Online Shopping and the Natural Environment

Exploring the Intersection of

Consumer Behavior and Environmental Impact
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*Exploring the Intersection of Consumer Behavior and Environmental Impact*

Fríða Óskarsdóttir

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Leiðbeinandi: Dr. Lára Jóhannsdóttir

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Foreword

The first thank you has to be to Iceland, my native country and what will always be home, for providing me with such a beautiful background to my graduate studies. The goal of my time there was to learn something new, and I succeeded almost wholly due to the helpful actions of others. First to my thesis advisor, Dr. Lára Jóhannsdóttir, for her patience, methodical eye, and continuous support – thank you. To the professors and fellow students involved in the Environment and Natural Resources (ENR) program at the University of Iceland, thank you for your warm and positive impact on my experiences in Iceland. To my family and friends on both sides of the ocean who patiently listened to me complain about my thesis for the last year – thank you, thank you, thank you. To my parents - for the infinite intangible gifts, all of which led me to this point. To Dan – support is not strong enough a word for what you have given me this past year. Thank you for sharing New York with me and for always being ready with a laugh when I thought I wouldn’t make it through to the other side.
Abstract

The aim of this thesis is to explore the intersection of consumer behavior and the environmental impact of electronic commerce. The intention is to inform the reader of the current impacts of consumption and online shopping while contributing to the opportunity for more sustainable individual online shopping practices in the future. Relatively recent literature was compiled and synthesized to form a literature review. The research method outlined a goal of identifying central issues and integrating them across subject areas, with a focus on research findings, practices and applications. Three research questions were formulated to guide the organization of literature, focusing on the environmental impacts of the electronic commerce supply chain, the environmental behavior of the consumer, and what opportunity for sustainability online shopping presented. Background information on electronic commerce, consumption and environmental degradation, and green consumption practices is provided. A major commonality across studies of varying fields that attempted to identify the environmental differences between online and in-store shopping is the number of caveats inherent in determining which has a more harmful impact to the environment. Often, a key factor is consumer behavior, and as such individual action is necessary in a shift towards more sustainable practices.
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1 Introduction

There are many different perspectives on how best to achieve sustainable development, a term with a simple definition - “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987, p. 43) - but an exceedingly complex practical reality. As a society made up of individuals, it is difficult to know how a personal action can result in a meaningful impact to improve environmental wellbeing, and where larger action on the part of larger actors makes a bigger difference.

Some experts posit that even with the best intentions, environmentally well-meaning individuals are no match for the deeply ingrained values of over-consumption or lock-in to inefficient practices (Mont, Heiskanen, Power, & Kuusi, 2013; Newton & Meyer, 2013; Wilk, 2010). Others argue that individual and household consumption, along with lifestyle choices should be treated as important indicators of sustainability (Arnold Tukker, Cohen, Hubacek, & Mont, 2010; Yee, Chung, & Sundaram, 2015). While data support both claims under varying circumstances, there are often important caveats in how far a person’s actions carry towards sustainability. The link between consumption and environmental degradation has been well documented and continues to grow more complex with advancements in technology (Brulle & Young, 2007).

As some form of shopping is a daily activity undertaken by most people in the developed world, the habits formed therein can be revealing on a larger scale. For many retailers and consumers, the Internet has revolutionized the consumption of goods and services. Its function as a channel through which to sell and purchase nearly every type of product continues to grow and outpace that of traditional commerce (Nevskaya, 2013). Estimates suggest that 66% of the 3 billion Internet users worldwide shop online, and outside of making a final purchase online, the Internet plays a role in the overall shopping process 90% of the time (GlobalWebIndex, 2013). This process typically includes information gathering, trial, evaluation, selection, transaction, delivery, use, and returns (Mokhtarian, 2004).
As prophesied in earlier studies, access to online shopping has increased social welfare in many ways, including lower prices, greater choice (Bakos, 2001) and, some would argue most importantly, through greater convenience (Chiang & Dholakia, 2003). In many countries, consumers can now thoroughly research products they purchase and return or exchange them easily with little to no cost. However, with such a restructuring of the retail supply chain from manufacturer to consumer, it becomes necessary to consider its impacts on other areas, specifically the natural environment. For instance, the ability to purchase electronic media such as music and films online has substituted for physical resources, leading to less material consumption in those cases (Coroama, Moberg, & Hilty, 2014). Conversely, the ease with which consumers can purchase and return goods has the possibility of leading to greater consumption (Reisch, 2001; Sui & Rejeski, 2002). This dichotomy of environmental savings and costs emerges in many areas of electronic commerce.

The research of this thesis will draw from the relevant studies conducted and discussions held over the last two decades. Some studies include quantitative investigations into the measurable difference in carbon impact of traditional “brick-and-mortar” (in-store) shopping (Wiese, Toporowski, & Zielke, 2012) versus the advent of electronic commerce, (Edwards, McKinnon, & Cullinane, 2010; van Loon, McKinnon, Deketele, & Dewaele, 2014). Others focus on the drivers behind behavioral choices such as the intent behind choosing electronic alternatives to traditional shopping methods (Chiang & Dholakia, 2003). There is importance in merging these two concepts to provide a more holistic review of the academic literature related to online shopping and the environment.

As the Internet transforms retail, there is potential for it to be a tool in the move towards more sustainable online shopping habits. Often, the most inconsistent element in terms of environmental impact of the retail supply chain is consumer behavior, e.g. what a consumer decides to do instead of make a shopping trip (van Loon et al., 2014). As such, general consumer knowledge of these consumption impacts is necessary, but the research done on the impacts of online shopping spans a number of fields and methods. This thesis will explore this impact through a review of the general theories of consumption and its relationship with the natural environment, the modern shift from
traditional to electronic commerce, and sustainable best practices for consumers. In looking at the environment as all encompassing of society and the economy (Figure 1), taking into account social and economic factors into the environmental impact of electronic commerce will be necessary.

Figure 1. Nested sustainable development (Giddings, Hopwood, & O’Brien, 2002, p. 192)

This thesis is organized into six chapters that comprise a literature review. The research methods and questions will be introduced and explained in Chapter 2, followed by theoretical chapters seeking to explore and answer those questions. While the questions posed span multiple content areas, each chapter does not address a single question individually, but rather acts as exposition and context. Chapter 3 will focus on the relationship between human consumption and the natural environment, Chapter 4 on the history and impact of electronic commerce, and finally Chapter 5 entails theories and recent examples of the environmentally conscious consumer in practice. The trajectory of writing will follow from a wider to more narrow scope. While these are vast fields of study, the chapters will provide key information to form the context for the discussion and highlight areas most relevant to online shopping specifically. Chapter 6 will then open up the discussion in order to answer the research questions posed and synthesize information outlined in the previous chapters.
2 Research Methods

The research method will result in a literature review including both scholarly journal articles and published industry data. The formation of a literature review, as opposed to a more rigorous systematic review, utilizes a more subjective and informal interpretation of literature (Kysh, 2013). Cooper and Hedges (2012) attribute six main characteristics to a literature review, detailed with categories in Table 1. These serve as the basis for the research method employed and are individually explored in the subsections below, where the chosen category is italicized and explained. The aim of the literature review is to bring together more specific studies into a larger context. This choice will contribute to the foundation for further research on this subject.

Table 1. Taxonomy of Literature Review (Cooper & Hedges, 2012 p. 5)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Categories</th>
</tr>
</thead>
</table>
| Focus          | • Research findings  
|                | • Research methods  
|                | • Theories  
|                | • Practices or applications |
| Goal           | • Integration  
|                | • Generalization  
|                | • Conflict resolution  
|                | • Linguistic bridge-building  
|                | • Criticism  
|                | • Identification of central issues |
| Perspective    | • Neutral representation  
|                | • Espousal of position |
| Coverage       | • Exhaustive  
|                | • Exhaustive with selective citation  
|                | • Representative  
|                | • Central or pivotal |
| Organization   | • Historical  
|                | • Conceptual  
|                | • Methodological |
| Audience       | • Specialized scholars  
|                | • General scholars  
|                | • Practitioners or policy makers  
|                | • General public |
The following sections reveal the specific literature review elements chosen for this thesis, based on the table provided. These appear in italics both in Table 1 and the following sections and are further explained in the context of this research.

2.1 Focus
Two main focuses were chosen for the literature review: research findings, through scholarly journal articles as well as published industry data, and practices or applications, or specific trends taking place within the relevant fields of research (Cooper & Hedges, 2012). In the case of this thesis, these will be trends towards more sustainable electronic commerce practices. Because of the sheer breadth of information and variations of methodologies, theories and research methods are excluded as focuses of this thesis, however that is not to say that neither is mentioned or explored at certain points in order to provide background or context.

2.2 Goal
The goal of a literature review, according to Cooper and Hedges (2012), is what the author hopes to accomplish overall. As preliminary literature gathering for this thesis lead to a wealth of conducted studies across multiple fields, the first goal chosen was integration (see Table 1), in order to bring together those varied fields through their common discussion along the spectrum of electronic commerce and the environment. Within integration, one narrower scope was chosen: generalization, or “formulating general statements that characterize multiple specific instances of research” (Cooper & Hedges, 2012, p. 4). This is particularly important as certain themes emerge across multiple content areas, and generalizing them as larger interwoven ideas aids the readers’ understanding.

The second goal is the identification of central issues, which may include “questions that have given rise to past work, questions that should stimulate future work, and problems...that have impeded progress within a topic area or field” (Cooper & Hedges, 2012, p. 5). As such, the research will focus on highlighting common themes and concepts in studies from the fields of consumer psychology, supply logistics, business, and the natural environment.
Criticism as a main goal was excluded both due to scope as well as relevance. Cooper and Hedges refer to criticism as holding work up to a certain criterion, typically methodological quality. As research methods were excluded as a focus in Section 2.1, it is also prudent to exclude criticism as a goal.

