Electronic Waste in the Technology Triangle

by

Carly Rosenblat

A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Master of Arts
in
Planning

Waterloo, Ontario, Canada, 2014

AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

A contemporary planning issue is how to strategically handle electronic waste (e-waste) within urban environments. E-waste is a fast growing waste stream, resulting in increasingly toxic hazards. This thesis employs qualitative research methods to investigate how key actors in a corporate environment mobilize e-waste in the Region of Waterloo. Additionally, the thesis examines the motivational factors, which instigate how e-waste transitions from being an outdated electronic device to being repurposed.

Participants were recruited and interviewed from fifteen companies located in the Region of Waterloo to explore how e-waste is understood and what policies exist, if any, to handle a company's old electronic devices. These participants represent companies where electronics are manufactured, used on a large scale, or where participants were involved in the waste-processing sector. The data collected from the interviews was subjected to a methodology of open coding and axial coding techniques to look for patterns in terms of how e-waste is managed.

The results of these interviews revealed that most participants are uncertain how to handle e-waste and that the Region lacks a comprehensive framework for guiding companies in handling their e-waste. The ease of recycling tends to balance on the convenience of e-waste receptacles; financial incentives that enable recycling to be a cost-neutral or a profitable process; and a dependency on the secondhand market for electronics. Furthermore, the results of this thesis indicate that the security of data on the electronic hard drives is critical to e-waste management and that the type of e-waste can often determine the disposal strategy a company utilizes.

Recommendations for this thesis include seven strategies to effectively communicate and foster better e-waste management using traditional planning tools and policies aimed at urban planners and corporate strategists.

Acknowledgements

I am grateful to the participants who volunteered to be interviewed for this thesis and allowing me to research what is trending in the e-waste world from their experiences. I am indebted to my family and friends for their critical perspectives and discussions we have engaged in over the past two years that have enabled this thesis to be produced.

I would like to thank my supervisor Dr. John Lewis for drawing on his vast experiences to provide useful feedback during the research and writing of this thesis. I would also like to thank my committee member Dr. Carrie Mitchell for her focused attention and eye for detail and my reader, Dr. Clarence Woudsma for taking the time to provide his useful insights.

Table of Contents

List of Figures

List of Abbreviations

AV – Audio-visual
CEPA – Canadian Environmental Protection Act
CIP – Community Improvement Project
CSR – Corporate Social Responsibility
DfE – Designing for Environment
EMS – Environmental Management Systems
EPR – Extended Producer Responsibility
GIS – Geographic Information Systems
ISO - International Organization for Standardization
IT – Information and technology
LCD - Liquid crystal displays
LEED – Leadership in Energy and Environmental Design
MOE – Ministry of Environment
OES – Ontario Electronic Stewardship
OP – Official Plan
PA – Planning Act
RoHS - Reduction of Hazardous Substances
SCT - Social Contract Theory
ST - Stakeholder Theory
VBN - Value Beliefs Norms Theory
WEEE - Waste electronic and electrical equipment
WMMP – Waste Management Master Plan

Chapter 1 Introduction

Canadians are living in an increasingly digital lifestyle, consuming electronic devices on a grand scale. With the liberal consumption of electronic equipment, there has also been an emergence of a relatively new form of waste production known as electronic waste. According to the Ministry of the Environment (2009), electronic waste refers to waste, which required an electric current to run, such as a discarded computer disk drive or a cellular phone. However, one of the challenges in defining e-waste is determining at what point in time the electronic device cannot be repurposed and is therefore waste, in the sense that nothing more can be done to it. According to Lepawsky et al., (2011), the electronic device and its components are also valuable resources, which extends the lifecycle of the electronics, whereby the concept of e-waste is only temporary as it goes from being one product and transforming into another device. Electronic waste (e-waste) is the fastest growing type of waste in the industrialized world (Deathe et al., 2008). On an international scale, e-waste disposal presents a range of human and environmental risks associated with disposal methods. There is a global trend of e-waste being exported to lesser developed countries with weaker environmental policies, namely China and India (Lepawsky et al., 2011). A goal of this thesis research is to develop explicit awareness for planners and businesses to better understand how e-waste products are valued and deconstructed; furthermore to gain knowledge on where these e-waste materials and resources are circulated.

The need for further research is evidenced by the small amount of research that directly concerns itself with the development of e-waste policies in Canada, and specifically, the Waterloo region. Existing research is consulted concerning related topics such as how corporate social responsibility is pitted between moral acts and economic logic (Reinhardt et al, 2008; Lyon et al., 2008; Khanna et al., 2002); understanding electronic consumption trends (Wilhelm et al., 2011); and outlining commodity chains of electronic waste (Lepawsky, 2011; Deathe et al., 2008).

The other main component of the study involves taking an analytical role in understanding how companies which produce, consume, and process electronic hardware are connected to waste management practices. More specifically, this study assesses how corporate social responsibility (CSR) relates to these practices. The term 'corporate social responsibility' is nuanced and contested. This paper draws on the definition by Portney (2008), to mean "...a consistent pattern, at the very least, of private firms doing more than they are required to do under applicable laws and regulations governing the environment, work safety and health, and investments in the communities in which they operate" (p.261). In other words, CSR is characterized by the responsibility of a firm to act in an ethical manner. The evolution of CSR and its numerous meanings is further examined in the literature review.

1.1 Research Questions

Determining business strategies to successfully mitigate e-waste is crucial to ensuring CSR in the Region of Waterloo. The cities of Guelph, Cambridge, Kitchener, and Waterloo represent Canada's hub for leading technological businesses since the 1980s known as 'Canada's Technology Triangle'. It is a region that actively promotes its cluster of innovative corporations and potential for collaborative initiatives (CTTI, 2013) and is host to companies such as Blackberry (previously Research In Motion), Electronic Arts, Communitech, and Google. As such, this research assesses how leading information and technology (IT) companies in KW are influenced by solutions of their competitors in the management and promotion of policies towards e-waste. The main research questions ask:

1) How is electronic waste mobilized in the Region of Waterloo?

2) Which motivational factors are most effective in triggering a company's e-waste policies?

1.2 Thesis Guide

The first part of this thesis is concerned with identifying e-waste management strategies and examining their strengths and weaknesses in the form of a literature review. The literature surveyed comes primarily from scholarly research and government documents. It provides an overview of some of the challenges regarding how e-waste is understood, why it is problematic, and provides insight on how it is managed. The review critiques and assesses the evolution of waste management in Canada and narrows in on the province of Ontario, and ultimately case studies from the Region of Waterloo. Following this is a

discussion of examples of how e-waste is treated globally in places such as China, the United States, and some European nations. After comparing the Canadian example in the context of global approaches, the review moves on to discuss and explain the evolution of CSR practices and policies.

Proceeding from this literature review, the paper discusses the theoretical frameworks that underpin the research. The three main theories consulted include a combination of ideas drawn from Social Contract Theory (SCT), Value Beliefs Norms Theory (VBN), and Stakeholder Theory (ST). These theories present an opportunity to help understand the phenomenon of how e-waste is valued and consequently moved. These theories are drawn upon at multiple stages in the research, for example, as a guiding tool for the literature review to the development of questions during interviews with participants.

The methodology for this study is qualitative in nature. The strategy of inquiry involves a case study in the Kitchener-Waterloo area, inquiring in detail the relationships between electronic waste management practices and corporate behaviour. The benefit of a case study is that there is an opportunity to study the topic and location in depth (Creswell, 2009); collecting detailed information with a context to place the data. The research project relies primarily on qualitative methods in order to learn about the relationship between e-waste and CSR.

The research is centered on a geographic cluster of information and technology (IT) companies in the Kitchener-Waterloo region as well as corporate consumers of electronic devices. The companies have been selected through purposive sampling and stratified by whether they are a manufacturer of electronic devices, a corporate consumer of electronics, or as key informants with knowledge of e-waste and e-waste processing. After receiving ethical clearance from the University of Waterloo, semi-structured interviews took place with participants from fifteen different companies in the Region

Subsequently, this thesis will discuss the significance of the research and assess the quality of the research for internal validity, reliability, and generalizability of the research process and data produced. Lastly, this thesis summarizes the key points and makes recommendations for future directions concerning e-waste and its entanglement with CSR and government bodies.

1.3 Purpose Statement

This thesis contributes to the increased understanding and awareness of e-waste for people in the Region and may potentially inform companies of ways to enable or foster best practices. For planners especially, this thesis contributes to insight into waste management - specifically, the flow of resources. Ultimately, this study has provided a snapshot of information regarding what matters to businesses concerning their e-waste. Moreover, this thesis aims to encourages a dialogue amongst planners and companies regarding where waste goes and what priorities and incentives are needed to develop good standards for dealing with old electronics and those technologies currently being produced.

Chapter 2 Literature Review

2.1 Introduction

This chapter will provide an overview of some of the challenges regarding how e-waste is understood and managed, beginning by looking at the social and environmental costs of e-waste. Next, the chapter goes on to examine how e-waste policies are politically situated internationally and in Canada. Following this will be a discussion of how e-waste is valued and the attachments people make with their electronics, employing environmental psychology theories such as Stakeholder Theory, Social Contract Theory, and the Value-Belief-Norms Theory in order to help communicate the business case for developing sound e-waste management policies. The end of this chapter will highlight the gaps in the literature and discuss my contributions towards filling those gaps.

In order to understand how e-waste is thought of and the type of actions that are taken to manage e-waste, this chapter illustrates the recent historical context in which e-waste production has been addressed. The current trend in managing e-waste combines incentives and regulations. Both incentives and regulations are a common strategy to persuade consumers of electronics to feel a sense of attachment and responsibility to the products they use and subsequently dispose, however, there is a contested understanding of what combination results in best e-waste practices.

2.2 The E-waste Problem

Corporations and the media have developed a discourse entitling consumers to use their purchasing power to buy a product they can feel morally satisfied with (Fontelle, 2010).

Greater consumption has led to increased e-waste, a consequence that is seldom taken into account in the initial purchasing decision. As well, electronic products are being consumed more universally, and these products have a shorter lifespan than their predecessors. In 1992, the average lifespan of a computer was 4.5 years; by 2005, the lifespan had become around half of that time, resulting in greater quantities of computers being disposed of either locally or abroad (Kiddee, Naidu & Wong, 2013). Products like MP3 players and cellular phones have a life span of approximately 18 months before they are disposed of (Deathe, MacDonald & Amos, 2008). They are built with a design that does not allow for replacement parts to be easily changed (i.e. the battery may be sealed in like on IPods) and therefore when there is a problem with the device, it is more often replaced all together rather than individual parts being repaired. According to a study in the United States (U.S.), more than 60% of cell phones and smart phone sales are to replace other phones, while 90% of phones that have been disposed of are still functional (Wilhelm, Yankov & Magee, 2011). There is a trend in electronic products being disposed of prematurely (i.e. they still function) and also an industry trend to design products for shorter-term use, rather than longevity. This combination has largely contributed to the proliferation of e-waste as a by-product of technological advancement and changing consumer culture.

The problem of e-waste has human health and environmental consequences associated with it largely because of its toxic nature. In regards to human health, the disposal of e-waste has an impact from a food chain perspective where disposal sites for e-waste can leach toxins that transfer into the food cycle and become ingested into the body (Kiddee et al., 2013). A

Canadian example of this was documented by Tomko and McDonald (2013): they wrote about the toxicity of an e-waste recycling facility in Edmonton, Alberta. As a by-product of processing 30 000 tonnes of e-waste per year at the Edmonton e-waste facility, the release of hexabromocyclododecane (HBCD), a type of brominated fire retardant found in electronics, was located in the nearby environment at higher levels than average readings. Brominated fire retardants are used in printed circuit boards and the plastic casings, in keyboards and for cable insulators; which during combustion, releases vapours known to cause hormonal disorders (Kiddee et al., 2013). HBCD presents a risk to human health because of its ability to bioaccumulate in the food chain by leaching into soils, as found in the bordering agricultural and parklands in Edmonton (Tomko et al., 2013). Expanding on this example, human health risks from disposal of electronic devices also include exposure to lead, phosphorus, cadmium, chromium, arsenic, beryllium, lead, mercury, and barium which can result in, but are not limited to, respiratory problems, neuropsychiatric problems, convulsions, comas, and fatal incidents (Wilhelm et al., 2011; Halluite, Linton, Yeomans, and Yoogalingam, 2005). The geographic location of e-waste facilities and how e-waste is disposed of and stored is significant because of the ability for these chemicals to make their way outside of the processing facilities. Moreover, the concentration of these toxic materials is harmful.

E-waste disposal also has a direct impact on the health of people who work in recycling industries, particularly informal scrap metal recycling. E-waste recycling has a direct occupational risk associated with it because of the leaching of hazardous substances which

typically happens during the deconstruction of electronic materials where toxic substances can be ingested or inhaled (Lam, Lim & Schoenung, 2012). For example, a common substance in electronic products is the chemical beryllium, typically used in power supply boxes and motherboards but when exposure occurs, is dangerous because it is a carcinogen (Kiddee et al., 2013). In Guiyu, China there is a concentration of facilities to disassemble e-waste and for people working in the recycling of e-waste, it has been reported that they have high levels of fire-retardant chemicals in their blood (Boudier & Bensebaa, 2011). Exposure to these chemicals, along with other toxic substances can have negative acute or chronic effects.

Some of the places most affected by e-waste recycling include countries such as China, South Africa, India, Ghana, and Pakistan (Kiddee et al., 2013). There is a trend for e-waste from North America to be shipped to places with lower environmental and work safety standards because it is financially cheaper (Lepawsky et al., 2010). As Boudier et al., (2011) state, "According to the Silicon Valley Toxics Coalition (SVTC), the cost of recycling a computer is $2 in China compared with $30 in the United States" (p.39). In other words, China can recycle a computer for 93% less than the cost of doing it in the U.S. From an economic standpoint, it seems rationale to ship waste from the U.S. to China where it is cheaper, however, shipping these goods to be processed abroad leads to a transfer of toxic materials too.

Disposal of e-waste can be a lucrative business but also a risky one. It was estimated

that by 2010, Canadians would have disposed of more than five million computers and monitors on an annual basis (Deathe et al., 2008), representing just one component of e-waste. The metals in circuit boards are valuable components for recycling electronics, however; the cost of extracting those components may be more costly than the value of the material itself, acting as a barrier to recycling programs (Deathe et al., 2008). There is an international trend to download this responsibility to places with less intensive pollution regulation and where lower wages exist to make it an economical process (Offenhuber et al., 2012). The trend toward downloading alleviates some pressure from manufacturing companies to re-invest in alternative product designs, but if designers and manufacturers were held to account for this future e-waste then they might be incentivized to produce a less environmentally harmful product.

In Canada, 24% of the population had dead or unwanted televisions or computer displays to dispose of in 2011, of which 5% put them in the garbage; 50% took them to a drop-off centre; 5% returned them to a supplier or retailer; 20% donated or gave them away; 1% repaired or sold them; 19% still had them; and 2% dealt with them in another manner (Statistics Canada, 2011). These statistics represent a snapshot of part of the e-waste recycling sector in Canada. One of the questions this paper seeks to address is how e-waste recycling is understood and what factors instigate good recycling behaviours. Barriers to recycling e-waste include security issues such as peoples' concern about the release of their private information stored on their electronic devices, thus risking exposure to problems like identity theft or risking data security (Bouvier et al., 2011). Furthermore, the heavy weight of

electronics like computers and televisions was also cited as a deterrent for recycling, along with the cost of time and transportation and recycling fees charged by municipalities and private recyclers (Bouvier et al., 2011). These factors represent a number of inconveniences to e-waste recycling, which have real environmental and social consequences on the sustainability of the Information and Technology (IT) industries.

The Ministry of the Environment (MOE) helps provide a framework for guiding waste management in Ontario. As past MOE Minister Ruth Grier articulated, waste should be disposed of nearby the people who generate it, signaling the need for improved recycling and packaging measures (Hostovsky, 2006)[1]. Implicit to this concept is the idea that distance to waste plays an important role in assuming responsibility of the output of waste. As Lepawsky and McNabb (2010) argue, waste is highly mobile and moves as both pollutants and toxins but also as new types of commodities and values. Moreover, viewing waste in a linear fashion (one with a definite start and definite end point) is a limited perspective that denies consideration for the constant change where electronics are made into by-products and re-distributed (Lepawsky et al., 2011). Supporting this argument, Offenhuber, Lee, Wolf, Phithakkitnukoon, Biderman & Ratti, (2012) articulate that the more distant waste is, the less aware consumers are of the true costs of production and disposal. A key focus in the scholarly literature is the distance waste travels and the contentious nature of the discussion around the responsibility. Decisions about the location of waste matter but the proximity is a point of contention.

[1] This refers to all waste streams, not solely e-waste.

Uzzell and Rathzel (2009) argue that people tend to accept more local environmental responsibility, but tend to view localized issues as unproblematic. In other words, a local problem of trash in a neighbourhood may not be viewed as part of a systemic litter problem. A potential consequence of this mentality is for the success of implementing effective waste management strategies. The power of consumers to relate to the consequences of, idea of, and magnitude of their electronic consumerism and the e-waste generated from such production is a real risk to effective e-waste management strategies. If consumers are not aware of or do not grasp the concept of the consequences of the magnitude of e-waste for the risk it poses to their daily lives, health, environment, and society as a whole, then they will not value the significance of the need to consider its disposal and the consequences of not considering that process. Consumer pressure towards companies is a key component in regulatory incentives aiming at improving environmental management (Madhu & Anton, 2002). Moreover, if this point of view at localized issues is downplayed for its environmental risks, how might that perspective affect individuals organizing themselves to lobby for an improved standard of an environmental management systems (EMS)?

To summarize, the main problems in managing e-waste includes minimizing the human and environmental health risks associated with its toxic substances. Secondly, limiting the transfer of these toxic substances geographically. The following section outlines various strategies typically used to connect these risks with the acquisition of electronic devices.

