on levels of innovation that show the magnitude of innovation coverage is lacking. Until now, only a few studies have attempted to examine various levels of innovation in a single study (Boons, Montalvo, Quist, & Wagner, 2013). Meyer and Goes (1988) investigated innovation from a multi-level contextual perspective. In this study, we will adopt a multi-level innovation perspective to explore implementation of SSCM practices because they are important to the creation of innovation and its types. Their importance is undeniable, particularly in supply chain management (Roy, Sivakuvar, & Williamson, 2004; Adams, Jeanrenaud, Bessant, Denyer., &

Overy, 2015). Implementing sustainability in supply chain management transforms the business arena into a competitive landscape and compels firms to alter the way they think about products, technologies, processes, and business models (Nidumolu et al., 2009), and these alterations require a series of innovations on multiple levels.

The nature of organizations, whether in the private and/or public sector, evolves to meet a need and, presumably, to provide value to some groups while at the same time organizations aim to survive and perhaps even improve their performance. How innovation is related to implementing SSCM may have significant implications for companies' performance. Innovative organizations that are implementing new SSCM practices also increase profits while positively contributing to society and the environment (Sustainability & Innovation, 2011). Research on the relationship between implementation SSCM and firm performance, especially in its earlier stages, has produced mixed results (Melynk, Sroufe, & Clantone, 2003). The findings show that firms are shy when it comes to sustainable development because of an endemic resistance to change (Lozano, 2013), and this resistance may well be rooted in the belief, held by a majority of firms, that sustainable practices increase overall costs. To achieve higher sustainability performance, the implementation of sustainability demands innovations and new practices in each dimension of sustainability: financial, social, and environmental. Organizations that implement sustainable practices increase their performance by reducing waste, improving their public reputation, and reducing overall costs (Handfield,Walton, Seegers &Melnyk 1997; Markley & Davis, 2007; Klassen & Johnson, 2004; Vachon & Klassen, 2008; Zhu Sarkis &Lai., 2008). The impact of integrating sustainability with regard to supply chains is critical to supply chain management (Klassen & Johnson, 2004; Kleindorfer, Singhal, & Wassenhove, 2005). This integration can increase long-term performance by implementing such practices as waste

management. Therefore, SSCM and organizational performance need more attention from scholars and practitioners than they have been receiving.

Statement of Research Problem and Conceptual Background

There are at least three reasons why the research to date has not provided more conclusive evidence on the relationships between innovation, SSCM, and firm performance. The first is that the literature is focused almost exclusively on an external business environment in which regulatory and stakeholder demands are direct influences on firms' inclination to adopt green practices (e.g., Bansal & Roth, 2000). While evidence exists that shows external motivators do play a role in the development of sustainable practices (Ageron, Angappa &Alain, 2012; Wolf, 2011), there is a lack of focus in the literature on how organizations generate new practices and implement sustainability in their supply chains. Specifically missing from the literature are investigations of innovation and the effects of innovative capability that influence the development of sustainable SCM practices.

The second reason is that the discussion and investigation of sustainable SCM in the literature is limited because it is thought to be still in the development stage (Linton Klassen & Jayaraman 2007; Zhu et al., 2008; Ashby, Leat, & Hudson-Smith, 2012). Furthermore, the consideration of the performance outcomes that result from reducing the environmental impact of firms' supply chain operations is a concept that has only gained attention in the last decade (Linton et al., 2007; Golicic & Smith, 2013). The lack of research implies that linkages between sustainable practices in SCM and sustainable firm performance — social, environmental, and financial — have not been thoroughly examined. More empirical testing and investigation of the linkages between sustainable practices in SCM and sustainable firm performance is necessary (Vachon & Klassen, 2008). Indeed, researchers assert that the attention given to the potential

benefits of sustainable SCM practices has actually raised more questions than it has answered (Linton et al., 2007; Carter & Rogers, 2008; Dubey et al., 2017).

The third reason that conclusive evidence on the relationships between innovation, SSCM, and firm performance is lacking is that researchers might not have been careful to apply the most appropriate theoretical lens to study these relationships. Part of the problem is the absence of theory development in the sustainability literature, and this absence has resulted in the failure to integrate theory and practice (Markman & Krause, 2014). In many cases, no theoretical base has been offered. Moreover, much of the research in this area is more prescriptive than explanatory or predictive. Researchers have begun to discuss the relative lack of theory development and the need for more emphasis on grounding sustainable supply chain management research in theory (Vachon & Klassen, 2008; Stock, Boyer, & Harmon, 2010).

The first gap will be addressed in this study by investigating a connection between innovation types from a multi-level perspective and sustainable SCM practices. Research into sustainable SCM shows that there are potentially two important determinants of successful sustainable SCM efforts while innovating: (1) a focus on the sustainable and the achievement of sustainability objectives, and (2) a focus on the economic and the achievement of economic objectives (Kaynak & Montiel, 2009; Messelbeck & Whaley, 1999). A focus on both the sustainable and the economic in supply chain management is driven by innovation creation, innovative corporate cultures and orientations related to their respective focus and objectives. Both orientations are considered to be important resources in the attainment of sustainability performance (Mentzer et al., 2001; Klassen & Johnson, 2004; Menguc & Ozanne, 2005).

The second and third gaps suggest that further empirical research, supported by an applicable and appropriate theoretical base, is critical to further understanding the relationship

between types of innovation implementation of sustainable SCM practices and a firm's sustainable performance. Organizational learning, ambidexterity, and absorptive capacity theories are appropriate theoretical lenses through which the research for this study can be viewed. Organization learning theory explains the processes by which organizations develop, innovate, and implement, and it further explains which organizations tend to sustain and improve their performances (Hedberg, 1981; Dibella, Nevis, & Gould, 1996). Absorptive capacity explains how firms adapt, imitate, and assimilate new knowledge as well as which knowledge will be cumulative in the long run that can assist continuous knowledge development and application. In this study, absorptive capacity will help explain the symbiotic relationship among SSCM practices and innovation patterns in firms' adapted sustainability practices in their supply chains. Ambidexterity directly affects how organizations approach the creation of new knowledge and innovation. In this research context, ambidextrous organizations use different strategies and approaches in the innovation process that seek new SSCM practices. Taking into consideration the theories cited above, this study proposes to find answers to the following questions.

- What specific innovations do companies generate to implement SSCM practices effectively?
- How do companies simultaneously implement and manage these innovations and SSCM practices?
- What are the interaction patterns of these innovations and SSCM practices for high sustainability performance?

Because theoretical explanations bridging innovation patterns and SSCM practices are lacking, this study will employ a grounded-theory building procedure (Suddaby, 2006; Strauss &

Corbin, 1998). More specifically, we will utilize a multiple case study design to develop a multi-level theory that can explain the dynamic and symbiotic relationships between innovation patterns of organizations and their implementation of the SSCM practices that affect the sustainability performance of a firm. A multi-case study design is thought to provide strong methodological support that can be used to generate theory (Eisenhardt, 1989), and it is an appropriate method to answer the questions "how?" and "what?" because these questions require explanatory answers. Yin (2003) clearly explains the circumstances that justify a case study approach: (a) the emphasis of the research is to answer "how" and "why" questions; (b) it prevents intentional or unintentional manipulation of the behavior of those involved in the study; (c) researchers are keen to study contextual conditions because these conditions are believed to be relevant to the phenomenon under study; and (d) if there are no clear boundaries between the phenomenon and context. We will explore the research questions by using semi-structured interviews with managers involved in the sustainability initiatives in their companies. In addition to interviews, this study will examine company reports to triangulate the findings.

Significance of the Research

This study is design to make two primary contributions. The first is identifying the different innovation types that emerge when SSCM practices are being implemented. The second is investigating and explaining the effects innovation patterns and SSCM practices have on sustainability performance. The research implications of these contributions can benefit scholars, and the managerial implications can benefit practitioners.

Contribution to Research

Empirical research on innovation in SSCM practices is limited, conflicting, and often inconclusive (Linton et al., 2007; Carter & Rogers, 2008; Vachon & Klassen, 2008). A number of research implications are anticipated from the results of this study which will help reduce this confusion. Employing organizational learning and absorptive capacity theories in a different context — innovation and SSCM — this research empirically investigates types of innovations and their impact on a firm's implementation of SSCM practices.

Studying the dynamic and symbiotic interplay between innovation and the SSCM practices can help reveal and understand developments and transformations in supply chain management. This investigation can also illuminate creation and potential future innovation patterns while highlighting the potential practices and processes through which alternative methods may emerge.

The conclusions of this case study research in conjunction with archival data can contribute to a greater understanding of the relationship between innovation and SSCM practices. Qualitative research will provide an in-depth analysis of the subject matter by interpreting the findings from a naturalistic approach, which will add meaning to the subject under study (Jones, 1995). Second, this study will draw on well-established sustainability implementation concepts in supply chain management found in the marketing (logistics) and management literature, and it will augment their presence in the SCM literature. The inclusion of three dimensions of sustainability in this study will contribute to the SCM literature, as both the operationalization and empirical testing of this construct is missing.

Last but not least, research on innovation creation and SSCM and its impact on a firm's sustainability performance is limited (Vachon & Klassen, 2006; Smith, 2013). The findings of

this research may fill this research gap by examining the effects of innovation creation and SSCM on specific operationalized firm performance measures.

We will also measure the impact of SSCM practices on three operationalized dimensions of firm performance that appear in the literature: financial (e.g., reducing costs by reducing waste), environmental (e.g., reducing the eco-footprint of an organization), and social (e.g., increasing fair labor practices). The inclusion of these three dimensions will enable us to gain a better multi-faceted understanding of the impact innovation has on the SSCM implementation process than we would attain with a single measure or dimension of firm performance.

Contribution to Practice

The results of this study may provide a number of potentially valuable insights for managers. Despite the scholarly and practitioner interest in SSCM, the literature has struggled to provide managers with applicable ideas and courses of action that will enable them to implement and manage sustainable practices in supply chains in ways that ultimately improve performance (Pagell & Wu, 2009). The results of empirical research can offer managers information on the nature of the relationship between innovation and SSCM and between creations patterns of innovation and SSCM practices. Furthermore, the empirical results can help managers recognize the innovative nature of the organization in the form of a sustainable supply chain strategy that can lead to the formation of SSCM practices and recognition of the benefits that may accrue with the implementation of these practices. These findings may encourage managers to innovate and implement SSCM practices before facing external pressures and threats to do so. An understanding of the effect that different innovation strategies can have on SSCM practices can offer managers insights into the possible control they can exert not only over their internal processes and research and development but also over the possible sustainability performance

outcomes. Managers may also be able to use this study's findings to assess the impact employing strategic resources to support innovation in their supply chains is or is not having. The results might well suggest that sustainable SCM practices may be related to higher sustainability firm performance, so managers can assess their firm's sustainability initiatives and supply chain management practices to better understand how these innovations are being utilized and to what degree they contribute to the value of a firm.

Definition of Key Terms

- Absorptive capacity. Cohen and Levinthal (1990) define absorptive capacity as a firm's ability to identify, assimilate, transform, and apply valuable external knowledge. It is also a limit on the rate or quantity of scientific or technological information that a firm can absorb.
- Ambidexterity and ambidextrous organization. Ambidexterity is defined as an organization's ability to adapt to dynamic conditions and apply exploration and exploitation while balancing both at the same time (Duncan, 1976; Gibson & Birkinshaw, 2004; Raisch & Birkinshaw, 2008). Ambidextrous organizations seek to acquire efficient alignment and innovation processes by using those two strategies sequentially and/or simultaneously (Tushman & O'Reilly, 1996; Gupta, Smith, & Shalley, 2006)
- Innovation. Innovation is simply "the implementation of an internally generated or a borrowed idea — whether pertaining to a product, device, system, process, policy, program, or service — that was new to the organization at the time of adoption" (Cf. Kaynak, 1997, p. 14; Damanpour & Evan, 1984, p. 393).
- Multi-level perspective (MLP). A MLP explains how technological transitions occur at various levels. In the context of innovation, MLP shows the interaction of different

organizational factors and external environments in the process of creation of innovations. Multiple levels of innovations and transitions between each level are clearly explained through the lens of MLP theory**.**

- Organizational learning theory. This theory states that in order to be competitive in a dynamic environment, organizations must change their objectives and actions to achieve their goals (Fiol & Lyle, 1985). If learning is to occur, an organization must make a conscious decision to adapt to a changing environment and other conditions, and this adaptation process must be linked to outcomes. Further, the organization must remember the desired outcomes. Organizational learning does not exist until the information is shared, stored in organizational memory in such a way that it may be transmitted, accessed, and applied to organizational goals (Marvel, 2012).
- Sustainable supply chain management (SSCM). The definition of SSCM is adapted from Seuring and Müller (2008): "the management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental and social into account which are derived from customer and stakeholder requirements" (p.1700).
- Sustainable supply chain practices. Because sustainability is a new topic in SCM, the definition and identification of SSCM practices in the literature is both limited and vague. The study conducted by Golicic and Smith (2013) identifies eco-product design, supplier partnership and collaboration, and customer relationships as SSCM practices. A study by Erkul, Kaynak and Montiel (2015) includes codes of conduct, sustainable supply management, and sustainable human resource development as SSCM practices. Practices that aim to decrease or eliminate waste, increase the efficiency of resource use, and

increase employee and community well being can also be viewed as SSCM practices (Erkul et al., 2015; Golicic & Smith, 2013).

- Sustainability performance. Defining performance in the context of sustainability is extremely difficult because established measures are lacking. Sustainability performance is defined as an outcome-related term measuring the intersection of economic, environmental, and social dimensions. This study, will view sustainability performance from three performance perspectives: environmental, economic, and social (Elkington, 1998; Kleindorfer et al., 2005).
    - The environmental aspect of sustainability performance includes reducing or eliminating waste with effective waste management, improving product quality, and using material efficiently.
    - The social aspect of triple bottom line includes employee well being and safety, stakeholder relationships (e.g., employee, community, and customer relationships), and fair labor practices.
    - The economical aspect of triple bottom line simply explains better financial performance by reducing cost, using resources efficiently, reducing waste, focusing on improving brand recognition by improving quality, enhancing supplier and customer relationships, and by implementing efficient and cost-effective purchasing and pricing strategies.

Organization of the Dissertation

In this chapter, we introduced the research problems that will be investigated including a brief discussion of the research methodology. The significance of the study was discussed in two sections: research and practice. We concluded this chapter with the definitions of key constructs.

The remainder of this proposal is organized as follows. In the next chapter, following a discussion of the theories we used in this study, the literature on sustainability and sustainable supply chain management is reviewed. In this chapter, the relationships among different levels of innovation and SSCM practices, all based on theory and literature, are also presented. The second chapter concludes with a theoretical framework for innovation and SSCM practices. In the third chapter, we elaborate the research methodology and include all details relevant to the multi-case study procedures that will be followed in this study.

CHAPTER II

THEORETICAL DISCUSSION, LITERATURE REVIEW AND PROPOSED THEORETICAL FRAMEWORK

This chapter provides a review of relevant literature on innovation and SSCM. In the first section, the current state of the literature on the theories that will be drawn on for this research are described: organizational learning, absorptive capacity, ambidextrous organizations, and multi-level perspective of innovation. The second section focuses on key constructs in the theoretical framework of sustainability in general, SSCM, and practices. Third section of this chapter highlights (1) the literature on innovation and its creations, (2) different types of innovation and levels of innovation. The fourth section emphasizes the symbiotic and dynamic interactions between innovation types and SSCM practices. The last section presents the available literature on sustainable performance of firms to highlight the limited research available on these topics and demonstrate the need for continued scholarship in this area. The literature to be reviewed consists of dissertations, peer reviewed journal articles, white papers, and books published between 1960 and 2017. Annual company, government, and other organizational documents will also be included.

Theories Relevant and Used in This Study

Organizational Learning

In today's dynamic business environment, having and maintaining a competitive position is extremely important for the survival and success of firms, but it is difficult to acquire and maintain a competitive position due to a variety of factors: increasing rivalry resulting from globalization and changing environment dynamics (Kalburgi, 1995; Bumes et al., 2003; Salavou, Baltas, & Lioukas, 2004; Birdthistle & Fleming, 2005), knowledge-based economies (Salavou et al., 2004; Birdthistle & Fleming, 2005; Birdthistle, 2006), information and communication technology diffusion (Bumes et al., 2003; Salavou et al., 2004), and stakeholder pressure for sustainability (Fernandez-Feijoo, Romero, & Ruiz 2014). Moreover, dynamic environmental and market conditions require that firms adapt to these changing conditions by increasing their learning capabilities. Organizational learning (OL) theory has been studied for many years (Argyris & Schon, 1978; Fiol & Lyles, 1985; Levitt & March, 1988; Stata, 1989; Senge, 1990; Huber, 1991; Garvin, 1993; Argote, 2013) in a range of academic disciplines such as sociology, psychology, and several management fields like strategy, operations and production management, organization theory, and organizational behavior (Easterby-Smith, 1997; Mavondo et al., 2005). However, the breadth and depth of OL research differs among academic disciplines. Management scholars are more interested in the organizational level of OL theory, for instance, whereas the research unit of analysis in psychology is the individual, and the subject of interest is the cognitive ability of human beings (Dodgson, 1993). Organizational theory scholars study learning from an organizational structural view and explain the patterns of learning and innovation in the organizations by investigating how learning occurs within organizations (Levitt

& March, 1988; Kim, 1993). In this study, the unit of analysis will be the organizational level, so the structural view of OL theory will be adopted to explain patterns of innovations and practices.

A firm's ability to learn and use existing knowledge is essential for survival. Several studies have investigated the need for implementing an effective strategy in maintaining an organization's competitive position (Porter, 1980; Teece, Pisano, & Shuen, 1997, Barney, 2007; van Hoof, 2013). According to Nonaka (1991), "an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge" (p. 96). This simple but well-addressed statement by Nonaka (1991) explains why organizations must create new knowledge, new technologies, and implement these at all levels of an organization that wishes to be successful and sustainable in a dynamic business environment.

Because the environment is dynamic and change in competitive markets is occurring at an accelerated rate, organizations have been motivated to implement new strategies that can help them adapt to these changes and, by better performance, stay competitive (Chirico & Salvato, 2008). Scholars suggest that creating knowledge and increasing learning capacity can be achieved if OL is applied at all levels, including different departments and functions in firms. Organizations that develop their knowledge and capabilities can easily be innovative and adaptive (Hurley & Hult, 1998; Calantone Cavusgil & Zhao, 2002; Therin, 2002), and they can improve their competitiveness and performance (Senge, 1990; Nonaka, 1991; Garvin, 1993; Bell, Whitwell, & Lukas, 2002; Craig & Moores, 2006; Garcia-Morales, Ruiz Moreno, & Liorens-Montes, 2006; Chirico, 2008). The results of studies investigating OL and business performance suggest that firms have benefited from learning activities in dynamic environments. Organizational learning theory has significant effects on maintaining organizational performance in changing environments if it is implemented effectively (Sadler-Smith, Spicer & Chaston;

2001; Bumes et al., 2003). Several other reasons can be suggested as to why the study of organizational learning is currently so important. Fast-paced environments and technology affect organizations significantly (Dodgson, 1993; Therin, 2002). Technological changes in processes, products, and organizations increase the uncertainties and challenges that organizations must face (Salavou et al., 2004). Learning is becoming essential to organizations as they develop new systems and processes that are flexible and responsive to change (Senge, 1990; Dodgson, 1993). Scholars argue that in competitive markets, OL is an essential component of firm strategy for innovation and the knowledge creation process that leads to the acquisition of the resources that are crucial to achieving competitive advantage (Senge, 1990; Nonaka, 1991; Foss, 1996). The OL theory perspective is similar to a knowledge-based firm that needs to use its existing capabilities to adapt to its environment continually and achieve competitive advantage (Grand, 1996).