2.3 Perspective
The findings of previous research should be accurately represented in a neutral manner. However, the thesis itself aims to frame these findings within the context of sustainable development and consumption, and in so espousès a position to a certain extent. Thus, a combination of the two perspectives will be used. The author aims to include a holistic representation of relevant information while framing a narrative founded on environmental protection.

2.4 Coverage
Electronic commerce is a relatively recent phenomenon and one that is undergoing changes rapidly as it increases its market penetration of developed and developing economies (JLL.com, 2013). As such, the literature on it and its impacts varies greatly and exists in a very wide scope. For this reason, the coverage of the thesis will be twofold according to Cooper & Hedges’ model, exhaustive with selective citation and representative. Due to the smaller scope of the thesis, the literature reviewed cannot be completely exhaustive, but aims instead to form a cohesive representation of ideas.

Certain boundaries were placed on the literature chosen, both due to necessity or convenience as well as scope of research, which is 30 ECTS (European Credit Transfer and accumulation System) credits, or the equivalent of 15 weeks of work.

- The majority of literature reviewed was published in scholarly, peer-reviewed journals
- All literature reviewed was published in English
- While some of the literature refers to earlier studies and trends, the majority was published after the year 2000.
- Most studies focused on the United States and Europe – in general on economies where electronic commerce had reached relative maturity and market saturation.
2.5 Organization
The organization of literature followed a conceptual model, so that “works relating to the same abstract ideas appear together” (Cooper & Hodges, 2012, p. 6), rather than works relating to the same methodologies, or in historical order. This is due to a number of different methodological approaches being used in the literature reviewed, including statistical analysis, literature review, and market research. Articles from all these methodologies are explored, and explored based on content.

2.6 Audience
The intended audiences for this thesis are the general public, general scholars, and practitioners and policymakers. As the review does not rely on overly technical information, it will be accessible to the majority of readers. The review conducted will be of use to policymakers in considering the wider environmental impact of online shopping from different perspectives, and in bringing together information from disparate backgrounds into a more unified narrative.

2.7 Terminology
This section is outside of Cooper and Hedges’ framework but is necessary due to the format of this thesis. As the literature spans many areas of scholarly discourse, a number of specialized terms will be used throughout. These will be defined as they appear. In regard to environmental issues, different authors will refer to similar concepts for which there is no clearly defined single term, and as such terms including “environmentally-friendly”, “green”, and “sustainable” may be used interchangeably. However, as Gilg, Barr, and Ford (2005) point out, the key distinction between the terms “green” and “sustainable” is that while both apply to consumption, the former is often associated with some form of purchasing, for instance buying products that are labeled organic or composed of recycled materials. In contrast, “sustainable” has come to represent a greater lifestyle integration which not only includes purchasing decisions but extends to a wider range of activities such as reducing energy use in the home, actively recycling, and composting waste (Gilg et al., 2005). This understanding will be followed throughout this thesis accordingly, unless where otherwise noted.
2.8 Research Questions

Three overarching research questions have been formulated to stand as the organizational framework for the paper. In order to address each comprehensively, the theoretical chapters aim to coalesce the issues and studies relevant to each.

I. Which factors in the supply chain and demand process of electronic commerce contribute most to positive or negative environmental impact?

II. How is the environmental behavior of the consumer reflected in his or her online shopping habits?

III. What opportunity is there for more sustainable online shopping?

After the literature has been reviewed and theoretical information synthesized, the Discussion that follows will answer these questions.

2.9 Relevance of Research

With the rapid transition to a technologically driven world, many things are left behind. As Melville (2012) points out, “we live in an increasingly digital world. Yet the scholarly discourse on business and the natural environment has proceeded, for the most part, according to business as usual” (p. 327). The goal of this research is to attempt to synthesize the intersection between online shopping and its environmental impact with consumer behavior, in order to contribute by providing a comprehensive amalgam of literature. As a literature review it will bring together information from various fields of study in order to add greater depth of understanding to the many factors involved in the environmental impact of online shopping.
3 Consumption and the Natural Environment

Individuals consume goods and services through various activities and at a number of levels. According to Wilk (2010), “the category of consumption includes many disparate activities, some of which are environmentally destructive, while others are benign or even necessary parts of the cycles of nature” (p.39). This is an important distinction to make because it points to the oversimplification that all human consumption negatively impacts the environment. As the issue is far more complex, this chapter will explore the more destructive aspects of consumption and theories behind policy solutions to these problems (APA, 2009).

In recent years, evidence has mounted to suggest that carbon emissions as a result of human, or anthropogenic, activities are in large part a driving force behind climate change, which threatens the current and future wellbeing of the earth and its inhabitants through warming temperatures, sea level rise, and loss of biodiversity (IPCC, 2014). While scientific evidence shows human consumption as a driver behind climate change, many barriers exist to the general public accepting the reality of its impacts and the need for a response, including uncertainty, ignorance, and habit (APA, 2009).

Human beings consume far more than their proportional share of natural resources on Earth. Net primary production (NPP) is defined as the “—the net amount of solar energy converted to plant organic matter through photosynthesis—can be measured in units of elemental carbon and represents the primary food energy source for the world’s ecosystems” (Imhoff et al., 2004 p. 870). While mankind represents just 0.5% of heterotrophs, or organisms that use organic matter for growth, it consumes approximately 31% of total NPP (Imhoff et al., 2004).

The concerns of growing populations and continued overconsumption can be traced from heavy industry and manufacturing down to the individual consumer, and the nexus of consumer psychology and environmental impact is important to explore further as consumption patterns change, specifically through electronic commerce. The following sections will follow the varying definitions of consumption as well as its determinants specifically in its relation to the natural environment, as well as give an overview of the theory of sustainable consumption.
3.1 Types of Consumption

Categorizing the varying types and scales of human consumption is important to explore the different links between consumption and the environment. It is difficult to discuss consumption without entering into semantics, as the term has come to bring with it a certain connotation, typically negative. Wilk (2012) contends that the term consumption is in fact a metaphor collectively understood in one way by most people, but operating differently. He gives the example that certain behavior, such as eating or spending money, is often considered under the umbrella of consumption while other behavior, like sporting events or investing money, is excluded, despite falling under the definition in terms of resource use. As there is no standardized description of consumption and the term itself can be ambiguous, the following types are not an exhaustive representation of every type of consumption, but rather an overview of its more common forms.

3.2 Economic Consumption

In simple terms, economic consumption is spending money to acquire goods (APA, 2009). Decoupling economic growth from resource consumption is a key factor in sustainable consumption and development (UNEP, 2011; Wiedmann et al., 2013). However, the term “economic consumption” can be troublesome when considering environmental impacts, as the term excludes the processes of production and distribution, as well as differentiates between consumption of goods and services and investment, which can have just as great of an environmental impact (Stern, 1997).

3.2.1 Personal Consumption Expenditure

According to the United States Bureau of Economic Analysis, personal consumption expenditure (PCE) is the main measure of consumer spending on goods and services (U.S. BEA, 2014). Personal consumption currently accounts for nearly 70% of total consumption in the United States, compared to gross private domestic investment and government consumption and investment (Brulle & Young, 2007). PCE is a broad term accounting for durable and non-durable goods such as household items and food, respectively, or services, including utilities, healthcare, and transportation (U.S. BEA, 2014).
In general, personal consumption levels increase steadily over time. Brulle and Young (2007) reason this stability with three claims, summarized here: first, habits form that acclimate the consumer to increased consumption: what initially is a luxury over time becomes a necessity. Second, consumers strive to maintain their current level of consumption, hence the utilization of credit. Third, consumption is a signifier of social status, and a decrease in the former symbolizes a loss in the later, and so a consumer is encouraged to maintain his or her consumption levels. According to these three claims, personal consumption is closely linked with the psychology of habit formation and identity (Brulle & Young, 2007).

3.2.2 Consumerism
Consumerism is defined by Zhao and Belk (2008) as:

a belief and value system in which consumption and acquisition rituals (e.g., shopping) are naturalized as sources of self-identity and meaning in life, goods are avidly desired for non-utilitarian reasons such as envy provocation and status seeking, and consuming replaces producing as a key determinant of social relations (p. 231).

While often typified as a Western ideal, the rise of consumer culture is growing globally, as a paradigm shift occurs as to what material goods are considered necessary to maintain social wellbeing (APA, 2009). In this way consumption becomes something of a right, or a symbol of freedom to buy not just what one needs, but what one desires (Wilk, 2001).

The implications of online shopping influencing consumerism are two-pronged. Some studies have determined a link between the ease of making a transaction online and increased consumption, particularly through impulse purchasing (Reisch, 2001). Rather than having to wait to go to the store in order to fulfill the desire to purchase an item, a consumer can satisfy the urge instantly online. This, combined with the rise of “fast fashion,” or low quality, low cost, and highly disposable clothing, fuels a culturally and environmentally destructive consumer mentality (Bein, 2015).

Other research theorizes that online shoppers are more purposeful because of their ability to research, and as a result do not impulsively buy something in a store when they know they can find a better deal online (PwC, 2015). These dueling ideas are difficult to solidify and point to a discrepancy between different types of shoppers.
also important to note that it should not be assumed that every aspect of consumerism is necessarily destructive to the environment, as can be evidenced by strides in so-called green consumerism (Stern, 1997), which will be addressed in Chapter 5 in greater detail.

3.3 Environmental Consumption

Nearly all forms of economic activity rely on some form of resource extraction, thereby leading to environmental consumption. A worry among environmentalists for the future is that the natural resources mankind relies on for survival including clean air, water, and land, will eventually be contaminated or depleted past their natural regeneration, leading to studies such as Rockström et al’s (2009) seminal work on planetary boundaries. Rockström et al. (2009) studied the ways in which humankind is brushing up against the earth’s carrying capacity through its irreversible impact on chemical and biological processes. According to their research, there are certain measurable atmospheric and physical thresholds which, when surpassed, threaten the earth’s resilience. These are climate change, ocean acidification, stratospheric ozone depletion, atmospheric aerosol loading, biogeochemical flows, global freshwater use, land-system change, rate of biodiversity loss, and chemical pollution. Their findings determined that of these nine, the rate of biodiversity loss and the biogeochemical flows have already surpassed the critical levels that protect the earth’s resilience (Rockström et al., 2009).