2.3 Environmental Management Systems

EMS refers to the formal system of integrating a framework for educating employees on the monitoring, reporting, and evaluation of environmental performances both internally and externally to stakeholders of a company (Melnyk, Sroufe, and Calantone, 2003). The two main forms of EMS this section explores include insight on corporate certification standards and product design of electronics.

A challenge policymakers face in the waste management industry is attaching environmental standards to economic incentives. Competitiveness in the market of production for environmentally friendly products is one condition that directs companies to produce goods at a higher quality in order to distinguish themselves from other companies in the same industry (Madhu et al., 2002). Perceiving the product as something that can be disposed of in an environmentally friendly way makes it more attractive to consumers concerned with the longevity of purchasing a good (Thorpe et al., 2009). EMS was developed as a way of improving the communication of business strategies, whereby a company asserts its licence to operate its business to a recognized standard - bringing some validation to their means of production. For example, there is the E-Steward certification in the U.S., which began in 2008 as a measure of environmentally responsible practice (Reis de Oliveira et al., 2012).

Having a licence to operate is a conundrum for e-waste management systems: while a licence or certification provides the user with a legitimate path for managing waste

production, it might not be the optimal solution toward being the most efficient or effective solution for e-waste management. However, as long as the user has been certified as conforming to the specific standards they might not feel any incentive to reduce further. The user and perhaps consumers are pacified and comforted to know they are doing something; but is it enough? On the one hand, businesses operate in accordance with certain regulations, but on the other hand "...regulators grant the legal licence, but the 'local licence to operate' - sometimes the one with the greatest impact on a company's performance - is obtained through consultation and good relations with affected communities" (Thorpe et al., 2003, p.23). Certifications that are non-required can still be used to generate community goodwill to this purpose. Certifications are like awards, which indicate a company's approval in a community and signal the right to conduct business in a specific manner, which can affect social acceptance.

The certifications negate some of the aspects of ecological economic logic, which questions who has the right to pollute. Parallels can be drawn with certifications and the use of emission trading permits. Emission trading permits are used as an environmental policy to reduce the quantity of emissions (like carbon dioxide or other toxins) that can be emitted into the environment (Portney, 2006). The goal of the trading scheme is to limit the emissions to a specific acceptable target over time. The government sets targets for emissions to be divided into units which are subsequently utilized by obtaining permits; or if their are leftovers, a company is able to trade their remaining permits with another company (ibid). The cap and trade system operates by making it expensive to be the producer of emissions.

Thus, trading permits allow a company to produce emissions until (theoretically) a new technology motivates a reduction in the sum of emissions because it is no longer economically feasible to continue operating in the business as usual method (Harrington, 2006). The extent to which a certification provides a sense of credibility is still problematic due to the difficulty in capturing the economic value of a less polluted environment compared to a more polluted environment. Certifications and permits are similar because they legitimize waste production to a standard.

Having a licence to operate can be achieved in multiple forms: however, it is a complicated process to achieve an EMS. Furthermore, who determines the right to pollute, be it government or local community and stakeholders, is controversial. Using a method such as command and control environmental policies are efficient for dealing with hazardous wastes, more so than market-based incentives (Cerin et al., 2002). Traditionally, environmental policies have been implemented not to eliminate pollutants but to generate income from the polluters (ibid). For example, "OES [Ontario Electronic Stewardship] collected 45 million Canadian dollars (C$) in ecofees during first program year, April 2009 to March 2010, with current fees ranging from C$26.25 for displays with a larger than 29-inch screen to C$0.10 for cell phones and pagers..." (Quoted in Hickle, 2013, p.258). In other words, OES collected 2.9lbs per capita of electronic waste from April 2009-March 2010 (Hickle, 2013). This type of governance may not be strategic enough to curb the emission of negative externalities like pollutants resulting from the deconstruction of e-waste.

Another approach to EMS is through changing the design of the electronic products with the purpose of reducing waste. By substituting the material composition of the electronics for less wasteful designs, a company may develop a competitive advantage against their competitor's designs.

2.3.1 Electronic Product Design

One focus of waste planning strategies is centered on internalizing the cost of electronic materials. Designing for the Environment (DfE) is a program through which producers internalize the cost of deconstructing materials. When producers internalize the environmental and social costs, there is motivation to DfE, meaning "... designing products to reflect environmental considerations throughout the entire life cycle, and minimizing their direct and indirect impacts to meet existing and future environmental regulatory demands" (McKerlie et al., 2006, p.617). Policy measures that impose EPR, act as a catalyst for industry producers to demonstrate care for the end-of-life time frame of the original electronic products (Boudier et al., 2011; Deathe et al., 2008). In other words, EPR can lead towards DfE and help divert e-waste away from landfills.

Take-back systems are one way industry is communicating better services to their customers, but innovative design may be more effective at changing how the e-waste industry works. For example, reconfiguring how mobile phones can be longer lasting, Dutch designer Dave Hakkens conceptualized the 'Phoneblok' where different components of the phone can be easily replaced or updated according to individual needs or desires. This design concept has an absence of authority for determining when a phone is to be fully replaced or

by which company, presenting a potential solution for the design of future electronics, which embody the DfE concept. The prototype for the phone suggests a collaborative build of the electronics, where a multitude of companies build various parts and the user can upgrade different versions according to their preference (Phonebloks, 2013). The implications of this type of production could be a great solution for reducing the amount of e-waste generated. While this is just a concept, it has universal applications for changing the lifecycle of electronic products.

Corporate leaders may also be motivated to conform to some moderate environmental initiatives to deflect or avoid negative public relations and scrutiny from regulating bodies (Lyon et al., 2008). CSR requires alliances with internal and external partners. Lannelongue et al., (2012) conducted a study to assess the effect of government's environmental policies on corporate performance, surveying more than fifty employees. They stratified the survey by companies with EMS, without EMS, and with uncertified EMS. In conclusion they endorsed having EMS as a tool to operate a business, but questioned the point in having certifications which are not continuously audited and reinforced, shedding skepticism on the credibility of certificates (ibid). Juxtaposing this view, Epstein (2001) argues certifications like the International Organization for Standardization (ISO) 14001 are still relevant to understanding CSR because it establishes a metric to weigh performance against. The ISO 14001 is a system, which has criteria regarding data security, protection for employees, management of toxins and accountability for the trading of e-waste materials (Babbitt et al., 2011). The benefit of having certificates is that it provides an option to stratify potential

vendors and consumers to choose from when disposing of e-waste (ibid).

Alternatively, regulating better environmental performance can be achieved through legal operations instead of certifications. For example, in New York City, there is an option to attend recycling workshops in lieu of paying fines for first time recycling offenders (Castro, 2012). This is an example of a publicly endorsed resolution to a waste management strategy, which speaks loudly to the city's agenda to educate recycling offenders. As well, legal frameworks or the absence of legally binding policies also speak to the norms of a community.

2.4 Policy Context

2.4.1 International Policy on E-Waste

Effective in 1992, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, herein referred to as the 'Basel Convention' is the international legislation governing e-waste management (Reis de Oliveira, Bernardes and Gerbase, 2012). The purpose of the Basel Convention is to reduce hazardous waste production, however, Reis de Oliveira et al., (2012) argue the Basel Convention has failed to curb the exportation of e-waste, particularly with countries that have not ratified, but also due to the complex nature of identifying and sorting e-waste. Furthermore, the high costs of recycling in the U.S., Japan, and the European Union (EU) has lead to illegal exports of waste electronic and electrical equipment (WEEE) to developing countries with lower environmental and health standards (ibid). Thorpe and Prakash-Mani (2003) suggest as a

business strategy for sustainable development, companies who trade internationally are more likely to abide by international standards of environment and labour than companies who trade domestically because of the desire to reach international clientele to gain a licence to operate. The implications for trading e-waste may not follow this pattern. Reis de Oliveira et al. (2012) advocate e-waste recycling requires different strategies to incentivize industry than those historically used for other sectors, like the recycling of aluminum cans in Brazil. Lepawsky (2012) suggests cross-jurisdiction legislation in a North American context would be beneficial, turning to the EU's Reduction of Hazardous Substances (RoHS) directives, which places limitations on using certain materials.

Extended Producer Responsibility

There is value in policy networks when facing challenges of transboundary resources such as e-waste. Implementing Extended Producer Responsibility (EPR) regulations has power to shift waste management costs and responsibilities in multifaceted ways. Within the EU, EPR regulations for WEEE have already been implemented in 27 member states (Mayers & Butler, 2013). Canadian policy is newly focusing on the role of government to facilitate a structure for EPR and measured using an "EPR Canada Report Card" as a benchmark to monitor the federal and provincial governments contributions (Lifset, Atalay, Naoko, 2013). A critique in the report card by the not-for-profit organization showed that as of February 2012, while Ontario had a new producer-funding model for its existing hazardous waste programs, there is a lack of performance targets (EPR Canada, 2013).

EPR's two main purposes are to allocate the responsibility of waste management from municipalities to companies, and also encourage operations that facilitate sustainable product development - thus cutting the financial cost of waste management (Reis de Oliveira et al., 2012). Expanding on that concept, Nicol and Thompson (2007) state another EPR characteristic as a focus on the end of life part of waste in order to produce more environmentally friendly designed products. EPR can take form as product fees and taxes, take-back programs, taxes on raw materials, waste collection or waste disposal charges (Reis de Oliveira et al., 2012). Nicol et al., (2007) argue that many firms view EPR as a burden to production strategies. Subsequently, the downside of product stewardship is the decreased incentive for product designers to phase out hazardous chemicals (Nicole et al., 2007). This is especially a concern for electronic products because the main components are typically hazardous materials

In contrast to the Canadian system, Switzerland is a world leader in the regulation of e-waste (Kiddee et al., 2013). Switzerland has two separate WEEE recycling systems, the Swiss Association for Information, Communication and Organization Technology (SWISCO) Recycling Guarantee developed in 1993 and the Swiss Foundation for Waste Management (S.E.N.S) system, which was developed in 1990 as a non-profit organization (Hischier & Wäger. 2005). Hischier et al., (2005) conducted a study which assessed the value of WEEE recycling compared to incineration of WEEE products using a case study of the Swiss take-back and recycling systems for WEEE. They found, "In 2004 they [Switzerland] enabled the participating recycling companies to process about 75, 000 t [tonnes] of WEEE -

which corresponds to about 11kg of recycled WEEE per habitant (Hischier et al., 2005, p.527)". This figure nearly triples the European Unions directive on WEEE. The EU WEEE initiative aims to have a recovery of 4kg of recycled materials per resident (Boudier et al., 2011, p.44). WEEE is expected to increase by 3-5% per year (Hischier et al., 2005). It appears that in Switzerland, e-waste recycling has become the normal behaviour with the aid of an effective recycling model.

2.4.2 Canadian Policy on Waste

In Canadian policy, there is no national system for e-waste, however the provincial governments in Alberta, Ontario, and Nova Scotia have all launched programs to deal with e-waste, starting with Alberta in 2004 (McKerlie, Knight & Thorpe, 2006). A shift in attitude and policy towards national waste legislation occurred in the 1980s as a result of the increasing costs of toxic trade (Lepawsky et al., 2010). As a result, in 1982 the MOE developed a Waste Management Master Plan (WMMP), which was funded 50% by the MOE and 50% by the municipalities (Hostovksy, 2006). The program was evaluated in 1990 and it was found that municipalities and their partner organizations cited the cost, time, and political unrest as barriers to the success of the WMMP (Hostovsky, 2006). Progress of the WMMP was viewed as questionable, when in 1995, with the Conservative government in power (Mike Harris); the premier repealed the Waste Management Act and disbanded the Interim Waste Authority (IWA), a crown corporation created by MOE Minister Grier (Hostovsky, 2006). By the 2000's, plans have shifted to ship waste to private sector landfills, primarily from the Greater Toronto Area (GTA) to places such as Michigan (Hostovsky,

2006) or more specifically concerning e-waste, to countries like China and India (Lepawsky et al., 2011).

The hierarchy of government policy that deals with electronic waste starts at the federal level and goes to municipal designations. Under section 92 of the Constitution Act, 1867, the provinces have jurisdiction of electronic waste (Doelle, 2006). For the Region of Waterloo, the municipality gained waste management responsibilities in 1973 (Region of Waterloo, 2011). Federal policy in the form of the Canadian Environmental Protection Act (CEPA) also regulates the use and disposal of electronic products (Doelle, 2006). In Ontario, the Ontario Waste Diversion Act, 2002, designates how waste shall be managed under the organization of Ontario Electronic Stewardship (OES) (Deathe et al., 2008).

It appears there is a void when it comes to the practice of enforcing regulators. There is a lack of literature that concerns agencies taking responsibility for the enforcement of regulators and it appears that are no consequences to producers of e-waste. Government agencies seem to have abdicated responsibility for enforcement of policies in favour of self-regulation by the industry. In Canada, CEPA is the only national policy addressing toxic substances (Hickle, 2013). Environmental protection is designated as provincial responsibility to draft regulation and ensure its compliance (ibid). Another invested organization is the Electronic Product Stewardship Canada (EPSC), which was formed in 2003 (Lepawsky, 2012). The EPSC lacks the power to regulate EPR or to enforce its own standards because it has no governmental authority; however, its Recycling Standard is well

known by management authorities dealing with the legal aspects of e-waste across provinces in Canada, so it has a certain soft power. According to the Canadian Council of Ministers of the Environment, "...[r]esponsibilities associated with management of e-waste are primarily borne by producers of the products, where 'producer(s)' means the manufacturer, brandowner or first importer of the product who sells or offers for sale the product in each jurisdiction (Quoted in Lepawsky, 2012, p.1202)". The implications of this statement appear to conflict with typical business philosophies and economic strategies toward capitalism that is, to maximize profits and minimize costs. E-waste is a cost of production so unless a producer is forced, legislated and enforced by governing bodies to incur extra costs and adhere to certain standards, it is unlikely that self-regulation would be effective.

Provincial producer responsibility programs are financed in part through 'eco-fees'. Eco-fees are due when an electronic product is being disposed of, and is paid by producers on a per weight or per unit, depending on the product and the specific jurisdiction (Hickle, 2013). In Ontario, Ontario Electronic Stewardship (OES) establishes the fees; as well, recycling contractors have to follow EMS standards, and be compliant with the Basel Convention (Hickle, 2013). The management of the fees are done independently which to date, has led to most companies downloading the fee to retailers who transfer them onto the consumers (ibid). Lepawsky (2012) argues legislative governance of e-waste uses EPR as a solution to e-waste management, however, the financial responsibility is passed onto the consumers rather than producers, undermining the legislative goals - namely, to produce more environmentally friendly electronics.

There is limited cross-boundary collaboration on waste management systems within Canada, demonstrating a weakness in policy. Hostovksy (2006) argues disposal capacity for all waste streams is fundamentally lacking progress because of political boundaries rather than a lack of waste planning options. He suggests public participation in the planning schemes such as the rational comprehensive model is popular in waste managements; however, public participation may be counterproductive due to the public not wanting waste disposal facilities adjacent to their properties (Hostovsky, 2006). The rational comprehensive model is a planning theory that is focused on utilizing land efficiently and monitoring decision-making through a series of feedback loops to inform decision-making (Hodge & Gordon, 2008). A significant outcome of the rational comprehensive model is the value of monitoring and evaluating plans to assess the success of a plan, however the resources available for this to take place varies in municipalities (Seasons, 2003). As McKerlie et al. (2006) argue municipalities' play a reactionary role to waste with little power or tools to impact product designs. In other words, there is a trend to be reactive to waste management strategies rather than proactive. Consequently, it would appear the theoretical framework of the rational comprehensive model is not practiced as well in a practical scenario where there are competing political goals, which must compete with transboundary issues such as waste management.

Tracking Waste

For regulating bodies to be effective in their monitoring and evaluation of e-waste trends, knowledge of how much and where e-waste is circulated is critical information. One

innovative idea to communicate the flow of e-waste is the idea of tracking where the waste circulates. In gathering this type of data, the Region accumulates data on where electronic waste flows. In 2004, Lee and Thomas proposed using a global positioning system (GPS) and general packet radio service (GPRS) to transmit data on electronic equipment originating from Seattle (Offenhuber et al., 2012). A program called the Trash Track project attached sensors to 2000 waste items through voluntary households who were asked to dispose of the tagged items in their usual manner. Of the 2000 sensors, 1,152 of the traces were able to be utilized and from that data collection, it was reported that on average the electronic equipment travelled 114km, however, the longest distance was a printer cartridge that ended up 6,000km away (Offenhuber et al., 2012). Tagging trash represents an approach to changing how e-waste is understood geographically. One benefit of tagging is that it can act as a tool to communicate to cities where their devices end up, or at least part of the loop. However, this kind of tool may pose surveillance issues and has potential to be ethically problematic.

Valuation of E-waste

Investigating how e-waste is valued is essential to understanding the types of incentives or regulations, which may be applicable to motivating companies to develop their e-waste policies. Therefore, this section looks at how materials that make up electronics are understood to be significant

Technology transitions plays a role in communicating the flow of e-waste and how variables such as material substitution impact the quantity of e-waste produced. Lam, Lim & Schoenung (2012) developed a study which focused on how substitutions in desktop computers for laptops and flat-panel liquid crystal displays (LCDs) and plasma displays for cathode ray tube televisions make a difference in the environmental consequences of these electronics at their end of life stage in the U.S. Metrics for human and environmental health were quantified using theoretical scenarios of e-waste of computers and televisions being disposed of in air, water, soil and from incineration where toxicity scores were calculated based on the mass of a substance and its release of metals (Lam et al., 2012). What they found in their study was that for the most part, products with less metal contents were better for the environment compared to media with more metal contents because they use less resources (ibid). While there is a trend in technology to develop smaller units (i.e. more LCDs than plasma displays), "By 2010, EoL [End-of-Life] laptops and desktops generated per year are estimated to be more than 60 million units and 25 million units, respectively" (Lam et al., 2012, p.305). In conclusion, they found the offset of using less media materials containing metals is minimal in the long run because of a growing demand for electronics (ibid).