Organizational learning theory explains the process of identifying and correcting mistakes, the essential activity in the learning process. Scholars have identified two learning activities, single loop and double loop learning, that explain how OL occurs. Single-loop learning emphasizes improving the work; double-loop learning focuses on what is being done and how it is being done (Hackman & Wageman, 1995; Kaynak, 2006). The operations and supply chain management perspective is concerned with the gathering and processing of information in and about organizations (Easterby-Smith, 1997), and it focuses primarily on the relationship between learning and organizational productivity and efficiency. Learning is a crucial resource that drives supply management success (Das & Teng, 2000; Hult et al., 2000; Hult, Snow & Kandemir, 2003).

From the above discussion, it is clear that OL theory can be useful for understanding the process of innovation creation and the formulation of SSCM practices. This theory also has great relevance when it comes to understanding how some SSCM practices can be implemented by using different levels of innovation. Therefore, this study will draw primarily on OL theory to discuss the impact of the symbiotic relationship between innovation and SSCM practices on the sustainability performance of a firm.

Absorptive Capacity

Absorptive capacity (AC) has been studied in relation to innovative activities. According to Cohen and Levinthal (1990), it enables firms to evaluate and exploit the external knowledge that leads to innovative results. AC explains how an organization develops new plans, alters processes (Zahra & George, 2002), and uses existing knowledge and the firm's learning capability. It also assists in creating new products (Gao, Li, & Clarke., 2008). This unique ability to acquire, assimilate, and integrate new knowledge from the external environment offers significant benefits to a firm (Kogut & Zander, 1993; Grant, 1996). Firms using their AC may acquire new external knowledge that leads to the achievement of competitive advantage. Organizations with higher AC are more likely to acquire new knowledge and skills that enable them to create new technologies (Tsai, 2001) than those firms whose AC is undeveloped or under-developed. In addition to new technology development, Stock, Greis, and Fischer (2001) examined AC's impact on new-product development and concluded that AC leads to better external knowledge acquisition and the subsequent application that improves product development, which results in more advanced products.

Scholars have also investigated AC and external factors. Liao, Fei, and Chen (2007) have shown that absorptive capacity explains the relationship between knowledge sharing and

innovative capability within an organization and such entities in the external environment as customers and suppliers. Absorptive capacity theory postulates that firms use existing knowledge and integrate new external knowledge to increase organizational innovativeness (Cohen & Levinthal, 1989; Garcia-Morales et al., 2007).

The preceding discussion should make it clear that AC theory can be helpful in understanding the creation process of innovation and its relation to new knowledge and SSCM practices. What these studies reveal is that this theory is a major tool for understanding organizational innovation and success in implementing new practices. Therefore, this study will use absorptive capacity as a major theoretical foundation to explain innovation creation and SSCM implementation.

Ambidextrous Organizations

Organizations must be innovative and efficient to stay competitive over the long run, and their ability to be innovative and efficient will determine their performance in a highly competitive environment (Benner and Tushman, 2003). Ambidextrous organizations choose a strategy that simultaneously pursues exploitation and exploration practices in their operations (Duncan, 1976; March, 1991). This strategy allows organizations to adapt to change and create innovations while continuing, to some extent, their traditional operations (Raisch & Birkinshaw, 2008). There are two perspectives in the literature that look at firm ambidexterity. Some scholars believe that an organization can pursue exploitation and exploration strategies together (Grove, 1996; Markides, 1998, Lawson & Samson, 2001). According to Teece (2007), organizations need to adapt both exploration and exploitation strategies in their system to be competitive. Other scholars, however, believe that two strategies should be separated or that one should be dominant (O'Connor, 2008). March (1991) asserts that pursuing exploration and exploitation

strategies at the same time is extremely difficult for organizations. Pursuing both strategies by innovating continuously to overcome inertia maintains companies' competitiveness and generates profits (Tushman & O'Reilly III, 1997).

Market conditions force firms to adopt an ambidextrous supply chain strategy. The ambidextrous SCM strategy utilizes the simultaneous approach of exploration and exploitation activities. In other words, exploration in a supply chain strategy engages in activities aimed at developing the new products or processes that enable adaption to market changes (Abernathy & Clark, 1985). Exploitation, on the other hand, influences existing supply chain capabilities and improves them to achieve higher efficiency and better performance (Barnes, Hinton, & Mieczkowska, 2004).

Multi-Level Perspective Theory of Innovation

A new mid-range theory, the multi-level perspective proposed by Geels (2002), focuses on the dynamic, non-linear relations of technological transitions (TT), and it asserts that patterns of these transitions occur at three levels (Rip and Kemp, 1998; Geels, 2002, 2005). Thus the theory provides a new theoretical framework for studying innovation.

TT are defined as major transformations in the way organizations and industries function, and it also fulfills such societal functions as practices, productions, regulations, and systems (Geels, 2002). An example is the transition in any work place that occurs when paper is replaced with computerized forms. Technology transitions (TT) and innovations are co-existing concepts, and both involve the development of new products, processes, and systems.

In MLP theory, innovation derives from the niche level where technologies evolve and reach maturation during their life cycle. The next level is the regime level, which is where matured innovation has been implemented and has established the practices that have enabled

them to become part of the existing societal function. The final level is the landscape level. At this level, innovation has a broad effect on a society in that it affects how that society operates. Multi-level perspective can be used to examine how these different levels affect the transitions from particular SCM practices, processes, and systems to new sets.

Key Constructs in the Theoretical Framework

Sustainability in General

The first evidence of concern about sustainability can be found in the eighteenth century's concern about the sustainable use of forestry (Pisani, 2006). After World War II and the oil crisis in the early 1970s, sustainability became an even bigger public issue. Despite the fact that it is a subject of intense public interest, the definition of sustainability in the literature is vague (Linton et al., 2007). Several studies have defined it in different contexts. This study will adopt the definition of sustainability found in the work of Brundtland and WCED (1987) that sustainability is, "satisfying today's needs without compromising the needs of future generations" (p. 43). Sustainability in organizations has three pillars that are often referred to as people, planet, and profit (Elkington, 1997; Kaynak & Montiel, 2009). To achieve an effective approach to sustainability, organizations aim to reduce or at least minimize environmental damage by using efficient and effective operations while balancing social righteousness and economical value, which taken together are the definition of triple bottom line (TBL) (Elkington, 1997). In today's demanding, competitive environment, firms find achieving TBL in their organizations and supply chains challenging (Elkington, 1998). However these challenges have not stopped organizations from implementing and measuring sustainability. The increasing importance of sustainability has prompted several attempts to identify metrics that can measure

sustainability correctly. To satisfy the need for the correct metrics, several sustainability indices, for example the Dow Jones Sustainability Index (DJSI), were established to measure and monitor activities of organizations (Paulraj, 2011). Scholars today agree on the importance of sustainability along the supply chain; however, most research has focused on only a single function such as purchasing or sourcing rather than looking at the entire supply chain (Pagell & Wu, 2009).

Sustainable Supply Chain Management

Resource scarcity and operational inefficiencies in SCM have made sustainable supply chain management (SSCM) essential for organizations. Sustainability has been defined and become the focus of several research projects in various disciplines for three decades; however, in-depth research on SSCM has not yet been developed. SSCM is defined as an approach to supply chain management that creates, protects, and grows long-term environmental, economic, and social values for all levels in the chain (The Sustainable Supply Chain, 2010). Several studies have investigated the three dimensional approach — environmental, social and economic — to sustainability in SCM (e.g., Seuring & Müller, 2008; Ahi & Searcy, 2013; Beske, Land & Seuring, 2014). The literature provides significant evidence that organizations have recognized the benefits of sustainability and its multi-dimensional, triple bottom line approach. Sustainability has positive effects on firm performance (Hong, Zhang, & Ding. 2017). Contrary to common belief, adopting a TBL approach can actually be profitable while at the same time it satisfies the social and environmental aspects of sustainability (Pagell & Wu, 2009).

Scholars have conducted numerous studies of SCM practices; however, only a few of these studies have focused on SSCM practices. SSCM practices encompass the internal and external practices of a firm that are implemented to make its supply chain more sustainable in

terms of all three dimensions of sustainability (Kaynak & Montiel, 2009; Morali & Searcy, 2013; Paulraj Chen & Blome, 2015). Firms practicing SSC are motivated by brand value and regulations to improve their sustainable efficiency. To the best of our knowledge, the research on SSCM practices consists mainly of conceptual and case studies that discuss the practices in single industries from a variety of industry sectors and national settings.

Sustainable supply chain practices (SSCP) are defined as activities or actions taken to improve supply chain-related functions or processes by increasing sustainability efforts in its social, environmental, and economic aspects (Golicic & Smith, 2013). Each aspect of sustainability impacts different processes and functions. Organizations that focus on social aspects of SSCP provide guidelines on corporate social responsibility initiatives, thereby creating a sustainable organization culture among employees and applying fair labor practices at all levels of their supply chains (e.g., Lopez, Garcia & Rodriquez, 2007; Kaynak & Montiel, 2009). The environmental aspect of SSCP practices has been the major focus of SSCM research. Increasingly scarce resources, pollution, and waste have drawn attention to the environmental aspects of SSCM research and applications (Zhu & Sarkis, 2004). Research on the economic aspect of SSCP emphasizes the reduction or elimination of environmental impact and increasing the economic value of an organization by reducing the cost of inputs such as eco-sourcing and waste management practices (e.g., Kaynak & Montiel, 2009, Golicic & Smith, 2013; Erkul et al., 2015).

Several concepts have been identified that address the environmental sustainability trend: green supply chain (Sarkis, 2003), green supply chain management (Zhu & Sarkis, 2004), environmental supply chain management (Zsidisin & Siferd, 2001; Handfield, et al., 2005), environmental purchasing (Carter & Carter, 1998; Zsidisin & Siferd, 2001), green purchasing

(Min & Galle, 1997), green supply (Bowen, Cousins, Lamming, & Faruk, 2001), green value chain (Handfield, Walton, Seegers, & Melnyk, 1997), and green supply chain practices (Vachon & Klassen, 2006). Green supply chain management (GSCM) consists of the various functions' involvement in activities that include eco-sourcing, waste reduction, recycling, and the reuse and substitution of materials (Carter & Narasimhan, 1998); and the term green supply chain practices (GSCP) is commonly used in the research literature to refer to a number of activities performed by an organization to minimize its impact on the natural environment (Vachon & Klassen, 2006; Sarkis, Gonzalez-Torre, & Adenso-Diaz, 2010). Zhu, Sarkis, & Lai (2008), also assert that green supply chain practices are an adoption of environmentally friendly supply chain management practices that include such things as cooperation with customers, eco-design, reverse logistics (Eltayeb & Zailani, 2009), supplier management inventory (Liu et al., 2012), supply selection and evaluation (Ben-Brik, Mellahi, & Rettab, 2013), and investment recovery (Perotti, Zorzini, Cagno, & Micheli, 2012). Thus, speaking more broadly, operations, marketing, and logistics have been integrated into a GSCM framework (Zhu et al., 2008). Previous studies show that green supply management practices in such developed nation as Japan, Germany, and other northern European countries are very advanced (Gutowski et al., 2005). GSCM practices becomes elevated when promoting the supply and demand for green product and services. Consequently, green practices can help manufacturers and their suppliers contribute to global environment protection by promoting eco-conscious activities that appeal to the general public and consumers.

We have carefully reviewed the literature on sustainable supply chain management so that we can provide an adequate background to this study. All studies that focus on SSCM and

use conceptual or empirical methodologies were covered. We start by presenting the major studies on environmental and green supply chain management, which are listed in Table 1.

Table 1. Major Studies on Environmental & Green Supply Chain Practices in the Literature

Study	Purpose	Research Type	Main Findings
Walton & Handfield, 1998	To investigate implementation and integration of environmental management practices involving suppliers and purchasers	Empirical	Companies must proactively manage supply chain environmental initiatives and seek higher benchmarks rather than simply comply with government regulations.
Zhu & Sarkis, 2004	To study the operational GSCM practices and their relationship with performance in China	Empirical	GSCM practices tended to have positive relationships with sustainability performance.
Vachon & Klassen, 2006	To examine the integration of green practices in supply chains	Empirical	Technological integration tends to help first-tier suppliers and buyers.
Vachon, 2007	To examine the association of GSCM practices with environmental technologies in an organization	Empirical	GSCM practices tended to be more effective if downstream organizations are adopting and implementing.
Zhu & Sarkis, 2007	To investigate the effects of institutional pressures on GSCM and performance	Empirical	Supplier and manufacturers under regulatory pressure tend to implement GSCM practices effectively.
Zhu et al,. 2008	To examine the effect of organizational learning and management support in adoption of GSCM in a Chinese context	Empirical	The adoption rate of GSCM practices tends to be lower than those of developed countries. Organizational learning is extremely important for GSCM adoption.

Table 1 continues

Study	Purpose	Research Type	Main Findings
Perotti et al., 2012	To investigate GSCM practices and Third party logistic (3PLs) performance	Empirical	Findings reveal an increasing interest in environmental issues, but the current adoption level of GSCP is still limited among third party logistic companies. Proactive companies tend to have higher firm performance
Laosirihongthong et al., 2013	To investigate the relationship among GSCM practices and three performance aspects: environmental, economic, intangible	Empirical	External pressures and regulations enhance environmental, economic, and intangible performance. Reverse logistics practices (pro-active practices) had low levels of adoption and lack a significant impact on GSCM performance.
Wu, 2013	To study GSCM integration and green innovation at two levels, green product and green process	Empirical	Supplier, customer and internal integration enhance both green product and process innovations.

A review of the studies listed in Table 1 makes it clear that scholars have focused on investigating integration, the role of GSCM practices, and their effects on firms' operations. The main effects of GSCM practices have been associated with increased firm performance (Zhu & Sarkis, 2004; Laosirihongthong et al., 2013; Perotti et al., 2012), enhanced product and process innovations (Wu, 2013), higher integration of supplier green practices (Vachon & Klassen, 2006; Vachon, 2007; Wu, 2013). On the other hand, other researchers have focused on antecedents and the effects of external factors while implementing GSCM practices (Lee, 2008; Laosirihongthong et al., 2013). The current environmental and green practices that have been examined in the literature are listed in Table 2.

Table 2. Environmental/Green supply chain practices in the literature

Green SSCM Practices/Study	Walton & Handfield, 1998	Klassen & Johnson, 2004	Zhu & Sarkis, 2004	Srivastava, 2007	Nikbakshsh, 2009	Zhu & Sarkis, 2011
Environmental certification	X	X				
Pollution prevention		X		X	X	
Life cycle assessment	X	X		X	X	
Eco-design	X		X	X	X	X
Reserve logistics	X			X	X	
Internal environment management (e.g waste management)	X		X	X	X	X
Green purchasing	X				X	X
Customer involvement in environmental requirements						X
Investment recovery			X			X
External GSCM			X			
Upstream practices	X		X			X

Recognition of the importance of sustainability's social aspects is growing significantly. Increasing labor and workers rights issue, community involvement efforts, and fair trade and sourcing have become focal points for firms whose operations are implementing sustainability (Erkul et al., 2015). Reviewing the studies listed in Table 3 makes it clear that scholars have focused on investigating the role of sustainability practices in this specific aspects of supply chain management such as socially responsible purchasing, using fair trade practices, developing local suppliers, supplier certifications, anti-child labor legislation (Carter & Jennings, 2002; Saint et al., 2010), codes of conduct, social responsibility (West et al., 2003), and organizational performance (McFadden, Henagan, & Gowen, 2009). As Table 4 shows, researchers have also identified some of the social sustainability practices organizations can follow to comply with sustainability standards throughout the supply chain such as those relating to supplier ISO 26000, external codes of conduct, and employee health and safety (Castka & Balzarova, 2008; Spence & Bourlakis, 2009; Erkul et al., 2015).

Table 3. Major Studies in Socially Sustainable Supply Chain Management

Study	Purpose	Research Type	Main Findings
Carroll, 1991	To explore the nature of CSR and its components and provide a framework for CSR in organizations.	Conceptual	Identified CSR pyramid with four levels of CSR: economic, legal, ethical, philanthropic.
Carter & Jennings, 2002	To identify the socially responsible logistic activities, antecedents and consequences	Empirical	By socially responsible logistic activities, executives can positively influence the creation of organizational culture. Socially responsible logistic activities tend to increase the trust of stakeholders and improve the financial performance.
Maloni & Brown, 2006	To examine the implementation of CSR practices in the food industry	Conceptual	Identified the deficiencies of CSR activities in the food industry. Stated that there is a need for empirical testing.
Castka & Balzarova, 2008	To investigate the role of ISO 26000 in quality standards	Conceptual	ISO 9000 provides a structural and infrastructural platform for organizations to develop and adopt corporate social responsibility (CSR). ISO 26000 facilitates a shift from customer focus to stakeholder focus, thereby creating a business-to-society orientation in organizations.
Spence & Bourlakis, 2009	To investigate the evolution from corporate social responsibility to supply chain responsibility in food industry	Empirical	Discusses good practice and corporate social responsibility in the supply chain and illustrates the substantive progress that can be made in achieving supply chain responsibility

Table 4. Social practices in Sustainable Supply Chain Management

Social SSCM Practices/Study	Carroll, 1991	Carter & Jennings, 2002	Maloni & Brown, 2006	Castka & Balzarova, 2008	Hutchins & Sutherland, 2008	Spence & Bourlakis, 2009
Socially Responsible Purchasing		X				X
Code of Conduct	X				X	X
Health and Safety				X		
Community initiatives					X	
Labor Rights			X			X
Fair Trade			X			
Animal Welfare			X			
Supplier selection (standards, e.g. IS0 26000)		X		X		X

The economic aspect of sustainability is the ability to support operations of a firm financially and thereby create economic value from its operations. Firms may achieve economic sustainability by implementing such practices that lower operational costs as the efficient use of materials and effective waste management (Melnyk et al., 2003; Shrivastava, 1995). Improved sustainability efforts will enable firms to improve their brand reputation, which will lead to higher market value (Shrivastava, 1995). Table 5 summarizes SSCM studies on the economic sustainability of a firm. Table 6 lists studies that examined the economic aspects of sustainability at the time firms were implementing sustainable practices.

Table 5. Major Studies on economic aspect of Sustainable Supply Chain Management

Study	Purpose	Research Type	Main Findings
Klassen & McLaughlin, (1993)	To investigate the relationship between total quality management (TQM) and environmental management	Conceptual	An integrated approach to TQM and environmental management in operations management is needed. Results showed that there is a gap between firms and public perspective to environment and quality practices.
Carter, Kale & Grimm, (2000)	To examine the purchasing function that can create value and affect the environmental actions of a firm and its upstream supply chain.	Empirical	Findings revealed that environmental purchasing is significantly associated with both net income and cost of goods sold, after controlling for firm size, leverage, and primary earnings per share.
Curkovic, Melynk, Handfield, & Calantone, (2000)	To investigate relationship between TQM and Environmentally Responsible Manufacturing	Empirical	Firms that have implemented TQM tend to be successful in the implementation of ERM due to similarities between the programs. TQM principles can be used to manage environmental applications.
Handfield, Melnyk, Calantone, & Curkovic, (2001)	To study relationship between the product design process and Environmentally Responsible Manufacturing (ERM) systems from the perspective of the supporters (champions of ERM) and users (DfE tool users)	Empirical	Firms may apply seven step process to include environmental elements into the design of products.
Kassinis & Soteriou, (2003)	To explore the relationship between environmental practices and performance in services and the effects of practices on the external service chain.	Empirical	Results show that environmental practices are positively related to performance through the mediating effect of enhanced customer satisfaction and loyalty.