3.4 Determinants of Consumption

As population continues to grow and a greater number of societies move towards standards of Western consumption, it is important to understand the drivers of this growth, to identify trends and lead to innovations in efficiency. Table 2 is adapted from Tukker et al. (2010), a review comprising articles from a special issue of the Journal of Industrial Ecology in regards to the practices and policies of consumption. Eight main determinants are classified: income, household size, location, automobile ownership, food consumption patterns, international and interregional trade, social and cultural differences, and geographic location and housing type. Each explanatory variable describes how the determinant leads to an environmental impact.
Table 2. Determining Variables of Final Consumption Impacts (Tukker et al. 2010 p. 17-18)

<table>
<thead>
<tr>
<th>Determinant</th>
<th>Explanatory Variable</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>• Environmental impacts rise with household income</td>
<td>Druckman &amp; Jackson, 2008; Weber &amp; Matthews, 2008; Kerkhof, Nonhebel, &amp; Moll, 2009; Baiocchi, Minx, &amp; Hubacek, 2010</td>
</tr>
<tr>
<td></td>
<td>• The rise is not always proportional</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Growing body of literature on disproportionate relationship between household consumption impact and income</td>
<td></td>
</tr>
<tr>
<td>Household size</td>
<td>• Per capita environmental impacts vary inversely with household size because people in cohabitation share appliances and space</td>
<td>Weber &amp; Matthews, 2008; Liu, Daily, Ehrlich, &amp; Luck, 2003; Wilson &amp; Boehland, 2005</td>
</tr>
<tr>
<td></td>
<td>• There is a positive correlation between household size and emissions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Two important observations: growing population and decreasing household sizes both lead to increase in emissions</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>• Urban residents are typically responsible for fewer environmental impacts than people living in suburbs or rural communities because urban dwellings tend to be smaller than suburban homes meaning lower heating and cooling requirements, and suburban/rural residents tend to have higher automobile dependency</td>
<td>Ewing &amp; Cervero, 2010; Sanne, 2002; Jackson, 2003</td>
</tr>
<tr>
<td></td>
<td>• Denser population distributions support concentration of commercial services which create positive feedback loops and reduces reliance on transportation</td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
<td>References</td>
</tr>
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</tr>
</tbody>
</table>
| Automobile ownership | - As mobility is responsible for substantial proportion of household consumption impacts, people who use public transportation generally have smaller footprints.  
- An important caveat is that public transportation tends to be less expensive than automobile ownership, and final determination of comparative environmental efficacy depends on whether the savings are spent on comparatively lower impact-intensive consumption categories. | Ornetzeder, Hertwich, Hubacek, Korytarova, & Haas, 2008 |
| Food consumption patterns | - Vegetarians and consumers who eat locally harvested/seasonal/organic food generally have lower per capita environmental impacts  
- Assessment becomes complicated considering local produce from energy-intensive greenhouses compared to “food miles” accrued by alternatives in distant locations  
- Difficulty forming unambiguous heuristics | Duchin, 2005; Foster, C., Green, K., Bleda, M., Dewick, P., Evans, B., Flynn A., Mylan, 2006; Garnett, 2008; Weber & Matthews, 2008; Tukker et al., 2009; Blanke & Burdick, 2004; Pretty, Ball, Lang, & Morison, 2005 |
| International (and interregional) trade | - In recent decades there has been large-scale relocation of production from developed to developing nations, where less-efficient technologies tend to be deployed, increasing environmental impacts of household consumption, which have been documented through ecological footprint and virtual water flow analysis. | Baiocchi & Minx, 2010; Strømman, Hertwich, & Duchin, 2009; Chapagain, Hoekstra, Savenije, & Gautam, 2006; Hoekstra & Chapagain, 2007; van Oel, Mekonnen, & Hoekstra, 2009 |
Social and cultural differences

- There is a variation in energy consumption across countries of similar incomes, e.g. in the US per capita CO2 is approximately 20 metric tons while in the UK it is roughly 9.5 metric tons.
- Some variability can be attributed to population density, infrastructure, etc. but it is important to recognize how different social and cultural predispositions temper prevalent understanding of energy and material use.

Erickson, 1997; Maréchal, 2009

Geographic location and housing type

- Residents of climactically extreme regions who have low-quality, poorly insulated homes tend to have comparatively high environmental impacts.
- More complexly, vastly different policy circumstances that are created by housing stock that is predominantly owner occupied versus renter occupied as well as factors related to how different information technologies and energy-control devices can differently affect household energy consumption without changes in price or policy.


Nearly all the determinants of consumption outlined in Table 2 can be viewed through the lens of electronic commerce. For instance, an individual who does not own an automobile and resides in a densely populated urban environment would have a relatively low ecological footprint compared to someone who drives long distances alone each day. In this scenario, were the former to substitute a shopping trip made using public transportation with an online order, it would result in delivery by truck and
lead to greater emissions (Edwards et al., 2010). The reverse would be true if the latter lived along a regular mail route and the online order replaced a trip by car. This partially illustrates the difficulty in mapping differences between traditional and electronic commerce.

Newton and Meyer (2013) provide a more visual appraisal of the demand and supply side of consumption determinants (Figure 2). Both infrastructure and mechanisms in place on the production side of goods as well as consumer’s choices and habits form this framework, which is an interaction between supply and demand factors.

![Figure 2. A conceptual framework for consumption (Newton and Meyer, 2013, p. 1216)](image)

In regards to these determinants, Wilk (2010) asserts that “the actual use of resources is often beyond individual control[…]most of our purchasing behavior has nothing to do with choice— it results from locked-in and long-term decisions[…]often by institutions (or social groups like families) instead of individuals” (p. 40). The term “lock-in,” first described by Arthur (1989) is a common idea behind the technology and systems in place such as historical events that make it difficult for individuals to break their habits. These barriers may consumption habits or others, and despite their inferiority to more efficient alternatives they remain in place. A relevant example of lock-in would be the majority of nations’ dependence on fossil fuels for energy production, despite the
existence of cleaner alternative methods of renewable energy such as hydropower, geothermal, wind, and solar power. This lock-in is attributed not only to technology but also to the enormous social and political forces behind fossil fuel proliferation.

3.5 Sustainable Consumption and Production

According to the United Nations Environment Programme (UNEP), sustainable consumption and production (SCP) “is a holistic approach to minimizing the negative environmental impacts from consumption and production systems while promoting quality of life for all” (UNEP, 2011 p. 10). This definition is in some ways a continuation of that of sustainable development, as it describes a balance between meeting basic needs to ensure a standard of living and maintaining a healthy environment. The United Nations General Assembly revised their United Nations Guidelines on Consumer Protection to include sustainable consumption in 1999, whereas previously the focus of consumer policy was economic interests (UNEP, 2011).

A basic keyword search for “sustainable consumption” was performed in ScienceDirect, a prominent scientific database composed of journal articles and book chapters from 2,500 journals and 26,000 books, covering physical sciences, engineering, life and health sciences, and social sciences and humanities. Figure 3 reveals the search results: journal articles and books containing the term “sustainable consumption” have increased more than tenfold, from 1,036 articles in 1998 to 11,621 in 2014.

![ScienceDirect Content Featuring Term "Sustainable Consumption"

Figure 3. Journal Articles Containing Term "Sustainable Consumption" Author Generated, 2015

1 www.sciencedirect.com
This focus on how to manage and live within the limits of the earth’s natural resources has been of growing academic interest as global material extraction and consumption of biomass, fossil fuels, and minerals continue to increase – by 25% from 1995 or 2005 (Bruckner, Giljum, Lutz, & Wiebe, 2012).

In support of the elements in Figure 2, Tukker et al. (2010) identify three general areas of final consumption that account for 70% to 80% of the total impact to the natural environment:

- **Mobility** (automobile and air transport, including holiday travel)
- **Food** (meat and dairy, followed by the other foodstuffs)
- **Home building and demolition** (including the use of energy-using products [EuPs]) (Tukker et al., 2010 p.17)

It is their suggestion that these areas should set the foundation for policy for sustainable development.

### 3.5.1 Sustainable Consumption and Shopping

While sustainable consumption covers a wide range of activities, for the purposes of this thesis the focus will be on individual sustainable consumption, particularly through shopping. It is understood as a basic economic tenet that there is a positive correlation between greater income and greater consumption, meaning as an individual acquires more wealth he or she spends that money on more goods (Brulle & Young, 2007). However, after a certain point of increased wealth this correlation is not proportional, meaning that consumption tapers off. For example, greater quantity of material consumption can be replaced by a smaller quantity of luxury goods, which despite being more expensive often have a smaller carbon footprint than non-luxury goods (Arnold Tukker et al., 2010). Extrapolating this argument leads to the notion that greater affluence does not have to correspond proportionately with greater consumption, but could rather allow for greater discretion and more responsible, sustainable consumer decisions.

The tenuous relationship between sustainable consumption and economic growth, particularly in more affluent societies where shopping is a more recreation activity, is exemplified in the issue of product longevity. Often, the most commonly purchased
household items are not built to last in order to encourage repurchasing for greater profit, which leads to higher levels of waste, a form of environmental degradation. In order for consumption of goods to continue more sustainably, products should be purchased less often and last longer (Cooper, 2012).