Unlike most other waste streams, e-waste is a dynamic product, which does not follow a linear commodity chain; where a product has a beginning and an ending firmly planted. There is an increasing global concern for the dumping of e-waste because of the environmental effects in the processing of electronics at the end of their lifespan (Lam et al.,

2012). Lepawsky and Mather (2011) emphasize how following a linear commodity chain route loses sight of the potential for value and value-added once materials are circulated, broken down, retrofitted, and transformed. Instead, they advocate that electronics should be looked at for their potential when they become dissected. Lepawsky et al., (2011) animated this case in point about reassessing value of a product through a discussion of the unmaking of a ship in Bangladesh that they observed. Interestingly, when they followed the process of a ship being dissected, they tracked the deconstructions of each part of the ship, as it was separated and sorted into smaller pieces and repurposed (Lepawksy et al., 2011). The ship was ultimately valued not for the broken product it had become but for the value of what it could produce. E-waste, like the ship, could be valued for its potential. From a social perspective, the decreased cost of purchasing a second-hand computer compared to a new one makes computers more accessible for lower income people (Babbitt, Williams and Kahhat, 2011). Incidentally, this presents a contrast in product value for companies who may not even be able to fathom the multipurpose use and users whom their product will be transferred to. Valuing for potential could introduce a disconnection between value and price of the commodity.

In their search for e-waste, Lepawsky et al., (2011) stated that following the flow of e-waste can only go so far before it becomes something else, “for example, copper wires or gold circuitry became unrecognisable as electronics but were now, for example, copper ingots or gold bars. These moments of transformation, the sites where they occurred, and our research about them constitute some of the boundaries and edges of the geographies of e-

waste" (p.247). The circulation of e-waste parts is widespread. With the multitude of repurposing of e-waste, privacy measures become significant when transforming an electronic device for re-use. Lepawsky (2012) makes a point that the legal ramifications of abandoning an item in Canada mean a loss of privacy property rights concerning that item.

The Porter Hypothesis

CSR is one strategy to advance production inefficiencies, taking company initiative to respond to and promote a company's positive impacts. Desrochers (2008) draws on the Porter hypothesis which states that, "...'properly designed and enforced' regulations that actually mitigate environmental harm could trigger innovate responses that would not only fully offset compliance costs, but also result in additional profits, or so-called 'win-win' innovations" (Desrochers, 2008, p.520). He proposes that allowing for greater freedom and flexibility in product design is a more effective solution than penalizing tax-based systems. Furthermore, he argues that economies related to geographic clustering of industries present a key opportunity to formulate by-products. This is significant for the production of e-waste as by-products are typically formulated from the mined components of electronic equipment after the waste has been exported (Lepawsky et al, 2010). The logic in the Porter hypothesis helps to validate the need to bridge the distance between production and waste management systems to capitalize on spatial proximity. The transportation costs alone of recycling e-waste can account for approximately 80% of the total procedure (Offenhuber et al., 2012). Accordingly, the idea of a centralized location for production and consumption of electronic innovation is a logical choice.

2.5 Theoretical Context

2.5.1 Understanding Corporate Social Responsibility (CSR)

The politics of e-waste are essential to the integrity of any EMS system. Therefore it is helpful to uncover under which conditions a company is motivated to voluntarily improve their environmental performance. Lyon and Maxwell (2004) suggest, "The fundamental idea is that politics is a battle of aggressive interest groups whose behavior can be best understood by their pursuit (sometimes in clever and convoluted ways) of economic self-interest" (p.292). Companies with CSR policies based solely on the notion that it is the right thing to do are more vulnerable than companies who have made a business case about incorporating sustainability actions because the companies are otherwise subject to changing priorities, corporate leadership changeover, and financial cycles (Epstein & Roy, 2001). There is a weak relationship of company's investing in CSR when marginal profit returns subside (Reinhardt et al., 2008). However, CSR does add value to companies when CSR costs are fully incorporated by investors; the cost is borne by the companies' creator, not the shareholders (Lyon et al., 2008). By strategically incorporating CSR investments into the conduct of a company, the results have greater potential for a meaningful commitment.

The question of what a corporation's responsibilities to the public has been redefined in the past fifty years, due to a shift in managerial positions of corporations (Donaldson et al., 2002). For small to medium size firms, according to the Canadian Federation of Independent Businesses, personal perspectives of business owners has the most weight in determining the

environmental stewardship of a company (Huppé et al., 2006). Likewise, Carroll (1999) agrees that the assumed responsibilities of a business comes down to the approach a manager takes in his or her philosophy on the best interests of a company. If a corporate manager chooses to promote environmentally sustainable behaviour, their bias of what 'environmentally sustainable' means is important to communicate and furthermore, the manager must be competent on how social performance plays a role in corporate profitability and how to set those goals in laymens terms (Epstein et al., 2001). Essentially, the manager must quantify how CSR variables will directly impact profit (Epstein et al., 2001). While many scholars argue CSR is an integral component to business practice (Weber, 2008; Lyon et al., 2004; Portney, 2008), Milton Friedman is most often quoted for his objection to CSR when he argued that the priority of business is to make a profit for stakeholders, and that to prioritize social responsibility falls outside the scope of businesses in a free society (Carroll, 1999). Milton's argument articulates that CSR is not in the best interest of the stakeholders. A corporation's priority is to maximize profitability but if the firm is legislated with the responsibility of incorporating waste management costs into a cost of production then they will be motivated to reduce costs and seek the most efficient means of production, which could include better end of life design principles.

The motivations for a company to develop CSR are commonly assessed from a dichotomy of economic self-interest reasons or ethical imperatives. A key issue is whether stakeholders influence businesses and which stakeholders have the most power (Mohr, 2001). Portney (2008) argues that no matter if a company incorporates socially responsible

behaviour for profit purposes or because of morals, they should not be considered superior to those companies' that have not made CSR a priority. Indeed, he argues "...unless these companies have made clear from the outset that they would be guided by social as well as financial returns, it is fair to argue that they would do better to return any monies spent on over compliance or philanthropy to their shareholders so they can choose and support their own favorite causes" (Portney, 2008, p.274). In other words, Portney considers it best practice to return the resulting benefits of philanthropy to the stakeholders to directly be in charge of. I would posit that CSR should not be conceptualized as a philanthropic gesture, but rather part of the cost of doing business with best practices in mind.

Measuring CSR

There is a lack of consensus on how to measure the effects of CSR. The benefits of undergoing the incorporation of CSR in their business plan may have a time lag, whereby the results are not known until a later point in time. For instance, CSR actions may add to the brand value of a firm. The financial merits of this investment may not be realized until the brand is sold (Weber, 2008). This is one measurement of CSR, however, it is contested how to accurately account for the effects of CSR and which metrics make for good indicators. Other variables to consider are whether the company is public or private and what the size of a company is, as this has a correlation with the amount of risk a firm is willing to take. Reinhardt et al., (2008) argue, "Investors with large private holdings are more likely to take an interest in their companies' activities and be able to influence the companies' actions" (p.226). Epstein et al., (2001) suggest companies involved in the recycling of hazardous

waste should measure the reduction in waste production by the weight of the waste (load/tonne) as an indicator of a company's operations.

Opposing this method, Lifset, Atasu, and Tojo (2013) argues measuring an EPR system by comparing the cost per tonne of expenditure or savings a company accumulates, provides a misleading impression when measured internationally because the requirements for take back programs are not globally standardized. Instead Lifset et al., (2013) suggests more consistent data is needed in the field of accounting systems for EPR programs. From a legal framework, most, but not all, provinces in Canada share legal definitions of e-waste. For example, in Nova Scotia, a computer disposed is e-waste in five other provinces, but in St.John's, it is considered 'bulk garbage' and sent to a municipal landfill (Lepawsky, 2012). Compounding efforts to sort e-waste is the inconsistency across provinces in how e-waste is understood.

2.5.2 Stakeholder Theory

Stakeholder Theory considers how a company's goals are aligned with other entities involved with the company (Moir, Webb & Harris, 2001). That is to say, there exists a requirement for corporate managers to check their activities match up with the interests of their stakeholders (Cragg, 2002). One of the goals of this theory is to determine who is or is not a stakeholder and how influential they might be to a company's operations. In relation to CSR, stakeholders expect companies to behave in a specific manner: however, each stakeholder may have a different perception of risk (ibid). One example of risk, in this context, is the risk of negatively affecting public perception of the company through poor

environmental practices. The risk involved in poor public perception is that consumers may boycott a given company, which has varying consequences; including the possibilities of both compromising the loyalties of an existing customer base, and alienating a future customer base. Clearly, shareholders of the company and other stakeholders have an obligation to guide the company to operate in its best interests, but also must consider how those operations influence those involved with its operations (Reinhardt et al., 2008). I am using stakeholder theory because it draws attention to who some of the key players in a company are. This is important to my research so I know who to talk to during the data collection phase of my research.

One strategy to mediate this risk is through the use of environmental management systems (EMS) in the form of a certification from a third party. The internationally recognized ISO 14001 certification is a popular EMS means of communicating this commitment as it requires a company to disclose their environmental policies internally and externally (Morrows et al., 2002). The criticism of this certificate is that there is no guarantee a company will achieve its specific environmental goals. EMS certifications are typically motivated by customer pressure as well as in response to peer pressure within industry. Indeed, companies are motivated by their potential to improve corporate image and to a lesser extent, the prospect of increased market access (Morrow & Rondinelli, 2002). By having certification, legitimacy is provided that will influence stakeholders' perceptions of and commitment to the company.

Key Assumptions of Stakeholder Theory

- Corporations are accountable to their stakeholders
- Stakeholder theory provides a business oriented strategy for management whereby pecuniary interest is a priority when a dichotomy exists between economic efficiencies and social issues
- Some stakeholders have more influence than others

2.5.3 Social Contract Theory

Social Contract Theory (SCT) stresses that there is some notion of a social expectation that a company is expected to conduct its business in (Donaldson et al., 2002). The theory is twofold: one part refers to the moral or ethical role of a business to take action towards fixing societal problems. On the other hand, rests a more conservative take on the social contract theory. This perspective is associated with the neoclassical view of a company that identifies its social responsibility as being limited to the company's employees (Moir, 2001). Therefore, company's who adopt the view of having a social contract - where actions are motivated by a societal expectation - seem likely to care for CSR policies. The difficulty in applying the theoretical underpinnings behind having CSR is that measurements of corporate social performance are contested. A common practice which bridges these two theories together, is that typically a company will establish principles for their CSR and then use stakeholder engagement to determine their course of actions (Moir, 2001).

SCT is being used to figure out if stakeholders have a social contract with their consumers and within a given company. Corporate managers have a twofold job; they need to figure out what environmental values they can bring to the consumer; and secondly, make other people in their company feel the bond of a social contract with the consumers in the same way that they envision a company should have a bond with their consumers. Moreover, SCT is being used to see what kind of power can be wielded on behalf of consumers if consumers are framed as environmentally friendly. If a company can convert their environmental policies into a conveyor of consumer goodwill, then environmentalist policies become compelling and worthwhile from a business marketing perspective. This thesis uses SCT to investigate what bonds a given stakeholder has to other stakeholders in the company. In other words, this research examines how SCT applies to companies such that they would see value in supporting environmentalist policies in regards to e-waste.

Key Assumptions of Social Contract Theory

- Perception of how a company interacts with society is significant to business decisions
- Non-pecuniary interests exert significant force on management strategies
- Societal expectations govern how a company defines their responsibilities

2.5.4 Value-Belief-Norm Theory

The level of engagement a person has with their environment, and the manner in which they prioritize and value good environmental behaviour, such as recycling, influences where

e-waste travels to. The Value-Belief-Norm (VBN) theory suggests people act in relation to social norms established by a combination of their individual beliefs, the values of their peers, and their local environment, and that people react to environmental issues in a specific manner based on these norms (Seacat & Northrup, 2010). Werner, White, Byderly and Stoll (2009) argue that when people are faced with a message about recycling, despite how much a person may agree or disagree with the prompt to recycle, people are persuaded more by how the message resonates with their values, rather than what the actual message is. How closely you feel connected to a message is important. In other words, the interpretation of a message and how a person internalizes the meaning behind it is an important aspect of communication. An analysis of this information indicates that locating a message whereby people still feel they have a choice to interpret a message, rather than somewhat arbitrarily following the signal to recycle, can be a promising means of communicating concerns about recycling goods when a person is functioning independently.

Even people who subscribe to environmental ideology, choose to sometimes act in environmentally friendly ways and other times they do not when it is expedient for them. Simply stated, people tend to act according to their expectations of themselves and also of others' behaviours within their periphery (Whitemarsh & O'Neill, 2010). The effects of group mentality are powerful at targeting people's tendency to act in a particular manner. Whitemarsh et al., (2010) argue, "Innovative strategies are required to use people's guilt or shame to motivate change, rather than disempowering and risking denial or apathy" (p.312). Comparatively speaking, Whitemarsh et al., (2010) suggest that shaming people into

adopting pro-environmental behaviour is a more powerful demonstrative strategy to promote the consumption of environmentally friendly products than a marketing strategy, which does not target specific group identities. By contrast, Boudier et al., (2011) articulate that companies tend to act in socially responsible ways when regulations are developed through consensus and negotiations between the public, stakeholders, and themselves. In addition, they cite social responsibility factors involving external actors such as trade unions and consumers to participate in the regulation of WEEE (ibid).

The consequences of bad behaviour also plays a role in establishing new social norms and recycling patterns, but consequences are not necessarily the key motivational factor to elicit positive change or behaviour towards the stated goal. Andersson and von Borgstede, (2010) postulates that knowledge of recycling materials as well as the perceived financial cost affect decision making. For example, "...the cost difference between public transport and private car is large, thus the private car is their (environmentally unfriendly) choice, whereas a majority would perceive the cost difference between buying washing powder with or without eco-label as small, thus the eco-labelled product is their (environmentally friendly) choice" (Andersson et al., 2010, p.402). In essence, if people see the cost of contributing to more environmentally friendly consumption patterns to be financially low, they are more willing to participate.

For example, to encourage recycling, it is beneficial to have good recycling information, like awareness of how materials are collected and utilized (Seacat et al., 2010).

Uzzell et al., (2009), highlight that, “Behaviour is not only the product of rational, deliberative and individual evaluation, it is also based on habit and cultural tradition, emotional impulses, the influence of family and friends and social norms as well as wider trends” (p.341). Therefore, to understand the actions and behaviours of community recycling tendencies, one has to analyze the culture surrounding recycling too. Industry marketing is particularly good at getting customers to replace mobile phones. For example, it is common to have a two year contract required for phone service where some companies will provide free phones for every contract which is renewed, thus sparking a constant upgrade with the extension of phone service plans (Wilhelm et al., 2011). It has become acceptable to consume more than one needs in relation to phones. Therefore, how do you change the norm for recycling? Norms vary by community and likewise, the priority of norms are also relevant when it comes to recycling policies and the environmental performance of a community (Cava and Mayer 2007; Seacat et al., 2010).

The valuation of a product also changes depending on what the product is and what people’s expectations are. Wilhelm, Yankov, and Magee (2011) argue that mobile phones have extremely short life spans and that replacing phones is largely due to marketing. Notwithstanding, consumer attachments to products vary. For example, when a customer purchases an item like a bicycle or washing machine, people are more hesitant to replace it - there’s an expectation that it is a durable item that will not be replaced until the customer feels strongly about doing so (Wilhelm et al., 2011). Typically, people will replace these items because they feel it has defects that cannot be overcome; they think the product has

lasted the amount of time they expected it to; or they feel deserving of a new product to replace the old one (Wilhelm et al., 2011). An obstacle to engaging customers to reduce their demand for new electronic products like mobile phones is that people generally do not share an emotional attachment with the product in the way they might have with a bicycle where different types of memories were cultivated (Wilhelm et al., 2011). Overall, there is a mental barrier people tend to have when it comes to replacing items they expect to be durable over time, compared to products they assume will have a short lifespan because of their perceived quality of the item or the influence of marketing an item as something which must be upgraded. The replacement of a mobile phone has negative consequences in terms of e-waste.

Key Assumptions of Value Belief Norm Theory

- People's behaviour is dependent on societal norms and personal value systems
- Non-pecuniary interests may exert more influence on people's actions compared to pecuniary

One of the tasks of this thesis is to find a way to make the consequences resonate more readily with consumers, which is why these theories have been employed. This research will try and illuminate the connection between corporations work and the social contract they have with their consumers, and in turn aim to supply companies with ways to market their electronics for environmentally friendly focused consumers.

Through this thesis, a goal is to try and figure out what environmentally friendly e-

waste policies are most compatible to a given company and how to incentivize them to use it. By considering the stakeholders of a company, this allows for a range of power dynamics to be identified within a company and gain knowledge on how certain actors, like a corporate manager, perpetuates decision-making as it relates to either developing electronics or consuming electronics and subsequently contributing to e-waste. Stakeholder theory suggests that some stakeholders have more influence over a company's operations than other stakeholders. Intertwined with this theory is Social Contract Theory (SCT), which examines how society expects a company to follow certain protocols while conducting its business. Where stakeholder theory examines whose values count (i.e. corporate owners, shareholders, government, customers...etc.), SCT proposes that what society thinks is justice is significant in gaining acceptance of how an organization conducts itself.

There is a difference between the intent of someone to act in an environmentally friendly way and the actual environmental impact their actions have. Environmental actions may not be because of environmental values; it could be because of financial savings or other agendas. Someone might hold a set of values or beliefs, but their actions might only reflect that in a very limited degree; perhaps because it is inconvenient for them to act in accordance with their values. The purpose in investigating this theory is to see how circumstances can be made easier for people to act on those environmentally friendly values. For example, if a company's users hold those values and the company starts marketing that they use environmentally friendly e-waste polices, they reinforce the values their customers have and makes them feel good about having consumed a given product. Part of what this thesis is

investigating is how to make a pitch out of selling companies on environmentally friendly e-waste disposal. With the VBN theory, it can be demonstrated that people actually hold these values but find it difficult to use them in various aspects of their life and if you make it easier for them to support a company, you stand to gain if your actions demonstrate the values of your consumers.