Table 5 continues

Zhu and Sarkis, (2004)	To investigate green supply chain management (GSCM) practices and their effects on firms' performance in Chinese enterprises.	Empirical	Survey results show that environmental practices have greater impact on environmental performance while it has a less significant impact on both positive and negative economic performance.
Gonzalez-Benito &Gonzalez-Benito, (2005)	To identify the environmental motivations associated with ISO14001 certification and their effects on sustainability initiatives	Empirical	Increased environment performance resulting from ISO 14001certification affects economic performance by increasing efficiency in processes.
Rao & Holt (2005)	To investigate the GSCM practices that have been fully adopted by all organizations in Southeast Asia and their effects on economic performance.	Empirical	Results show that greening supply chains leads to an integrated green supply chain, which ultimately leads to competitiveness and economic performance.
Pagell, Krumwiede, & Sheu, (2007)	Examine buyer supplier relationships and environmental management while controlling for the competitive environment" relative to SC performance	Empirical	Operational performance is not a uni-dimensional construct. Both types of non-traditional investments (buyer – supplier and environmental management) can influence supply chain performance.
Zhu, Sarkis & Lai, (2007)	To examine the increasing pressures on Chinese automobile firms to initiate implementation of GSCM practices to improve both their economic and environmental performance	Empirical	Findings reveal that Chinese enterprises have experienced high and increasing regulatory and market pressures while having strong internal drivers for GSCM practice adoption. However there is no significant economic performance improvement.
Vachon & Klassen, (2008)	To investigate the relationships between environmental collaboration and suppliers, and environmental collaboration with customers	Empirical	The findings show that a positive relationship between environmental collaboration with suppliers and manufacturing performance. The relationship between environmental collaboration with customers and manufacturing performance is mixed.
Govidan et al., 2014	To study the impact of lean and green supply chain management practices on supply chain sustainability	Empirical	The findings showed that not all the lean, resilient and green SCM practices have significant impact on the SCs sustainability.

Table 6. SSCM practices and economic aspect of sustainability in the literature

Studies/Practices	Production	Upstream/Supplier Facing	Downstream/Customer Facing	Product/Process Design
Carter, Kale & Grimm, (2000)		X		
Kassinis & Soteriou, (2003)	X			
Zhu and Sarkis, (2004)		X	X	
Zhu and Sarkis, (2005)				X
Gonzalez-Benito &Gonzalez-Benito, (2005)			X	
Rao & Holt, (2005)		X		
Zhu, Sarkis & Lai, (2007)		X		
Vachon & Klassen, (2008)	X	X	X	
Yang et al. ,(2011)	X			
Govidan et al., (2014)	X	X	X	X

A review of the research summaries listed in Table 5 indicates that empirical studies (Carter, Kale, & Grimm, 2000; Zhu & Sarkis, 2004; Rao & Holt, 2005; Zhu, Sarkis, & Lai, 2007) discuss the economic challenges such as short term cost increases and sustainable supplier selection that supply chains face when they try to implement SSCM practices upstream (supplier level). From a variety of perspectives, other scholars have examined specific areas in which companies implement SSCM in their supply chains, areas such as production (Kassinis & Soteriou, 2003; Yang et al., 2011), downstream (Zhu & Sarkis, 2004; Gonzalez-Benito & Gonzalez-Benito, 2005), product and process design (Zhu & Sarkis, 2005).

Innovation

Innovation has been a prominent phenomenon in the history of organizational research. For decades and for various reasons, practitioners and scholars have been studying the importance of innovation in organizations (Biemans, 1992; Storey & Salaman, 2005; Trott, 2008; Simon, 2009). These investigations have produced an immense body of literature on innovation and definitions of the term, but so far no consensus has been reached on a definition of innovation (Rowe & Boise, 1974; Dewar & Dutton, 1986; Utterback, 1994; Utterback & Afuah, 1998; Garcia & Calantone, 2002). The various schools of thought approach innovation from diverse viewpoints. Thomson (1965), for instance, asserts that, "Innovation is the generation, acceptance and implementation of new ideas, processes products or services" (p. 2). Along the same line, Wong, Tjosvold, & Liu (2008) think that, "innovation can be defined as the effective application of processes and products new to the organization and designed to benefit it and its stakeholders" (p. 2). A second school of thought (e.g., Becker & Whisler, 1967; Knight, 1967; Damanpour & Evan, 1984; Van de Ven., 1986) does not include the generation of new ideas in the definition of innovation. This view defines innovation as a practice or idea that is

considered new for the first time in an organizational setting (c.f. Kaynak, 1997). The literature shows that some research focuses on the concept of newness, which is often associated with change (Baregheh et al., 2009). A study by Van de Ven et al. (1986) provides an illuminating illustration of the relationship between innovation and "newness." This study views newness as an idea that is perceived as new to the people involved, thus it is an innovation even though it may appear to others to be an imitation of an old technology, product, or idea. A third school of thought considers innovation in different stages, "as a process, as a discrete item such as product or service and as an attribute" (Kimberly, 1981, p. 108).

For this study, we will adopt the definition from the frequently cited study by Damanpour and Evan (1984) that defines innovation as, "the implementation of an internally generated or a borrowed idea — whether pertaining to a product, device, system, process, policy, program, or service — that was new to the organization at the time of adoption" (Kaynak, 1997, p. 25). The holistic viewpoint considers innovation as changes in process, product, or organization aimed at adapting to an organization's external environment or to change its own external environment (Damanpour, 1996). For these reasons, innovation and its derivatives are used to explain the phenomena that include new products and services, processes, technology, structure, systems, and new programs in an organization.

Innovation and innovation creation in an organization is a complex process that is not yet fully understood. This complexity stems partially from the diverse phenomena subsumed under the several definitions of innovation mentioned above. Organizations' innovativeness is a key aspect of innovation development (Hult et al., 2004; Wang & Ahmed, 2004; Lee and Tsai, 2005), and several studies have already investigated organizations' innovativeness and types of innovation in various fields and settings. Wolfe (2007) asserts that across diverse disciplines,

there are three major research streams regarding innovation typology: product vs. process (Gopalakrishnan & Damanpour, 1997), radical vs. incremental (Ettlie, Bridges, & O' Keefe, 1984; Normann, 1971), and technical vs. administrative (Evan, 1966). A careful review of the literature reveals that since the early 2000s, scholars have been losing interest in research on innovation and its types. Table 7 lists some major studies that emphasize major types of innovation. A review of the studies listed in Table 7 reveals that innovation research has very diverse innovation typologies. Most innovation studies concentrate on specific aspects of innovation and use different terms for similar innovation types, primarily because for decades scholars have defined and theorized innovation in various ways. Besides innovation types, some scholars focus on innovation characteristics and their relationships to innovation types to explain the innovation creation process and its scope (Table 8). Following Table 8, we review and summarize the major studies in innovation and supply chain in the literature in Table 9.

Table 7. Major Types of Innovations in the literature

Study	Product	Market	Process	Behavior	Strategic
Schumpeter, 1934	X	X	X		
Miller & Friesen, 1983	X		X	X	X
Capon et al., 1992		X			X
Avionitis et al. 1994	X		X	X	X
Subramanian & Nilakanta, 1996			X		
Hurley & Hult, 1998				X	
Rainey, 1999				X	X
Lyon et al., 2000	X		X		
North & Smallbone, 2000	X	X	X	X	

Table 8. Innovation characteristics and Types

Innovation Characteristic	Innovation Types	Main contributors
Nature of Innovation	Process	Capon et al., 1992; Ettlie and Reza, 1992; Rosenberg, 1982; Utterback and Albernathy, 1975
	Product	Utterback and Albernathy, 1975
Magnitude (time and size) of Innovations	Incremental	Dewar and Dutton,1986; Ettlie et al., 1984; Henderson and Clark, 1990
	Radical	Meyer et al., 1990; Tushman and Anderson, 1986
Application of Innovation	Administrative	Damanpour and Evan, 1984; Kimberly and Evanisko, 1981
	Technical/Technological	Daft, 1982; Damanpour and Evan, 1984

Table 9. Major Studies in Innovation and Supply Chain Management

Study	Purpose	Research Type	Findings
Kim, 2000	Supplier and buyer relationships and coordination of suppliers' innovation	Modeling	Market demands tend to increase supplier-buyer profitability. Revenue increase plays crucial role in supplier innovation
Azadegan et al., 2008	Investigating supplier innovativeness and inter-organizational learning	Empirical	To maximize innovativeness, firms need to align their learning styles with suppliers
Flint et al., 2008	Investigating supply chain learning and logistic innovation process	Empirical	Customer and supplier are significant parts of cross-organizational learning processes in supply chain learning management
Oke et al., 2013	Supply chain partner innovativeness	Empirical	Supply chain partner innovativeness positively relates to product innovation performance through product innovation strategy

A review of the studies listed in Table 9 makes it clear that authors have focused on investigating the role of innovation in, among other areas, suppliers' innovation in buyer-supplier relationships (Kim, 2000), supply chain partner innovativeness (Oke et al., 2003), and inter-organizational learning and supplier innovativeness (Azadegan et al., 2008). But an integrative research model emphasizing innovation creation among supply chain entities is missing. On a similar note, studies have offered similar findings on supplier innovativeness and linked it to organizational learning theory (Azedagan et al., 2008). While supplier innovations are an important part of quality innovation creation, there are several other components of innovation creation.

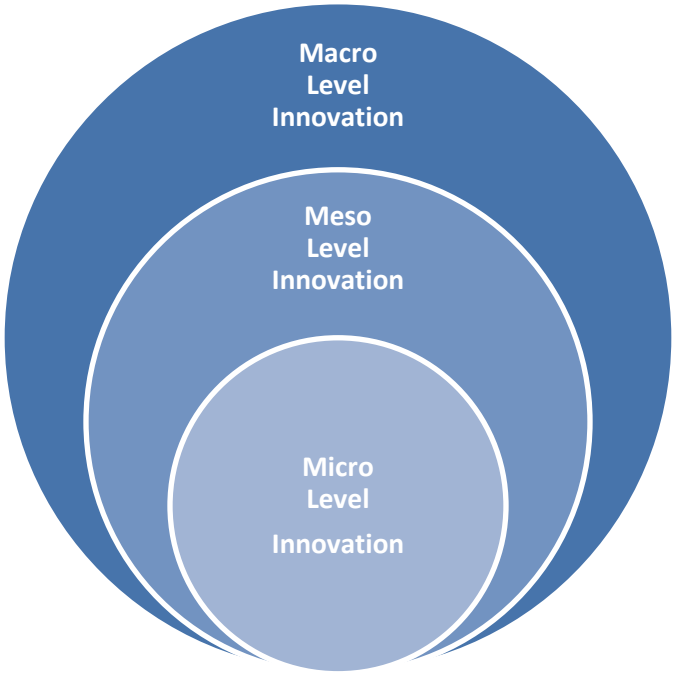
Innovation and Multi-Level Perspective

Innovation has been examined at many levels: micro, meso, and macro (Goffin & Pfeiffer, 1999). For this study, we propose a multi-level perspective of innovation characterized by structural and dynamic dimensions, as illustrated in Figure 1. The structural dimension pertains to the hierarchy of levels nested within one another where the most internal level is that of innovation representation at the micro-level of innovation. In other words, the micro level innovation is single product, process, or technology level that is nested within the meso and macro levels of innovation, both of which are a broader phenomenon. Organizational learning theory has significant implications for the development of new knowledge and absorptive capacity over time, which may lead to much broader innovations and innovative performance of organizations (Cohen & Levinthal, 1989). Innovativeness as a shared system of meaning can be formed at each of these levels. The dynamic dimension pertains to the interrelationships among the different levels of innovation and the way they impact each other. The micro level innovations are much more specific and their effects on the environment are significantly limited as compared to meso and macro level innovations. As companies move to meso and macro level innovations, the effects of innovations on the environment become greater, respectively. The multi-level perspective claims the ability to analyze the innovation process from a broader perspective, the transition of simple incremental innovations to a new system of production or process, perhaps even a new socio-technical system that changes how a society operates (Smith et al., 2010). This broader perspective requires different innovation types at each level to cope with internal and external environmental factors.

The essential characteristic of the multi-level innovation perspective is that firms' organizational learning capacity and innovation creation process will vary in response to their

environment, competition, and strategy. Thus there will be a strong, mutual relationship between a firm's choice of an innovation strategy and its environment.

Figure 1. Levels of Innovation



Micro Level Innovation

Micro level innovation refers to an innovation that introduces a new or significantly improved service, process, or product at a level where it is effective only in its specific function. The scope of micro innovation is limited to a single product or process level, and most of the time it is a modification of existing technology, product, or service. Therefore, micro innovations are only marginal departures from existing practices and largely reinforce the existing potential of firms (Henderson & Clark, 1990; Ettlie, Bridges, & O'Keefe, 1984; Meyer et al., 1990). The difference between micro level innovation and the other two levels, meso and macro, is clear and distinct.

Micro level innovations that consist of small changes can lead to improvements in reliability, performance, size, or specific product features (Worthington, Collins, & Hitt, 2009).

Product innovation refers to the process of introducing new products or services to achieve a better performance while satisfying customer needs (Utterback & Abernathy, 1975; Ettlie & Reza, 1992). Product innovation helps firms reduce costs, increase product efficiency by improving established designs, expand existing products and services, and increase the efficiency of existing product and process, all of which improve firm performance (Moore, 2004; Tidd, Bessant, & Pavitt, 2005). Nike emphasizes product design as a product innovation that improves its product performance by reducing water use and material in their production process (Ottmann, 1998). One other example of micro level innovation is process innovation that alters the way in which products, services, or functions are created, delivered, or operated (Tidd et al., 2005). Zara's production and distribution system is an excellent example of process innovation in a firm. Its innovative production and distribution systems respond quickly to rapid changes in the fashion market. From design to customer delivery, the process takes only four weeks.

Meso Level Innovation

Over the past two decades, the literature on innovation has emphasized organizational-level innovations, and this emphasis includes supply chains. Meso level innovations are defined as sets of activities linked by some product or process groups that create significant improvements or changes in organizations such as using or sharing new technologies or production systems with suppliers (Malerba, 2004). Knowledge and technology varies across organizations or industries in terms of their specificity, tacitness, complexity, and interdependence (Breschi et al., 2000). The main characteristic of meso level innovation is that innovation patterns tend to display commonalities across elements of an organization such as different departments within the company that use the same innovative technology or buyers-suppliers who use the same innovative process in their supply chains. At the meso level of

innovation, micro innovations are amplified by elements of an organization and its supply chain. In the last three decades, we have seen some dramatic examples of innovation creation at the meso level in big corporations and their supply chains like Proctor & Gamble's (P&G)'s Continuous Replenishment System, which operates in conjunction with its suppliers. This system changed the company's whole supply chain strategy and its supply chain operations. This example illustrates a new dimension of innovation that still includes the traditional types of innovation such as product and process. Every year industries invest billions of dollars into R&D and innovation creation, and meso level innovations can be source of a superior performance even in mature industries. Southwest Airlines is a good example of a company that achieved superior performance by creating such meso level innovations as implementing new practices that can be applied to several different functions. By focusing on high utilization with simple "lean" structural practices in every department, Southwest improved both its value creation and profit. Some of these simple structure practices involved such things as using the same type of aircraft to minimize training and maintenance costs and maximizing the efficiency in their operations. It offers simple in-flight services and operates limited routes with non-stop point-to-point flights.

The business model innovation (BMI) is an example of meso level innovations that has become one of the major interests of innovation literature and organizations (Massa & Tucci, 2014). The BMI requires fundamental changes in an organization, like realigning a firm's strategy and resources to acquire new value propositions. This firm or supply chain-level modification requires a broader innovation perspective than merely product and process innovation. In today's competitive business environment, BMI can provide a distinct advantage to companies by using proactive innovation strategies (Massa & Tucci, 2014).

Macro Level Innovation

Macro level innovations can be defined as break-through changes that lead to newer and/or improved systems and structures. A list of examples of macro level innovations that have changed the structure of industry and even society might include such innovations as printing, the computer, and micro loans. Macro level innovations have a broader context than product and or process innovations; they require fundamental structural changes (Frantzeskaki & De Haan, 2009). The invention of the steam engine seems to be a product innovation; however, it also created a fundamental transition from carriage to automobiles and eventually to planes (Geels, 2002). Moreover, this far-reaching transition changed society and how it operates. Macro level innovations affect broader organizational and societal contexts; in other words, these innovations not only include product and process innovations but also changes in the external environment such as industry, government and policies, culture, consumer behaviors and habits, and management styles of firms (Kemp & Rotmans, 2005; Geels, 2006).

System innovation is a good example of a break-through change that explains macro level innovation; it requires changes in the entire structure associated with product and/or process at both the technical and socio-cultural levels (van den Bosch et al., 2005). Geels (2005) defined system innovation, "as a transition from one socio-technical system to another" (p. 446). This definition may imply changes in underlying economic or market dynamics as well as in infrastructure and the behavior of related organizations and stakeholder groups. At this level, system innovation requires full collaboration throughout the supply chain, but it also needs to consider customers and other stakeholders (Williams, 2007).

Innovation and Sustainable Supply Chain Management Practices

The significant role of innovation in SSCM is undeniable. Implementing sustainability in a supply chain requires new approaches, new technologies, and new ways of operating (Nidumolu, 2003). A careful examination of the research summaries in Table 10 reveals that several studies have investigated the relationship between innovation and SSCM in an effort to explain sustainability initiatives from the holistic supply chain perspective. Some of these studies have considered various aspects of this relationship: drivers and motivators, types of innovation, and the adoption and implementation processes. However, the literature shows that a consensus on how SSCM practices should be implemented and what kinds of innovations a firm needs to create if it is to implement those practices is still lacking.

In this study, multiple level perspectives will help explain the symbiotic relationship between the different levels of innovation and SSCM practices. Therefore, we propose a framework built on a theoretical foundation that offers a new model for assessing a firm's approach to innovation and sustainability (Figure 2). It seems that firms implementing sustainability in their supply chains may map their innovation creation process at three levels: (1) whether it focuses on single and limited innovations, (2) the firm's view of innovation has broadened to include its supply chain and other business functions, and (3) the extent to which innovation extends beyond the supply chain to become closer to society and industry.

Based on organizational learning theory, sustainability, and organizational learning support each other (Senge, 1999), and OL is essential for sustainability innovation (Sinkula, Baker, & Noordewier, 1997). Moreover, OL encourages a holistic approach to innovation and sustainability at every level. The literature shows that the higher the level of learning orientation, the greater the degree of firm innovativeness (Calantone et al., 2002; Weerawardena et al.,

2006). Organizational learning theory helps firms transform existing knowledge into new insights about products, processes, and services (Nonnaka, 1994), and it can explain the transformations that occur between different levels of innovation (Jimenez & Valle, 2011). Knowledge sharing within organization and with a supply chain through interaction creates an appropriate environment for firm innovativeness (Jerez-Gomez Céspedes-Lorente & Valle-Cabrera., 2005).

Table 10. Major Studies on Innovation across Sustainable Supply Chain Management

Study	Purpose	Research Type	Findings
Porter & Van Linde, 1995	To investigate how GCSM initiatives and innovations for greening the supplier and impacts on environmental performance	Empirical	Increased environmental efforts tend to result in greater competitive advantage even if a resistance to change exists in the organization.
Klassen & Whybark, 1999	To identify and categorize green technology and environmental product design	Empirical	Proactive management orientation has more interaction with stakeholders.
Zhu & Sarkis, 2004	To examine the relationships between environmental management, innovation and GSCM practices in Chinese manufacturing firms	Empirical	Implementation of GSCM practices creates a win-win situation for both Chinese manufacturers and buyer firms
Chen, 2008	To investigate green process innovation and a firm's capabilities	Empirical	Core competencies have a positive influence on a firm's ability to develop green product and process innovations.
Chiou et al., 2011	To examine the relationship between green supply chain management, green innovation, and their effects on environmental performance	Empirical	Green innovation has an indirect effect on greening suppliers.
Zhu et al., 2012	To identify and investigate different types of manufacturers and new SSCM practices and innovations	Empirical	GSCM adoption by Chinese firms suggests that different patterns of implementing GSCM practices are pursued at each adoption stage by early adopters, followers, and laggards. Many organizational and environmental factors influence the firms to innovate.