3.6 Chapter Summary
This chapter focused on the different forms of consumption and explored the often-vague definition of the term. Specific determinants were provided to explain how certain factors exacerbate or minimize the impacts of consumption. Where relevant, online shopping was described in relation to the themes discussed, to contextualize these elements. However, Chapter 4 will fully introduce and investigate electronic commerce from its advent and growth. While a background of a breadth of factors relating to electronic commerce will be explored, the influences of online shopping on consumer behavior and environmental impact will be of focus throughout.
4 Electronic Commerce

In 2009, the Organization of Economic Cooperation and Development (OECD) updated its definition of electronic commerce (e-commerce) as:

the sale or purchase of goods or services, conducted over computer networks by methods specifically designed for the purpose of receiving or placing of orders. The goods or services are ordered by those methods, but the payment and the ultimate delivery of the goods or services do not have to be conducted online. An e-commerce transaction can be between enterprises, households, individuals, governments, and other public or private organisations. (OECD, 2011, p. 184).

This broad definition encompasses both electronic and physical delivery, a key divider in considering the environmental impacts of electronic commerce. Electronic books or CDs which are downloaded and thus require no materials in their final form are an example of a electronic delivery, which avoids a significant portion of emissions (Coroama et al., 2014). More complexities emerge when goods ordered online are later delivered in a physical sense.

The aim of this chapter is to provide necessary background information on the emergence, growth, and changes to electronic commerce and subsequently focus on those facets of online shopping most relevant to the discussion of environmental impact. The first two sections, 4.1 and 4.2 introduce the practical background of electronic commerce, including its categories and history. Section 4.3 looks at common online shopping behaviors. Section 4.4 comprises the second half of the chapter, and is split into seven sections, each focusing on the various environmental effect of electronic commerce. Therein, both positive and negative effects are explored. The consumer’s role in these processes and further opportunity for more sustainable online shopping will be further described in Chapter 5.

4.1 Categories of Electronic Commerce

Business to business (B2B) electronic commerce entails the flow of products from suppliers to manufacturers to wholesalers to retailers, while business to consumer, or B2C, covers the flow of products from the retailers to the end customers (Abukhader & Jönson, 2003). In the United States, electronic commerce sales are still dominated by B2B transactions. B2C sales, or what is commonly referred to as “online shopping,”
made up only 5% of electronic sales in 2012 (US Census Bureau, 2014). Before the Internet was as widely used for commercial purposes, the term “teleshopping” referred to using any information and communication technologies (ICT) to shop, including home shopping channels and phone ordering from catalogs (Mokhtarian, 2004). As online shopping steadily grows, considering its economic, social, and environmental impacts through its implementation becomes more important.

Electronic commerce makes up the commercial activities of of electronic business, or e-business, which apart from market transactions, also includes a wider range of business processes within and among firms (Fichter, 2001). Table 3 illustrates these processes that are far removed from the idea of online shopping, and include tax transactions between businesses and government administrations, or the distribution of unemployment benefits to individuals.

Table 3. Market and Transaction Types of E-Business (Fichter, 2001 p. 9)

<table>
<thead>
<tr>
<th>Supplying Actor</th>
<th>Demanding Actor</th>
<th>Consumer</th>
<th>Business</th>
<th>Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer</td>
<td>Consumer</td>
<td><strong>C2C</strong></td>
<td><strong>C2B</strong></td>
<td><strong>C2A</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>e.g. exchange of music files, purchase/sale of second-hand goods</td>
<td>e.g. product evaluation by the consumer</td>
<td>e.g. tax transactions of individuals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e.g. ordering in Internet shops, download of software and music, online newspapers</td>
<td>e.g. data mining, software downloads</td>
<td>e.g. tax transactions of companies</td>
</tr>
<tr>
<td>Administration</td>
<td>Administration</td>
<td><strong>A2C</strong></td>
<td><strong>A2B</strong></td>
<td><strong>A2A</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>e.g. welfare payment transactions (unemployment benefits, etc.)</td>
<td>e.g. procurement measures of public institutions via Internet</td>
<td>e.g. transactions among authorities via the Internet (e.g. Bonn- Berlin)</td>
</tr>
</tbody>
</table>
Consumer to consumer (C2C) is often referred to as peer-to-peer, which since the 1990s includes platforms such as Craigslist and eBay, online platforms that have emerged to connect people with underutilized goods, usually through local transactions (Fremstad, 2015). These sites are thought of as part of the larger sharing economy, a network that claims among other things to build community and reduce resource use by allowing individuals to share goods and services outside of typical corporate or business avenues (Fremstad, 2015). In addition to solely online businesses, many brick and mortar retailers are incentivized to adapt by opening an avenue for online shopping to their own business, what is called a dual-channel (Carrillo, Vakharia, & Wang, 2014). This further adds to the complexity of both supply chain logistics and consumer behavior online and in store.

4.2 Emergence and Growth of Online Shopping

In 2000, the percentage of United States companies that sold their products over the Internet rose to 56%, more than twice as many as were doing so in 1998. A similar growth rate was seen in the amount of money spent in B2C transactions from 1997 to 1999, from US$2.2 billion to US$5.6 billion (Sui & Rejeski, 2002). In 2012, US B2C sales accounted for roughly $US227 billion (US Census Bureau, 2014). Globally, the percentage of total retail taken by online retail climbed from 2.2% in 2007 to 4.0% in 2012, leading to projections that the revolution to a largely digital market has just begun (JLL.com, 2013). In 2007, 60% of all US consumers used the Internet in order to research products, while 50% completed a purchase online (Punj, 2011).

Grewal, Iyer, and Levy, (2004) summarize the history of retailing as “an endless search for convenience” (p. 712). Electronic commerce is not exempt from this characterization, and its popularity can in large part be attributed to the convenience it affords consumers. The following timeline is provided to place electronic commerce into a more historical context.

One of the oldest theoretical models of modern retail is called the “wheel of retailing” (Hollander, 1960). According to this theory, a business enters the market with low prices and margins, because it is the most cost effective way to acquire as many customers as possible. Later, the business adapts to the unique needs of its most loyal customers, and seeks out those customers who shop often and are willing to pay more.
As the business transforms to have higher prices and margins, a place opens up for a new entrant to the market, and so the wheel continues (Massad, Nein, & Tucker, 2011).

While initially useful, the “wheel of retailing” has proven unable to explain the popularity of gigantic discount retailers, or “hypermarkets” such as the United States’ Walmart and Home Depot, or France’s Carrefour, because these entered the market as large, low price sellers and remained as such, indicating the model’s oversimplification and irrelevance to newer establishments (Massad et al., 2011; Schultz & Block, 2015). Electronic commerce, too, defies the theory because of the freedom the internet allows retailers to better exploit make use of market opportunities find and succeed in niches in less time (Reisch, 2001).

The Internet’s prominent role in transforming retail is due in part to “the individualization of trade,” whereby consumers have the ability to conduct a transaction directly with a seller, domestic or foreign, without travel (Terzi, 2011). Customers are able to customize purchases to their needs and in some cases design the products themselves for complete personalization (Mokhtarian, 2004). Online shopping provides shoppers with greater access to product information through a more transparent market, allowing them to compare and contrast based on preferences, and altogether participate more actively in the process (Rezabakhsh, Bornemann, Hansen, & Schrader, 2006).

The rate of growth of electronic commerce is uneven across countries and its impact on trade varies. For instance, as the Internet becomes more prevalent in developing countries, exporting grows as a percentage of their total sales, especially to richer economies (Clarke, 2005). As seen in Table 2 (Section 3.4), international trade is a key determinant in increased consumption, and the increase in exports from developing countries often correlates with increased emissions due to less efficient manufacturing practices (Tukker et al., 2010).

4.3 Online Shopping Behavior
Research supports that behavior is markedly different in an individual purchasing a product online versus in the store (Farag, Schwanen, Dijst, & Faber, 2007; Punj, 2011). However, there is a lack of behavioral data at the consumer level available in order to more clearly depict the online shopper (Edwards et al., 2010). It seems to follow
intuitive logic that as consumers have the freedom to research products online rather than travel to multiple locations for comparison of price and other factors that this would lead to a decrease in the number of trips to shops in order to do preliminary research. However, this is not always the case, as some studies point to an increase in research done in store for online purchases, and that frequent online shoppers are also frequent in-store shoppers (Farag et al., 2007). It follows that there are certain environmental implications linked to multiple trips and subsequently greater emissions.

Mokhtarian (2004) speculates that there are four ways in which the transport impact of electronic commerce differs from that of a traditional shopping trip, based on consumer behavior:

- changes in shopping mode share (i.e. shifts in the proportion of shopping activities conducted through store shopping, online shopping and other modes), keeping the volume of goods purchased and per capita consumption spending constant;
- changes in the volume of goods purchased, keeping per capita consumption spending constant;
- changes in per capita consumption spending, independent of demographic changes;
- demographic changes (Mokhtarian, 2004, p. 13).

As these points were made over a decade ago, it is prudent to see what developments have occurred in the research published since then. In direct response to Mokhtarian’s first and second points, Schultz and Block (2015) found in their survey of over 286,000 US respondents that while shoppers reported a decrease in their online shopping habits, the volume of goods purchased has actually increased over the past five years. Wang, Malthouse and Krishnamurthi (2015) note that as shoppers become more comfortable with their mobile device, even typically low-spending buyers increased their order rate and size for all items purchased. Schultz and Block (2015) also establish that the ratio of purchased goods to researched goods is much higher for online shopping than it is for in store shopping, meaning customers are more likely to place an order online rather than in-store after the same amount of research. They note that this runs contrary to the notion that a live sales associate and the experience of testing out a product would lead to greater purchasing. This leads to their hypothesis that the retail store is being used to search and evaluate and then online platforms are
being used for purchase. This indicates that the means heavily influenced the end and resulted in greater consumption, which may have otherwise been deemed unnecessary during an in-store shopping trip.