To have a social contract, you need people to have similar values. So, essentially if a company that embraces these environmentally friendly values held by some of their consumers, they would be extending the social contract or making it more robust by becoming a more explicit representation of the values which their consumers hold. Additionally, it upholds the idea that companies should act in ethical ways and if they are acting in ethical ways towards the environment, then they are acting in good faith. VBN theory makes it more possible for consumers to act on their own values. This thesis is using different theories to give a variety of rationale for companies to adopt e-waste policies.

2.6 Research Paradigm

2.6.1 Canada's Technology Triangle

The Region of Waterloo has undergone a transformation since the 1980s in its economic activities from being a traditional manufacturing area to a technological hub known as Canada's technology triangle (CTTI, 2013). A direct product of this technological revolution has been the development of new electronic devices. The metamorphoses of cities where the production and distribution of technological advancement has developed, has contributed to the output of e-waste. A challenge to cities that produce technology is the life-

cycle of the waste produced. As Doelle (2006) argues, the energy used for electronic equipment is significant in considering e-waste disposal; reuse is the least energy intensive, recycling is somewhat energy intensive, while disposal is considered the most energy intensive way to deal with electronic equipment. The quality of the materials in electronic devices and whether they are considered hazardous or non-hazardous components, impacts under which jurisdiction e-waste is handled. For example, electronics are not necessarily considered hazardous materials until they are taken apart, and so the regulation of electronics changes over time, as the electronic device goes from non-hazardous waste to being labeled as hazardous waste. The establishment of technology companies who produce electronic hardware, creates a need for strong waste management policies, specifically geared towards dealing with e-waste as a consequence of increased technological manufacturing processes.

Studies conducted by Bathelt et al. (2011) as well as Boudier et al. (2011) test the merits of geographic clustering, arguing in the case of Canada's technology triangle, the location of technology innovators plays a questionable role. While typically the most effective way to convert other companies to good corporate social responsibility (CSR) policies is often through corporate peer pressure primarily from within the same sector, this approach does not appear to be as effective in relation to electronic goods being produced (Boudier et al., 2011). This is because the extended producer responsibility (EPR) is considered a burden to producers as opposed to a positive business strategy (Boudier et al., 2011). Consequently, if one company adopts more socially responsible behaviour (perhaps even sacrificing financial capital to do so) such as an EPR strategy, they may gain a

competitive edge over competing companies. The effect of investing in EPR may have a small payoff relative to companies which do not subscribe to EPR policies, however, measuring the profit of return for this type of investment is difficult and research suggests calculating the isolated benefits is difficult data to procure (Reinhardt et al., 2008).

The connection a company feels to its local community is also a factor that contributes to influencing corporate policies. Leibovitz's (2003) study focused particularly on the Region of Waterloo, where he argued a recurring problem which prevented collaborative action is the issue of institutional thickness to bridge the trust between the private and public stakeholders in the IT business. Institutional thickness is a term that refers to how social and economic cohesion aids in procuring a state of trust and legitimacy amongst companies. It is composed of four elements: having a variety of public and private partnerships; a high level of cross-institutional interactions where collective actions produce a unifying identity; the establishment of formal and informal hierarchies of power; and a shared vision or end goal (Leibovitz, 2003). Umbrella organizations like Communitech were founded with the goal of supporting the Region's technology basis (Bathelt et al., 2011). However, Leibovitz argues that the actual connections facilitated by companies like Communitech are mostly at surface level and has not reached its potential for institutional thickness. He argues that despite the cluster of businesses, they are detached from their community (Leibovitz, 2003).

In the study conducted by Bathelt et al., (2011) the purpose was to investigate how the University of Waterloo start-up IT companies contributes to the technology triangle. They

conducted a qualitative study of IT companies in the region using semi-structured interviews to understand the transfer of knowledge between the companies in the Region of Waterloo. It was found that the IT start-up firms were not closely connected with other regional companies; instead they were engaged more in international connections to stimulate growth in their fields (Bathelt et al., 2011). The study is quite valuable to this research, specifically the case study, but also in terms of methodology. To help answer the research questions, interviews were selected to highlight how e-waste policies of individual companies relate to Regional policies as well as other company competitors.

2.7 Summary of Key Points in the Literature

- E-waste is problematic because of its toxic nature, resulting in adverse environmental and human health concerns
- It is a fast growing waste stream, which is largely the result of built in obsolescence, consumer culture demands and values, and the fast pace of growing technology
- E-waste policies are largely underdeveloped in the Canadian context and there are multiple challenges to communicating a sense of responsibility for its production
- Management of e-waste costs are typically passed onto consumers, undermining incentive for manufacturers of electronics to design for the environment
- Having an EMS certification conveys a level of commitment regarding environmental responsibility, which may or may not resonate with a given community depending on the culture of consumption

2.7 Contributions to the Literature

This research will fill several gaps in existing knowledge. First, while research and policy strategies have been well documented in European countries, little attention has been paid to developing policies and regulations to mitigate the harmful effects of e-waste in a Canadian context (Death et al., 2008; Doelle, 2006; Hickle, 2013). Moreover, there exists a gap between municipal waste management objectives and practices, particularly from the point of view of a planning perspective (Garkowski et al., 2011).

Secondly, the research concerning how environmental waste strategies are valued within companies in inconclusive. Further research should be undertaken to examine how corporate managers make decisions about sustainability strategies (Epstein et al., 2001). Illuminating how corporate environmental policies emerge and are negotiated amongst stakeholders, would improve our general understanding of how to motivate companies to develop or enhance their e-waste policies (Uzzell et al., 2009). For example, Morrow et al., (2002) noted, "...relatively few studies have explored the motivations of firms adopting and certifying EMS [environmental management systems] and even fewer have examined the results or impacts on the companies that do so" (p.159). It would be interesting to understand what binds a company to a specific e-waste management strategy and what types of barriers exist between a company's stated policies and actual implementation.

Third, this research will highlight what type and how much regulation, if any, is needed to instigate better e-waste management policies for companies located in the Region

of Waterloo. The increasing availability of electronic goods necessitates a better approach to incorporating electronic product life cycles into the cost of business (Cerin et al., 2002; Babbbitt et al., 2011). To date, there is inconclusive research on the benefits and risks of regulating e-waste. On one hand, it is argued that ineffective policies such as those that fail to account for the lifecycle of product development have perpetuated the increase of waste in recent years (Nicole et al., 2007). To the same effect, a communication gap between consumers and producers on how to recycle materials has also been said to act as a catalyst for waste production (Castro, 2012; Mohr et al, 2001). On the other hand, there is a concern that over-regulation of e-waste materials may exclude stakeholders in second-hand markets who extract economic benefit from the re-use of electronic materials. In order to reconcile these competing perspectives, more data must be collected concerning how electronic products are dismantled and treated (Halluite, 2005; Hischier et al., 2005; Boudier et al., 2011).

Another research area that remains inconclusive is the relationship between extending producer responsibility (EPR) towards electronic goods, and the benefits that are realized for companies who utilize this strategy (Lam et al., 2012; Mayers et al., 2013). There are a number of EPR systems that have been developed to encourage more environmentally friendly product design (i.e. products that are designed for longevity or are easily disassembled for maintenance, repair or recycling), so the question of, "why have so few jurisdictions [have] not opted to create systems conducive to such incentives?" persists (Lifset et al., 2013, p.165). More research is needed on how to develop a balance between

incentivizing and regulating e-waste producers and consumers. To fulfill this gap, this thesis examines what factors companies take into consideration when they create strategies for managing their e-waste and develops policy recommendations.

It is posited that these gaps exist to a large extent because producers and large-scale consumers of electronics are largely removed, in a physical and social geographic sense, from the consequences of e-waste. Deliverables of this thesis include gaining insight into how companies are motivated to initiate and develop meaningful e-waste policies.

Chapter 3 Methodology

3.1 Introduction

The methodology for this study will be qualitative in nature to help understand the details of how electronic waste management decisions are made and understood. The research strategy will involve a case study in the Kitchener-Waterloo area, inquiring in detail about the relationships between electronic waste management practices and corporate behaviour, as well as consumer behaviour. The benefit of a case study is that there is an opportunity to study the topic and location in depth and collect detailed information with a context to place the data (Creswell, 2009). This chapter outlines the framework of qualitative research methods, sampling strategies, methods for obtaining data, and evaluating them.

3.1.1 Qualitative Research

Qualitative research is most often compared to quantitative research methods. In qualitative research, as data is collected, theory emerges as an end point of the study. The role of theory is primarily inductive reasoning compared to qualitative research, which relies on deductive reasoning (Bryman et al., 2009). A main goal of qualitative research is to understand the perspectives of the people being studied with an emphasis that the researcher must participate in the minds of others to gain social knowledge (Bryman et al., 2009). By having face-to-face interactions with participants, detailed data is collected, which allows for some context to understand participants and their experiences. The knowledge gathered from these interactions is then developed into a narrative. Some critiques of using qualitative

research are that findings may be too subjective and based on the researcher's values and opinions of what is significant, whereas quantitative research minimizes researcher bias (Creswell, 2009). Furthermore, it is difficult to know if findings are transferable to other studies. With qualitative research, the study is often unique to a site whereas in quantitative research, the study can be replicated in multiple environments.

The two methods are also contrasted by their sampling. With qualitative research, sampling ends once theoretical saturation is reached. Theoretical saturation refers to the point where no more new knowledge is acquired by increased sampling (Creswell, 2009). By contrast, quantitative research has a sample size based on statistical representativeness. The sample size is determined prior to the study being conducted (Bryman et al., 2009).

This thesis utilizes qualitative research methods because there is a need for analytical depth to study e-waste management (Moir et al., 2001; Wilhelm et al., 2011; Bouvier et al., 2011). An aim of this research is to understand the process behind decision-making in waste management, and deconstruct some of the policy and attitudes that aid in the choices of electronic production and consumption patterns and social norms. There is limited prior research, which addresses these issues. A qualitative method provides me with the opportunity to uncover trends and make queries on how various factors influence choices regarding e-waste.

3.2 Sampling and Recruitment

3.2.1 Sampling

The sampling stage of this study will be centered in the Kitchener-Waterloo (KW) area because of the geographic cluster of IT companies in the Region of Waterloo, herein known as the Region, as well as the researcher, Carly Rosenblat's, access to participants because the researcher lives and studies in Waterloo. In some instances, the geographic boundaries extended to Cambridge because that is where head offices are located for some companies of interest. The objective of sampling is to acquire a breadth of perspectives to help address the research questions (Mohr et al., 2001). Time and resource limitations are also factors, which impacted the researchers decision to choose this location. The sampling units consisted of the companies that manufacture electronic devices, large-scale corporate consumers, and key informants with knowledge of electronic waste practices. Ideally, stratified random sampling within the geographic cluster is beneficial for the potential to make inferences about the behaviour of the sampled companies to the larger population (Newing, 2011). However, due to time constraints and limited access to companies, the researcher chose to use purposive sampling. Purposive sampling is the deliberate attempt to recruit participants who are most relevant to answering the research questions. This includes people with expert knowledge in the area of interest or perhaps in a place of authority (Rowley, 2012). This is a more efficient approach in gaining access to the gatekeepers of knowledge, rather than being statistically significant in sampling a population. Snowball sampling is another technique employed in this research which is a process, that entails

asking other participants to recommend other potential participants that they believe to be relevant to the study's objectives (Rowley, 2012).

At the beginning of this research, the researcher assumed that there would be an extensive inventory or directory of IT companies listed somewhere with the government in the Region. After attempting to locate a list of IT companies in Kitchener-Waterloo with the Chamber of Commerce and other organizations, which based on subsequent research does not exist, the researcher decided to initiate her recruitment for IT companies with a list published by Communitech of the "Top 50 Tech Companies" in the Region in the 2009-2010 year (Communitech, 2013). A subsequent research question in the study asks how leading IT companies regard e-waste, and so it seems appropriate to recruit based on a list that ranks the top companies in the Region. With the consultation of her supervisor, the researcher also added several more companies and institutions who are large consumers of electronic products to form the sampling framework from which to recruit potential participants. Subsequently, she researched some basic information on what each of those listed companies does by visiting their websites and making phone calls. One of the challenges she faced was being able to comprehend what a company does as she attempted to decode some of the technology jargon. Most of the company websites had an 'About Us' section and even then it was not always clear what the company does and whether or not it focuses on software development, hardware development, or operates as an IT consulting company.

The researcher then stratified the list by the type of company, forming a group of electronic producers in one category and one group of large-scale electronic consumers into another category. The purpose of stratifying the companies was to identify if there would be different e-waste strategies employed if a given company manufactured or consumed electronics. Based on the literature that focuses on endorsing DfE (Boudier et al., 2011), there is an unexamined assumption that a company that is responsible for the design of electronic devices might have different strategies to deal with e-waste compared to the EPR strategies employed by a company that does not produce electronics.

One of the listed Top 50 Tech Companies no longer exists but, out of the 49 remaining companies, 18 of them or 37%, are involved in hardware manufacturing, whereas, 31 of them or 63%, are involved in software development or another IT related sector like consulting. Of this list, the researcher prioritized contacting the 18 companies who she perceived to be the most relevant due to their larger company size and role as producers of electronics. The researcher expanded her recruitment to some of the software companies on the list who her supervisor advised may be more relevant than others. As mentioned previously, she also expanded her recruitment to companies not on the Top 50 list, including companies who represented large scale consumers of electronics and some key informants, like a waste collector or waste processor vendor. Of the 42 companies she attempted to recruit for interviews, she interviewed participants from 15 of those companies - an overall response rate of 36 %.

Summary of Companies Interviewed	
Group	**Number of Companies**
A	7
B	5
C	3

Figure 1: Companies interviewed stratified by the type of company.

In essence, the targeted participants were organized into three groups. Group A consists of companies within the Region who are involved in the manufacturing of electronic devices. For example, the participants in this group may manufacture cell phones. Group B consists of companies within the Region who are considered large-scale consumers of electronic devices. For example, an educational institution like a university would fit into this category. Group C consists of key informants involved in the electronic waste industry, who do not necessarily fit into category A or B, but are also located within the Region. An example here would be a participant representing an e-waste processing vendor.

A key challenge in recruiting for this study was learning who specifically might be the most appropriate person to contact within a company the researcher was interested in. The researcher's goal was to interview people in managerial positions but she was mostly directed to people who hold a number of positions, some with well-defined roles, others who are members of companies with less distinctive roles. Typically, she went through a number of people before reaching a person who might have knowledge related to their companies e-waste or even know what she meant by e-waste. The researcher was most often directed to an

employee working in the Information and Technology (IT) department. The researcher also went to three different events on the University of Waterloo campus where it was noted that local IT companies would be present. The researcher went with the intention of networking with those people in hopes of recruiting them for her study. While she did speak to these representatives in person, the results did not end up in an interview being set up so the success was limited.

The first person of contact at any company was almost always an administrative person. The researcher had to explain in lay terms what e-waste is and why she wanted to speak with someone, while attempting to convey the importance of the study. If the administrative person was unsure whom she should speak to, she asked to be directed to someone in human resources (HR) departments who may be able to direct me to the appropriate person. Thus, administrative personnel and HR people proved to be the number one gatekeepers to accessing a person of interest at the company. This process was also complicated, as some companies did not have any phone numbers listed, only e-mails. Therefore, the researcher had to send out 'cold' e-mails addressed to "whom it concerns", which made it difficult to follow up with a potential participant. Additionally, some companies are part of international companies and finding a local contact proved difficult, despite the presence of a local office in the Region.

After reaching out to a company five times, be it a combination of phone calls and/or e-mails, the researcher decided to stop and mark the company as a 'non-response' to the

study. She tried to be strategic and called the companies at different times during the workday in case some employees had varying work schedules. Only two people who she communicated with, one by phone and the other through e-mail said 'no' - that they were not interested in participating. There were also two people from two different companies who agreed to being interviewed, but when the researcher attempted to follow up with details of a date, she never heard back from them again. The rest of the people she contacted provided no response.

3.2.2 Snowball Sampling

In addition to employing a purposive sampling technique to recruit participants, the researcher also sought the assistance of those participants she interviewed to make recommendations for other people she should be in contact with. While some recommendations did not produce subsequent interviews, one person put her in touch with her colleagues, which resulted in two additional interviews.

3.2.3 Theoretical Saturation

Theoretical saturation refers to the point where no new knowledge is being presented; further sampling produces redundancy of information (Bowen, 2008). By the twelfth interview, the researcher felt like participants were echoing information that she had heard from other participants. The perspectives concerning e-waste did not seem to expand beyond what the researcher had heard previously. She had been trying to investigate what companies do differently and as she proceeded to complete a total of fifteen interviews, the researcher felt she had reached a point where companies were discussing similar phenomenon of how they engage with e-waste.

3.3 Data Collection

3.3.1 Interviews

With the goal of gaining more in depth knowledge, the research entailed conducting semi-structured interviews, using some open-ended and some closed questions with people in managerial positions at the sampled companies. Semi-structured interviews offer a balance of having a list of predetermined questions, which forms an interview guide, but also allows for leeway in how the interviewee may respond (Bryman et al., 2009). According to Huppé et al. (2005), the personal perspectives of the business owners are very influential in developing environmental stewardship among small to medium size companies and so I decided to target corporate managers through purposive sampling. The benefit of open-ended interviews is the variety of potential responses from the interviewees and the detailed data, which can be collected (Seasons, 2003). A challenge in conducting interviews is the researcher's ability to access gatekeepers of information. One of the factors that may influence the researcher's access depends on if the company or organization the researcher targets is public or private (Bryman et al., 2009). The smaller the sample, the less confident the researcher can be about making generalizations based on their results, but the researcher can still achieve a range of insights with information (Rowley, 2012).