In the multi-level innovation approach, organizations at the micro level of innovation add new sustainable products or processes to their existing product line and processes. In this stage, organizations aim to improve their sustainability efforts and reduce their sustainability impact by reducing waste and focusing on lean practices. Firms focusing on environmental sustainability, for example, concentrate on pollution prevention, environmental certification, life cycle assessment, eco-design product and process design, reserve logistics activities, waste management, green purchasing, and upstream practices (Eg., Zhu & Sarkis, 2004; Klassen & Johnson, 2004; Zhu & Sarkis, 2011; Nikbakshsh, 2009; Srivastava, 2007; Walton & Handfield, 1998).

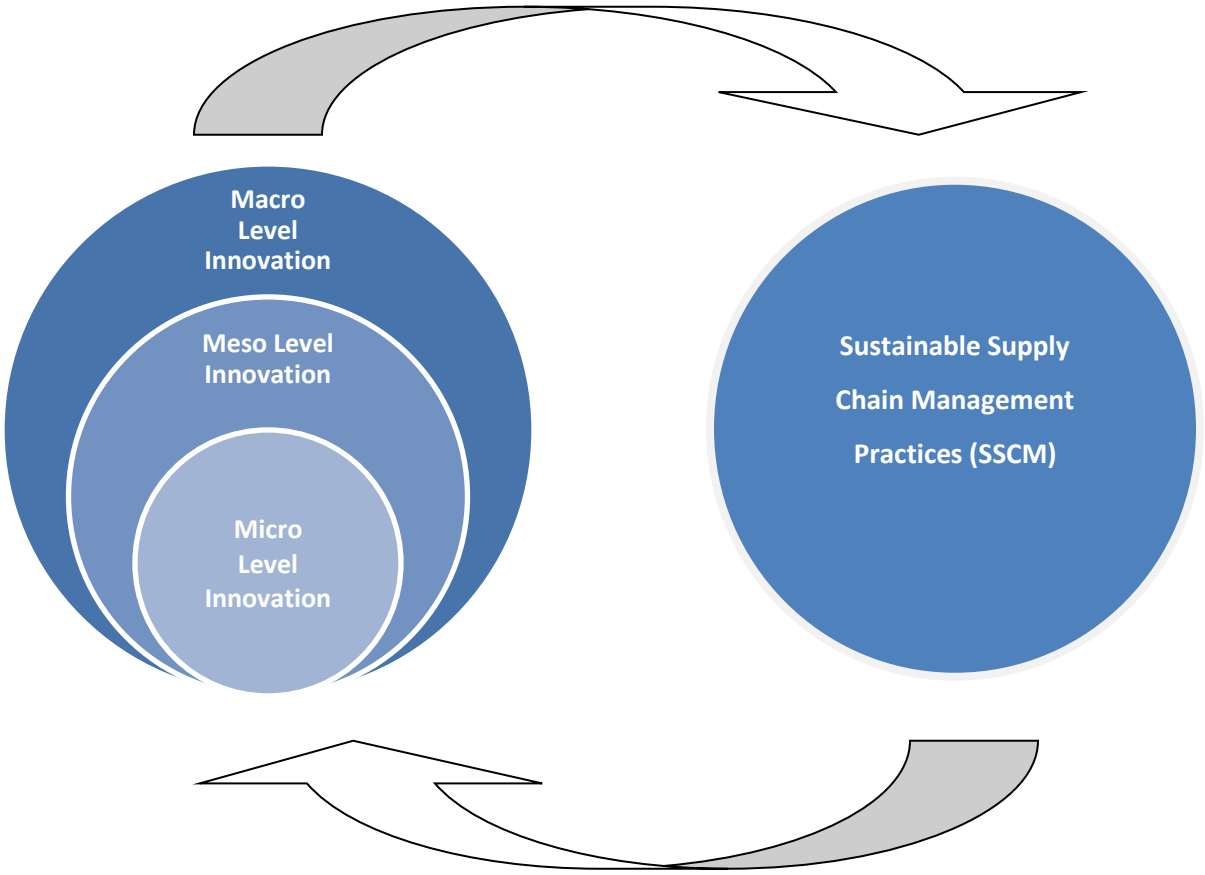


Figure 2. Symbiotic Relationship between innovations and SSCM practices

Organizations at the meso level observe significant improvements in innovations, and they introduce new products or processes that may also improve other supply chain units such as downstream and upstream elements. This level can be exemplified as a new business model innovation in sustainability. Organizations at the macro level are already introducing significant innovations that change other agents in the industry and society that are parts of a broader interconnected ecosystem. As they move from the micro to the macro level, firms have a significant impact on sustainability in the system. Tesla cars, for example, will never be completely sustainable as long as its electrical vehicles are charged by fossil-powered energy sources. However, focusing on innovation and continuous learning, Tesla is expanding its product line to include solar energy panels and high capacity batteries, both of which perfectly represent the transition from micro to meso level innovation.

The majority of innovations in organizations can be identified as micro level innovations (Table 10). Every organization has different learning capabilities and absorptive capacities, and, for this reason, organizations can, based on their resources and capabilities, move through different the innovation levels. The leaps from micro to meso level and meso to macro level require radical shifts in an organization's mindset, shifts that vary with each company. Not all organizations start at a single level. Some launch innovations directly at the meso level by using business model innovation to implement sustainability in their supply chains. Lifestraw, a personal water filter company, is an excellent example of an organization that starts from meso level innovation. Its business model focuses not only product and process innovation but also on meso level innovations that include unique distribution, societal, and financial innovation. Lifestraw targets markets that do not have access to clean water, thus carbon-offset systems become a financial option. So, while this framework shows innovation and SSCM practices

implementation as a sequential process, some ambidextrous organization can straddle more than one level. The ambidextrous organization is one that has a specific business unit or department experimenting with a more advanced stage of innovation while the rest of the organization maintains a conventional approach. The ambidextrous approach to sustainability provides organizations flexibility and better chances for survival in the market (Van Looy, Martens, & Debackere 2005).

Often, firms develop micro level innovations such as an eco-innovation. Eco innovation is a term often confused with sustainability innovation, and both terms are misused in the literature. Compared to eco-innovation, sustainability innovation is a broader concept and includes three aspects of TBL: environmental, social, and economic. Environmental innovation includes new or adapted products, processes, and systems that reduce or eliminate the environmental impact of a supply chain (Kemp & Arundel, 1998). At the micro level of innovation, organizations actively reduce their current environmental impact without fundamentally changing their business model. In other words, organizations innovate to improve on a limited scope such as reduced packaging or use of raw material in a specific product. At this level, innovations are typically incremental and address one issue at a time. Innovation tends to be focused inward with regards to both development and outcome. At this stage, companies typically rely on internal resources to innovate, and the resulting innovations are most likely company-centric: their intent is primarily to reduce costs or maximize profits.

Rather than focusing only on innovations of limited scope, organizations can benefit from a broader new technology or process in their supply chains. Organizations may see opportunities to have all entities in their supply chains comply with sustainability standards, or serve new markets with sustainable products, or become new entrants with business models based on

creating sustainability in their holistic operations. At the meso level of innovation, organizations may reduce their emphasis on creating products and place more emphasis on processes, which often have a higher impact on supply chain sustainability. At this level of innovation, the innovations are both technological and broader inter-organizational, and they are designed to improve sustainability as well as improve the performance of products, processes, and operations. Reducing paper consumption by using computer and electronic methods rather than paper and physical methods is a simple example of a process innovation at the supply chain level. As a summary, the move from micro to meso innovation requires a radical shift in mindset from doing things new and better in a product or process to doing thing new and better within the firm and throughout the supply chain.

At the macro level of innovation, organizations perceive their sustainability initiatives as being part of industry and society, not distinct from them. At this level, innovations are designed and created to be collective and part of the system, and they are more break-through than incremental. System innovation is a great macro level innovation that includes not only a firm's supply chain partners but also includes competitor and other environmental actors. Because the concept is so broad, only a very few new sustainable practices qualify for this level.

Regarding the discussion above, the role of innovation in SSCP varies with the level of innovation, and firms need to introduce many different innovations and practices in quick succession. This could mean developing more than one version at once to comply with and achieve sustainability goals in the marketplace and learn where to focus their energies next. In short, companies need to be highly adaptable, so their SSCM practices need to be highly adaptable too. Firms tend to have diverse patterns while implementing SSCP. The types of innovation and SCCM measures in the literature are summarized in Table 11. In addition to

Table 11, which shows innovation indicator variables, Table 12 shows the different levels of SSCM practices and their applications with examples of different levels of innovation.

Table 11. Innovation types and sustainable supply chain management measurements Developed from Chiou et al. 2011

Constructs for innovation	Indicator Variable
Product	• Developing non-polluting or toxic materials. (For Using environmentally friendly material in practice) • Improving and designing environmentally friendly packaging (e.g., less paper and plastic material) for existing and new products. • Recovery of company's end-of-life products and recycling • Establishing eco-labeling
Process	• Findings methods to achieve low energy consumption such as water, electricity, natural gas, and gasoline during the production, use, and disposal cycle. • Recycle, reuse, and re-manufacture material • Implementing cleaner technology to make savings and prevent pollution (such as energy, water, and waste)
Administrative	• Redefine operation and production processes to ensure internal efficiency that can help implement GSCM • Re-designing and improving product or service to obtain new environmental criteria or directives

Table 12. Level of SSCM practices, their applications and examples and innovation levels

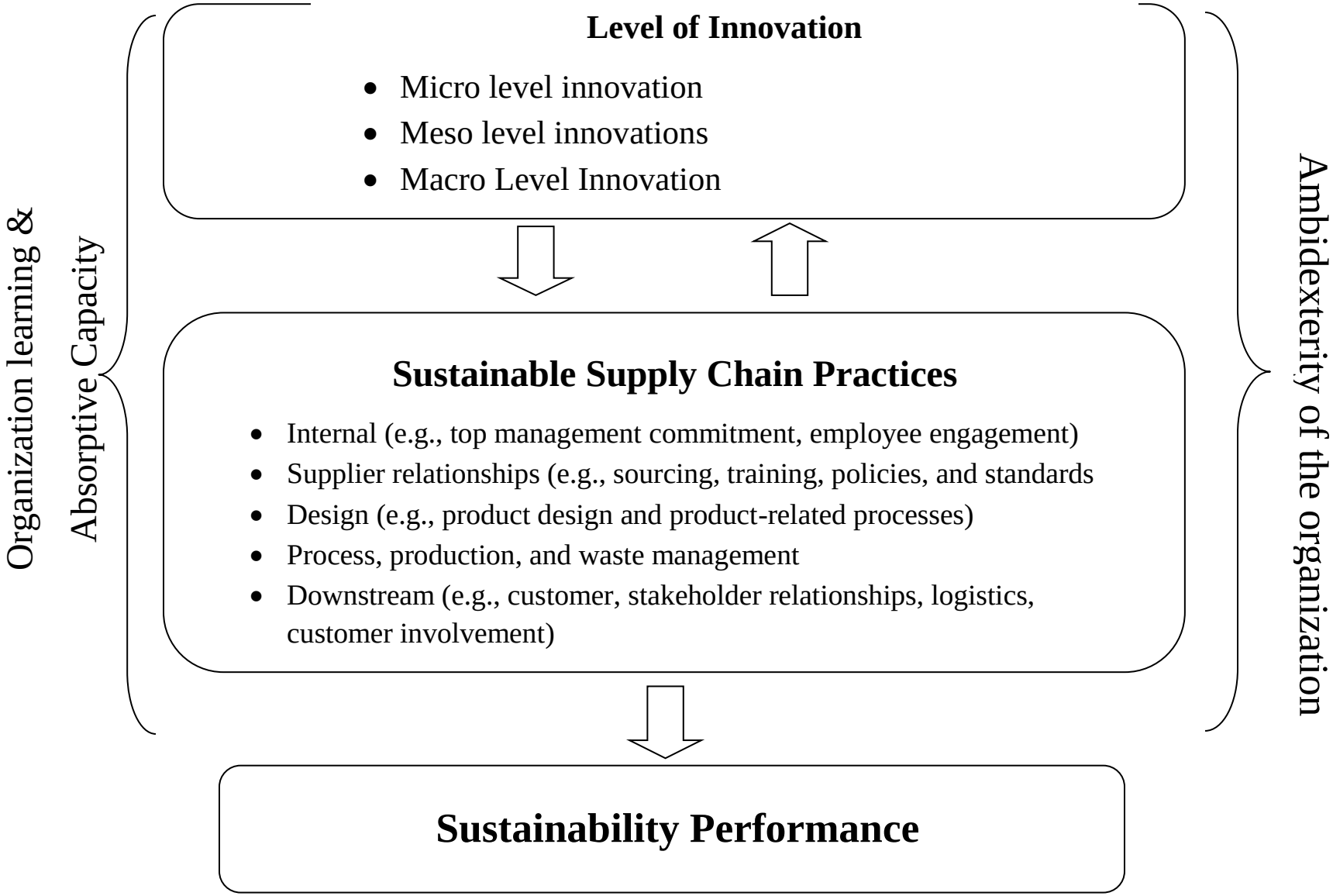
Level of Practices	Application	Example	Level of Innovation
Internal (e.g., top management commitment, Employee engagement)	Supporting environmental stewardship, creating sustainability culture with HR practices	Alcoa, GE	All level, macro mostly
Upstream-Supplier Relationship (e.g., sourcing, training, policies, and standards	Fair trading, setting sustainability standards for suppliers	Trader Joe's, Theo Chocolate, Starbucks, and Ford	Micro and meso-level
Design (e.g., product design and product-related processes)	Innovative product design, materials, and packaging	NIKE, Patagonia	Micro-level
Production and waste management	Eliminating waste, efficient use of resources and materials	Coca Cola, Adobe	Micro-level, meso-level
Downstream (e.g., customer and stakeholder relationships, logistic, customer involvement)	Emphasizing climate change, sustainability education, public health issues	PepsiCO	Macro-level

Sustainable Innovation Performance and Outcomes

One of the objectives of innovation in a firm is to perform at a high level or produce an outcome that will create a competitive advantage in the industry. In the context of sustainability, innovation and new practices mean reducing or eliminating waste, scrap, and improving inefficient processes in production and the supply chain. The relationship between innovation and SSCM practices has been thoroughly reviewed to identify performance measures and outcomes for the SSCM-innovation relationship. The majority of the measures identified come from studies that emphasize innovation and sustainability in general.

Measuring sustainable innovation is something of an issue. The literature review shows that reducing carbon emissions, energy usage, environmental complaints in conjunction with recycling and waste programs are some environmentally sensitive practices of sustainability performance (e.g., Chen, Lai, & Wen 2006). A study by Chen, Lai, and Wen (2006) classified sustainable innovation performance as green product innovation performance, focused only on micro level innovations, and measured each performance with four items. Several other studies (e.g., Chen, 2008; Huang & Wu, 2010; Chang et al., 2011; Wong & Goh,2012; Tseng, Wang, Chiub, Geng, & Lin, 2013) all used the same items to measure sustainable performance. Porter and van der Linde (1995), however, said that firms are increasing their profits and improving their sustainability performance by emphasizing resource productivity. A study by Arundel and Kemp (2009), however, uses input, intermediate output, direct output, and indirect impact as sustainability measures in SCM. These articles consist not only of sustainable innovation but also environmental (or green or eco) innovation because sustainable innovation covers environmental innovation and incorporates societal dimensions alongside the environmental and economic. Therefore, based on the thorough literature review, we propose a theoretical model (See Figure 3) which shows the symbiotic relationship among innovation, SSCM practices and sustainability performance

Figure 3. Proposed theoretical model - Innovation and SSCM practices creations model



Chapter Summary

Basing our remarks on a review of the literature from a variety of interdisciplinary fields, we discussed the current state of innovation and SSCM practices and their effects on sustainability performance. In this chapter, we also summarized the literature and provided comprehensive relevant perspectives in several tables and figures. The following chapter describes the research methodology, and the description includes detailed explanations of the multi-case research methodology and data collection process.

CHAPTER III

RESEARCH METHODOLOGY

To achieve the objective of this the study, an exploratory qualitative research approach was adopted. The advantage to this approach is that researchers are able to obtain participants' stories and their insights into the phenomenon under study. It is because I want these stories and insights about firms' sustainability efforts that I am employing the case study approach. One other advantage to this approach is that the case study methodology helps researchers explore a confined system of a case or multiple cases by utilizing in-depth data collection from information sources rich in context (Creswell, 1998). Moreover, this methodology enables researchers to not only question the concepts and phenomenon itself but also provide a rich, in-depth context (Yin, 2003; Stake, 2013). The multi-case study method utilizes analysis within cases and between cases, and it produces a literature referred to as "creative reframing" (Eisenhardt, 1989). Researchers are interested in case studies because of both their commonality and uniqueness. To date, only limited empirical work has been done that draws on qualitative data to explore the relationship between innovation and SSCM. The multi-case study approach was utilized for this research because it provides robust methodological support that can generate new theories and detailed information (Eisenhardt, 1989; Ellram, 1996) that can help researchers explain the symbiotic relationship between sustainability and innovation. This comparative, multi-case study is designed to explore how organizations develop and implement sustainable practices in their supply chains through the innovation creation process.

Case Selection

The researcher used established criteria from the literature to select the companies for this study. The companies were chosen from multiple industries to identify innovation and SSCM patterns, and only companies that have implemented sustainability in their supply chains were recruited to participate. Multiple industry perspectives may reveal different patterns due to both the nature of the specific industry and the similarities among industries. External sustainability indices and rankings will be used to ensure that the selected companies have developed some form of sustainability practices. The researcher consulted the following sources:

- The Dow Jones Sustainability Index (DJSI). This index monitors the sustainability initiatives and performance of more than 500 top sustainability companies around the world. The DJSI screens companies using annual questionnaires and monitors their performance on critical issues. The index scores and rankings are calculated in accordance with sustainability information systems that are based on a pre-defined scoring and weighting structure. Each score and ranking is also a benchmark with industry scores (n.d. About us. Retrieved from www. sustainability-indices.com).
- The MSCI/KLD Index/Ranking. The MSCI/KLD is a global index that rates 6000 companies (11,000 with subsidiaries) based on their sustainability efforts and performance. Companies are rated and compared against others in their industry and their peers.
- Global Reporting Initiative (GRI). The (GRI) is a comprehensive, global database that includes sustainability reports by companies and organizations about the economic, environmental, and social impact caused by their everyday

activities. GRI's reports can be considered synonymous with other terms for non-financial reporting such as triple bottom line reporting and corporate social responsibility (CSR) reporting.

Participant companies were selected based on the Dow Jones Sustainability Index (DJSI), GRI and MSCI/KLD indices, ranking, and classification. In this dissertation, 30 companies from eight different industries were contacted and 13 of them from seven industries agreed to participate. Two companies from each industry were selected to analyze the industry effect on the phenomena. At the end of case selection one participating company was eliminated from analysis due to a non-existing pair in the same industry. All companies are publicly traded global companies. U.S. and global companies that are based in the U.S. will be selected on the basis of the region controlling specific regulations and ease of accessibility. For this study, interview respondents were selected from those companies that are involved in innovation, and sustainability implementation and adoption in their supply chain management.

Data Collection

To collect data, the researcher has drawn primarily from interviews. The researcher has also supplemented the interviews with data collected from organizational documents and reports. Combining these methods enabled an in-depth investigation of sustainability (Yin, 2008) that includes current practices of SSCM and relevant innovation in the organizations being studied.

Interviews are considered one of the most common and effectively utilized methods in qualitative research and management studies (Denzin & Lincoln, 1994; Shah & Corely, 2006). They have a high response rate, and they make it relatively easy for researchers to collect a great deal of detailed information about a phenomenon under study. Detailed information obtained in a face-to-face interview helps identify and address complex issues (Pedhazur & Schmelkin, 1991).

Interviews can be categorized into three different types: structured (formal), semi-structured, and unstructured (informal) (Fontana & Frey, 1994). The unit of analysis for this study is the individual organization, and data for each participant company is gathered from multiple sources as I briefly mentioned earlier: (1) semi-structured interviews, (2) internal company documents, and (3) publicly available online data (e.g., annual financial and sustainability reports). Semi-structured interviews enable the researcher to gather detailed information about the relationship between innovation and SSCM, the subject of our research, and provide answers to our research questions (Patton, 2005). Rigorous guidelines and steps will be followed in case selection, data collection and the data analysis process (See Figure 4).