In regards to demographics, as the use of technology and digital media becomes more prevalent, so does online shopping among various demographics. In fact, research surveying Internet users in Spain found that once familiarity of online shopping was reached, there was little significant difference in behavior across socioeconomic characteristics such as gender, age, or income (Hernández, Jiménez, & Martín, 2011).

Mobile shopping has emerged as a popular evolution of electronic commerce, allowing for even greater convenience than a personal computer. According to Wang et al., (2015), this allows for a reinforcement of “psychological and experiential state of being in a relationship with the firm” (p. 218). However, this increase in consumption is partially tempered in the fact that electricity usage is far less for mobile devices than laptop or home computers (van Loon, McKinnon, et al., 2014). As such, online shopping behavior, while different from in-store, does not paint a clear picture for researchers of which is more environmentally sustainable.

4.3.1 Products Purchased Online

Certain products seem to lend themselves more readily to be purchased online rather than in store. It should be noted that a great distinction lies between goods and services, both of which are offered online. Laroche, Yang, McDougall, and Bergeron (2005) assert that the differentiating factor between the two is intangibility, or “the total lack of the good or service’s attribute accessibility through the senses” (p. 251).

Further, the device used in the transaction also has an impact on purchase behavior. In a study of UK grocery shoppers, researchers found that customers growing accustomed to shopping on their mobile devices purchased items that they already had a habit for, such as fruit, milk, baby food, and coffee creamer online more frequently, while they tended to purchase items with long consumption cycles, such as batteries, vitamins, and light bulbs in store (Wang et al., 2015).

Many of the purchases made online are for intangible products, such as automobile insurance, which saw a near tripling of growth in online purchasing from 2002-2007 (Lieber & Syverson, 2012). While both are technically deliveries, the variability in
difference between delivering something intangible such as online insurance and a large package is noteworthy. However, in looking at the delivery impact of products typically bought online, their individual physical nature has little effect on the energy and carbon intensity of their delivery (Edwards et al., 2010). Rather, the patterns of production and delivery contribute more to emissions.

4.4 Environmental Effects of Electronic Commerce

There is a general consensus that electronic commerce is in many cases less environmentally harmful than its traditional counterpart, but with many important caveats (Weber et al., 2008). Often studies will note the large potential that lies in the restructuring of the electronic commerce supply chain in greater sustainability, but due to the variability of factors including consumer behavior, this potential is not consistently achieved (van Loon, McKinnon, et al., 2014).

Abukhader and Jönson (2003) categorize the environmental effects of information communication technologies (ICTs) into three effects: primary, secondary, and tertiary (Table 4). From primary to tertiary effects the scope widens further, from more to less concrete. For instance, measuring the energy usage of a data center or the amount of land used for warehouses of a certain company is not easy, but can be done. In contrast, mapping changes in consumption patterns and the possible side effects of those changes requires a much more multi-faceted approach.

Table 4. Classification of Environmental Effects of the Internet (Abukjader & Jönson, 2003 p. 467) adapted from (Tuerk, 2001) with little modification

<table>
<thead>
<tr>
<th>Effect</th>
<th>Caused by</th>
<th>Examples</th>
<th>Aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>Infrastructure</td>
<td>Terminal Equipment (Computers) Network Infrastructure</td>
<td>Energy Use Material Use Toxicity of end-of-life equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Servers, routers, etc.</td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>Application</td>
<td>B2B Change in Warehousing Change in Transportation</td>
<td>Energy Use Material Use Traffic Land Use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Change in Packaging</td>
<td></td>
</tr>
<tr>
<td>Tertiary</td>
<td>Changes in consumption patterns, new habits, rebound effects</td>
<td>Increase in Consumption Substitution Effects Side Effects</td>
<td>Energy Use Material Use Traffic Land Use</td>
</tr>
</tbody>
</table>
Mangiaracina, Marchet, Perotti, and Tumino (2015) reviewed over 56 papers from 38 peer-reviewed international journals in an attempt to offer the most up-to-date information on the environmental implications of B2C electronic commerce. They identified four main areas therein where environmental impacts occur:

- transportation planning and management
- warehousing
- packaging
- distribution design

The impacts within these areas have been assessed by researchers most often using four indicators: energy usage, gas emissions, waste generation, and traffic mileage (Mangiaracina et al., 2015). The following sections will further delve into these areas and others to create a general illustration of these impacts.

4.4.1 Categorizing the Environmental Savings

Sui and Rejeski (2002) categorized many of the efficiency improvements of electronic commerce under the umbrella of the ‘three D’s’, or dematerialization, demobilization, and decarbonization. The following explores the savings that fall under the first two of the three D’s, as decarbonization is itself a byproduct of decreased material consumption and less transport.

4.4.1.1 Dematerialization

Sui and Rejeski (2002) define dematerialization as a decrease in material goods needed in production, as in the digitization of printed items such as catalogs and books, which in turn minimizes the use of paper resources. The concept was concretely measured by Coroama, Moberg, and Hilty (2014), who focused specifically on the efficiency savings of teleconferencing. Their investigation into the efficiency of several localized conferences linked through video rather than one central location involving more travel found that while electronic media can represent greater efficiency, Their findings showed that while it was possible to reduce transport and energy use through teleconferencing and decentralization, it took extra planning in order to implement without adding on new energy costs in the process.
4.4.1.2 Demobilization

Demobilization occurs in less time spent travelling in order to deliver or purchase goods or services, which are now provided through the Internet. Again, the case of telecommuting is relevant, as an employee no longer travels to and from work and thus reduces emissions. As has been discussed earlier in this thesis, demobilization in regards to online shopping is difficult to pinpoint because of the scope of travel. Van Loon et al. (2014) isolate four general ways in which online shopping impacts consumer travel and its related carbon emissions:

- **Substitution**: the physical trip to the shop is eliminated by the online purchase.
- **Complementarity**: consumers continue to go to the shop, despite the online purchase, to inspect the products, collect the item (using a “click and collect” service), buy accessories for the products, or to buy the product after finding it online.
- **Modification**: the amount of travel stays the same but the characteristics of the trips are changed, like the transport mode or trip chaining.
- **Neutrality**: there is no effect on travel behavior because the online purchase would not have taken place if the product was not available online (van Loon et al., 2014, p. 289).

There is potential for great carbon reduction per product were an individual car trip to be replaced by a van delivery, however, this reduction is predicated on the pure substitution of trips, whereas in reality a customer is more likely to replace a trip to one store with a trip to another (van Loon, McKinnon, et al., 2014). This makes it very difficult to measure the savings and costs in electronic commerce developments, as they rely so much on consumer behavior.

4.4.2 Supply Chain Logistics

As with many developments through technology, retail processes have become more intricate over time, with a greater number of interacting parts. The main purpose of logistics is to reduce costs, and so it follows that logistical restructurings over time serve to reduce monetary or temporal costs to the supplier and consumer (Rodrigue, Slack, & Comtois (2001). The evolution of electronic commerce has introduced new points along the retail supply chain, such as collecting and sorting distribution centers and data centers, as well as changed certain flows to the original structure, such as the means of
travel from the consumer to the product. Figure 3 provides a visualization of the evolution of retail logistics dating back to the 1970’s (JLL.com, 2013). While simplified for understanding, four phases are depicted, each growing more complex as new elements are introduced. The most recent phase includes electronic commerce, which saw the addition of “e-fulfillment centers”, or large facilities that assemble individual orders that are then shipped through parcel services, to the logistics chain (Rodrigue et al., 2013).

According to the most recent data, demand for new electronic commerce logistics facilities falls into three categories: mega e-fulfillment centers which average between 500,000 – 1,000,000 square feet in size; parcel hubs or sortation centers; and parcel delivery centers (JLL.com, 2013).

Figure 4. Evolution of Retail Logistics (Adapted from JLL, 2013)
Van Loon et al. (2014) found that these types of facilities, often referred to simply as warehouses, often use less energy per square meter than retail store locations, even up to 16 times less in certain cases. In the case that warehouses are substituted entirely for retail locations, this is a significant saving in the environmental impact through energy use. However, actual energy savings from changes in warehousing may be modest due to other changes in the supply chain (Romm, 2002). In any case, there has been relatively little research done to attempt to quantify the environmental impact of the design of the electronic commerce supply chain as a whole, in terms of energy use or carbon emissions (Mangiaracina et al., 2015).

4.4.3 Green Logistics

While it still receives less attention in the research on online shopping than other topics, there is a growing movement among electronic commerce companies to initiate “greener,” or more environmentally conscious, practices along their supply chains (Mangiaracina et al., 2015). As mentioned in section 2.7, according to Gilg et al. (2009), the term green often reflects a more consumption-based ideal rather than a more holistic, sustainable practice. This is part of a larger trend of “supply chain decarbonization,” wherein efficiency improvements and opportunities for carbon abatement are expected to provide the benefits of lower costs and economic growth (World Economic Forum, 2009). These are generally transport related, such as the use of electric, hybrid, or more fuel-efficient vehicles for deliveries, or in the case of Amazon, the world’s largest online retailer, the projected use of drones to deliver smaller packages within ten miles of a warehouse (Mangiaracina et al., 2015).

As changes in the logistics chain increase efficiency in some areas, so too do they lead to inefficiencies in others. Table 5 provides a brief look at the many paradoxes inherent in the efficiency savings of a greener supply chain (Rodrigue et al., 2001). The table refers to the attempt of all retailers (not only online) to increase efficiency in their supply chains. It is relevant in showing that even conscious attempts by manufacturers and retailers to reduce emissions can be met with opposing consequences. In specific regard to online shopping, the biggest paradox is one fundamental to this thesis, that as certain business opportunities grow and the supply chain diversifies, this results in
greater energy consumption. This coincides with the notion that greater convenience can lead to greater consumption on the part of the consumer (Reisch, 2001).