Collecting data for the purpose of assessing current practice within the companies surveyed requires in-depth inquiry in the form of primary research. The exploratory nature of this research is best met through the ability to have open communication with persons of

interests. Semi-structured interviews offer the opportunity to engage in a way that allows the corporate associate to communicate in their own words (Mohr et al., 2001). The interviews began with general questions and built up to more specific questions. Questions were developed into an interview guide that aimed at uncovering existing e-waste management practices, motivational factors concerning e-waste, and lastly, some wrap up questions to provide the interviewee the opportunity to discuss something that was not previously addressed. Additionally, to understand corporate social responsibility, Rowley (2012) argues interviews are superior to questionnaires because the key informants may not take the time to fill in a questionnaire. More importantly, the interview process allows the researcher to explain questions to the interviewee and likewise, they can seek clarifications by asking the researcher questions so that there is a rich data set at the end of the process.

In the end, of the fifteen interviews the researcher conducted, thirteen of them were done in person and two of them were on the telephone. Ideally, the researcher wanted them to all be in person, but due to convenience, this was not possible and so phone interviews were used. Both of these phone calls stood out from the face to face interviews as being shorter in length. One of them was the shortest interview of all of them, lasting twelve minutes, while the other interview was 23 minutes in length. The one that lasted twelve minutes also had pauses for poor reception, and overall, the researcher found it difficult to establish rapport with the participant in part due to technology hiccups, but the researcher also suspects the participant was not the best person to be speaking to the subject of e-waste, despite assurances from two other colleagues at the company. The participant did not seem to have

much knowledge of e-waste at the company and so responses were often very short statements of few words. On average, the interviews lasted 37 minutes each, with a range of 12 minutes to 63 minutes. Also notable, three of the interviews involved numerous participants for one interview, and these tended to be lengthier than interviews where there was one participant present.

3.3.2 Interview Guide

To assist in the process of gathering information from companies, the researcher developed an interview guide to help address the overall research questions, and subsequent questions that were influenced by the literature review. This guide is illustrated in Appendix A. An interview guide is useful for maintaining focus during an interview and provides a format for making choices about which information is valuable to pursue in more detail (Patton, 2002). Furthermore, having an interview guide helps reduce variation amongst the interviews, therefore making it a more standardized procedure to compare and contrast how different companies deal with similar issues (ibid).

3.3.3 Pre-Testing

Before making contact with the companies of interest, the researcher conducted a pilot study to test her interview guide as well as practice being an interviewer. Conducting a pilot study provides the opportunity to revise questions to see if the researcher is asking the right questions and for the opportunity to rehearse (Rowley, 2012). According to Bryman et al. (2009), before an interview the researcher should know the research setting and questions

in mind, have structure and be clear, equip themself with a reliable recording device, look for inconsistencies, be ethically sensitive, guide the interview, and respond to the participant in a non-judgmental manner. By pre-testing the interview, the researcher can practice and develop some of these necessary skills. After receiving clearance to proceed with the project from the Office of Research Ethics, the researcher contacted the companies of interest to set up the interview process.

As Creswell (2009) suggests, to help document the interviews the researcher took notes and used an audio-recorder, with the permission of the interviewee. The recordings were then transcribed following the interview as soon as possible because ideas were still fresh. Prior to the pre-tests, the researcher purchased an audio recorder and practiced using it and transcribing from it. The researcher chose to use ExpressScribe, software she downloaded online to aid in transcribing the data. It was beneficial because it allowed the researcher to slow down the speed at which she was playing back the audio recordings. During the first and second transcribing processes, she realized that it takes approximately one hour for me to type fifteen minutes of audio recordings, which was a good incentive to keep the participants on track for future interviews. Ultimately the researcher conducted three pilot studies; one with a person unrelated to her recruitment requirements but useful for clarity of questions, and two with persons of interest, one acting as a representative of a large scale consumer and the other as a representative of a waste collection company.

3.4 Data Analysis

3.4.1 Transcribing Data

Data transcription refers to reproducing what has previously been stated, for example, taking audio-recorded dictation and writing it down (Halcomb & Davidson, 2006). The benefit of transcribing data is the chance to reflect on information collected from the interviews in detail. Recording the interviews allowed for information to be distilled and assessed within a context of the dialogue. Furthermore, hearing the information repeated and not just embedded in memory or from note taking provides another means to learn from the data (Rubin &Rubin, 2012). Poland (1995), argues the accuracy of a transcript is subjective to the person who is responsible for the transcription process. However, the risk of multiple people making inferences on the meanings of what was said is reduced in this thesis because the researcher was the sole transcriber and had first-hand knowledge of the interviews. The researcher wrote down everything she heard that was said word for word, and also included expressions of laughter and sometimes instances of coughing and pauses in the dialogue.

Another benefit of having transcripts that are verbatim, is the development of an audit trail (Halcomb et al., 2006). Should an issue arise where member-checking is required, the researcher can situate the question at hand in context to what came before and after a statement or question was made by a participant. The downside of writing everything that was audio-recorded is that people tend to speak in run-on sentences and do not always formulate complete thoughts or ideas. Notwithstanding, it is a time consuming process as previously mentioned.

For the purpose of gaining accuracy, the researcher also wrote down field notes during interviews and sometimes following the interview. This technique was useful for capturing her experience of the interview as well as filling in information that is not as easily heard as it is seen. For example, during one of the researchers interviews, a participant drew a concept map to help communicate how Ontario Electronic Stewardship (OES) operates. While the information the participant said was orally recorded, it was also beneficial to copy down the visual aid the participant used to explain their point. Furthermore, the field notes acted as an insurance policy in case something went wrong with the recording technology, the researcher would still have a paper copy with notes on how a participant answered a question. Fortunately, all audio recordings were successfully recorded and the researcher did not have to rely solely on her field notes, rather, they were used to enhance the accuracy of the data.

The formal interview always began after a consent form was signed stating the participants willingness to be interviewed and whether they agreed to be recorded or not (please see Appendix B for a copy of the consent form). Pre-interview conversations were more about providing some background information and reiterating what had been communicated in the letter of information sent out during the recruitment stage of the thesis process (please see Appendix C for a copy of the Information Letter).

3.4.2 Coding Data

After completing a qualitative study with participants, the researcher processed the information looking for trends and patterns by annotating the transcripts. She developed categories based on broader themes to analyze the content of the interviews and corporate policies. These themes were revealed partially through memos gathered throughout her entire research process. As Pope et al., (2000) outlined in their research, other themes appeared from the repetition of keywords, by means of constant comparison amongst the interviews.

One means of coding data is using a technique known as thematic analysis or axial coding, whereby common themes are linked together that emerge from the narrative of the interviews (Rowley, 2012). There are a variety of themes that may be coded, such as facts; experience; processes; actions; and point of views (ibid). The research represents an attempt to describe and interpret the relationships between companies, their environments, and how e-waste is managed in the Region. Data collected from the transcripts, company websites and other public documents, were then subjected to content analysis techniques focused on answering the research questions. Findings were compared with related scholarly research journals and government documents to see if the case study in Kitchener and Waterloo follows similar approaches to those uncovered in the literature review. This is discussed in the Results Chapter.

3.4.3 Open Coding

Open coding was a prominent technique to assess the data. Open coding refers to the process of deconstructing segments of data while formulating categories to account and explain what is happening (Charmaz, 2006). Each code is connected to a specific section of the transcript. The type of codes have variation to them, where some aim to capture a point of view, others describe a specific idea, or role of an organization. For example, one of the codes the researcher assigned to a transcript says, 'eco-hero', referring to a person who is committed to environmental stewardship. This code is relatively straightforward at noting text, which refers to someone acting on behalf of an environmental cause. Some of the codes refer to more complex ideas. For example, 'workplace hierarchy' is another code the researcher employed which at surface level, refers to an employee's position in a company but also conveys a sense of how an employee may be valued based on their position or highlights the role of workplace structure at influencing issues of labour and responsibility. This code extends itself to multiple categories surrounding some of the phenomena, which influence how a company may integrate e-waste into its formal and informal policies.

The researcher loosely followed Corbin and Strauss's (1990) model of concept analysis by giving the raw data from the transcripts similar labels or codes. As they argue, "Only by comparing incidents and naming like phenomena with the same term can a theorist accumulate the basic units for theory" (p.7). This specific technique was referring to a Grounded Theory approach; however, it is just as applicable for content analysis to better understand the data collected from participants. The researcher did not use Grounded Theory,

but borrowed from pieces of that theoretical framework strategy for understanding data. As the researcher went through this process of open coding, she was automatically doing a constant comparison as she searched to find the right word to apply to a statement; she turned to the codes she had previously established for insight.

The researcher started to formulate a data dictionary, a list of her codes that she attempted to explain as it related to her data. For example, after observing what she coded as "backdoor policy" numerous times, it took on its own specific meaning, which the researcher understood as e-waste being a private topic for a company. The researcher collected these codes into a list that she organized alphabetically by concept to make it faster to locate. This list was printed out and used as a reference guide while she continuously coded other transcripts; it grew simultaneously in the number of codes as new labels were developed. The process of open coding resulted in a deconstructed narrative of the participants' responses. In doing so, the data became fractured. According to Corbin et al., (1990), "Fracturing the data forces preconceived notions and ideas to be examined against the data themselves" (p.13). As a result, the researcher analyzed the data based on the overall messages exhibited by reviewing the transcripts as a whole, and also for the subtext of the content.

3.4.4 Memo Writing and Concept Maps

The researcher also employed memo writing and developed concept maps as a technique of data analysis. She conceptually mapped out a company's process of dealing with e-waste using figure drawings in her notebook. This visual aid helped demonstrate at

what point in the chain of downstreaming waste, companies differed and by what means. For example, if a company had a rollover policy, meaning a set timeframe when they recalled their electronic devices such as a computer from their employee to replace it, the researcher noted if it was a matter of months or years and how this rollover is initiated and by whom in the form of a diagram. The researcher then integrated this into a concept map to help record the different stages a company goes through. Essentially she recorded a sequence of events that triggered an overall process of how e-waste is processed, ranging from the day to day operations of inputs that stimulate the system of downstreaming waste, to the regularity of the system and how it fluctuates and the security systems which surround the process. Memos were involved in the formulation of understanding and influencing the research process. By including memos in the writing process, they facilitate the development of the analysis process (Corbin, et al., 1990). The results of this exercise are depicted in the Results chapter.

3.4.5 Axial Coding

Axial coding was the next step in data analysis where the researcher categorized the codes from the previous phase. It is considered important to have well refined categories to help draw understanding from the text (Corbin et al., 1990). During the phase of axial coding, categories are assessed by their relationships and hypothesis formulates to help explain connections (Bhattacherjee, 2012). Integrating themes from the literature and themes that emerged from the transcripts developed these categories. The researcher then narrowed down the dimensions of each category, to help identify patterns emerging from the data.

Subsequently, she linked each thematic category to one or more of the questions asked in her interview guide, to relate her findings to the inquiries.

3.5 Analysis Quality

3.5.1 Internal Validity

According to Bryman and Bell (2011), "internal validity is concerned with the soundness of findings that specify a causal connection…" (p.43). In other words, internal validity is concerned with whether a conclusion for one participant, was echoed by the experiences of others. Corbin and Strauss (1990), further explain that relationships drawn from axial coding must be considered lightly until similar findings from incoming data are repeated, at which point the researcher can verify an experience to have a causal relationship and not be an outlier. Some of the methods to achieve internal validity have been described by Creswell (2009) to include, but are not limited to, techniques of cross-referencing information, triangulating data, peer briefings, member-checking, and disclosing biases.

Biases are the foundation of how an individual relates to their surroundings, which impacts how the researcher forms perceptions and judgments about the information gathered. According to Bryman et al., (2009), the more interviewers that exist, the more variability exists in the information collected. The timeline of interviews was conducted in January, February, and March of 2014. The researcher conducted all interviews, which is beneficial to reduce bias of having a variety of interviewers who may conduct an interview differently

because each researcher describes and perceives data relatively differently (Diefenbach, 2008).

One strategy the researcher employed to test whether the findings from the interviews were coincidental or part of a larger trend, was by doing constant comparisons amongst the data collected in each interview with the information from previous interviews and again once all interviews occurred. This allowed for the researcher to quantify the experiences of the participants and note the emergence of patterns in the data. The outcomes of this are noted in the results chapter. For example, it became apparent to the researcher that knowledge regarding OES and their protocols was not well distributed amongst participants when it was found that only two out of fifteen of the participants were aware of OES's role in governing waste. By cross-referencing the data internally, participant's responses to questions could be situated into a larger context, which signified for example, an educational gap between how OES disperses their information regarding e-waste policies to companies in the Region.

The researcher used a process of triangulation in order to ensure validity in the data. This process is one where a variety of data sources and perspectives are consulted to corroborate results (Diefenbach, 2008). To achieve this, the researcher interviewed multiple people, used a wide variety of peer-reviewed literature, government documents, and consulted with a committee of people to ensure an acceptable process of data collection techniques.

3.5.2 Reliability of Study

The researcher conducted a reliability check to see if how she understood the data collected was also how someone else may interpret the data. When learning how to code the transcripts, the researcher did some preliminary research in the literature for points of reference. She wanted to see if how she was interpreting what was stated, is how somebody else may interpret what was stated and if not, what are the points of discrepancy. According to Corbin et al., (1990), "Opening up one's analysis to the scrutiny of others helps guard against bias" (p.11). Subsequently, the researcher read over one of her transcripts with a fellow Master's graduate in Planning and cross referenced the types of codes that may be applicable – each of them suggesting what they thought was appropriate and orally discussing it page by page[2]. Overall, the researcher tended to segment the data into more specific ideas or events, while the other graduate student tended to use more general terms. The concepts were similar, but the word choice had variations. At some points in time, the researcher supplemented content and background information on e-waste to help elucidate the process. This was a very useful method for learning how to simplify some complex ideas into codes with someone who has already completed this process in their own published thesis.

After going through and open coding the one interview, the researcher then used the same process to independently open code the rest of the interviews, doing two to three interviews per day each day until they were all open coded. Once that took place, the researcher met

[2] All identifying information of participants was hidden from transcripts during this process.

with her supervisor again to review the next part involved in data coding. The purpose of analyzing the transcripts closely together is that the researcher would be able to recall similar word choices to code similar concepts, as opposed to doing them over a time period that was more spread out and may therefore have more variability in how I code data.

3.5.3 Generalizability

The rationale behind doing a case study is to gain insight on the Region and describe what has been found in a place that is known for its leading information and technology hub. Electronic waste is more broadly addressed in European countries; however, it is not a well-researched topic in a Canadian setting (Lepawsky et al., 2010). The external validity of this thesis is limited by the small sample size of the case study, which impedes its ability to be statistically generalizable. However, this thesis is analytically generalizable, meaning the concepts discussed in the results chapter can be extrapolated to other scenarios (Miles & Huberman, 1994). In other words, the researcher's specific findings are context specific but the concepts may be extrapolated and applied to the overall theories surrounding the study of e-waste. The theoretical framework, in which the problem of e-waste has been approached, has the capacity to reinforce current theories of e-waste while also presenting Regional information regarding e-waste management.

Chapter 4 Results

4.1 Introduction

The purpose of this chapter is to answer the main research questions based on information participants shared during their respective interviews. It focuses on identifying the systems that mobilize electronic waste, and notes the various relationships that companies have in regard to their e-waste management practices. Furthermore, it presents information on companies' motivations to adopt an e-waste policy. This chapter will also describe the factors that contribute to the mobilization of e-waste and the resulting consequences for e-waste. These particular findings are the results of personal interviews with employees from fifteen different companies where electronic devices are manufactured, consumed, and processed.

4.1.1 Main Research Questions

The first research question asks how is electronic waste mobilized in the Region of Waterloo? The purpose of asking this question is to understand the decisions that influence where e-waste is distributed and investigate the circumstances of how or why those decisions are made. The second main research question asks which motivational factors are most effective in triggering a company's e-waste policies?

4.1.2 General Findings

1) Companies typically use a combination of strategies to reuse electronic devices in combination with employing an e-waste processor vendor for destruction of the electronic device. These strategies are composed of internally redistributing the

electronics to other employees within the company or auctioning them off to the public. Some electronics are donated, but this is less common because the electronics often lack the harddrive, which has been destroyed prior to most re-use taking place.

2) All companies surveyed have a contract with an e-waste processor, mostly in the Region. Participants voiced wanting more options for e-waste processors, arguing they are limited by the small selection of companies, which operate in the area. A major concern for them is the security of data from their electronics when transporting it over long distances for recycling.

3) Companies are motivated by a variety of circumstances pertaining to external markets for secondhand electronic devices, access to waste receptacles, as well as factors such as reputation for sustainable practices and environmental stewardship. Financial motivation to make a profit or be cost-neutral in recycling e-waste also influences e-waste management strategies.

4) A top-down policy for directives on e-waste management was also demonstrated as an effective catalyst for proceeding with e-waste recycling. Participants voiced leadership opportunities at their place of work to be one method to regulate compliance with e-waste policies. Having knowledge and appreciation of the value of an electronic device and also the quality of e-waste can facilitate the tipping point for expanding or reducing the

lifecycle of an electronic device through different means, depending upon corporate values, perceived value of the device to the current user and its inherent value as e-waste.

4.2 How e-waste moves

In order to comprehend how e-waste is circulated, participants were asked a series of questions related to their understanding of what their e-waste policies are and how they work; how they monitor and evaluate the effectiveness of their e-waste policies; and what sort of certification processes, if any, they utilize.

As a result of the data collected, four main themes emerged from participants' responses to questions pertaining to how e-waste is mobilized. Evidently, the dominant contributing factors involve:

1. Workplace hierarchy and company culture;
2. Secondhand market for electronics;
3. Governing body of electronics, namely Ontario Electronic Stewardship; and
4. The influence of security measures of e-waste and its respective data. The following sections will outline the results of these findings, beginning with an explanation of how e-waste is acquired.