After the selection of case participants, each interviewee was contacted by email and/or telephone (Appendix C& D—copies of telephone and email scripts). Interview details are presented in Table 13. From each company, two titles were identified to be part of the research. All the participants were knowledgeable about the research topic and have experience on the topic in their company. Titles of respondents vary in most cases. Regional and global supply chain directors/managers, lead sustainability officers, sustainability directors, lead R&D researchers/engineers and purchasing managers are the titles of the participants. In this stage, researchers obtained information about interviewees' willingness to participate in the study and scheduled an interview with interviewees. In this first communication, participants were informed about the study and interview process.

Figure 4. Research Methodology Framework

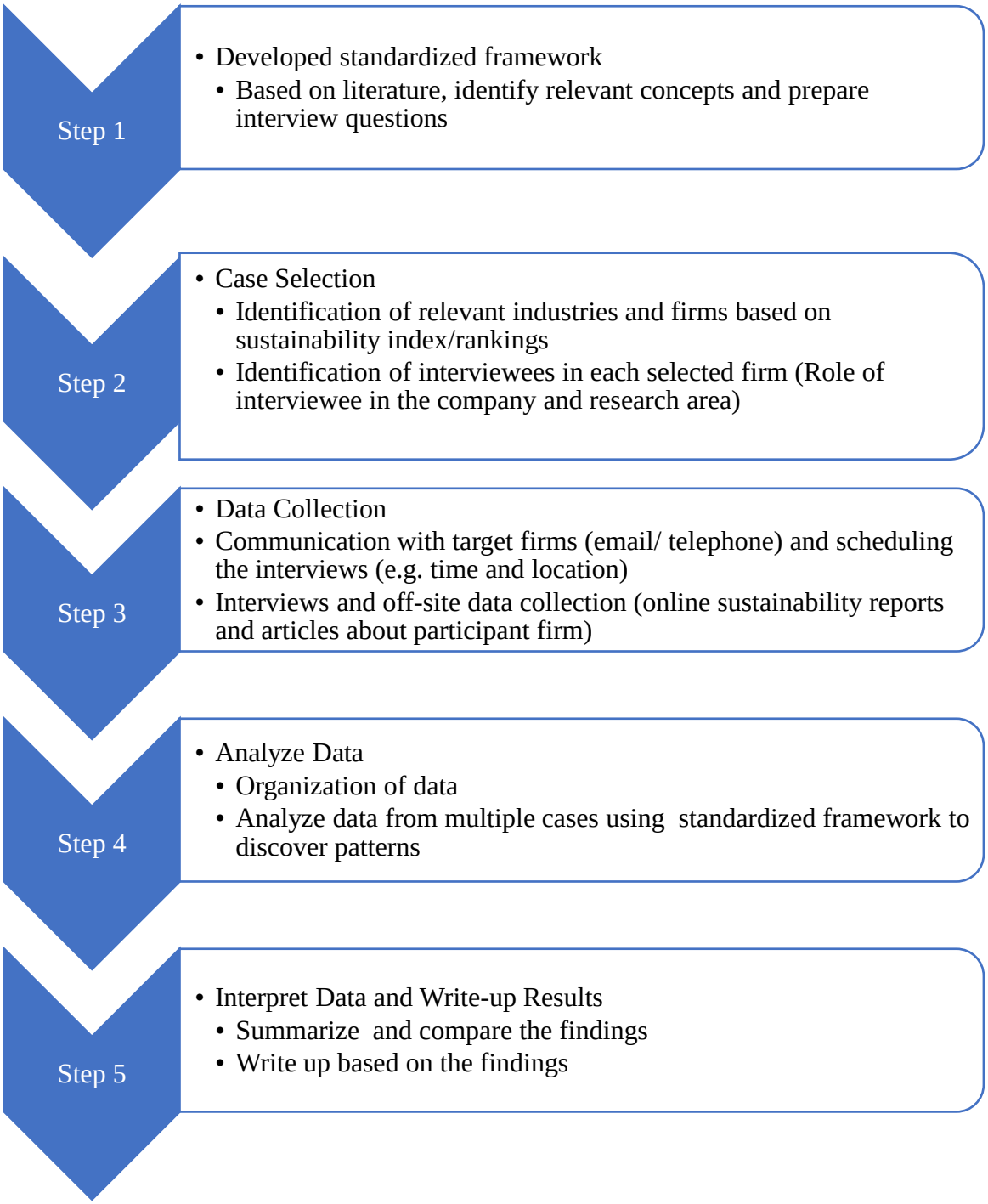


Table 13. Interview details

Cases	Title(s) of interviewees	Experience in research topic (years)	Interview Duration (minutes)
Company A	Associate Supply Chain Director	10	84
	Procurement Director	6	63
Company B	Regional Supply Chain Manager	14	95
	Senior R&D director	12	45
Company C	Supply Chan and Logistic Director	16	55
	Product Development Associate	8	64
Company D	Global Procurement Manager	24	132
	Regional Operation Manager	13	52
Company E	Supply Chain Coordinator	12	53
	Sustainability Officer	5	75
Company F	Regional Supply Chain and Logistic Manager	17	62
	R& D Engineer-Product Development	7	50
Company G	Supply Chain Manager	13	58
	Sustainability Coordinator	8	52
Company H	General Operation Manager	20	115
	Global Purchasing Manager	14	54
Company I	Chief Sustainability Officer	12	64
	Production Director	21	90
Company J	Supply Chain Director	11	82
	Lead Research Engineer	6	48
Company K	Regional Supply Chain Manager	17	52
	Sustainable Development Officer	11	64
Company L	Regional Supply Chain Director	12	58
	Sustainability Officer	4	64

The interview protocol includes questions related to innovation creation and SSCM practices and the roles they played in sustainability outcomes. In each interview, researchers recorded the participants' response by taking notes and audio recordings (with participant's consent) and then the collected data was transcribed and analyzed. Interview questioning is adjusted to companies' backgrounds in sustainability-and their products and services. The researcher analyzed the data by employing content analysis and the pattern matching logic described in Yin (2003).To increase the reliability of the results and establish inter rater reliability, the researcher worked with his advisor to analyze the data and identify the commonalities and differences in the patterns. I also research various concepts related to innovation, SSCM practices, and their adoption process and patterns in the literature.

For this study, interviews continued until a theoretical saturation was reached and no additional information of significance could be obtained (Eisenhardt, 1989; Thompson et al., 1989; Ellram, 1996; Russell & Levy, 2012). In exchange for their participation, participants will receive a copy of the results of the study. The interviews lasted from 45 to 132 minutes totaling 25 hours of interview time with an average length of 68 minutes. Prior to each interview, participants were informed about the purpose of the study and were assured of anonymity and confidentiality after their consent was given. All interviews were conducted in a quiet, convenient place such as an office or coffee shop so that both participants and the researcher felt comfortable. The researcher made a concerted effort to create a comfortable, informal, and friendly atmosphere, and to that end the researcher used a conversational tone and an informal manner so that participants could feel at ease when discussing their experience and knowledge (Eisenhardt, 1989). The researcher also tried to create a feeling of compatibility so that participants felt comfortable offering detailed descriptions and narratives.

After obtaining consent from participants (See Appendix A—a copy of the informed consent form), a thorough interview protocol was followed during this study (see Appendix B). Interviews began with a set of general questions (McCracken, 1988) about participants' demographics and background and were followed by several general questions about narratives and perceptions of supply chain management and sustainability. Participants were asked about how they became involved in innovation and/or sustainability in their organizations, how long they have been involved, the history of their involvement and the like. These questions were aimed at breaking the ice between the interviewer and the participants as well as obtaining information and insights relevant to the research questions. The role of the interviewer was to encourage participants to "describe actual experiences related to their general perceptions rather than allowing the dialogue to stay at an abstract, experience distant level" (Thompson & Haytko, 1997, p. 19) and to elaborate on these experiences and narratives by probing with follow-up questions that clarified questions and answers when necessary. Organizational documents and sustainability reports were gathered from online databases and external sustainability auditing companies to support and validate the information provided by interviewees.

Scholars have criticized the validity of qualitative studies and their methodology, but researchers can utilize numerous validation methods to increase a study's reliability and rigor (See Table 14) (Creswell & Miller, 2000). In this study, a triangulation method was used to establish credibility and validation. Data were triangulated by using several forms of data collected such as literature review, media interviews, and other documents. In addition, as mentioned earlier, transcripts were rated by two researchers and patterns were identified based on their agreements. One of the most severe limitations of case research is that findings cannot

be generalized due to the small number of cases. On the other hand, case methodology provides deep insights of unexplored phenomena that cannot be achieved by other methodologies.

Data Analysis

Data were collected, coded and analyzed. The researchers coded the transcripts and compared the coding. I created documents from the notes from each interview, write-ups of my reactions to the interviews and transcripts from the interviews. These steps were followed right after the interviews. Before the data were analyzed, the researchers – my advisor and I – transcribed all interviews, observations, and documents so that they became familiar with the data (Reissman, 1993). All documents transcribed are in Microsoft Word files, and the data were coded by meaning, not by sentences, which will help researchers understand the logic behind participants' narratives and insights. The interviews were typed on my computer and a password set for each document. Based on the models of data analysis by Creswell (1998), Stake (1995), and Yin (2003), the data were analyzed by both direct interpretation and aggregation of instances in the form of codes. Following the appropriate procedure by Miles and Huberman (1994), the within-case analyses were conducted to derive the key constructs. Then the cross-case analysis was conducted to identify a pattern between cases. In order to answer the research questions, the analysis was conducted over all the cases. As suggested in Yin (2003), individual cases were described but not analyzed. Initial exploratory analysis was conducted to identify the codes (Creswell, 2005). The researcher read through the text from interviews and became familiar with documents and codes (Creswell, 2007). After gaining familiarity with the documents and searching for general ideas, coding and analysis were done with an eye for both descriptive and thematic data (Creswell, 1995). Themes and information were compared across cases for similarities and differences within industry and across the industries. Interpretations were done

from transcriptions using both direct interpretation or "drawing meaning from a single instance" (Creswell, 2007, p. 245) and generalized themes or "making the case understandable and its application to other cases" (Creswell, 2007, p. 246). Interpretation followed by pattern analysis to identify common patterns between cases (Creswell, 2007; Stake, 1995). To ensure validity, triangulation was used across cases.

Within Cases Analysis Methodology

A within case analysis (Miles & Huberman, 1994) was conducted to identify themes and trends within a case study in order to answer the research questions. Later, within-case analysis results were used for cross-case analysis in the same industry and across industries to find common themes between cases. The purpose of this analysis was to determine innovation creation process, possible patterns of innovation and SSCM practices. Furthermore, interactions and effects of innovations and SSCM practices on sustainability performance were identified. The within-case analyses helped the researcher explain levels of innovation and SSCM that are crucial in sustainability implementation. This process had two key steps. First, all of the factors influencing (enabling and or inhibiting) innovation creation and sustainable practice implementation were identified. Once the influencing factors were determined, within case analysis was used to identify the relationship between key constructs and relationships. Within case analysis provides researcher with an extensive data base of process of innovation creation and sustainability implementation for each company and specific industry setting.

Cross-Case Analysis Methodology

The cross case analysis was aimed to identify patterns across the various cases and industries. Cross case analysis was applied to utilize various methods to reduce the amount of information and to exhibit that information in a meaningful approach (Miles & Huberman, 1994;

Yin, 1994). In this method, the researcher aims to identify, analyze and report the common patterns (themes) within data. It also helps the researchers to organize and describe the rich data for interpretation (Thomas & Harden, 2008; Cruzes & Dybå, 2011). In order to utilize the cross-case analysis, individual factors had to be complied across the cases. Some of the constructs identified through the literature review were not important to all cases. Each case described above has gone through its unique process and compared with other cases to identify the similar patterns of innovation and SSCM practices.

Table 14. Case methodology and construct validity. Adopted from c.f. Chapa, 2009)

Tests	Case Study tactic	Phase of research in which tactic occurs
Construct validity	Use multiple sources of evidence	Data collection
	Establish chain of evidence	Data collection
	Have key informants review draft of case study report	Composition
Internal validity	Do pattern matching	Data collection
	Do explanation building	Data collection
	Do time series analysis	Data collection
External validity	Use replication logic in multiple case studies	Research Design
	Use case study protocol	Data collection
Reliability	Develop case study database	Data collection

Chapter Summary

This chapter presents all the detailed procedures of the research methodology and data collection process that will be utilized. Chapter three also notes the target organizations and case selection process that will be used for the interviews. The chapter ended with a discussion of the interview approach that will be used for analysis of the data.

CHAPTER IV

RESULTS

In the previous chapter, a brief information about case selection, cases and this chapter and research method is provided. In addition, background information for each company and a description of the companies' path to creating innovations and implementing SSCM practices are discussed in the chapter 4. Also provided in this chapter, is a presentation of the findings of the within case analysis of each organization and cross case analysis of all the cases that have studied.

Within Case Descriptions

Pharmaceutical Industry

In this study, I selected two pharmaceutical companies to analyze the phenomena. Industry has a unique nature, R&D development budgets are very high, and regulations imposed by both government and industry are strict. The cases studied in this research are major players in the industry. Both companies are market leaders in sustainability and members of the Pharmaceutical Supply Chain Initiative (PSCI) organization, which aims to support pharmaceutical suppliers in their efforts to operate with consistent quality while remaining compliant with industry standards of sustainability and consistent with industry expectations regarding labor, health and safety, environment, ethics, and management systems. Table 15 shows the general characteristics regarding the cases analyzed in the pharmaceutical industry.

Table 15 Summaries of Cases A and B in Pharmaceutical Industry

	Company A	Company B
Research Setting	US headquarter	US headquarter and research center
Size (No. of employee)	Over 7500 employees in US and Canada only	Over 59700 employees worldwide
Age of the company	Over 100 years	Over 15 years
Global Operations	Global	Global
Primary Customers	Consumers, organizations and governments	Consumers, organizations and governments
R&D Expenditure	Over 2 billion U.S. dollars in 2016	Near 6 billion U.S. dollars in 2016

Company A

Company A is a major global pharmaceutical company that was established over a century ago. It has approximately seven thousand employees in the U.S. and Canada, and more than forty thousand total around the world. The company's revenue is nearing $23 billion US, and its R&D expenditure is approximately $2 billion US. I studied the North America division of the company, and I was able to meet with two directors of supply chain management and procurement for the North America region, whose regional headquarters is in the Northeastern U.S.

Company A leads the Over the Counter (OTC) market in the U.S. and offers the majority of OTC medicines. The division operates as both headquarters and research center for its products. The North America office controls the majority of the functions such as product development, manufacturing, and supply chain activities. It also controls the operations and manufacturing facilities in Mexico. The supply chain director described the challenging conditions the industry faces.

> Our supply chain is mainly responsible for direct materials procurement. Within this scope is the responsibility for demand planning, coordination of order management with supply sites, importation, warehousing and

> distribution activities. The nature of the industry limits all those supply chain activities plus the innovation process. Strict regulations on manufacturing and logistics make innovation creation and practice implementation very challenging.

R&D is a big part of the firm's operations, and it spends billions of dollars on research and development of new products and processes that will improve efficiency and profitability. The director stated that his company identifies innovation and the supply chain as the process of translating an idea or invention into products or services that create value for customers. An efficient supply chain is vital for businesses to deliver their products to customers who need them. As the marketplace continues to evolve, supply chain teams must think more innovatively and proactively to balance product flow and costs throughout a product's life cycle.

He went on to say that the process of creating innovations is a complex one. His firm's R&D division facilitates innovation by utilizing a matrix type organizational structure. Different regional, functional, and divisional research teams work independently and cohesively. The creation processes that lead to innovation are generally initiated by local leaders of innovation teams that report to the global team. Company A categorizes innovation into three groups:

- new product creation, development, implementation, and product manufacturing processes
- managerial and administrative manufacturing processes and services
- innovations for improving efficiency, effectiveness, profitability, and competitive advantage

Innovation occurs at all three levels. The macro innovation of the firm's products is readily visible. The director added that,

> Creation of new patents or medicines is a very long journey. Development, testing and approval take years and usually decades. However, the impact of only one single patent is very significant and affects a wide range that includes patients, health care providers, and the industry. It may require a completely different approach in the supply chain including new suppliers, productions systems, and other supply chain actors. Ambidextrous strategy is our firm's main survival action. We have to explore new approaches and products to be sustainable and also to continue to be in the market by using existing practices.

In Company A, both a lean operation and sustainability are important. Its lean effort was an outcome of continuous improvement and quality management efforts that were applied throughout the company's supply chain, including supplier, warehouses and transportation companies.

> We [the supply chain function of Company A] are a very important part of our firm's sustainability, and in general we are responsible for supply chain governance including setting and complying with sustainability standards, monitoring suppliers sustainability and keeping track of sustainable performance measures. These activities increase the accountability of our supply chain sustainability.

The supply chain is focused on increasing the efficiency of manufacturing and other processes by developing new practices that lower greenhouse gas emissions and water usage. In pursuing these developments, milestones were established: zero incident, zero injuries, and zero releases into the environment. In 2014, the company's environmental sustainability, the

development of new manufacturing and supply chain technologies reduced its carbon emissions by six percent and water consumption by 17 percent. Eco-packaging is also an important part of the firm's sustainability effort, but it is very limited due to industry-specific regulations. These development and improvement practices can be identified, based on their magnitude, as micro and meso level innovations. Company A also emphasizes supplier development and an extended code of conduct that aims to improve suppliers' sustainability by requiring suppliers to follow industry and firm-specific standards, and it provides support for implementing newer technologies and methods that increase sustainability. With regard to the sustainability's social aspects, Company A focuses on creating a safe environment for workers and patients. The director explained his company's approach:

> Learning is a big part of our efforts. We learn from our mistakes and attempt to improve our products and processes continuously. It is actually a feedback loop. We develop practices, test them multiple times in our operation, and we have to do that; we are providing healthcare. As a pharmaceutical company and supply chain, we have to work with nature and our society.

Company B

Company B is a major global pharmaceutical company that was established nearly two decades ago. Even though it is a fairly new company in the industry, a significant number of patents and products position Company B as a major pharmaceutical company. It has over fifty thousand employees around the world, revenue exceeding $20 billion US, and an R&D expenditure of approximately $5 billion US. Company B is a foreign global company, and I also studied the North America division of this company. Its headquarters are also located in the

American Northeast. The East Coast division operates as headquarters as well as a research center for its products. The North American office controls the majority of the functions such as product development, manufacturing, and supply chain activities. The office also controls the operations and manufacturing facilities in Latin America. Company B is one of the major companies in creating new projects and products; the firm currently has more than 100 projects in progress. I interviewed its director of supply chain management and the lead researcher of the product development team in two meetings.

Both interviewees agreed that without innovation, Company B would not occupy the position in the market that it does. Both interviewees also agreed that firms must create new innovations and implement new practices while remaining profitable with current practices. Organizational learning is crucial in daily operations throughout every function of the firm.

> Learning and innovation is the nature of our industry. We must keep developing new practices besides our breakthrough division oncology research department. Our products are market leaders such as cancer treatment and cardiovascular treatment option. However we (supply chain and procurement) must support our main operations. As you know, our company has a very big budget for R&D. However it is mostly used by medical research, so we have to be smart to use our limited budget to implement new sustainability practices that keep the cost low. We started our sustainability approach by focusing on lowering cost and keeping our operations as lean as possible. It took years for us to learn how to improve processes, and we worked hard with our suppliers to lower our carbon emission and water usage. We did manage to cut them by 20 to 25 percent.

> One of our main goals was to reduce hazardous waste, and we also managed to do that and reduced the waste by 15 percent, which is indexed to the number of employees.