Table 5. Paradoxes of Green Logistics. (Rodrigue et al., 2001 p. 7)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Outcome</th>
<th>Paradox</th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td>Reduction of costs through improvement in packaging and reduction of wastes. Benefits are derived by the distributors</td>
<td>Environmental costs are often externalized.</td>
</tr>
<tr>
<td>Time/Flexibility</td>
<td>Integrated supply chains. JIT and DTD provide flexible and efficient physical distribution systems.</td>
<td>Extended production, distribution and retailing structures consuming more space, more energy and producing more emissions (CO2, NOx, etc.)</td>
</tr>
<tr>
<td>Network</td>
<td>Increasing system-wide efficiency of the distribution system through network changes (Hub-and-spoke structure).</td>
<td>Concentration of environmental impacts next to major hubs and along corridors. Pressure on local communities.</td>
</tr>
<tr>
<td>Reliability</td>
<td>Reliable and on-time distribution of freight and passengers.</td>
<td>Modes used, trucking and air transportation, are the least environmentally efficient.</td>
</tr>
<tr>
<td>Warehousing</td>
<td>Reducing the needs for private warehousing facilities.</td>
<td>Inventory shifted in part to public roads (or in containers), contributing to congestion and space consumption</td>
</tr>
<tr>
<td>E-commerce</td>
<td>Increased business opportunities and diversification of the supply chains.</td>
<td>Changes in physical distribution systems towards higher levels of energy consumption</td>
</tr>
</tbody>
</table>

The first dimension, cost, relates to the spectrum of changes that result in environmental savings and at what point these changes are no longer cost-effective. While there are often parallel cost savings in improving packaging or reducing waste,
not all cost reducing measures are correlated to environmental impact reductions, especially as environmental impacts can occur externally. Externalities occur when “the benefits of logistics are experienced by the users (and eventually to the consumer if the benefits are shared along the supply chain), but the environment assumes a wide variety of burdens and costs” (Rodrigue et al., 2001, p. 3).

The second dimension and paradox suggest that while providing customers with door-to-door (DTD) and just-in-time (JIT) services is a sign that a supply chain has increased time flexibility and efficiency, a result is greater environmental harm in order to act within new time constraints. This is a similar parallel to the dimension of reliability, wherein the modes of transport that are most reliable in distributing wares are often the least environmentally efficient.

The third dimension refers to the wider supply chain network, and how changes to it can result in a concentration of environmental impacts at certain points. This is reflected in electronic commerce specifically when considering that certain points along the delivery of products result in greater emissions than others, as will be explained in the next section. The fourth dimension, reliability, reflects the overarching idea that convenience and reliability, valuable concepts to customer retention, can be at odds with efficiency, both cost and environmental. Finally, the shift in warehousing may at first seem to be beneficial to the environment, but in actuality the facilities that replace warehouses are not necessarily more energy efficient.

4.4.4 The Last Mile in Delivery Service
There are myriad interacting variables that work together to deliver a package from business to consumer. According to many studies, one of if not the most critical factor in determining the environmental impact as well as cost efficiency of B2C online shopping supply chain in is what is referred to as the “last mile.” The last mile refers to the final leg in a B2C delivery service, where the product is delivered to the recipient, at their residence or at a collection point (Edwards et al., 2010; Gevaers, Van de Voorde, & Vaneilsander, 2011).
Emissions vary greatly depending on the final execution of the delivery. In the case of a failed delivery, a consumer required to drive to a collection point to pick-up his order increases the average emissions greatly in comparison to a successful delivery (van Loon, Deketele, Dewaele, McKinnon, & Rutherford, 2014). The time sensitivity of services guaranteed by companies adds another dimension of complexity, and could result in multiple trips for only a single delivery in order to act within a given window of time (Gevaers et al., 2011).

In a comparison of the last mile of a consumer shopping trip and home delivery, it was found that unless a customer purchases more than 24 items in a single in-store shopping trip, home delivery will result in fewer CO2 emissions (Edwards et al., 2010). However, the same study also notes that this conclusion is hinged on several qualifications, including a successful delivery, no return on the part of the consumer, and the home delivery and shopping distances were of average length (Edwards et al., 2010). Given that all of these qualifications are not always present, it continues to be difficult to make a clear comparison between in-store and online shopping.

4.4.5 Packaging

Depending on the circumstances, packaging of an item purchased online and delivered can be less than or greater than an item purchased in stores (van Loon, McKinnon, et al., 2014). In their study of book retailing, Williams and Tagami (2002) found that while e-commerce packaging was becoming more streamlined, the amount of cardboard used in the home delivery of an average book order was nearly 5 times greater than that used for in-store purchasing. In contrast, (van Loon, McKinnon, et al., 2014) note that as
items purchased online do not need to be packaged attractively for display in a store, this gives the retailer freedom to use more basic, presumably less carbon heavy, packaging.

Ultimately, as the packaging used for a product in online shopping ends up in the consumer’s home, the final task of recycling is left up to him or her. Similarly, in a traditional shopping trip the choice to utilize plastic bags or a more sustainable alternative is also the consumer’s responsibility.

4.4.6 Returns
As customers are typically unable to test out products before purchasing online, there is an inherent risk that leads to greater returns than in-store. For this reason many modern online retailers forgo added shipping costs in order to secure customers as “re-purchasers,” and consider facilitating the returns process an integral part of business (Griffis, Rao, Goldsby, & Niranjan, 2012). The overall ease and convenience of buying and returning items online without added shipping cost can lead to a larger order than would occur in one pre-arranged shopping trip (L. A. Reisch, 2001). According to the United Postal Service (UPS) 93% of shoppers surveyed added more to their virtual shopping carts in order to qualify for free shipping (UPS, 2014). These trends could theoretically cultivate a more recreational approach to shopping, corresponding to greater consumerism and consequently greater emissions.

4.4.7 Devices Used in Online Shopping
The devices that consumers use to shop online include computers, laptops, tablets, and smart phones. The environmental degradation as a result of resource extraction in order to manufacture many of these devices is well documented (Williams, 2011). However, it is difficult to measure the amount of time spent shopping online versus performing other tasks. On one hand, drawing a comparison between laptop energy usage between 2005 and 2014, there is a 63% decrease in idle energy consumption, indicating vast efficiency savings in modern technology (Coroama et al., 2014). On the other hand, the more frequent upgrades to newer devices either due to sociocultural values or what some believe is “planned obsolescence” lead to problems with e-waste as well as the resources used in their manufacturing (Williams, 2011).
Drawing from these points it is possible to widen the scope of online shopping from the manufacturing and use of the item purchased to the device used to purchase it. In doing so, as with constructing the boundaries on a life cycle assessment (LCA), uncertainty and variability grows in calculating the environmental impact of a single action (Freidberg, 2015).

4.5 Chapter Summary
The aim of this chapter was to introduce the concept and give a brief history of electronic commerce, followed by a narrowing down to the environmentally relevant impacts of B2C online shopping. What has emerged is that consumer behavior, both while shopping online and in action during the last mile, is critical in the variability of emissions. In the following chapter, the consumer will be the focus, as his or her willingness to pay for environmental efficiency in the delivery of goods is a key factor in its success. Further theories of sustainable consumption, introduced in this chapter, with a focus on demand will be explored.
5 Choosing Green: Pro-Environmental Consumers

The previous chapters have explored the relationship between consumption and the natural environment, and how this relationship is and will continue to be impacted through the advent and growth of electronic commerce, particularly business to consumer (B2C) online shopping. As the final theoretical chapter, what follows will shine a light on the drivers and barriers behind more environmentally friendly shopping practices, hereafter described as green.

Green consumers are those that are motivated by environmental values and concern, socio-demographic variables, and psychological factors such as social responsibility to make environmentally-conscious consumption choices (Gilg et al., 2005). As early as the 1970’s and 80’s, many companies took notice that consumers were willing to pay more for greener products, or those which in some way had a smaller environmental impact, and responded to those demands with less environmentally hazardous commodities (McDonagh, Dobscha, & Prothero, 2012). However the trajectory of this trend has not been linear, but rather cyclical, as the priority of sustainability rises and falls depending on a number of factors, such as changing perspectives of the green consumer and the ways sustainable consumption has been studied academically and practically (McDonagh et al., 2012).

While shopping practices make up a small part of a much larger cycle of environmental impact, any steps taken to reduce environmental harm in one area could lead to “spillover” in others, as has been evidenced in certain practices such as utilizing fewer plastic bags leading to greater instances of recycling (Truelove, Carrico, Weber, Raimi, & Vandenbergh, 2014). It is therefore important to integrate shopping habits into a wider scope of behavior.

The focus of this chapter will be the environmental perspective of the consumer on the demand-side, including his or her access to information and the impact of more environmentally conscious behavior. This will contribute to the context of online shopping as an individual action with the potential to influence sustainable behavior.
5.1 Environmentally Significant Behavior

Categorizing the types of behavior that cause positive and negative environmental impacts is important in informing the public of how their behavior is linked to their natural surroundings. Environmentally significant behavior (ESB) can be defined twofold: impact driven, meaning how a person’s behavior changes the availability of environmental resources or the structure of ecosystems, and intent driven, or behavior that is initiated with the intention to change (usually positively) the environment (Stern, 2000). There is capacity for a disparity between intent and impact, and it lies in the consumer’s understanding of his or her behavior. For instance, one could behave in a way that is beneficial to the environment without having intent or concern behind his or her actions, and conversely behave in a way that is intended to benefit the environment, but has the opposite outcome. Stern (2000) further outlines three general categories of environmentally significant behavior:

- **Environmental activism**, or behavior that includes active participation in environmental organizations and demonstrations.
- **Nonactivist behaviors in the public sphere**, which refers to behavior in support of environmental activism while not directly participating. This behavior affects the environment indirectly, but has the potential for influencing public policies and thus resulting in a greater effect.
- **Private-Sphere Environmentalism** is characterized as the “purchase, use and disposal of personal and household products that have an environmental impact (Stern, 2000 p. 409).” This is distinguished from public sphere behavior in that it has a direct environmental impact. However, the individual impact is small, but in the aggregate is significant.