E-waste results from the production of electronic devices and their ultimate recycling or disposal. The 'lifecycle' for electronic products can be short or long depending upon many factors such as: corporate culture, knowledge and policies, motivation, actual function and intrinsic value, product or system obsolescence, new technologies, proprietary data, competing products, corporate plans, strategies and profitability, emerging market trends, product surpluses and more. E-waste begins with purchasing or leasing an electronic product. Once a device is determined to no longer have value for that user or perhaps that company, there are choices to be made regarding extending a products use at that company, or disposing of it externally in some manner. A device can be redistributed to other departments internal to the company or ultimately sent out as e-waste. Different factors influence what to do with different types of electronic devices (depending on the intrinsic value and functionality of the device and/or its' proprietary data) and influence what types of solutions companies use and/or purchase for their various e-waste products. In summary, options for dealing with e-waste include internal re-use of a product within a corporate environment, selling used-devices into a second-hand market or donating them once data is removed, or they can be destroyed and the components re-used or recycled.

There exists a range of criteria for e-waste processors to meet in order to gain a contract with a given company. These criteria range from certification standards to factors such as establishing a trusting relationship with the vendor. Some of those factors include certification standards like being ISO certified; proximity to the company wanting to dispose of their electronics; security of the data being destroyed; knowledge of government

regulations and compliance of OES standards; and facility infrastructure. Furthermore, recycling involves software wiping, de-gauzing, shredding, and general forms of hard drive destruction. De-gauzing refers to the process of vibrating the electronic device to essentially scramble up any functions inside the device that may lead to someone being able to recover any stored data on the device (Personal communication, January 17, 2014). Most often this destruction phase of electronics occurs onsite of the company getting rid of their electronic device before going out to the e-waste processor or donations, but sometimes only at the e-waste processing facility.

During the interview process, the researcher created memos to keep track of the information that was shared with her. The researcher used these memos to create a concept map to illustrate how individual companies process their e-waste and the factors that influence their decisions in the Region of Waterloo. This map is meant to model the e-waste process but there does exist variations amongst individual companies' strategies.

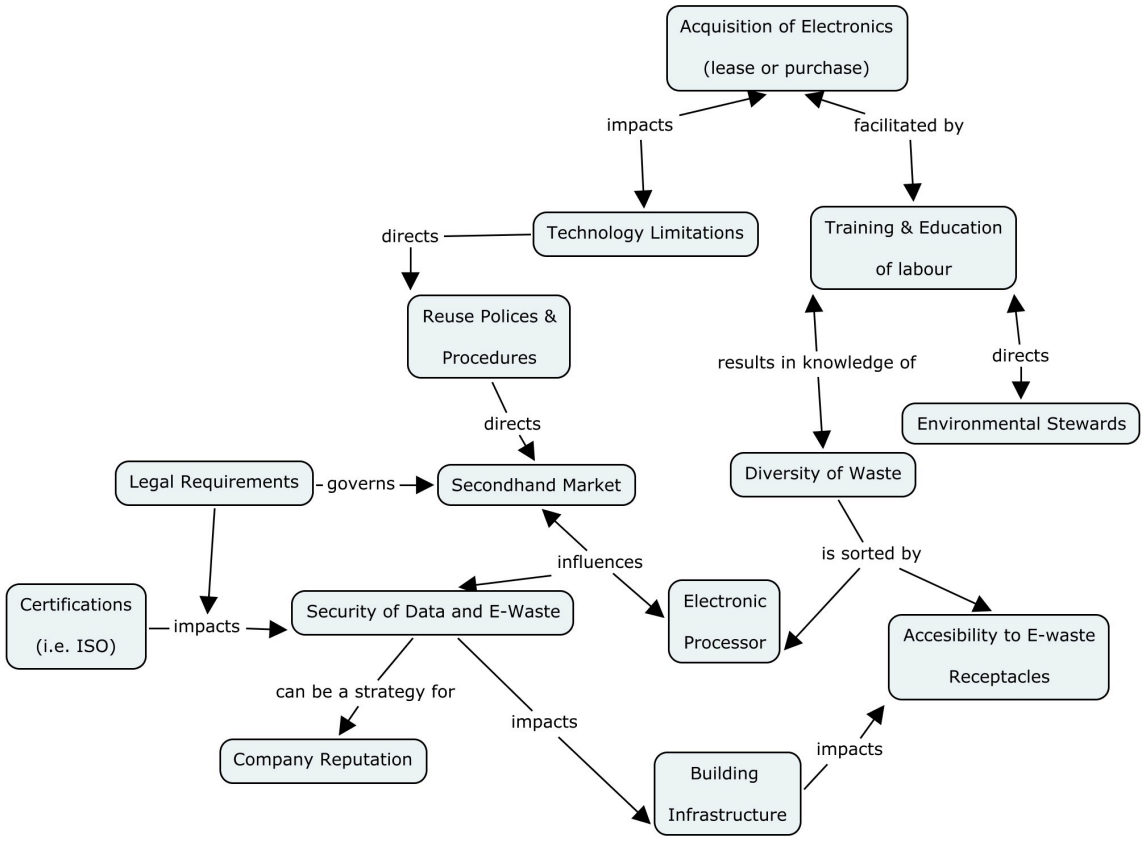

Figure 2: Chain of influence of e-waste

This map represents a chain of influence that links different parts of the system that surrounds the circulation of e-waste. Additionally, it shows the input factors, which contribute to the decisions of the details of where and why e-waste is moved. In some parts of the system, there are hierarchies that influence the next tier down. Some arrows are bi-directional, meaning that the relationship between the two concepts is reactive to each other. For example, environmental stewards at a company seem to influence the training and education of other employees in regard to waste management strategies. Subsequently, the training of employees and their education can result in environmental stewards.

Promotion of old electronics being available for reuse is a critical point in the potential extension of the life cycle of an electronic device along with a companies policies on how and when technological devices are acquired. Through the research, the researcher found that internal websites are one of the methods companies rely on for an internal auction of old electronics. Often, the need for the latest technologies relates to an employee's position in a company. Not only is the type of job relevant to the need for the latest technology, but also the workplace structure of acquiring resources impacts the consumption patterns of electronic devices. For example, one of the participants interviewed, who represents a company that is a producer of electronic devices, describes the system that occurs at the company when a laptop is broken and a new one is required. There is a process of internally requesting a replacement that triggers a demand for new technology or device and subsequently for the older electronic device to become available for other employees before leaving the company. The participant stated,

> "…depending on what type of gear it is, we have different outlets for testing, for fixing, for you know, upgrading and then re-deployment. So your group or cost center wouldn't pay for it, but they would request it and would be kind of like a first come, first serve basis, but it's hard to…if you say you're looking for this specific gear and someone else sees it on the list first, they might say, John Smith has been looking for it, so no. We're sending it to him first" (Personal communication, February 18, 2014).

The system of acquiring new electronics for an individual or a team of employees relies on employees' initiative to reach out for new and used electronics. Furthermore, the company must have items available. There must be a supply of old electronics that have been stored, and are available to employees to access.

Factors to consider in extending the lifecycle of a technological device are: the quality of the e-waste, the demand for new products, and whether a device is considered to have intellectual property (IP) value. If there is IP value, this typically results in the company demanding a high level of security systems to destroy any data on the electronic device (Personal communication, January 20, 2014). Non-IP waste may be gathered if employees bring in their personal electronics (that are not considered company property) to be disposed. Therefore, depending on how the e-waste is streamlined, different disposal methods are applied.

The age of technology is significant to pushing future development of new products for companies. Where some companies have a transition of electronic devices every four years, the participant at one electronic manufacturing company described that for their software developers, a computer that is one year old would be considered aged technology for priority employees, therefore it is redistributed at the end of the year. There is a tiered system of ranking the needs of some employees, which contributes to the technology turnover rate. After wiping the data from the electronic device, most of the companies surveyed will redistribute their electronics through online sales before supplying the electronic waste to an e-waste recycling processor.

The information in figure three represents a summary of how each company interviewed deals with its electronic waste. The methods utilized are denoted by 'X' or the number of years, when referring to a rollover policy.

Recycling Strategies of Interviewed Companies								
Group	**Acquisition of Electronics**	**E-Waste Processing Vendor**	**Methods**					
			Internal redeployment	**Auction**	**Rollover Policy**	**Surplus Sale**	**Directly to Processor(s)**	**Donate**
A	Purchase	Eco-Tech	x	x				
A	Purchase	EDI & Eco-Tech					x	
A	Purchase	New Hope			4 years		x	
A	Purchase	OES & SIMS					x	
A	Lease	Greentec			3 years		x	
A	Purchase	Greentec & ERS Intn'l	x					
A	Purchase	Greentec					x	x
B	Purchase	Eco-Tech & Greentec				x		x
B	Purchase	Compucom					x	
B	Purchase	Greentec			4 years	x		x
B	Purchase	Greentec	x		5 years	x		
B	Purchase	Eco-Tech			4 years	x		x
C	Waste collector	n/a						
C	Waste collector	n/a						
C	Purchase	Unknown[3] vendor local to Region					x	

Figure 3: Recycling strategies of the 15 participating companies.

[3] The participant interviewed did not disclose the name of the vendor their company has a contract with.

Electronic Waste Processors		
Vendor	**Frequency**	**Location**
Eco-Tech	5	Waterloo (multiple locations in Region)
Greentec International Inc.	6	Cambridge
Compucom	1	Mississauga
Electronics Distributors International	1	Orillia
New Hope Commodities (partners with Eco-Tech)	1	Cambridge
SIMS Recycling Solutions	1	Mississauga
ERS International	1	Toronto
Unknown[1]	1	Region of Waterloo

Figure 4: E-waste processing vendors.

Figure four shows the number of companies that use a specific e-waste vendor and where that vendor is located within the province of Ontario. Four of the vendors are located within the Region of Waterloo; the remainder is within a radius of approximately 80km to 200km distance from the Region.

As illustrated in Figure three, two of the companies have an internal process of redistributing electronic devices that are deemed outdated or technologically subpar for some of their employees and providing them to other employees who may still find the product functional. The researcher has labeled this process as 'internal redeployment'. Participants described this centralized process of redistributing electronics as occurring around one year after having the electronic device; in some circumstances after a number of months and other times, depending on the job requirement, redistributing after more than a year of utilizing the electronic device.

Six out of fifteen (or 40%) of the companies are involved in donating some of their used electronics directly to a charity or an educational institution but the amount donated was often considered minute in proportion to the aggregate quantity of e-waste that was directed towards an e-waste processing company. One participant reiterated the low amount by saying, "It's not the norm. That's for sure. It has to be a pretty unique situation" (Personal communication, January 20, 2014). This was echoed by several of the other companies who noted their charitable donations occur under occasional circumstances where an employee sought special permission.

Another method of redistributing used electronics is in the form of surplus sales or auctions. This was a strategy used by five (or 33%) of the surveyed companies. Essentially, once electronic devices (i.e. a computer) are wiped of data, they are gathered by whoever is in charge of e-waste diversion, and are resold either internally to employees at the company or are open to the public. There were three large-scale consumers of e-waste in the Region that are educational institutions that resell their old electronics very cheaply to aid students who may not be able to afford new electronics. Alternatively, the profit from their sales is invested into scholarship funds for students. One of these institutions also uses some of the profit of e-waste sales towards the cost of recycling other products such as fluorescent light bulbs. Beyond having a correlation with student aid, these three educational institutions open their surplus sales to the public for anyone to purchase. The other two companies, who are not educational institutions, used the sales profit of their auctioned items towards investing in either their company's charity or towards a charity external to their company.

Rollover programs are the most direct catalyst for technology turnover in a company**.** Rollover programs are predetermined, similar to a best-before date for a food product, where after a pre-designated time; an older electronic device is removed and replaced by a newer electronic device. These types of policies expedite the shrinking lifespan of electronic products**.** A benefit of a rollover program is upgraded technology, which may have more energy efficiency according to most participants interviewed, but not necessarily.

Two of the participants described their respective companies as having a rollover policy that includes a technology upgrade every four years. Another company has a rollover policy every three years, and another company every five years. One of the companies interviewed does not buy most of their electronics; rather, the company leases them every three years. After three years, the electronic device is sent back to the vendor as part of a take back system. When asked why they automatically upgrade every four years, a participant from a large-scale consumer company replied it is a matter of obsolescence and technology malfunctions:

> "…four years was because we were on the cusp of buying new tablets when they were first designed, and um, you know how technology is. Usually the first year versions always end up with like ticks somewhere along the way, right? So it had to be four years because people were asking for new computers after two. They [the tablets] were so bad" (Personal communications, March 7, 2014).

The temporal cycle for renewal is influenced by changes in technology. Furthermore, the repairs costs of fixing electronics are often cited as a deterrent from maintaining older electronic devices (personal communication, February 12 and February 18, 2014).

4.2.2 Workplace Hierarchy and Company Culture

Through the interviews, some participants expressed how people in senior managerial positions expedite the time and effort to participate in e-waste drives. Facility operators often complained of the difficulties in recruiting participants for e-waste drives because the collections are underfunded and a lack of interest from colleagues. Based on their personal experiences in working with waste management, they argued that people are more responsive if the message to participate in an e-waste drive comes from someone like a company manager (Personal communications, January 20, 2014). The facility's operators who were interviewed are attempting to strategically run their e-waste collection by capitalizing on the value of employee hierarchy's to gain popularity for e-waste collections and processing. The success of this strategy seems to balance precariously on employee turnover rather than through dedicated policies and resources, whereby new e-waste initiatives needs to be presented on a regular basis to people in new leadership positions, like the heads of student governments.

Employees positioned as IT managers or facility operators were most often the catalysts for decisions on e-waste lifecycles within a given company. Those employees are important agents of change in the lifecycle of electronic devices. When I asked these types of employees about their background knowledge in preparing items for resale or recycling process, a trend became apparent whereby knowledge was gained from observing processes over long periods of time. As one participant from a large scale consumer company stated,

> "I helped the guy that was in charge of this job for ten years before he retired so I got to know from the great big monitors to, we used to sell those for seventy-five dollars and in

> the end we couldn't sell them for ninety-three cents. I've learned all through seeing what the newer stuff is coming up and up and I just learned that on my own" (Personal communication, January 20, 2014).

The training and education of the labour force that works with electronic devices is significant to the longevity of secondhand markets for older electronic devices. Formal training and education was a common missing component from the majority of the interviews the researcher conducted regarding e-waste processes. It seems to be a very niche market of knowledge, which is often supplemented informally by employee's own observations and discretions of the amount and type of value, at least in financial terms. In thirteen of the interviews, participants tended to steer the narrative towards highlighting other recycling initiatives to give references to how their company handles waste. Meanwhile, e-waste remained a segment of the waste stream that presented a lot of uncertainty.

For one company in particular, a manufacturer of electronic devices, the topic of labour and billing stood out as a direct influence on the process of dealing with e-waste. Factors such as billable hours were cited as a determinant of how to select an e-waste processor to handle their electronic waste. The participant explained,

> "Labour is a very sensitive topic for us. Everything is chargeable to projects and to departments and so if we have this sort of, undefined, how much labour will it take to sort through these monitors, it's you know, it's difficult for us to manage that. So if we can have a vendor that can recognize our reality and you know, just, here's a receptacle to take it away, sort it, and give us our values and that's really the way we kind of want to outsource that. Other companies, they may have some value in segregating it internally just because of the way they're structured, but for us labour is sensitive" (Personal communication, February 4, 2014).

The company's choice of creating a contract with a certain electronic processing vendor related directly to the restrictions of how the company organizes its billable hours. To highlight, the participant indicated dealing with e-waste to be part of this 'undefined' boundary. A consequence of this undefined boundary results in an uncertainty of who is responsible for e-waste management.

4.2.3 Secondhand market for e-products: national or international?

The majority of participants expressed security concerns regarding the shipment of e-waste. Their fears were that the vehicle transporting the e-waste away from their facility to be processed elsewhere risked being intercepted if there was a breakdown (Personal communication, March 7, 2014). For example, if the truck transporting the materials broke down, there seemed to be an overall concern with trusting the employee delivering the materials successfully to the processing vendor. Some of the participants stated they were concerned items would be stolen en route, therefore threatening the security of their waste and mostly, their data (Personal communication, January 22, 2014). Nearly every participant surveyed also cited how he or she did not want his or her materials ending up in the landfill – noting how this is illegal.

The location of the secondhand market for e-waste is a key facilitator in the circulation of e-waste, which begs the question – is it better to export e-waste to a secondhand market or work with local processors? The Basel Convention notwithstanding, one participant argued, "Some of these products are re-sold into, you know, countries that don't have access to

higher end products. So to me, that's all good use of these products" (Personal communication, January 21, 2014). Inherent in this perspective is the idea that accessibility to electronic devices is a critical point in how e-waste is considered. By accessibility, the researcher is referring to how much opportunity there is to participate in e-waste downstreaming.

The dilemma of shipping e-waste as an export also brings forth the issue of efficiency in recycling costs and resources. A participant said she was unsure as to how to dispose of e-waste. Subsequently, the participant argued that their company uses global efficiencies for the manufacturing of their electronics, referring to the cheaper labour force that is present in many Asian nations as opposed to North American labour forces, so why not use those global efficiencies in the processing of e-waste? The participant questioned the benefits of keeping e-waste in Ontario, where it is likely less efficient than outsourcing it to another country, but noted that it must be managed properly offshore. The participant stated,

> "For e-waste, there is an argument to be said, for companies, as long as it's managed…Put it in a container and send it offshore and if there were companies there that could manage the risk as well as reuse for the developing world that don't need the latest Iphone, Iphone5 or whatever, someone in Africa might be fine with something that's four years old and that could be reused as opposed to breaking it down and recycled. So that way, it makes more sense" (Personal communication, February 4, 2014).

When e-waste is sent offshore, it typically ends up in places with lower environmental standards, or from a political perspective, those countries that have not ratified the International Basel Convention (Lepawsky et al., 2010). The statement also evokes a common rhetoric of the language, which often surrounds and makes the difference between

charitable donations and dumping and a bias or judgment of perception of what a "third world" market might want or need. Perhaps not everyone in Africa wants a four-year-old computer. Alternatively, it begs the question: is it a valid opportunity for increasing accessibility to electronics? Is this a fair trade or is this dumping e-waste? This debate will be further assessed in the discussion chapter.