Economical sustainability is the main driver for Company B's implementation of sustainability practices in its supply chain. Lean practices, internal supply chain practices, and waste management practices are the main economical practices that have been implemented in its supply chain. The firm eventually realized that lean practices, resource, and waste management practices improved its environmental sustainability. Interviewees added that most of the innovation and practices are relevant to single product and process levels, though some, such as lean practices, have a broader scope. The firm established lean practices and worked with its supply chain players so that it affects a broader range and magnitude of sustainability practices.

The social aspects of sustainability and social practices were not well developed until recent years, but Company B now has new social initiatives that capture the social aspects of sustainability.

> We increased the number of our social and ethical programs recently. These programs have different targets: reaching patients by helping seize illegal products, increasing the access of health care (Africa program) and emergency aids in disasters, reaching employees by employing code of conduct training within our company and supply chain units, increasing employee health and safety conditions, and reaching the society by fighting counterfeit and illegal medicines.

Company B's social practices have very broad effects on its surroundings and society, which can be described as meso to macro level innovative practices in social aspects of sustainability.

Medical Device/Equipment

The medical device and equipment market in the U.S. is one of the largest in the world; revenues are nearly $140 billion US and comprise approximately 40 percent of the global market. R&D expenditures are very high, and one of the highest in revenue/R&D ratio in the U.S. market, averaging 6.7 percent. The ratios and R& D numbers show that the industry is decisively innovation oriented. Table 16 summarizes the cases that were studied in this research.

Table 16 Summaries of Cases C and D in Medical Technology and Devices Industry

	Company C	Company D
Research Setting	US headquarter	US headquarter
Size (No. of employee)	Over 54000 employees Worldwide	Over 48000 employees worldwide
Age of the company	Over 150 years	Over 80 years
Global Operations	Global	Global
Primary Customers	Consumers, organizations and governments	Consumers, organizations and governments
R&D Expenditure	Near $ 300 million	Not disclosed

Company C

Company C is a major medical device company that was established over a century ago. It has approximately 54,000 employees around the world, and its revenue is approaching $7 billion US. I studied the North America division of the company. I had two meetings (one of them via telephone) with two directors of supply chain management and the regional R&D director. The North America headquarters of the company is located in the Northeastern U.S. As in the pharmaceutical industry, innovation and improvement are crucial in the medical device industry if it is to survive and be successful. Innovation creation and R&D activities help the

firm increase its efficiency and improve product and process performances. The regional director of Company C explained the innovation process:

> Due to the nature of the industry and our company's vision, innovation is in our DNA. The medical field has very strict regulations which may slow down innovation creation. We encourage innovation and new ideas in our company. We have a global program that creates opportunities for our employees to present their new ideas and improvement.
>
> We adopt continuous improvement in every level of our operations. We are investing over two billion dollars in improving our building to have green buildings. Our goal is to achieve 100 percent customer satisfaction with cost effective sustainable solutions. Our firm continuously searches for new innovations while efficiently managing current condition. We have several teams that are assigned just for R&D projects at every level besides our daily operations.

Company C's primary goal is to introduce innovative processes and products that will increase customer satisfaction and firm performance. The company's main emphasis is on the process innovation that will enable it to reach its sustainability goal. Water consumption, efficient material management, and waste management are some of the major improvements that enable Company C to outshine others. Additional improvements in production processes and sustainable sourcing with green manufacturing facilities have improved production's sustainability performance.

The quality of life of both employees and the community is important to Company C. Continuous improvement programs that promote employee health and safety as well as

community wellness programs are the major social sustainability efforts undertaken with the aim of increasing Company C's sustainability initiatives.

Company D

Company D is a major medical device company that was established over 50 years ago and is now one of the biggest competitors of Company C. It has approximately 50,000 employees around the world, and its revenue is nearing $10 billion US. In this case analysis, I studied the North America division of the company. I had separate meetings with the director of the supply chain and the lead sustainable product development engineer from the company's northeast office in U.S.

Company D prioritizes sustainability and innovation efforts in its operations. The company's objective is to reach sustainability goals by using innovation to achieve sustainability standards at every level of the organization, and in doing so the firm utilizes various practices to satisfy the triple bottom line approach.

The company focuses on product innovation that reduces the environmental impact of each product. Quality management practices, lean practices, recycling, and packaging are the major areas in which the company implements environmental sustainability.

> Our products must be sustainable if we want to survive in this business. To create sustainable products, we need new ideas, new approaches, and new ways of thinking. That is why innovativeness is a crucial factor for our company's sustainability effort. We continuously improve our product quality so that we can reduce patient complaints. In 2016, we reduced the number of complaints by 13 percent compared to last year while increasing our sales. At the same time, we used the materials efficiently,

so there was less material input; we achieve higher output and with most of our materials, we make sure we use sustainable resources. Since we source sustainable material, we also implement recycling so we reduce our packaging material by 12 percent. These numbers are huge. If you look at our sales numbers, they are in the billions. We reduced the energy and water use and waste which is 10-15 percent of our revenues. We are very happy with our sustainability outcome.

Company D's efforts to promote sustainability are not limited to the environmental level. The firm also emphasizes such social sustainability practices as employee health and safety, and supplier and local community practices. Working with suppliers and local government agencies to improve sustainability in the supply chain is part of the supplier development programs.

Food

The food and confectionary industry is beginning to understand the significance of sustainability. A growing number of companies are working to introduce environmental and social improvement in product ingredients, manufacturing, and packaging. The confectionary industry has revenues over $35 billion US, and it provides over 55,000 jobs in the U.S. alone. Table 17 summarizes the cases that were studied in this research.

Table 17 Summaries of Cases E and F in Food and Confectionary Industry

	Company E	Company F
Research Setting	US headquarter	US headquarter
Size (No. of employee)	Over 15000 employees worldwide	Over 70000 employees worldwide
Age of the company	Over 110 years	Over 100 years
Global Operations	Global	Global
Primary Customers	Consumers	Consumers

Company E

Company E is the industry leader in the U.S. confectionary market. Sustainability is important for this firm, and the company is listed and well ranked in several sustainability indices. The company has been committed to sustainability and the triple bottom line approach long before sustainability became a trend in the market.

The company implements several sustainability practices to reduce its environmental impact such as reducing carbon emission waste, water consumption, and packaging material. Supplier development is another practice it implements to promote both environmental and social sustainability. Innovation in processes and its supply chain, the company believes, is the key to reaching sustainability goals.

> Confectionary is a very stagnant industry, so we do not see product innovation frequently. However, it is very common to see process innovation in manufacturing and the supply chain. Our company has been the market leader in every level. We currently invest millions of dollars to increase our water efficiency. With new production methods we use less but higher quality water in operation which increases quality and the quality of life in the communities where we operate. We also focus on eco packaging and waste management. We work with designers and engineers to design our processes and packaging to reduce our impact on the environment.

Company E also has been focusing on the social aspects of sustainability for several years. It has created social practices, new programs, and a service company that reaches into communities with the aim of increasing their living standards. It focuses on a broad range of

social responsibility activities that affect the company, its supply chain, and society, so we can identify its innovations and developments as macro level innovations and developments.

Company F

Company F is one of the major confectionary companies in the market. The company invests more than a billion dollars into improving its sustainability initiative. The main sustainability aspects that Company F focuses on are environmental and social sustainability. The firm's sustainability principles involve increasing the quality of life for employees and communities while taking care of the environment.

> Our value chain is huge. We believe we have over one million lives in our value chain. We want to create a healthy, high quality and safe environment for those people. We can achieve that by investing in people and the environment. We believe that if we take care of Mother Nature, we can make a difference in communities and provide a better future for our kids. Innovating new approaches to operation is the only way to be sustainable. World population is increasing and we have to be more efficient with resources so we can sustain life on earth.

As the lead sustainability officer mentioned, the supply chain is vital in implementing sustainability, for it consists of several elements that have a direct effect on the environment and society. Company F uses innovation and R&D to increase the efficiency of production and material use at every level of the supply chain. Using responsible resources increases the firm's environmental sustainability performance.

Advanced Energy Storage and Solutions

The advanced energy storage and solutions industry suffers from a poor sustainability image due to the materials it uses in its products. But the industry also has the highest recycling rate compared to other industries. Advertisements, recycling educations, and buyer-integrated recycling programs make the industry one of the top performers in recycling. In the U.S., 99 percent of lead-acid batteries are recycled (SmithBucklin Statistics Group, Chicago, Illinois April 2014). Table 18 summarizes the cases studied in this research.

Table 18 Summaries of Cases G and H in Advanced Energy Storage and Solutions

	Company G	Company H
Research Setting	US headquarter	US headquarter
Size (No. of employee)	Over 8000 employees worldwide	Over 9000 employees worldwide
Age of the company	Over 70 years	Over 100 years
Global Operations	Global	Global
Primary Customers	Consumers, organizations and governments	Organizations, consumers and governments

Company G

Company G has been operating in the battery industry for over 70 years, and it emphasizes the future of energy storage solutions and sustainability practices. The company implements continuous improvements, and it pursues new technological advancements in battery technology. Company G mainly produces industrial batteries such as auto batteries, industrial equipment batteries, military level batteries, and even batteries for the space program.

> Current batteries in the market are mostly lead-acid, nickel-metal hydride (Ni-MH) and Lithium-ion (Li-ion). All of those have been on the market for decades and as a technology, they are in the maturity stage. We have already reached 90 to 95 percent efficiency in the batteries, and new technologies demand better performing batteries. That is why innovation

> and R&D is very important. Currently in our company, we are very ambidextrous. While we maintain our old system batteries, we are continually seeking for improvement and new battery technologies. If we do not spend time and money on development, we could be out of business soon. While we are looking for new battery technologies, we are also looking for solutions that will help us use resources efficiently so we can use less input and get more output. That is why we focus on sustainability practices, mainly recycling. For example, we can 100 percent recycle lead-acid batteries, which achieves our environmental and economic sustainability goals. We have several initiatives to increase the reserve logistic, and we have curbside pickup for used batteries. We produce more than 30,000 batteries a day for various customers. Mostly we use our own truck to deliver the orders to customer. While we deliver the product, we utilize the same trucks to pick up the used batteries. It is a win-win situation. We recycle the lead, acid, and plastic from batteries. Currently we have several awards and recognitions for sustainability, including IS0 14001.

Innovation is Company G's main sustainability focus, and it emphasizes environmental sustainability. However, while it implements environmental practices, it also achieves its economical sustainability goals. By recycling batteries, the firm decreases its costs significantly and it tries to impose the same sustainable practices on its suppliers so they too can achieve a lower environmental footprint while still making money. Waste management and lean

manufacturing are the other practices that the company actively implements to promote sustainability.

Company H

Company H is the industry leader in industrial energy storage, and it operates in more than 100 countries. Through the acquisition of small companies, the firm has been growing rapidly. Company H provides different energy solutions for different energy needs, which are growing every day. It uses its advantage as an industry leader to work on innovative new products and systems that will meet the energy storage needs of tomorrow. These innovations range from enhancements of existing products with higher reliability and efficiency rates, to innovative service solutions, and to transformative technologies that will change the power solutions of the future. Company H's innovation strategy is based on delivering better products that reduce costs, extend product life cycles, and reduce environmental impact. In an interview, several new innovations and practices were identified. The number one sustainability practice in the company, just as in Company G, is a recycling program. Due to the high cost of material and hazardous conditions, battery firms aim to invest in recycling activities so that they remain sustainable and can reduce costs. The cost reduction is derived from efficient material use or re-use, waste elimination, and efficient supplier and distributor relationships. The company also implements life cycle analysis and related practices to provide better service to customers and increase product efficiency. In cases where the design of products is simple and not to open to new design such as industrial batteries, the company focuses on production processes to increase sustainability in manufacturing and logistics activities.

Heating and Energy Solutions

Heating and energy solutions is an industry that has a direct effect on sustainability issues. The industry is evolving around new energy sources, so efficiency is becoming a key factor in the heating and energy solutions industry. Table 19 summarizes the cases that were studied in this research.

Table 19 Summaries of Cases I and J in Heating and Energy Solution

	Company I	Company J
Research Setting	US headquarter	US headquarter
Size (No. of employee)	Over 12000 employees worldwide	Over 29000 employees worldwide
Age of the company	Over 100 years	Over 100 years
Global Operations	Global	Global
Primary Customers	Consumers, organizations and governments	Organizations, consumers and governments
Revenue	12 billion dollars	11 billion dollars

Company I

Company I is a well-known heating and energy solution global brand. The company has over 10,000 employees with manufacturing and design facilities in 14 countries and sales in more than 60 countries. Its main products are heating and building systems and renewable energy. The firm's developed vision focuses on innovative, sustainable, and responsible systems. Company I is the market leader in innovative products. In fact, several products in the company's history have changed the industry. The company sees innovation as an opportunity for greater efficiency and sustainability that also develops solutions that help protect the environment.

> Our main objective is creating products that are more efficient, products that are particularly effective. We try our best to innovate. It is not easy, as R&D activities depend on many other factors such as costs, raw materials,

> and production. Sustainability and innovation is a continuous process; actually it is a cycle. Once you start the process you need to continue. We see sustainability and innovation as complementing activities. Sustainability is a complex issue. For example, some sustainable products/process can be sustainable in different countries, but it may have different effects in other countries. Sustainability is a big picture. That is why we need new ideas and innovation. We study our products again and again to see how we can improve them. For example, our heat pumps. We improved their efficiency by reusing the waste heat produced, which increased efficiency of the pump by 20 percent. We focus on materiel efficiency, so product life cycle analysis is very crucial for us.

That practices and programs of Company I engage in all three aspects of sustainability. The major activities that the company implements for environmental and economic sustainability are material management, recycling, eco-product, waste management, process design, and lean practices. The company also focuses on elevating the quality of life of their employees and society by implementing health and safety practices and educational programs.

Company J

Company J is one of the other main competitors Company I has in the U.S. market. This company has over 25,000 employees, operates in over 100 countries, and has over 20 manufacturing facilities around the world. In 2016, its annual revenue was over $11 billion US. The firm focuses on creating innovations that provide efficient products to its markets. The director of the global supply chain commented on his company's sustainability efforts:

> Creating new technologies drives our company to achieve higher customer satisfaction. As a major company, we want to grow by innovating and finding new ways to satisfy our customer. We implement continuous improvement at every level of our organization. Sustainability is one of the innovative channels that we want to strive for in our holistic operations. As a company, introducing new products and processes to decrease our carbon emission and increase our sustainability impact in every aspect of it, but mainly in environmental sustainability. Our innovative perspective helped us to develop several sustainability practices including reducing water and raw material use and focusing on lean practices and waste management while supporting our community in social issues. We measure our innovation performance, and by using innovative methods and sustainable products, we increased our revenue by 25 percent in the last four years.

Company J implements innovation and sustainability into several different stages in its supply chain. Product innovation and sustainability, materials management, supplier development, transportation, customer integration, and product life cycle are the major areas where Company J develops innovative sustainability practices.

Small Consumer Electronics

The small electronics and personal electronics industry is growing drastically due to new technological developments. Increasing efficiency due to automation and lower labor in developing countries support the rising trend of small electronics. The industry is known for fast-paced product introduction and technological developments. The downside of new product introduction is growing sustainability concerns. Increased energy consumption due to high use of

electronics, electronic waste, limited recycling programs, and some health and well-being effects of small electronics challenges the sustainability of the industry. Table 20 summarizes the cases that were studied in this research.

Table 20 Summaries of Cases K and L in Small Consumer Electronics

	Company K	Company L
Research Setting	US headquarter	US headquarter
Size (No. of employee)	Over 30000 employees worldwide	Over 300000 employees worldwide
Age of the company	Over 90 years	Over 100 years
Global Operations	Global	Global
Primary Customers	Consumers, organizations and governments	Consumers, organizations and governments
Revenue	12 billion dollars	73 billions dollars

Company K

This company mainly operates in small electronics and electronic industrial solutions. In the U.S., Company K has three main divisions that contribute small personal electronics, medical devices and industrial devices with innovative sustainable solutions to society. These industries are highly competitive and compete on technology, product quality, and innovation. A global company, Company K has over 40,000 employees around the world and revenue over $1.5 billion US. Even though the company suffered from some political and financial crises, it was able to recover its efficient global operations.

Innovation is the key factor that dominates the industry. Competition and a high-speed technology clock pressures firms to seek innovation and new product and processes continuously. Since its establishment early in the twentieth century, Company K has considered itself an innovation driven company.

Our company, back between 1920 and 1960, invented several products

such as high quality biological microscopes and medical cameras in the

> medical area, high quality professional cameras in the personal electronics division, which make Company K a pioneer of the industry. Nowadays, we are currently focusing on sustainability to reduce our impact on our planet and the lives on it while still innovating high quality opto-digital products. We are the market leader in the endoscope business.

Company K adopts new strategies to increase its innovation capabilities. These new strategies focus on daily improvement and practical implementation in its production while producing high quality products. The director stated that, "continuous improvement and quality management are the key practices that increase our performance." The company's emphasis is on its environmental and manufacturing processes. To achieve its environmental goal, the firm implements new practices and technologies that enable it to reuse and recycle materials and reduce waste from its operations. The scope of recycling and waste management is generally limited (micro level) and is usually implemented in Company K only. However, the company has been successfully implementing a lean management system in its supply chain, which has become part of its organizational culture. Sustainability development officers mentioned that:

> Our company complies with all required environmental, health and safety laws and regulations. Where there is a shortcoming in regulation, our company will develop and adopt our own internal standards to protect human health and the environment. We will monitor this process to ensure compliance with these requirements.

The firm has established new sustainability programs and practices to ensure that it will achieve its goals in next five years. These practices are economically and environmentally driven innovation and practices implemented in very component of its

operations. $C0_2$ emission reduction with waste elimination, Leadership in Energy and Environmental Design (LEED) principles for design, eco-packaging, energy efficient buildings, manufacturing, product life cycle management, and recycling practices are some of the main practices that company implements for sustainability.

Company L

For engineering and electronics, Company L is one of the largest companies in the world. The company has several major divisions globally such as automotive parts, consumer goods, electronics, and building systems. The company spends over $3 billion US on R&D and has nearly 4,000 patents published per year. For the last two decades, the company's main interest has been implementing sustainability and efficiency at every level of its operations. The supply chain director commented on the company's sustainability effort:

> As a major player in the world, we need to lead the market with sustainability so other companies can follow us. We believe that we can make a major contribution to solving problems by finding new solutions and practices. We take innovation and sustainability seriously, and we do not emphasize only one aspect of it, we do it all.

The sustainability officer added that:

> We are the leader in the market. We have several activities and innovations that we implement which were not available. We had to develop them from scratch. As a consumer small electronics department, we find new ways to manufacture and reduce the CO_2 by 35 percent and reduce waste by 5 percent. We continuously audit our suppliers for

environmental and health and safety issues so we can increase the diversity in the supply chain and reduce the number of accidents.

Cross-Case Analysis

Each case described above has gone through a unique process of innovation and sustainability in its operations. This evolutionary process and the relationship between innovation and SSCM practices and the levels of innovation are captured in Table 21. The table lists and compares all 12 cases based on innovation levels and SSCM practices. I discuss now how each of these areas of comparison plays out in these cases.

The results of the cross-case analysis showed that the innovation creation process varies based on companies' resources and product types; however, some innovation patterns are similar. The companies emphasize innovation because of market conditions and economic factors, and they pursue innovation and sustainable practices with the aim of cutting their long-term operational costs. Environmental and economic practices such as waste management and quality management are the most common practices across industries and the cases studied. Only a few of the cases actually innovated to implement social sustainability to impact society and improve the quality of life in their communities.

Some industries are highly regulated, so product development in such industries as pharmaceuticals and medical devices can take years. Those industries tend to focus on product/process innovation at the micro level, quality and lean management practices at the meso level, and social practices at the macro level, such as social initiatives in developing countries. Table 22 provides a detailed summary of the innovation creation process and SCCM practices.