Private-sphere environmentalism is the category under which consumer behavior falls. It is interesting to note that behavior in the public sphere, whether activist or nonactivist, only indirectly affects the environment, while private-sphere, despite being on a smaller scale, has a direct effect. In considering these magnitudes of different types of environmental behavior on the environment, it’s important to note that more convenient measures are not necessarily more impactful, and vice versa. For example, using reusable rather than plastic bags has less of an overall impact than reducing car usage (Steg & Vlek, 2009).
5.2 The Gap between Intent and Behavior

Harkening back to sustainable consumption, the consumer is often viewed as an integral focus of the concept. Among the findings in the UNEP’s 10 year framework report, they state that

Significant progress has been made on cleaner production and the supply side in some countries [...] awareness raising on sustainable consumption and tools to reorient consumer behavior still requires significant additional work [...] Where consumers are prepared to shift towards sustainable products, mechanisms need to be in place to ensure that producers [...] have the opportunity and capacity to supply affordable, sustainable products and have access to the relevant markets. (UNEP, 2011 p. 97).

A key theme within the study of environmental ideals is that even those who want to act in a less environmentally harmful often find themselves without the proper knowledge or tools to do so. This is referred to as the “gap” between environmental thinking and behavior (Kollmuss & Agyeman, 2002; Mont et al., 2013; Newton & Meyer, 2013). This gap is one of the biggest obstacles to improving environmental health through action, and fueled by generalizations, misconceptions, and simplifications which proponents for sustainable consumption seek to eradicate (Mont et al., 2013).

The findings of Newton and Meyer’s 2013 study on household consumption versus environmental ideology revealed that while consumers may claim adherence to certain eco-friendly lifestyle choices, their actual behavior often strays from their perceived environmental identity. Many times, the impact of those who believe they engage in pro-environmental behavior differs little from their less environmentally ideological counterparts. In their survey and analysis of 1,250 individuals, the findings definitively support that “lifestyles characterized by pro-environmental values, attitudes, and intentions did not reflect actual low consumption behavior” (Newton & Meyer, 2013 p. 1227). Newton and Meyer (2013) further describe the barriers between intent and behavior as individual and contextual (Figure 6). Individual barriers are behavioral or structural, whereas contextual barriers are more external, such as urban location or dwelling. Both of these can contribute to the lock in of certain behavior described in Chapter 3.
Individual barriers often stem from deeply engrained notions of consumption. For example, many consumers find that purchasing certain products based on a certain label to be environmentally friendly, but would not consider the alternative of actually decreasing overall consumption, which results in a greater benefit to the environment (Kollmuss & Agyeman, 2002). There is then a certain extent to which a consumer considers his or her role in sustainability, and a disconnect that stops short of significantly reducing consumption. This is emblematic of what is referred to as the dominant social paradigm (DSP), which continues to promote capitalism over its environmental consequences (McDonagh et al., 2012). Consumer data support this idea, that behaving in a green way still included a form of consumption rather than total abstinence. Consider the definition of green from a 2009 Deloitte survey:

A broad set of product attributes that are more environmentally and socially sustainable. These characteristics included: low water usage, reduced packaging, organic, locally grown, fair trade, energy efficient, biodegradable, non-toxic and low volatility organic compounds, and recyclable materials or content (Deloitte 2009, p. 9)

While these values reflect important steps on behalf of both suppliers and consumers, there is still an underlying current of commercial consumption at the forefront of the definition. Further, of the more than 6,000 US shoppers surveyed, the findings showed that nearly all shoppers (95%) would buy green, but only two thirds actively seek green products on each shopping trip, and even fewer, 22%, actually find and buy the green

Figure 6. The gap between subjective indicators of intent and actual consumption behavior (Newton & Meyer, 2013 p. 1217)
products that interest them. It is difficult to ascertain whether this is due to a lack of suitable products or a lack of awareness or willingness on the part of the consumer.

The general impetus behind the Deloitte report was to outline to companies the reward in investing in greener products, specifically because these self-identified green shoppers actually shopped more frequently and purchased more products than their non-green counterparts (Deloitte, 2009). This highlights the general ignorance to reduced consumption and focus rather on a different form of consumption. Wilk (2004, p.46) supports this claim, stating “that people often seek to achieve balance not by adjusting their behavior, but by adjusting their assessment of the moral valence of the things they buy, use, eat, and own.” Rationalization of less severe environmental behavior is often coupled with the belief that some other entity, whether the government, businesses, or technology, will take care of solving larger environmental problems (Kollmuss & Agyeman, 2002).

While discrepancies continue to exist between intent, action, and impact, the shift to more environmentally friendly lifestyles is still important and necessary, as the gradual process towards sustainability will involve a number of behavioral and habit changes among a significant number of people (Gilg et al., 2005). However, the time and space needed to implement a greener lifestyle are increasingly difficult to attain when so much of modern life is focused on the fast pace (Young, Hwang, McDonald, & Oates, 2010).

5.2.1 The Cost of Pro-Environmental Behavior

One of the most significant barriers to more environmentally sustainable consumption is cost. Diekmann and Preisendorfer (1998) hypothesized a relationship between the cost – the time, money, and effort – of making more environmentally conscious choices and the strength of impact an environmental intent had on behavior (Figure 7).
While making choices like using reusable shopping bags and recycling cans are relatively low cost and thus easily adopted by those with more environmental attitudes, the same consumers would find it much more difficult to rely solely on public transportation or reduce their energy use significantly (Diekmann & Preisendorfer, 1998).

5.3 Encouraging Sustainable Retail Practices

Steg and Velk (2009) assert that pro-environmental behavior harms the environment as minimally as possible, and may even benefit it. They assert that it is possible to influence people to engage in pro-environmental behavior through interventions such as informational strategies to change perspectives or structural strategies to provide access to more sustainable options. In order to encourage more sustainable consumers, an important intervention is education (UNEP, 2011). However, at what level or in what capacity remains largely unclear, but recent studies have attempted to isolate different approaches to encouraging more environmentally friendly behavior among consumers. Broadly, Young et al. (2010, p. 29) assert that in order for a green consumer to translate his or her values into a green purchase accordingly, six factors must be present:

- the consumer’s green value is strong
- the consumer has purchase experience
- the consumer has plenty of time for research and decision-making
- the consumer has good knowledge of the relevant environmental issues
green products are reasonably available
the consumer can afford and is prepared for the financial costs.

In the decision making process behind a purchase, green values, those which are concerned with environmental impact, are in competition with many other factors, such as brand strength, culture, finance, habit, lack of information, and tradeoffs between different ethical factors (Young, et al., 2010). However, newer research has shown that a using certain tools can promote the prioritization of sustainability. One such study looked at descriptive norms – how people perceive the prevalence of a behavior – and their influence on online purchase behavior (Demarque, Charalambides, Hilton, & Waroquier, 2015). The findings revealed that when presented with the information that other consumers purchased a higher proportion of green products, in this case those with recognizable eco-labels, consumers were influenced in the same way. This reinforces the notion that an individual’s behavior can influence a collective shift.

5.3.1 Sustainable Shopping Practices Online: Preliminary Research

With such an increase in freedom and convenience through shopping online, there are a greater number of choices to make. The customization of the online shopping experience often allows the consumer to choose among local and international retailers, shipping times, prices, and materials. There are current options for consumers to make more sustainable choices online, but they are often limited to what is made available by businesses. For instance, Amazon offers financial incentives for choosing a slower shipping speed rather than more popular one or two-day shipping (Kleinman, 2014), but it is unclear whether the efficiency savings driving this promotion are aimed at reducing cost or environmental impact.

Few recent academic studies have looked at online shopping through the lens of sustainability on the part of the consumer. In considering the gap between intent and behavior, new systems are necessary in order to inform consumers of the impacts their shopping choices can have. One such system, which puts the individual at the forefront of sustainability, is called the Individual Sustainability System (ISS). This attempts a comprehensive approach to “facilitate information, collaboration and entertainment features to support a holistic sustainable transformation” (Yee et al., 2015). Yee et al.’s system relies on a series of inputs including health data from wearable devices and
values entered by the user, which in turn match to outputs, or products, which are shown along with their ecological footprint. The aim is to align personal health, finances, and environmental sustainability into one shopping experience (Figure 8).

![Figure 8. Aggregated Health, Finance and Environmental Scores (Yee et al., 2015 p. 5)](image)

Tracking financial and personal health and exercise habits is common through the use of apps. Since 2013, mobile health apps have grown twofold to over 100,000 available on the most common platforms (Research2Guidance, 2014). However, including the environmental aspects of shopping in a personal application is novel. Yee et. al’s (2015) model is still in its prototypical phase but considers the inclusion of green consumption necessary to a more successful sustainable consumer.

5.4 The Sharing Economy

As briefly introduced in Chapter 4, the sharing economy is an important development in new modes of consumption, and deserves exploration in the context of this chapter as in many ways it lends itself to more environmentally-friendly ways of online shopping. While sharing among local communities and families has taken place as long as humankind has existed, the Internet has facilitated these older forms on a much larger scale, and for a far greater profit (Belk, 2014). This section will discuss the concept and investigate its effectiveness in promoting more sustainable consumer behavior. However, it is important to recognize that often the environmental savings associated with buying and selling used wares is secondary, and that consumers choosing to participate in the shared economy are doing so primarily due to convenience and cost saving (Fremstad, 2015).

Schor and Fitzmaurice (2015) define three categories of the new sharing economy, which they refer to as connected consumption: the re-circulation of goods, optimizing
the use of durable goods, and the exchange of services. The most relevant aspect of the sharing economy to online shopping are websites allowing for the exchange and purchase of used or new goods among consumers, or peers, which leads to the term peer to peer (P2P) electronic commerce.