The problem of a secondhand market is a prevalent issue to the circulation of e-waste based on this case study. Several participants expressed that few people want to repair their computer (as opposed to buying a new one), and in some instances repair is not an option. A participant exclaimed, that calling a company back on their warrantee and stating that a computer or Ipod does not work results in the company providing the customer with an upgraded version, instead of repairing the original one (Personal communication, February 12, 2014). There exists a limited secondhand market in the Region. The secondhand market in Ontario seems to promote a short lifespan for electronic devices, whereby an electronic device is sent to an e-waste processor where the vendor will make sure it has been destroyed and give you certification with proof that they have destroyed the device and that it stays somewhere in Canada, assuming OES protocols are followed.

Having knowledge and appreciation of the value of an electronic device and the quality of e-waste can facilitate the tipping point for expanding or reducing the lifecycle of an electronic device through different means, depending upon corporate values, perceived value of the device to the current user and it's inherent value as e-waste. The choices appear

to be: re-purposing the components, or recycling the gadget internally or externally. Companies that produce the products or companies that downstream can mine the actual components of a device for their elemental value, if its value is greater than the costs of re-purposing the components. Some participants view the lifecycle of electronics controlled by industry to be a barrier to the success of developing something akin to the Phoneblock mentioned in the literature review. A challenge for changing the market of electronic devices and gaining more collaboration is the proprietary developments of individual companies. As one participant stated,

> "The other problem with the manufacturers, they don't want you to just be able to buy a part that's interchangeable either, right? For example, in iPhone it's very proprietary and same with Blackberry. Very proprietary. Even with computers, the power adaptor won't work with this model just because then you've got to buy their stuff" (Personal communication, February 4, 2014).

The design of the electronic product itself has a dominant effect on the future of e-waste trends.

4.2.4 Governance of Ontario Electronic Stewardship (OES) – Who is leading who?

The benefits of OES were contested in two interviews, with thirteen out of fifteen participants being unsure of what OES's exact role is in governing e-waste. Both participants expressed strong feelings of disappointment with OES's leadership and standards. One participant, who represents an e-waste processing company, argued OES triggers extended producer responsibility (EPR), but has conflicting interests. The participant used an analogy to describe how OES operates, stating,

> "It's kind of like having the tobacco companies, who cause a lot of problems with health for people who smoke, to run the healthcare system. Just doesn't work. You just can't have that because producers at the end of the day, they're going to produce products that people want to buy. So if people want to buy environmentally friendly products, they'll make them more environmentally friendly. People who couldn't care less, they just get more and more concerned about the functionality and the bells and whistles of the device. It's for whatever it does for them in a different way, that's really what they're going to produce" (Personal communication, January 31, 2014).

Essentially, the participant is describing the role of the regulators to be moot. The participant argued the market drives consumption and that lifecycle of a product is not at the forefront of most consumers mind when purchasing electronic devices. Furthermore, the participant describes the impetus for OES regulators to be very biased, describing OES's leadership to be no better than tobacco industries monitoring themselves.

Another participant describes shortcomings of OES in regard to their policies of what they do and do not accept as e-waste. The participant said,

> "Problem is OES will take large photocopiers whole but won't take parts that are internal to the machine. For example, when a copier needs to be serviced and parts are replaced; OES does not accept those individual parts. In British Columbia and Alberta, or maybe Alberta, I'm unsure – the processor will pick up all the parts for free. This is a big miss for Ontario which results in lots of parts going to landfills that could otherwise be redistributed" (Personal communication, February 12, 2014).

This concern for change in how OES operates has a direct impact on the secondhand market and ease of disposal options. Indeed, it connects back to having an accessible secondhand market for e-waste and its individual parts. Are consumers really driving the market? It appears that the built-in obsolescence is a core principle of industry power.

In terms of built in obsolescence, every participant mentioned this to be an issue in the turnover of electronic devices. The expectations of how long an electronic device will last have become shorter. One participated described this shrinking timeline saying,

> "…if you look at technology and how it's changed over, you look at the way they made televisions ten or fifteen years ago, we had the CRT. They would last ten to fifteen years you know. Today, they are producing LCDs and LADE's and the obsolescence is a lot faster so people don't keep their stuff as much as they used to and they don't use as much valuable materials like they used to. There's less copper, there is less gold. They are being built with obsolescence right from the get go. They don't last as long, they don't, they won't last as long and that really works in their benefit, the producers" (Personal communication, January 31, 2014).

The participant attributes the components that go into the electronics to be of a lesser quality than ten to fifteen years ago. By supplementing copper and gold with alternative and ostensibly cheaper materials, the consequence has been a product that does not function for as lengthy a duration; device turnover is greater. The implication is that electronics are being designed for obsolescence and the dump, which contributes to the greater consumption demands, which benefit the producers of electronic devices.

4.2.5 Surveillance of Electronics

A process of asset tagging material is one form of surveillance of electronic products, enabling them to be tracked. Asset tagging refers to the process whereby a unique tag or barcode records the serial number of the electronic device linking the device to its end-user. The process of internally tracking the devices is somewhat mimicked by the e-waste processing company which, provides downstreaming accountability and certifications of when the electronic product leaves the company to its destruction stages. However, nothing with a hard drive is sent out for this process, they are destroyed separately (Personal

communication, January 22, 2014). For those companies who have integrated waste into their business model this system also allows the company to monitor and evaluate how their money is being spent. As one participant stated, “That’s why we are tracking the waste over here, because we need to make sure we are not spending more money for the waste management” (Personal communication, January 22, 2014). Indeed, if you can monitor and see where you are being the most wasteful, you can figure out which part of the e-waste systems are more vulnerable to higher turnovers. It is similar to when a resident diverts their garbage on the curb for pick up and organizes their waste into a blue bin, a garbage bag, and perhaps a compost bin. By breaking down the streams of waste, the resident can observe what they are producing and how it relates to other waste streams, which may or may not impact their future waste production.

Lastly, security of information and e-processor criteria are an integral component to the circulation of e-waste. This is both a motivator for companies to have a formal e-waste policy, but also a procedural practice of risk management conducted by each company. Every participant interviewed accounted for the destruction phase of hard drives. Interestingly, the shredding of the hard drives was often accounted for in almost animated drama, describing machines like shredders as these types of all-powerful machinery that would solve a company’s security concerns. The process of destruction was described by one participant stating, “I’ve heard that we have a crusher. I’ve heard that we drill holes in them [hard drives]. I’ve heard that we degauze them a couple times, um, or we’ll run it through a

program" (Personal communication, February 18, 2014). A different participant described the destruction phase as follows:

> "… because over the course of time, we've had literally a few buckets of hard disks that we weren't quite sure what to do with because they would have to be wiped and some of these things were so old that the computer that they would go in, like the connection, like the computer was so old, we didn't have the computer anymore, so we didn't have the connectivity just to wipe them, so in that case, in our machine shop…I haven't seen this, I haven't seen this with my own eyes, but I'm told they have this giant shredder and it can shred anything. And they throw the hard disk into it and it becomes scrap metal and then they deal with the scrap metal appropriately" (Personal communication, February 18, 2014).

The security process is very important to the companies surveyed. The crushers described are built to act as a barrier to leaking company information out. As noted above, changes in technology require alternative destruction methods. Legally, these companies are also bound to this type of procedure, however; only one participant articulated this point, stating, "…hard drives are wiped as per the Department of Defence standards. So to ensure that all the data is not recoverable or any data is not recoverable if anyone tries" (Personal communication, February 4, 2014). While many companies share a similar destruction strategy, it became apparent that these directives served as a practical solution to data management, but also hinders how reusable an electronic device can be. For example, several companies articulated that local schools were not receptive to the company donating their old electronics because they did not have a hard drive that came with the electronic. Subsequently, the electronics are routed directly to the processing stage where they transition into the recycling phase of their lifecycle.

4.3 Motivations

While the previous sections addressed the first research question of how e-waste is mobilized and touch on factors that influenced mobilizations, the following results relate to the second main research question, which asks which motivational factors are most effective in triggering a company's e-waste policies? Through subsequent research questions, data was collected regarding company's e-waste policy agendas; what instigates them; who instigates them; and what influences their company to have various disposal routes. The results of these findings are summarized in a chart. Following that, more in depth themes that emerged from subsequent research questions are presented and organized into four main themes that address salient motivational factors uncovered by the research. This set of data pertains to building infrastructure qualities; economic resources and technology turnover; public relations; and lastly a note on collaboration within the technology triangle.

When each participant was asked directly what motivates their company to have an e-waste policy, they listed a variety of responses. These findings are summarized in the table below, which has categorized each company based on their grouping and their respective certification standards as expressed through personal communication with each participant.

Group	Certifications	Motivations										
		Reputation for Sustainability	*Financial Benefits*	*Overall Waste Diversion*	*Security of Data*	*Environmental Stewardship*	*Company Merger*	*Customer Perception*	*Health, Safety, Environment*	*Not strongly motivated*	*Efficiency in Technology*	*Storage*
A	None		X								X	
A	ISO 14001	X					X					
A	ISO 9001			X					X			
A	ISO 14001	X						X				
A	ISO 14001				X				X			X
A	ISO 14001				X	X						
A	ISO 14001	X										
B	ISO 14001	X	X	X			X					
B	None				X							
B	None		X									
B	None	X	X								X	
B	None					X				X		
C	None					X						
C	ISO 14001, RQO[4]	X	X	X				X				
C	None									X		
FREQUENCY	8	6	5	3	3	3	2	2	2	2	2	1
	RANKING	1	2	3	3	3	4	4	4	4	4	5

Figure 5: This chart summarizes the profiles of a company's motivational factors as each participant stated their rationale. To reiterate, group A represents manufacturers of electronics; group B is large scale consumers of electronics; and group C are key informants.

[4] RQO stands for the Recycling Qualification Office, which is a certification involved in measuring recycling stewardship, granted by a not for profit Canadian organization (http://rqp.ca)

As depicted in figure five, certification standards whether they are present or not, do not have a strong correlation with the types of motivating factors a company uses. Interestingly, six out of seven manufacturers have certifications which are part of the ISO designated series, five being ISO 14001, and one being ISO 9001 standards, whereas the inverse relationship occurred with large scale consumers where only one out of five had a certification. Two out of fifteen of the companies did not have a formal e-waste policy, meaning they followed a loose protocol but had no set standards – notably neither had any certifications. Having some certification may have bearing on commitment to e-waste policy but further research would be needed to see if this is statistically significant – with such a small sample size, these results may be coincidental.

Despite the rankings as demonstrated above, when participants were asked subsequent questions regarding factors which impeded or aided the success of their e-waste policies, there were some inconsistencies between what a participant stated as their motivating factor compared to what their actions conveyed. For example, ranking in last place is 'storage constraints', yet when discussing instances of purging electronic waste, storage constraints or building infrastructure were mentioned frequently, with seven out of fifteen (or 47%) companies making an explicit reference to storage being an issue or access to waste receptacles. Likewise, ranking in first place is 'reputation for sustainability', yet only one company noted that there has been an increase in customers asking about their e-waste policies in the past two years. Overall, it seems companies are motivated by practical concerns more so than they would admit.

The researcher was left with a strong impression that the most informative method to incentivize people to be responsible with their e-waste comes down to education of consequences and the convenience of acting responsibly. Awareness of the environmental consequences of poor e-waste management is not enough to encourage good practices; thus, convenience and practicality should be considered. Accessibility to waste receptacles plays an important role in sustaining e-waste management policies.

There exists a peer surveillance that occurs which facilitates perception of waste and ownership of responsibility. Some companies use this to their advantage and reward their employees as 'eco-heroes', where an employee can inform colleagues of proper policies and thus correct poor recycling practices within the workplace. The employee is given permission and a reward for acting as an environmental steward (Personal communication, February 4, 2014).

One technique to empower a company's labour force is through manifesting corporate ideals with employees who are on the ground, like facility operators as opposed to a manager that may be located elsewhere in an office building. During an interview with a company that manufactures electronics, the participant described using this technique as a successful component to their waste reduction strategy. She described,

> "The other really advantageous thing is we have facility maintenance people. It's above and beyond a janitor. It's not just a guy that does garbage and the halls. These folks are part of the facility maintenance teams. They're passionate about the environment. I've

> made them champions of the divisions that they represent. They own it! If they find a circuit board or something electronic in the waste, they're going to figure, they're going to trace back where it came from and confront people and communicate to them. They're not shy at all. They'll call something out that's not acceptable. We've empowered the people that have the direct day to day contact with potential liability. First of all, they understand why it's something not acceptable to [name of company] and also that they take a lot of pride in our compliance and they will take a personal responsibility to monitor it" (Personal communication, February 4, 2014).

There was only one representative from a company which expressed using this strategy. It represents an interesting contrast from another participant's point of view, where they expressed frustration with the janitorial staff not being receptive to added responsibility for e-waste and therefore not prioritizing its collection (Personal communication, March 7, 2014). Overall, building infrastructure is important in terms of having receptacles for e-waste and making it literally as convenient as possible for employees to have access.

4.3.1 Building Infrastructure

Building infrastructure and storage space was often referenced as the framework for developing formal and informal e-waste drives. Events such as a company merger or location change tended to be instigators of how a company would deal with their e-waste. As one participant stated, "Another part of the thing why we started doing this with e-waste was because we have a move, and what are we going to do with this waste and we need to know where we are generating the waste and how are going to handle the waste through the company" (Personal communication, January 22, 2014). The ability to monitor and evaluate e-waste production was sensitive to the space in which it was developed. When the

participant described moving facilities, it became a point in time for purging. As one participated argued,

> "If you're an independent company, you won't spend a lot of time on how to get rid of stuff. You'll go with the assumption that waste is waste and I'll get rid of it on the curb or however this building that I'm leasing from allows it. You don't think those things though, it's not like a full lifecycle analysis" (Personal communication, January 9, 2014).

The participant noted building infrastructure or leasing contracts influence waste disposal options, but others argue this is to a limited extent. A company may stipulate in a contract that a tenant is responsible for recycling their electronics, however, it takes resources to ensure those stipulations are followed. As one property manager argued, it is not worth risking building vacancy because a tenant does not follow recycling protocols (personal communication, April 14, 2014).

Another participant explained how over the years, e-waste accumulated in their building garage and storage facility, and when they were moving offices, they were forced to recognize the accumulation of e-waste and do something with it. As it turned out, the company's neighbour was having an e-waste drive and so they brought their e-waste next door to be purged (personal communication, January 7, 2014). Moving offices acted as the main catalyst for dealing with e-waste that had collected since the 1970s. The method the company used to deal with their e-waste was largely a factor of their built environment and their proximity to their neighbour's e-waste drive. The participant also attributed the amount they accumulated to a mentality of hoarding materials for employees to use at a later point in time (personal communication, January 7, 2014).

Storage constraints act as a stimulant for e-waste policies. While e-waste is seemingly not a priority for many of the companies interviewed, storage receptacles can be a barrier to company's functionality. As one participated described,

> "The computer room it just...just…it's like someone's garage in a way. Sometimes things just you know, become dormant and obsolete and it's sort of stored there and then after a while, we get, honestly…we get sick of it looking that way…well, we're trying to have a more regular procedure every three months to just cull the thing…like cull as in sort of clear out, so that, you know, we're not walking into sort of a disaster areas sometimes. Not a disaster area but it just starts gathering up and we're so busy doing other things, it's kind of the least thing we're worried about" (Personal communication, February 18, 2014).

E-waste itself is not necessarily viewed as a problem; rather the space it takes up is a concern for the companies surveyed. All together, e-waste management seems largely circumstantial.

As a consequence of the undefined intersection of e-waste and labour, is the departmental overlap internal to companies that causes disconnect in the information involved in e-waste management systems. While the financial cost of dealing with e-waste hovers between cost neutral and profitable for the companies interviewed, the specific benefits of e-waste in financial terms is often understated. As one participant noted,

> "You know, so Purchasing is in charge of making sure that Greentec handles things on a basis by basis and send us invoices, but it's Account Receivables who know how much money we have and it's Facilities' who I'm through who ensures that this program is working and that we have people in place to actually make it work. And yet, nobody actually knows how much money we're either spending or making on it. Yet, that's not something that's communicated. So I don't want to say that it's a big deal, because obviously it's not something we discuss regularly but it certainly does help that we do end up making some money on it. It's not much, but essentially it doesn't cost us anything and that's what we're going for" (Personal communication, January 9, 2014).

The participant identified the departmental overlap to result in a communication problem where a lack of education is dispersed on the cost benefits of e-waste reuse and recycling.

Another interesting caveat of communication is the role of visual aids like films and photographs at having an impact on people's education of e-waste processing. Multiple participants referenced having seen a documentary about e-waste being handled by children in Bangladesh or China, which had a lasting impression on them. Nonetheless, one of the key informants argued the public's knowledge of toxic e-waste dumpsites, like those famous in China, are outdated news. He argued,

> "They have their own e-waste problem in China because they're a billion people. They're starting to develop some of the most modern plants in the world for processing e-waste. So anybody who tells you electronics or e-waste makes it ways to China and it's being handled unsafe, that's the 90's, that's from the 90's and what was happening back then, or early 2000 if you want" (Personal communication, January 31, 2014).

Contrary to the public perception that China is handling e-waste in questionable ways (Boudier et al., 2011; Kiddee et al., 2013; Lepawsky et al., 2011), the participant argued that China is an industry leader in e-waste processing. I am uncertain to what extent that statement is factual, but found this participant's perspective to be an outlier worth sharing.

Having an EMS system resonates with people differently; however, tapping into the 'feel good' factor has significance. One participant articulated that customers could feel good about engaging with a company that has a take-back service with strong environmental ties. For example, one of the electronic manufacturing companies has a take back program where

a policy on their website informs customers they can return a product when they are done with it. The participant argued this is an attractive feature for their customers (personal communication, January 22, 2014). Another participant stated,

> "There are large corporations that are looking for, um, environmental stewardship to be incorporated in their core values and when larger collection contracts come to tender we need to be able to provide those services, those sort of value-added services. Feel good services" (personal communication, January 7, 2014).