Innovation Focus	Cases / Firms / Industry Cases/ Firms SSCM Practices	Pharmaceutical		Medical Device / Equipment		Food / Confectionary		Advanced energy storage and solutions		Heating / Energy Solutions		Small Electronics	
		A	B	C	D	E	F	G	H	I	J	K	L
Meso level, Supply chain level	Lean Practices	X		X	X	X		X	X	X	X	X	X
Micro-meso level Product oriented	Recycling / Waste Management	X	X		X	X	X	X	X			X	X
Micro Level Single product / Process oriented	Eco-Product/process design	X	X		X	X	X	X	X	X	X	X	X
Meso Level Supply chain level	Quality management practices	X	X	X	X	X			X	X	X	X	X
Meso Level-Macro Supply chain & Society	Code of Conduct/ Extended code of conduct	X	X	X	X	X	X			X	X	X	X
Micro Level Single product	Eco-Packaging	X	X			X	X						X
Micro Level Product	Product life cycle			X	X			X	X	X	X	X	X
Meso – Macro Level	Health and Safety	X	X	X		X	X		X	X	X	X	X

Table 21 Case summaries with SSCM practices

Table 22 Innovation Creation and SSCM practices

Innovation Creation Processes and Patterns						
Major SSCM Practices						
	Lean Practice	**Recycling/ Waste Management**	**Eco-Product/process design/Life cycle**	**Quality management practices**	**Code of Conduct/ Extended code of conduct/Health and Safety**	**Eco-Packaging**
Company A	Collaborative relationship with supplier to implement, Shared R&D resources New methods and process created to reach lean practices Often starts as micro innovation, one directional	Often new methods implemented separately or firm pushes suppliers to implement. Often micro level innovation	Develop with collaboration, Micro level, one direction No product life cycle analysis	Often implemented by main company and impose to suppliers, industry standards are high, meso level	Main firm develops, meso-macro level	Main firm implement and impose them to suppliers, micro level
Company B	N/A	Firm pushes suppliers to implement.E.g. expired medicine recycling. Often micro level innovation	Develop with collaboration, Micro level, one direction No product life cycle analysis	Often implemented by main company and impose to suppliers, industry standards are high, meso level	Main firm develops, meso-macro level	Main firm implement and impose them to suppliers, micro level
Company C	Integrated relationships with supplier and distributors Often starts as micro innovation, often one directional	Often new methods implemented separately or firm pushes suppliers to implement. Often micro level innovation	Only product life cycle analysis, main firm only, micro innovation	Often implemented by main company and impose to suppliers, industry standards are high, meso level	Main firm develops, meso-macro level	N/A
Company D	Supplier development and shared R&D resources Often starts as micro	Little collaboration in new methods development or firm pushes	Only product life cycle analysis, main firm only, micro innovation	Often implemented by main company and impose to suppliers, industry	Main firm develops, meso-macro level	N/A

Innovation Creation Processes and Patterns						
Major SSCM Practices						
	Lean Practice	**Recycling/ Waste Management**	**Eco-Product/process design/Life cycle**	**Quality management practices**	**Code of Conduct/ Extended code of conduct/Health and Safety**	**Eco-Packaging**
	innovation, multi directional	suppliers to implement. Often micro level innovation		standards are high, meso level		
Company E	Collaborative relationship with supplier to implement New methods and process created to reach lean practices Often starts as micro innovation, often multi directional	Firm and suppliers has separate practices, Micro level	Firm develops and impose the new product and processes, Micro level No product life cycle analysis	Often implemented by main company and impose to suppliers, industry standards are high, meso level	Main firm develops, meso-macro level	Main firm implement and impose them to suppliers, micro level
Company F	N/A	Firm and suppliers has separate practices, Micro level	Firm develops and impose the new product and processes, Micro level No product life cycle analysis	N/A	Main firm develops, meso-macro level	Main firm implement and impose them to suppliers, micro level
Company G	Collaborative relationship with supplier to implement New methods and process created to reach lean practices Often starts as micro innovation, single directional	Collaborative relationship with supplier to implement, Micro level single product	Firm develops and impose the new product and processes, Micro level	N/A	N/A	
Company H	Collaborative relationship with supplier to implement New methods and process created to reach lean practices Often starts as micro innovation,	Collaborative relationship with supplier to implement, Micro level single product	Firm develops and impose the new product and processes, Micro level	Often main firm or implemented separately, meso level	Health and Safety only, Main firm develops, meso-macro level	

Innovation Creation Processes and Patterns						
Major SSCM Practices						
	Lean Practice	**Recycling/ Waste Management**	**Eco-Product/process design/Life cycle**	**Quality management practices**	**Code of Conduct/ Extended code of conduct/Health and Safety**	**Eco-Packaging**
	single directional					
Company I	Collaborative relationship with supplier to implement New methods and process created to reach lean practices Often starts as micro innovation, multi directional	Collaborative relationship with supplier to implement, Micro level single product	Develop with collaboration for product , process development separately Micro level, one direction	Often main firm or implemented separately, meso level	N/A	N/A
Company J	Collaborative relationship with supplier to implement New methods and process created to reach lean practices Often starts as micro innovation, multi directional	Collaborative relationship with supplier to implement, Micro level single product	Develop with collaboration for product , process development separately Micro level, one direction	Often main firm or implemented separately, meso level	N/A	N/A
Company K	Collaborative relationship with supplier to implement New methods and process created to reach lean practices Often starts as micro innovation, multi directional	Limited collaboration in new methods development or firm pushes suppliers to implement. Often micro level innovation	Firm develops and impose the new product and processes, Micro level	Often main firm or implemented separately, meso level	Main firm develops, meso-macro level	N/A
Company L	Collaborative relationship with supplier to implement New methods and process created to	Full collaboration in new methods development or firm pushes suppliers to implement.	Firm develops and impose the new product and processes, Micro level	Full integration, Company L develops meso level	Main firm develops, meso-macro level	Company L develops

Innovation Creation Processes and Patterns						
Major SSCM Practices						
	Lean Practice	**Recycling/ Waste Management**	**Eco-Product/process design/Life cycle**	**Quality management practices**	**Code of Conduct/ Extended code of conduct/Health and Safety**	**Eco-Packaging**
	reach lean practices Often starts as micro innovation, multi directional	Often micro level innovation				

CHAPTER V

DISCUSSION AND IMPLICATION

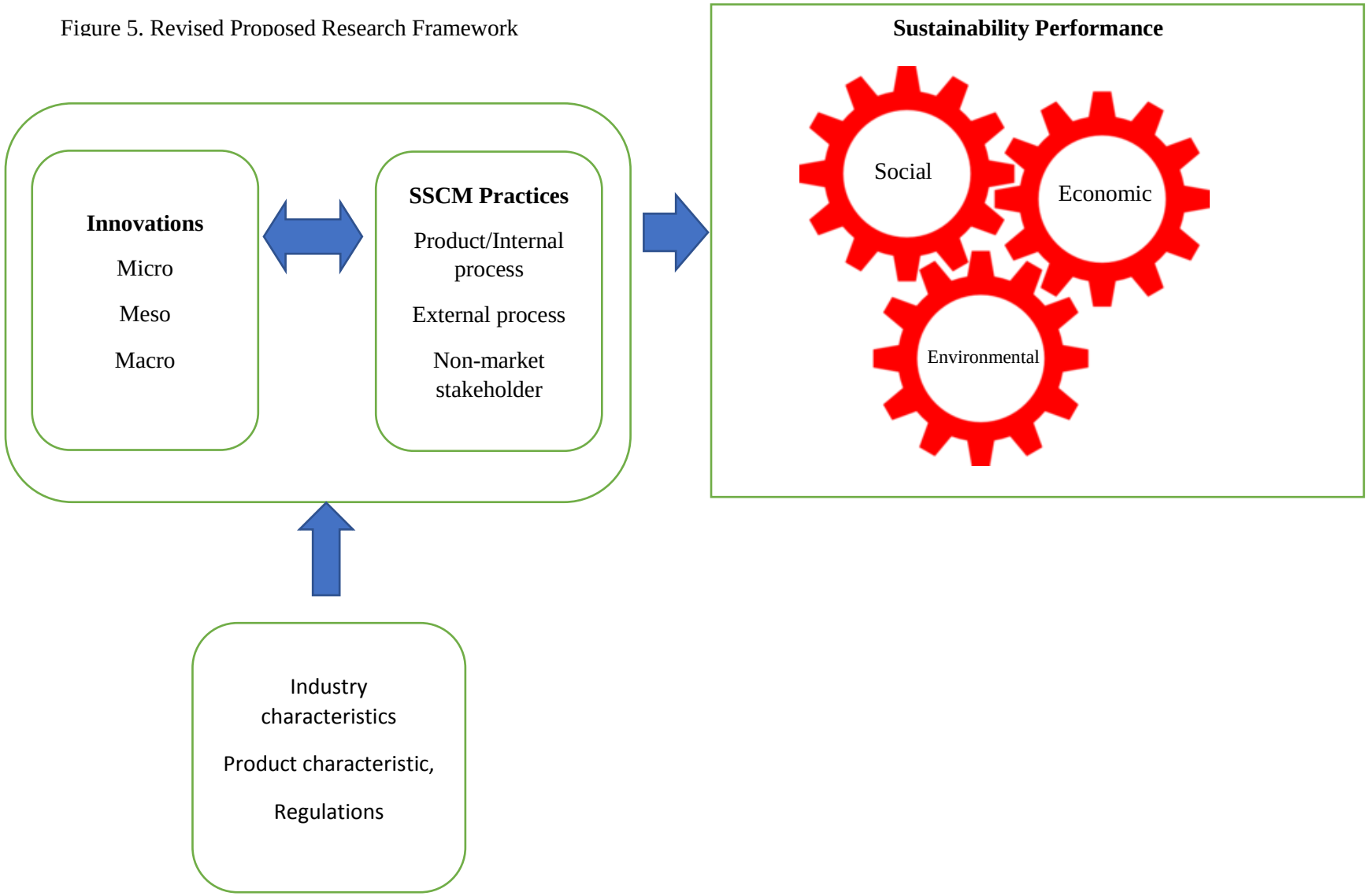
Chapter 5 explores the theoretical perspectives and case study findings to develop propositions between the theoretical model's constructs (see Figure 5). This chapter offers explanations for each proposition along with the empirical results, developed from the analysis of cases that support the explanations. The chapter concludes with limitations of the study and implications for future research.

Multiple Level Innovations Perspective and SSCM Practices

To achieve sustainability, all the cases researched for this study implemented new techniques and practices. Micro level innovations were created to implement sustainability; however, their scope is limited. Evidence from the cross-case comparisons suggest that firms creating micro level innovations promote certain types of SSCM practices such as eco packaging, eco-product/process design, product life cycle analysis, and some degree of waste management. Eco-packaging is one of the practices implemented in only four cases from pharmaceutical and food industries. Product conditions, industry regulations, and type of final consumers are the common factors between cases in the same industry and across industries. The firms implementing eco-packaging manufacture consumer products, pharmaceuticals and food, for instance, that have short shelf lives and are consumed frequently. These two industries in particular are highly regulated. The companies with industrial buyers are somewhat different.

They emphasize and implement product life cycle analysis to enhance their products sustainability in order to accurately forecast buyers' demand. In other words, of six industries, only food and pharmaceuticals are not implementing product life cycle analysis.

Figure 5. Revised Proposed Research Framework



New micro and meso level techniques and practices have been developed by the firms so that they can implement recycling and waste management practices. Almost all the cases, with the exception of medical device and heating and energy solutions industries, adopted new methods to reduce carbon emissions and manage material and water usage in their processes. These new methods were mostly implemented at the single product and process level. The most common characteristics of industries managing waste are the types of materials used in production and their emphasis on specific aspects of sustainability. Small electronics and advanced energy storage companies, for instance, focus on recycling and reusing materials to reduce their environmental and economic footprint. The pharmaceutical and food industries reduced water and material use to increase their economic sustainability.

Among the cases, eco product/process design was one of the major practices developed through micro level innovations. Sustainability requirements, customers' needs, and efficiency objectives are usually the motivators for the development of new techniques and methods, which requires single product and process level innovations. Only one industry, medical device, does not focus on eco product and process design to comply with industry standards and regulations. The case analysis suggests the following proposition:

> *Proposition 1: Firms that create micro level innovations tend to emphasize the product and internal process innovations to facilitate effective implementation of product and process-oriented SSCM practices.*

Meso level innovations are very common, and almost all the cases studied have developed new techniques and methods not only to improve their sustainability at the supply chain level but also to achieve a broader sustainability. The majority of the cases in this study created meso level innovations in their supply chains in order to implement such lean practices

as transportation management, lead time reduction, the use of electronic supply chain management, and data solutions. Recycling and waste management throughout a supply chain can be identified as a lean practice. Some of the cases examined for this study focused on waste management practices and imposed those practices on their supply chains to achieve holistic supply chain sustainability performance. In addition to lean and waste management practices, firms worked with their suppliers to create and employ methods to increase such quality management practices as sustainability reporting to monitor sustainability activities. In all the industries I studied, firms had implemented quality management to increase suppliers' quality performance and increase buyers' sustainability performance. Recent social failures such as the use of child labor caused an improvement in health and safety standards and practices, which in turn enforced social sustainability processes. New methods and process are developed to enhance quality of workplace. In this study, almost all cases were actively seeking to improve suppliers' workplaces and employees' health and safety. The evidence from the cross-case analysis suggests the following proposition:

> *Proposition 2: Firms that create meso level innovations tend to emphasize system innovations to facilitate effective implementation of internal and external process-oriented SSCM practices such as lean practices and quality management across the supply chain entities.*

Macro level innovations have a broad perspective that includes a focal firm, its supply chain, and society. Except for the advanced energy storage companies, all the industries have developed some methods to reach their supply chain and society with new methods and practices. The pharmaceutical industry is one of the largest industries to emphasize innovation; however, innovation creation efforts mainly involve new product/treatment development not

sustainability. On the other hand, the unique nature of the industry contributes sustainability at the social level by creating macro innovations in non-market stakeholder practices such as an extended code of conduct and community education programs. There are a couple of reasons behind this outreach. First, their products are strictly regulated, so there is little or no room for improvements in product sustainability. Second, products and processes are highly standardized in the industry. The common practice across those industries is extended codes of conduct that aim to increase society's quality of life.

Proposition 3: Firms that create macro level innovations tend to emphasize innovations that impact industry and society while facilitating effective implementation of society-oriented SSCM practices.

Firms with accumulated knowledge through micro level innovations and a certain degree of know-how absorptive capacity can take advantage of other opportunities present in the environment to improve innovations at the supply chain level. My cross-case analysis showed that firms' innovation creation can be identified as a cycle or double learning. Firms learn from their micro level innovations and can effectively apply that knowledge to their suppliers' operations.

Proposition 4: Firms that create micro level innovations benefit from organizational learning capabilities to develop the absorptive capacity that helps firms effectively create meso level innovations.

Firms prefer to make incremental changes in their profitable products and cost-efficient processes to ensure financial stability while emphasizing exploration to develop new products and processes that will produce competitive advantage in the future. Companies in the power and

energy storage industry, for example, maintain current products while simultaneously and continually looking for new technologies to stay in competition.

Proposition 5: Firms that are highly ambidextrous in exploration and exploitation will improve economic sustainability performance.

This cross-case analysis has revealed some different innovation patterns and practices that vary with the characteristics of the industries and products. Because it is so highly regulated and produces non-innovative products, food/confectionary is unique among the industries in this study. Confectionary products have been stable in the market, so there are few if any product innovations. As the interviewees from the industry noted, its products have been on the market for decades without any changes in raw material, processes, or even packaging. Customer demand is highly predictable during seasons. For that reason, the firms in the market focus on other areas where they can implement new methods to increase efficiency, decrease costs, and improve the sustainability impact of the products. The final stage of production and the supply chain is so standardized that there is almost no room for improvement. Raw materials such as cacao and sugar are the main ingredients of almost all the products, so the farmers/suppliers are crucial to the final products' quality and sustainability, thus it seems that these are only areas that can be improved. Thus, firms develop new methods to train and collaborate with their farmers to harvest highly efficient and sustainable raw materials. In this case, firms' innovation creation and new product development can be done through their suppliers, for the quality of the raw materials depends on suppliers' conditions and their wellbeing. We see more and more companies develop social practices such as supplier development, community education, and other initiatives that increase quality of life for suppliers/farmers and their communities. These

non-market stakeholder practices become a significant success factor for companies aiming to be sustainable especially at the social level.

Proposition 6: In industries that offer standard products where suppliers' inputs are important, product innovation occurs at the supplier level.

Proposition 7: In industries that offer standard products where supplier's inputs are important, firms tend to emphasize macro innovations to implement non-market SSCM practices to achieve social sustainability performance.

Similar to industries with standard products, industries with highly regulated products are intensely challenging. In the pharmaceutical industry, for example, creating a new product or process is difficult and complex. There are strict guidelines, policies, standards, and tests that must be followed and completed by manufacturers and suppliers. Inputs and raw materials are major factors in the products and even the companies' success. However there is little or no opportunity to improve the products sustainability due to the factors cited earlier. Firms see that challenge and channel their efforts to a broader level in the social aspects of sustainability where there is room to improve. In this study, the firms in these industries focus primarily on community engagement activities, fair labor practices, the provision of free or lower priced products and services in areas where the need is great such as Africa and other under developed economies. Therefore, I propose the following proposition:

Proposition 8: Firms that operate in highly regulated product industries such as food and pharmaceuticals tend to create meso and macro level innovations to facilitate the implementation of social SSCM practices.

Cross-case analysis helps researchers identify uncommon innovation patterns, practices, and development processes. The advanced power storage and energy solutions industry is unique

in its nature. Products and sourcing are standard, mature, and unsustainable. The main product can be one of the most toxic products that every consumer uses every day such as batteries. Furthermore, interviewees unconventionally expressed their concerns about their products' future because current technology has reached 95 percent capacity. But market demand is growing due to increasing use of electronics, hybrid cars, and new energy solution options. All these factors encourage battery producers to be more innovative in their internal and external processes and adopt such practices as product life cycle analysis, recycling/waste management, and lean practices within the company and throughout the supply chain; innovations yield higher efficiency and lower costs.

Proposition 9: In industries with mature products, where market demand for new products is high, companies are more likely create internal and external process innovations that lead to economic sustainability.

In some industries, products must align with sustainability demands of the market. In this study, two companies in heating/energy solution industry are distinctive from others. These two companies must be sustainable due to characteristics of the products they manufacture. Customers of this industry seek the energy efficiency that will reduce costs and be greener. Because they produce sustainable products, the companies are aware that social sustainability practices are needed to achieve complete sustainability and increase customer satisfaction, and these factors are the ones that ultimately motivate firms to emphasize sustainability in all three aspects.

Proposition 10: In industries with sustainability-oriented products, companies tend to emphasize all three dimensions of sustainability along their supply chains.

Cross-case analysis reveals that companies in innovative industries have different innovation creation patterns and prioritize their innovation choices based on the characteristics of the products and industry. In this study, for example, small electronic companies chose to implement innovations that emphasize eco-product design, product life cycle analysis, and process efficiency by employing lean and quality management practices. In other words, the industry is dynamic, so firms must come up with new products frequently. Therefore, these firms channel their sustainability efforts into the product and process level.

Proposition 11: In industries with innovative products emphasize micro and meso level innovations rather than macro innovations. These companies are more likely implement product and internal/external process practices than social practices.

Sustainable Supply Chain Management Practices and Sustainability Outcomes

The findings indicate that companies consider SSCM practices as tools for achieving different aspects of sustainability. Every company wants to pursue sustainability performance by using different patterns of innovation and SSCM practices implementation. Cross-case analysis reveals that almost every firm wanted to achieve economic sustainability performance as its ultimate goal. However, firms did realize that implementing practices such as recycling, eco-product/process design, CSR activities, lean and quality management improve their financial performance by reducing costs and waste, using resources efficiently, and enhancing brand image. By implementing social sustainability practices within an organization and its supply chain, employees feel important and safe, which lead to improved employee satisfaction and performance, and these improvements ultimately increase the organization's financial performance. These findings also show that three aspects of sustainability performance—economic, environmental, and social—have symbiotic relationships. Each aspect of

sustainability interacts with the others. As the discussion of the food industry shows, social practices such as fair trade and improving the welfare of suppliers and their communities, for instance, affect the focal companies' product development and financial performance while satisfying environmental aspects of sustainability.