Fremstad (2015) asserts that the roughly 500,000,000 posts in the “for-sale” section of Craigslist, the most popular P2P network, can lead to significant benefits to the environment. These are expanded on as per Fremstad’s study below (p. 15):

- Waste diverted from landfill that would otherwise be discarded
- Increased local transactions reducing transport-related emissions over long distances
- In counties where Craigslist launched an area list for residents to buy and sell secondhand goods, a correlated reduction in waste generation occurred
- Estimates suggest that Craigslist reduced waste in California by at least 1.7 percent – comparable savings to the state’s glass bottle recycling program

While these are particular to a single website, there are myriad sites providing nearly identical platforms for exchanging secondhand goods online.

The opposing argument is that these potential benefits are merely side-effects of a larger trend, whose societal and environmental harms outweigh the positives, stating that “by creating new markets for used goods, they expand the volume of commerce and inject additional purchasing power into the economy, which in turn creates impact” (Schor & Fitzmaurice, 2015, p. 414). In this way the convenience of sharing still stops short of even more significant environmental strides, for example choosing to pay less for a used item that one only uses a handful of times, rather than spending a bit more time and effort to rent that item and make better use of it among many people (Kessler, 2015). This pattern is reflective of ingrained consumption patterns that place habitual behavior such as ownership over utilization, and is reminiscent of the drivers behind other inefficient practices such as impulse buying and consumerism in general.

5.5 Chapter Summary
This chapter provided a brief background and overview of general theories behind green consumption, as well as its drivers and barriers. It sought to give recent and relevant examples of green consumption, through the sharing economy as well as the
emergence of newer business models for sustainable online consumption. The focus of the following Discussion chapter will be the convergence of theories and practices discussed in Chapters 3-5 in order to answer the research questions outlined in Chapter 2.
6 Discussion

The overall goals of this thesis were to generalize and summarize a vast amount of research and to identify central ideas therein (Cooper & Hedges, 2012). More specifically, the content-driven goal was to open the discussion of the environmental impact of online shopping to include consumer behavior and the opportunity for sustainable consumption. In order to provide a holistic background to the issue, both practical and theoretical literature was reviewed, from scholarly journals and more popular outlets such as marketing information and news media. The following sections will each address the three research questions formulated in Chapter 2 individually, drawing from the theoretical information presented.

6.1 Environmental Impact of Electronic Commerce

The first research question posed was “Which factors in the supply chain and demand process of electronic commerce contribute most to positive or negative environmental impact?” This question can be addressed practically and theoretically. In actuality the negative and positive environmental impacts of electronic commerce are shaped by the same factors. In many of the studies that addressed the supply chain of electronic commerce, certain areas were kept equal between electronic and traditional supply chains in order to simplify the boundaries, as including them all is too complex an undertaking. However, an overall consensus is that transportation is among the most environmentally significant variables, considering both the emissions from van or truck delivery as well as the consumer’s shopping trip (van Loon, Deketele, et al., 2014). This is in line with Tukker et al.’s (2010) finding that mobility through automobile and air transport accounts for the largest part of the environmental impacts of consumption. As such, much of the research done in greening the supply chain has looked at transportation-related reductions (Mangiaracina et al., 2015).

An issue that muddies the waters of distinguishing between the impacts of electronic commerce versus in-store shopping is the availability of dual channel retailing, which many businesses offer (Carrillo et al., 2014). Positively speaking, given a number of variables such as distance travelled during delivery versus to a store and number of items per purchase, there are fewer emissions per product during home deliveries (Edwards et al., 2010; Weber et al., 2008). But as a greater number of people in
different types of locations are purchasing items online for home delivery, there is uncertainty in regards to the long-term effects of the combination of trips made by the consumer as well as deliveries to the home (Farag et al., 2007).

One of the most significant aspects of B2C online shopping transport is the “last mile,” or the final stage of delivery to the consumer. This illustrates the many differences in emissions that can occur in this final leg of the journey – failed deliveries resulting in additional attempts can lead to far greater emissions than a successful first run (Gevaers et al., 2011). If the delivery of a good substitute purely for a shopping trip made by the consumer, there is typically a reduction of emissions. However, what the consumer then does with that saved time is meaningful – if it is replaced by another trip to purchase another good, the environmental savings are eliminated (van Loon, McKinnon, et al., 2014). As such, how the consumer translates the convenience of delivery into more sustainable actions is left up to him or her.

6.2 Shopping Habits as Linked to Environmental Behavior

The second research question asked, “How is the environmental behavior of the consumer reflected in his or her online shopping habits?” Being able to shop online significantly increases the freedom that a shopper has in selecting products that may not be available as conveniently through traditional retailers. In this regard, there is greater opportunity for those seeking more environmentally friendly products to find them online, if businesses are willing to disclose relevant information. However, there is no clear-cut relationship between those who shop online and those who are more likely to make green choices.

The intent behind online shopping has been researched, but within the studies reviewed for this thesis, environmental concern has not been a significant factor in the choice to shop online, with convenience and cost savings at the forefront of drivers (Chiang & Dholakia, 2003; UPS, 2014). The research showed that pro-environmental behavior takes many forms, including but not limited to shopping practices, such as purchasing certain products for their environmental impact (Gilg et al., 2005). While the possibility for online shopping to act as a tool in encouraging these practices exists (Yee et al., 2015), it is still in its early stages.
6.3 Sustainable Online Shopping

The final research question posed, “What opportunity is there for more sustainable online shopping?” As has been outlined throughout this research, there is much that a consumer can do to behave in a pro-environmental way and that is not to be dissuaded. However, there is also a limit to the impacts of this behavior without strides in the production and supply-side, which was not explicitly focused on in this thesis. While the research herein attempted to isolate the consumption practices of the consumer within online shopping as linked to the overall environmental impact, many of these choices must be made available by businesses or through public policy. As such the following discussion will focus on consumer actions with the understanding that they do not occur in a vacuum.

First, there is some evidence to show that the dimensions of the product ordered are not as important as the transport processes behind its delivery (Edwards et al., 2010). Extrapolating this can mean that an environmentally conscious shopper should focus rather on streamlining his or her shopping habits – number of trips, number of items per trip – rather than purchasing certain types of products, whether online or in store. For instance, avoiding purchasing products online that are likely to be returned due to experiential factors can save emissions from multiple trips, in comparison to one shopping trip that allows the consumer to try on for fit before purchasing. Similarly, purchasing multiple products online resulting in a single delivery rather than many separate deliveries is more beneficial. In this regard it becomes more important how online shopping fits into the larger lifestyle of a consumer, and taking small steps towards more thoughtful consumption.

One of the greatest differences between online and in-store shopping and one of the most significant draws to online shopping is convenience: the ability to buy what you want when you want it without changing locations (Chiang & Dholakia, 2003). This can lead to greater consumerism, as purchasing products becomes easier and easier their necessity becomes less important. The Internet should thus be used as a tool for information and research rather than simply a new medium for shopping. The Internet affords the consumer more freedom of choice, and in many cases this indicates lower prices than in-store purchases. The combination of ease of purchase and lower prices
has the potential to exacerbate “throwaway culture,” wherein the consumer has the option to buy lower quality, less expensive wares and thus places less importance on their longevity (Cooper, 2012). In order to make more sustainable purchasing choices, consumers can shift the focus from using the Internet to find the cheapest product available to finding more sustainable products.

It is integral that environmentally positive or neutral behavior becomes more convenient and less expensive, rather than environmental benefits being an occasional byproduct of online shopping. It is clear that cost is one of the most significant factors in encouraging sustainable behavior among those who wish to do so (Diekmann & Preisendorfer, 1998). However, the option to consume less or forfeit a purchase altogether, while clearly cost-effective, is not seen as viable by many consumers (Kollmuss & Agyeman, 2002), indicating leisurely consumption is an ingrained value. The sharing economy shows that in many ways convenience through reusing goods at a lower price rather than purchasing them new has led to an environmental benefit, but it does not typically factor in as a main driver (Fremstad, 2015). Further, even more difficult is encouraging less consumption overall, rather than whichever greener alternatives may currently be popular (Wilk, 2010).

6.4 Contribution, Limits and Suggestions for Future Research

The research was conducted in an attempt to contextualize the environmental significance behind the growth of electronic commerce, in particular through consumer behavior. The contribution of such an endeavor is the inclusion of individual behavior in the discussion of the environmental impact of such a complex and large-scale operation as electronic commerce. While many studies on online shopping and its environmental impact mention the consumer, he or she is not the focus as a driver for more sustainable practices. This is largely due to the uneven influence of supply versus demand forces on consumption, yet consumer choice can be a more important tool given the right information.

The scope of something as large as a shift in retailing is difficult to grasp. It is possible to widen the boundaries of processes ad infinitum, to include the energy involved in fueling the Internet, the materials necessary to produce computers and phones, and the entirety of the social, economic, and environmental implications that come along with
such profound connectedness. As the methodology of a more general literature review was chosen in favor of a more narrow systematic review, it necessitated a broad but shallower scope (Kysh, 2013). Criticism was excluded as a goal of the research method, and as such would be an interesting avenue to visit for future research, that is, evaluating the various methodologies used to measure and identify the environmental impacts of online shopping.
7 Conclusion

One overarching theme that has consistently recurred throughout the research is the tension inherent between environmental protection and economic activity. There is no simple solution that will allow for sustained levels of global consumption without degradation to the natural environment. As economic processes transform, it is essential to foster a narrative of inquisition and accountability between consumers and producers. Online shopping is already commonplace in many societies, and so should the discussion of its environmental impact be. In order to move towards a more sustainable future, even small decisions in the right direction can be important, as they reflect a greater understanding of the impact our actions have on the world around us.
References


toward a “Wheel of e-Tailing?” *Journal of Management and Marketing Research, 8*, 1–11.