Consequently, innovation and double-loop learning become necessary for sustainability in a supply chain. Most of the cases in this study believe that ultimate sustainability outcomes are economic; however, they have realized that the effects of all three levels of sustainability performance are interlocking.

Every case in this study implemented SSCM practices at different levels in accordance with its innovation capabilities and industrial factors. The pharmaceutical, medical device, and food industry firms, for example, have a limited sustainability capability at the single level product innovations because the industry and its products are highly regulated. On the other hand, some unsustainable industries such as energy storage can have highly effective SSCM practices such as recycling and reusing materials. Therefore, my study reveals that some SSCM practices—employee health and safety, lean, quality management and eco-product/process design practices—are common in all industries.

This cross-case analysis also uncovered the fact that firms implementing eco-packaging and eco product/process design in a limited scope tend to have higher environmental performance. Choosing sustainable materials, constructing green buildings for facilities, and improving processes to implement sustainability would increase environmental sustainability outcomes of the firms. In addition to those practices, some firms in this study adopted product life cycle analysis to measure a product's sustainability footprint from its origin to the end of its cycle so as to improve the reuse of materials.

Proposition 12: The implementation of product/internal process-oriented SSCM practices will have higher positive effect on a firm's economic and environmental sustainability performance than social sustainability performance.

There is evidence that the implementation of waste management and lean SCM practices increase firm's economic and environmental performance. Waste management and lean practices such as using sustainable sourcing and waste reduction applications contribute positively to sustainability performance. Improvements in transportation activities, for instance, reduce the carbon footprint of inefficient deliveries, which are criticized as an unsustainable practice. However, deployment of new transportation strategies and methods such as implementing new scheduling and routing software make it possible to overcome this negative effect, since it optimizes the trips and uses capacity more efficiently.

Proposition 13: The implementation of external process-oriented SSCM practices will have higher positive effect on firm's economic and environment sustainability performance than social sustainability performance.

Almost all the firms that were analyzed have implemented a code of conduct and related practices to some degree. Some of the firms such as pharmaceuticals have extensive code of conduct standards in their supply chain. Employee health and safety, anti-child labor, fair trade, responsible sourcing, CSR reporting, and community involvement activities are the most common practices among the cases in this study, and all the companies and their supply chains benefitted from them. Increased brand reputation, recognition, market value, and employee wellness are the major benefits of this implementation process. Findings show that firms implemented codes of conduct at higher levels tend to have high social performance in the long run.

Proposition 14: The implementation of administrative and society-oriented SSCM practices will have higher positive effect on a firm's social sustainability performance than economic and environment sustainability performance.

This multi-case study provides significant evidence of a positive relationship between environmental sustainability outcomes and economic performance. Reduced carbon emissions as well as material and resource use contribute to a reduction of environmental costs and practices like water use reduction or utilizing new sustainable reusable materials, and these outcomes will lead to a decrease in costs and thereby increase economic and sustainability performance. The evidence produced by case analysis shows that eco-packaging reduces the environmental impact of products and material while indirectly reducing the cost of products, transportation, and handling.

Implications of the Study

It is evident from this study that several factors drive firms to innovate and implement sustainability in their supply chains. This research investigated innovation creation and the implementation of sustainable supply chain management practices to answer the research question: "What specific innovations do companies generate to implement SSCM practices effectively?" While companies create innovation to implement sustainability in their supply chains, there are some specific innovations that outshine the others in SSCM practices implementation. For instance, a firm with limited scope of innovativeness may not succeed in sustainability, and that may eventually affect the firm's performance. All the cases studied have participated in various activities that developed new, innovative sustainable processes as well as products. The interviews allowed the researcher to understand the innovative activities in different industries and firm settings. Implementing sustainability practices has also led to the

development of diverse innovation mixtures from a multi-level perspective. Companies have focused on micro innovations to improve their current processes and products, and they have focused on meso innovations mainly to increase supply chain sustainability and efficiency. Results, supporting the proposed framework, showed that macro level of innovations are rare, almost non-existent in current market conditions, and they are currently limited to social aspects of sustainability such as society welfare practices in the markets of developing countries.

A multi-case research approach was utilized to investigate this topic with a relevant theoretical framework. With the second research question—"How do companies simultaneously implement and manage these innovations and SSCM practices?"—this research aimed to explore firms' management capabilities and SSCM practices applications. Based on case results, the influence of organizational learning, absorptive capacity, and an ambidextrous orientation of the firm have significant effects on innovation and SSCM practice implementation and management. Firms vary to some degree in management approaches and exploration-exploitation ratio; however, all sustainability-oriented firms follow an ambidextrous strategy. Firms with high revenues and R&D budgets tend to manage implementation simultaneously and effectively, and they aim to pursue the original innovations that guarantee technological advances in future. Given finite resources, firms need to balance exploration and exploitation during the process of innovation and implementing SSCM practices. Otherwise, they fail to develop both new sustainable products and processes for market launching and original technologies for sustainability implementation and its outcomes while continuing their current operations. However, some industries such as pharmaceuticals and medical device/technologies, have been significant affected on implementation processes due to higher regulations and industry requirements.

To answer the third research question, "What are the interaction patterns of these innovations and SSCM practices for high sustainability performance?" the researcher utilized interview data and publicly available documents and reports. All cases have sustainability-oriented innovation activities for implementing new practices while continuing their current operations. Double-loop learning, feedback, and the absorptive capacity of the companies may be the key success factors because they allow implementation of tacit knowledge for the convergence of new practices and sustainability initiatives in supply chains. Firms that have prioritized sustainability have played a critical role in encouraging suppliers and retailers to adopt new practices. This motivation enables the development of new SSCM practices reflecting the diversity of supply chain elements and stakeholders. As all interviewees clearly stated, innovation and new SSCM practices tend to increase the cost in the short term; however, in the long run they enable the firm to pursue higher sustainable outcomes with financial value. The financial performances of cases also demonstrate that their innovation activities have resulted in meaningful progress after a certain point.

Little research has been performed using a survey methodology to study sustainability in supply chain management. After developing appropriate measurements, the use of survey methodology could provide greater insight and generalizability into how innovations are created and sustainable practices are implemented in companies and their supply chains, which, by expanding this research, could be used to verify results of this study.

In addition, further research is needed to assess recent changes in sustainability as well as industry and market conditions. Involvement in sustainability has increased substantially since early 2000, and more stakeholders are demanding that organizations be sustainable in their operations, especially in their supply chains. As a result, companies are driven to sustainability

by business needs versus just "being good." Since most firms have been implementing sustainability for over a decade, applications of sustainability may be less challenging in some cases. Future research is needed to study sustainability within supply chains to determine if they keep innovating and continuously improving, as they stated in the interviews.

This research also revealed that sustainability developed differently in the studied organizations based on their industry and priorities. Future studies can be conducted to see if these results hold for other organizations.

Limitations

As with all empirical studies, this one has several limitations that must be considered when interpreting the above findings. To begin with, I address several issues with the research methodology used. First, because this research used a multi-case qualitative approach to analyzing the data, the results of the study are based on the researcher's interpretation of the data. As a result, researcher bias is inevitably present. However, to mitigate this bias, two researchers transcribed and analyzed the data.

The study was also limited by the number of companies selected for analysis. These companies are large, global organizations considered leaders in sustainability. They are involved in industries that are innovative and amenable to sustainability, and they have histories of being sustainable and addressing environmental, economic, and social issues. Different results may have been found if the following types of companies had been used: smaller-sized companies, companies in sustainability-averse industries such as oil or mining industries, companies with weaker sustainability standings, and companies in less regulated and developing countries.

The research data were also limited based on the relatively limited number of interviewees for each case. The participants were all related to sustainability and supply chains in

upper-level management. The results may have been different if a larger number of participants was included in the study or if participants from different functions of operations had been included. Finally, the study only utilized a case methodology to explore phenomena, and this limitation may create some shortcomings in generalizing the results in different company settings.

Conclusion

Implementation of sustainability in supply chains is a complex process. It is affected by several factors such as industry, customer demand, suppliers, government and industry regulation, and financial markets. It also requires full collaboration within organizations and initial investment. This research provided insights into the relationships between innovation and SSCM practices and their complex implementation patterns. The findings of this research contribute to ongoing sustainability research that examines the influence innovation creation that ultimately affects firms' sustainability outcomes.

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APPENDIX A

APPENDIX A

IRB APPROVAL LETTER

The University of Texas Rio Grande Valley

The Institutional Review Board for Human Subjects Protection (IRB)
Division of Research, Innovation, and Economic Development
Office of Research Compliance

October 29, 2017

To: Muratcan Erkul

Cc: Dr. Hale Kaynak, Faculty Advisor

From: Institutional Review Board

Subject: Approval of a New Human Research Protocol

IRBNet ID: 1067881-1

IRB# 2017-128-05

Project Title: Symbiotic relationships among innovations and sustainable practices. A supply chain management perspective.

Dear Researcher,

The IRB protocol referenced above has been reviewed and **APPROVED ON October 12, 2017**.

Basis for approval: Exepdited 6; Expedited 7

Approval expiration date: October 11, 2018

Recruitment and Informed Consent: You must follow the recruitment and consent procedures that were approved. If your study uses an informed consent form or study information handout, you will receive an IRB-approval stamped PDF of the document(s) for distribution to subjects.

Modifications to the approved protocol: Modifications to the approved protocol (including recruitment methods, study procedures, survey/interview questions, personnel, consent form, or subject population), must be submitted to the IRB for approval. Changes should not be implemented until approved by the IRB.

Approval expiration and renewal: Your study approval expires on the date noted above. Before that date you will need to submit a continuing review request for approval. Failure to submit this request will result in your study file being closed on the approval expiration date.

Data retention: All research data and signed informed consent documents should be retained for a *minimum* of 3 years after *completion* of the study.

Closure of the Study: Please be sure to inform the IRB when you have completed your study, have graduated, and/or have left the university as an employee. A final report should be submitted for completed studies or studies that will be completed by their respective expiration date.

Approved by: Laura D. Seligman
Interim Chair, Institutional Review Board

APPENDIX B

APPENDIX B

INFORMED CONSENT

The University of Texas Rio Grande Valley

Informed Consent Form

Benefits of Participation: There is no direct benefit to participants. After completion of my research, results of the study will be shared with every participant as a reward. I hope that the results of my study will be of benefit to those organizations directly involved in the study, other voluntary recreation organizations not directly involved in the study, as well as to the broader research community.

Voluntary Participation: Your participation in this study is voluntary; you may discontinue your participation at any time without penalty. If for any reason you decide that you would like to discontinue your participation, simply tell the researcher that you wish to stop.

Anonymity and/or Confidentiality: Aforementioned, your participation and data generated from this study will be kept confidential. Data and all information from participants will be stored in a locked office. Data will be kept for three years for research purposes.

Who to Contact for Research Related Questions: For questions about the research itself, or to report any adverse effects during or following participation, contact the researcher, Muratcan Erkul at phone number (956) 720 8886, and/or email: muratcan.erkul01@utrgv.edu. My faculty advisors contact phone number is (956) 665-3351 and email: hale.kaynak@utrgv.edu

Who to Contact Regarding Your Rights as a Participant: This research has been reviewed and approved by the Institutional Review Board for Human Subjects Protection (IRB). If you have any questions about your rights as a participant, or if you feel that your rights as a participant were not adequately met by the researcher, please contact the IRB at (956) 665-2889 or irb@utrgv.edu.

Signatures: By signing below, you indicate that you are voluntarily agreeing to participate in this study and that the procedures involved have been described to your satisfaction. The researcher will provide you with a copy of this form for your own reference.

_____ ____/____/_____

Participant's Signature Date

The University of Texas Rio Grande Valley
IRB APPROVED
IRB# 2017-128-05
Expires: 10/11/2018

APPENDIX C

APPENDIX C

AUDIO RELEASE

The University of Texas Rio Grande Valley

Audio Release Form

Symbiotic relationships among innovations and sustainable practices. A supply chain management perspective.

Researcher: Muratcan Erkul

Phone: (956) 720 8886

Email Address: muratcan.erkul01@utrgv.edu

Faculty Advisor: Dr. *Hale Kaynak*

I hereby give permission to Muratcan Erkul to audio record my responses during the interview for this study, Symbiotic relationships among innovations and sustainable practices. A supply chain management perspective. I further understand that researchers will use a pseudonym to identify me and that neither my name nor any other identifying information will be associated with the audio recording or transcription of my recorded responses. The recorded material will only be used for research purposes. As with all research consent, I may at any time withdraw permission for audio recorded material of me to be used in this research project.

I acknowledge that there is no compensation for allowing myself to be audio recorded.

I am permitting the review and transcription of my recorded interview by the investigators. The recorded material will be securely stored in a safe (locked) drawer for approximately for three years. After that time, all recorded data will be destroyed. No one other than the investigators will have access to the data.

Participant Signature:_____

Date: _____

Please keep a copy of this sheet for your reference.

The University of Texas Rio Grande Valley
IRB APPROVED
IRB# 2017-128-05
Expires: 10/11/2018

APPENDIX D

APPENDIX D

TELEPHONE SCRIPT

Hello, my name is Muratcan Erkul, I am a doctoral candidate from The University of Texas Rio Grande Valley (UTRGV).

The purpose of this study is to empirically investigate the relationship among types of innovations, sustainable supply chain practices and sustainable outcome. With your consent, I would like to conduct an interview which should take about 45 minutes to an hour to complete. Your participation is completely voluntary. I ask that you please try to answer all questions. However, if there are any questions that you would prefer to skip, simply let me know and I will just skip that question and go on to the next one.

All the information I receive from you by phone, including your name and any other identifying information, will be strictly confidential and will be kept under lock and key. I will not identify you or use any information that would make it possible for anyone to identify you in any presentation or written reports about this study.]

I would like to ask for your consent to audio record your responses during this interview. Your confidentiality will be protected with the use of a pseudonym The recorded material will only be used for research purposes and for the presentation of this research. All data collected, including the recorded material will be securely stored in a place where only I have access to.]

There are no other expected risks to you for helping me with this study. There are also no expected benefits for you either.

Do you have any questions now? If you have questions later, please contact me by telephone at 956 720 8886 or by email at muratcan.erkul01@utrgv.edu.

You may also contact my faculty advisor Dr. Hale Kaynak, at hale.kaynak@utrgv.edu.

This research has been reviewed and approved by the Institutional Review Board for Human Subjects Protection (IRB) at the University of Texas Rio Grande Valley. If you have any questions about your rights as a participant, or if you feel that your rights as a participant were not adequately met by the researcher, please contact the IRB at (956) 665-2889 or irb@utrgv.edu.

Do you agree to participate in this study?

APPENDIX E

APPENDIX E

EMAIL SCRIPT

My name is Muratcan Erkul, I am a doctoral candidate from the Department of Management at the University of Texas Rio Grande Valley (UTRGV). I would like to invite you to participate in my research study to how sustainable organization developed and implement sustainable supply chain practices (SSCM) and relationships among innovation and SSCM practices.

This research study has been reviewed and approved by the Institutional Review Board for the Protection of Human Subjects (IRB) at the University of Texas Rio Grande Valley.

In order to participate you must be 18 years or older. Participation in this research is completely voluntary, you may choose not to participate without penalty.

As a participant, you will be asked to participate in an interview which should take about 45 minutes to an hour to complete. All data will be treated as confidential. All the information I receive from you, including your name and any other identifying information, will be strictly confidential and will be kept under lock and key for three years. I will not identify you or use any information that would make it possible for anyone to identify you in any presentation or written reports about this study.

If you would like to participate in this research study, please reply to this email with your acceptance to schedule an in-person interview.

If you have questions related to the research, please contact me by telephone at (956) 720-8886 or by email at muratcan.erkul01@utrgv.edu.

If you have any questions regarding your rights as a participant, please contact the Institutional Review Board (IRB) by telephone at (956) 665-2889 or by email at irb@utrgv.edu.

Thank you for your cooperation!

Muratcan Erkul

PhD Candidate

Dept. Management

University of Texas Rio Grande Valley

APPENDIX F

APPENDIX F

INTERVIEW PROTOCOL

(Participants' title: R&D director, supply chain manager, and other titles)

Date_____ Company ID_____

Pseudonyms (Optional)_____

Introduction

- Introduce yourself
- Discuss the purpose of the study
- Provide informed consent
- Provide structure of interview (audio/video recording, taking notes, and use of pseudonym)
- Ask if they have any questions
- Test audio/video recording equipment (when the participant permits)
- Make the participant feel comfortable

General Questions

1. What is the role of the supply chain in your organization?
2. What does sustainability mean in your organization? Why is it important?
3. How long has does your organization been implementing sustainability?

Questions about Innovation and Innovation creation

1. How do you define innovation in your organization? How about innovations in the context of sustainability and supply chain management?
2. What are the main strategies of the organization to innovate? What are the factors that affect the innovation process?
3. What are the innovations that your organization implements?
    a. Multi-level perspective (micro, meso, and macro?) Please explain the magnitude of the innovations and their effects on the product/process/firm/industry/society.
4. How do those innovations occur?
    a. Do innovations occur as a continuous process? Please explain.
5. Who initiated the project (e.g., specific innovation) and/or how did project idea come up?

Questions about Sustainable Supply Chain Management Practices

1. What is your role in sustainability issues?
2. Could you please tell me how your company's SSCM efforts have developed?
3. How long has your company been concerned about sustainability issues? What has been the primary driver(s) for action?
4. What are the SCM practices that have been implemented in your organization? Could you please share your knowledge about these sustainability initiatives and practices and create a timeline (maybe a framework) for each one with a short description of the key events and decisions?
    a. Internal Practices

b. External Practices

If applicable;

5. Have any processes been redesigned to reduce waste?
6. How is the product designed? Is the life cycle of the product considered?
7. How do sustainability issues impact purchasing?
8. Are environmental criteria used to evaluate potential suppliers (e.g., supplier's manufacturing process, use of materials, source of materials)?
9. What is the interest level of your suppliers? Have any suppliers actively participated in sustainability efforts?
    a. Do you have any specific projects in this area?
10. How are your products packaged?
    a. What are your company's sustainability efforts in this area?
11. Does your company manage any reverse logistics flows? Describe.
12. How do sustainability issues impact transportation selection and/or distribution methods?

Questions about Sustainability Performance

1. Why is your company involved in sustainability issues? Overall, what are the tangible and intangible benefits?
2. What are the outcomes of innovativeness in sustainability that you have observed in your company?
3. Do interactions among innovations and SSCM practices affect the sustainability outcome? Please explain how.

4. In your organizations, how do you measure your sustainability initiatives and innovation performance/outcome? What are the metrics?

Concluding Questions

1. Is there anything else you would like to add or share about this topic that you feel is important for other executives interested in sustainability to know?
    - Anything besides what we talked about?

Concluding Statement

- Thank them for their participation
- Ask if they would like to receive a copy of the results
- Record any observations, feelings, thoughts and/or reactions about the interview

BIOGRAPHICAL SKETCH

Muratcan Erkul, born in Izmir, Turkey, holds a Bachelor of Business Administration (BS) degree in management from Dokuz Eylul University, Turkey and a MBA degree from The University of Texas Rio Grande Valley (formerly known as University of Texas Pan American. He received his Ph.D. in Business Administration (Operations Management) from The University of Texas Rio Grande Valley in 2017. His research interests include sustainability, supply chain management, innovation and lean operations. He has presented several papers at premier academic conferences such as the annual meeting of the Academy of Management and the Decision Sciences Institute. He has also co-authored a paper in academic peer-reviewed journal. Muratcan is now an Associate Professor of Management at Kutztown University and can be reached at erkul@kutztown.edu