Some of the companies surveyed recognize that eliciting these types of emotions from customers is a positive business strategy where they can capitalize on their waste management as a selling feature of their company.

When a contract is out to tender, waste disposal holds different value depending on the company culture, rather than the type of company. In interviewing two different insurance companies, the researcher was intrigued by how they each perceived their relationship with e-waste and gaining clientele. When asked about how customer perception of their company's e-waste policies plays a role, if any, in their company's policies, they contrasted starkly. In terms of customer perception of e-waste, one participant responded saying,

> "Um in general, because we're not a manufacturing company, we're mostly a service provider, and a lot of people aren't actually in our offices. We meet them in the field. I think that it's a pretty low perception. It's not really something that crosses their mind, um, usually we meet up with clients at a time when they're thinking about other things. Their house is burnt down, right? So, as long as we're coming with equipment and helping them to solve their problems, they're not worried about anything else, yeah. So the perception is pretty low" (Personal communication, March 7, 2014).

The participant cited remote work being a factor, but also articulated how an e-waste policy will not hold much power in a potential consumer choosing an insurance company. In other words, it is not at the forefront of customers' issues when they interact with the insurance company. The other participant expressed how e-waste destruction and security is a huge part of their liability role and functions as the main motivator for their company to have strong e-waste policies (Personal communication, January 17, 2014). They informed me that precedence of other company's problems was an instigator for their company to develop their security measures for electronic equipment. She remarked,

> "You hear about CIBC and some of those places a few years ago, maybe more than a few years ago, CIBC had a leakage of information on their printers and we make sure that none of that, you know, we make sure we have the proper measures in place so none of that gets leaked out to the outside world" (Personal communication, January 17, 2014).

The participant viewed their e-waste policy as a security policy with a direct consequence on their company's public relations. Their reputation is important and security of information is a driving force. The participant elaborated on that point, saying how "It's [e-waste management policies] not just something that goes by the wayside and I think it's a good marketing strategy for us because we do have so many security measures in place and people can trust us and then depend on us as well" (Personal communication, January 17, 2014). The security aspect of e-waste is the over ruling issue for the majority of the companies surveyed because they are liable for the information on their product.

4.3.2 Economics and Technology Turnover

Financially, the rebates available for e-waste processors fluctuates with the international market as well as the standards set by OES, like eco-fees, a type of tax that is meant to contribute to EPR strategies. Subsequently, these monetary costs influence waste disposal options. As one participant argued, it is cheaper to recycle e-waste than throw it out, because the e-waste processor pays their company for their e-waste (Personal communication, March 4, 2014). The majority of the companies echoed this experience. Another participant argued it simply is illogical to be wasteful with materials, saying,

> "It doesn't make sense to get rid of a lot of waste because this is product you paid a lot of money to get it and you don't want to scrap it and put it on the waste stream if you don't have to, so there's products we've had aground, we've been trying to sell it, you know, move it along as best as we can, and right now, we're at the point where it's not going to move I reckon. So one of the policies we do have is around purchasing the material. We try to, we're very careful of that. Making sure that our forecasting system is as accurate as it can be. Because if the forecasting is out, then you're going to end up with extra material which you don't want" (Personal communication, March 4, 2014).

The participant linked their environmental and economic ties closely together, arguing that ownership of waste is expensive. Moreover, being wasteful is a consequence of poor forecasting, which can be a costly mistake.

When asked how a company measures the effectiveness of their e-waste policies, a participant responded that it can be a profitable exchange, measured in financial terms. The participant stated, "Now we're actually making money from them coming to pick up our e-waste. So, we can measure it financially, the value that we're getting back from the vendor" (Personal communication, February 18, 2014). Another participant said, "We accept it

because I mean, you do make money for e-waste. There's no argument against it. I think a business that doesn't have it, that actually doesn't really make sense, because you make money. You actually get paid" (Personal communication, February 12, 2014). For these participants, and nearly every participant, the small profit or cost neutral equilibrium makes it challenging to not take advantage of having an e-waste policy from a financial perspective.

International regulations are significant for a global company and therefore the role of forecasting market trends is essential in the business of technology turnovers. As one participant stated, precedence from a failed forecasting measure left them vulnerable to changing international markets. The participant commented that the environmental industry is rapidly changing on a global and local level, but faster on a global scale (personal communication, March 4, 2014). As a result, there are consequences to operating with outdated technology methods. The participant explained how in 2004 a new regulation came into effect that required many corporations to redesign their products with technology that had not even been in existence the previous year. He stated,

> "Had to get rid, needed to get rid of lead and solder because at that point, at seventy years of experience soldering with lead, and lead solves some technical problems with soldering, and okay, and brittle, there's other tin whiskers that can form, so we had to develop technology to solder with silver instead of lead and that introduced potential risks to our liabilities so the whole world kind of got hit by that at one time, so when we realized, we needed to really pay attention because the world is changing and we can't just produce products the way we were in the past" (Personal communication, March 4, 2014).

It is not so much that the design of the product was changed by the e-waste disposal options, but namely through international regulations, which governed the market for the sale of those company's electronic products.

With the evolution of company policies in the last few years to develop e-waste policies, there is often an adjustment period between implementing policies and following them. As one participant described,

> "…you always get the new policy and procedure, no one really knows how to follow it, no one knows how it works, but you talk to the right managers, or people, or groups and you get them on board and you explain the benefits, even just financial benefits. Sometimes that's enough for them to just reach out for your assistance, it's not always the environment. Unfortunately, it's not always the environment" (Personal communication, February 18, 2014).

Employees are acting on behalf of economic factors, in addition to environmental values, for waste management projects. Dispersing knowledge to company leaders is also a motivational factor.

4.3.3 Public Relations

From a theoretical perspective, a company's reputation signifies, at best, an introduction to the values it holds. The effort a company puts into communicating its presence represents a social image they have created for themselves. The effects of a company communicating their e-waste management are twofold. Two of the companies referenced that when potential employees know of their environmental strategies, it acts as a pull factor for a younger generation of employees being attracted to their workplace (Personal communication, March 4 & February 4, 2014). These companies articulated that it is a generational thing that Gen Y's are into sustainability movements, which outpace their older generation, composed of Gen X's. While a generational difference would be an interesting study, it may be best for future research to undertake. Based on the survey, it was inconclusive as to whether Gen Y's

or Millennials act in a more sustainable manner with regard to e-waste. Instead, the researcher associates her peers as those consuming more electronics than older generations where there is a constant want for the latest technology, and likewise, we have started to use technology like cell phones and MP3 players from a young age.

When asked about customer perception of the company's policies, a participant responded that they do not advertise on their website what their policies are because they do not want to risk their reputation. The participant stated, "I'm sensitive to the fact that you do not want to be seen as being greenwashing" (Personal communication, March 4, 2014). An adjoining argument as one participant stated, "Companies want to be perceived as environmentally friendly more so than necessarily paying the extra costs for being environmentally friendly" (Personal communication, February 12, 2014). Another participant contended their e-waste policy is part of a grander scheme of waste reduction to comply with the Ministry of Environment's waste diversion goals as well as internal Sustainability Action Plan agendas specific to the company (Personal communication, February 12, 2014). Incorporating waste management as their company's bottom line holds a company accountable and boosts their reputation. Part of their social contract is with their clients and because they are a high profile company, their company's reputation is significant.

Given that the reputation of a company's policies are important, the question arose, is e-waste a backdoor policy or newsworthy? Three of the participants implied that it is not newsworthy. In response to asking if having an environmentally friendly e-waste policy is

trendy in the Region, a participant said, " [E-waste's] not really posh or, um…like the flavor of the month is social media. …it's not really like you've got anything fancy to share about. It's waste" (Personal communication, March 7, 2014). She argued it is not savvy to promote waste, nor is it fashionable. To extend this point, another participant stated, "Nobody wants to think about their waste. Nobody cares where it goes, they just want it taken away and because it is a garbage, it's the last thing they want to think about when they're looking at their bottom line" (Personal communication, January 7, 2014). In essence, the participant articulated that it is something that is meant to be out of sight and out of mind. In contrast to this perspective, while another participant did not think it newsworthy, she argued it is part of their company's policy. She noted, "I don't even think there should be much argument around it [e-waste] so that one doesn't come to mind when I think of trying to be cutting edge or like you know, getting in the news for doing something cool" (Personal communication, February 12, 2014). A key distinction seems to be between whether e-waste is broadcasted as news, meaning it is posted somewhere open to the public like on a company's website, compared to being newsworthy, something to highlight. This point is further investigated in the discussion chapter.

The personal values and knowledge of employees shapes how e-waste protocols are followed. As one participant said, "Internally we're more optimized because I think before it was like, oh, we don't need it, let's discard it. Whereas now, its wait a second, that still has value. We might not be able to use it but this group over here might be able to use it" (Personal communication, February 18, 2014). Perhaps the mentality of hoarding electronics

is not a negative consequence, but a conservative measure. On the other hand, there is a constant demand for new products where, “People just want cheaper stuff” (Personal communication, February 4, 2014). As another participant reverberated, “People just want the next new device, right? The new new Ipad or whatever the heck things are” (Personal communication, February 12, 2014). The mentality of gaining the latest technology seems to overpower consequences of e-waste. There is somewhat of a divide between companies storing their electronics in case of future needs, with the desire to want the latest technology. However, it seems the drive for the latest technology ranks higher than the drive to keep outdated electronics.

4.3.4 Collaboration

The merits of geographical clustering of IT-related companies that give the impression of a technology triangle were found to be null. Companies did not interact with other local companies for consultation of e-waste pathways. As one participant astutely noted, the lack of critical mass of having enough quantity of e-waste to hold power for more choices in local e-waste vendors prevents a tipping point in how e-waste is processed and under what conditions (Personal communication, January 22, 2014). Lacking a local vendor, who met all the criteria of what a company was looking for, came up in numerous interviews. Consequently, knowledge of e-waste protocols remained localized to individual companies.

4.3.5 Conclusion

The findings of this research do not clearly indicate the best practices for e-waste management. However, they demonstrate a variety of procedures the companies surveyed currently follow. Firstly, the type of e-waste matters to companies because of the liability contained on electronic devices with hard drives. Consequently, the security of data guides the e-waste to be sent to e-waste processing vendors. While this action results in the recycling of e-waste, it sets limitations on the extension of the lifecycle of the electronic devices, which has environmental, social, and financial costs associated with the technology changeover. Communication of e-waste processing was also discussed as a factor that affects whether employees participate as environmental stewards. The framework of the company culture and hierarchy also preludes decision-making factors for the development of e-waste management formal and informal policies. Next, the discussion chapter will address the implications of these findings and recommend roles that corporations and government personnel can utilize to encourage e-waste management to be delivered in a comprehensive framework, drawing on practical solutions for consumers of electronics.

Chapter 5 Discussion

5.1 Introduction

The intent of this chapter is to discuss the implications of how decisions surrounding e-waste occur as presented in the previous chapter and offer recommendations for some of the problems associated with e-waste. These recommendations are directed towards planners, researchers, and companies looking to develop and improve their current e-waste policies. Overall, the results of the researcher's study indicate that practical measures motivate companies to develop an e-waste policy, but competing in international and local markets sets the framework for downstreaming of electronics to occur. Other explanations, such as environmental stewardship and reputation of a company, are highlighted as key motivational factors for e-waste policies. There exist discrepancies surrounding the best practices for managing e-waste. The researcher suggests greater analysis into applying green infrastructure to help increase education on e-waste management. The researcher proposes a means to improve communication tactics for consumers to comprehend the implications of their electronic consumption through product labeling techniques. The researcher also recommends making amendments to the Waste Management Master Plan; endorsing green audio visual standards; developing an e-waste source separation by-law; and formulating an e-waste registry.

5.1.1 Local versus Extra-Local Motivations

Inherent in motivating companies to adopt environmentally friendly e-waste policies are local factors as well as extra-local factors. Extra-local factors refer to factors that affect a company's local disposal processes, like a parent company. This creates relationships with

people who may not be local, but impact local disposal systems. A few of the companies interviewed have a parent company, for example in Japan or the U.S., that has a policy that the local company subsequently must follow. International markets and regulations have significant consequences on the future growth and sustainability of a company. As one participant argued, it is not logical to be wasteful; therefore, it is important to invest in forecasting and connecting environmental well being with economic benefits, hence the significance of purchasing departments being in tune with the disposal of products too (personal communication, March 4, 2014).

The values associated with being wasteful relate to the category 'philosophical subscriptions'. This category was developed during the process of axial coding of interviews. This category refers to the personal feelings and values that people identify with. An example of a philosophical subscription would be whether an employee believes in sustainable business practices like the precautionary principle, which is about taking conservative action if the consequences of certain behaviour are unknown. Employees' personal values play a significant role in how they spend time thinking about disposal options.

If practical access to e-waste receptacles is unavailable, a barrier to participation in e-waste policies unfolds. This is significant because multiple participants expressed a sense of frustration because leadership in environmental stewardship or, in simpler terms, embracing e-waste diversion as part of company culture is a challenge. The most direct reason for e-

waste diversion from landfills is because it became illegal to dispose of e-waste in landfills in the Region of Waterloo.

By analyzing participants' use of e-waste policies, the researcher concluded that it is not generally known how to best manage the disposal of e-waste, as this issue is heavily dependent on circumstances. A common theme in the interviews was that people wanted to get rid of e-waste, but were unsure how to proceed. Many of the participants struggled with this question, as it is common ground for these companies. When the researcher asked participants how they deal with their e-waste or how they would define e-waste management, most participants proceeded with some laughter, and a long pause saying, 'well…' before elaborating. E-waste policies are complicated, and because there is a lack of definitive gold standards and a comprehensive framework, the convenience factor is so critical.

Participants had a tendency to express frustration over the lack of e-waste processing vendor options. Product quality of e-waste is closely linked with patterns of geographic distribution. As mentioned earlier, some companies use multiple e-waste processing vendors, depending on ownership of the waste. One participant stated, "I need to be sure that our IP [intellectual property] is not re-used" (Personal communication, January 22, 2014). Notably, none of the companies interviewed referenced using a refurbishing company to extend their product lifecycle. [5] While other methods were used in most of the companies, not using a refurbishing company seems like a missed opportunity and perhaps a step that can be inserted

[5] A few of the companies do return products to their own production facilities if a product is flawed, but this is before it reaches a consumer or if the product has been returned by a consumer as part of a product warrantee. In mentioning an e-waste refurbishing company, I am referring a company like Techwreckers Inc. located in Cambridge.

somewhere between a company's take back policy for electronics, and before sending the waste to a processing vendor.

Overall, educating employees on the consequence of poor e-waste management strategies, as well as reputation of the final processor of e-waste is a strong motivation for a company to develop an e-waste policy. When the researcher asked what motivates a company to have a policy, one participant responded,

> "Stewardship. We want to be a waste leader. We want to be known as an organization that is cutting edge as far as technology goes and we have an obligation to shareholders to maximize profits so anytime we can extract value, that's to our advantage" (Personal communication, January 7, 2014).

Environmental stewardship and leadership in public relations is a driving force for some of the companies' e-waste policies. The participant essentially put forth a corporate social responsibility argument, explaining how it is an obligation to incorporate waste management as part of the bottom line of their company's mandate and the purpose of the company - that is, to make money. Other participants echoed this point of view as well. For a company to transition forward with sustainable growth, a tipping point exists where shareholder values become shared values at a company, followed by those values developing into stakeholder values (van Tulder et al., 2014). Thus, if sustainable business practices are part of the business philosophy, then the tipping points for decisions regarding e-waste management identified in the Results chapter need greater focus.

This sense of aspiration is a defining characteristic of the companies surveyed; because this is an undefined and not totally regulated space, there is room for people to triumph quite easily by being visible and figuring out the best way to manage their e-waste. The undefined space evokes the perception of being loosely responsible for e-waste, but not necessarily acting that way because of environmental clauses. In distilling this further, the idea of having a secondhand market and how that market is governed is significant to how e-waste is mobilized. A company must decide if repair costs are worth it and likewise, process their waste accordingly.

A compelling reality is that consumers and potential customers of a company are rapidly forming independent ideas of a company's reputation, which is expressed in the following quote:

> "Opinion forming in society has developed rapidly due to higher levels of education, loss of authority of opinion – forming institutions and emancipation of various sectors of the population. Add to the increase in transparency due to the rise of the Internet and social media, and companies effectively operate on the catwalk" (van Tulder et al., 2014, p.24).

In essence, van Tulder et al., (2014) argues because a company is so readily on display for public opinion, the swiftness in which a company can morph its self image is attention worthy. The business case for sustainability is an economic one where stakeholder accountability is an important threshold to permeate through; therefore, the researcher argues strong e-waste management policies are an essential step in keeping up with technology transitions and maintaining a sound reputation.

5.1.2 Fair Trade vs. Dumping E-waste

The idea of exporting e-waste to developing countries was presented in the Results chapter as a potential solution to using global efficiencies to handle e-waste. According to Wang et al., (2012), e-waste exports to China and African countries are driven by the secondhand market for electronics, which fuel the e-waste processing markets. However, the risk of exporting e-waste may have negative implications on fair trade, as opposed to dumping e-waste.

Fair trade attempts to expose the conditions under which a product was developed (Marston, 2012). Subsequently, certifications of fair trade are one strategy used to make production conditions relevant and visible to potential consumers (Marston, 2012). In following the destruction tactics of e-waste there are many challenges to ensuring proper regulations are followed internationally, and deciding which countries' laws are to be followed is difficult if the standards are varied. Wang et al., (2012) provide an example of a challenge the Chinese government faces when importing e-waste, articulating, "The environmental bureaus in China are concerned that tracking multiple disassembly fractions overseas is very difficult and the chances of fraud or toxic transfer is regarded significant" (Wang et al., 2012, p.10). In other words, it is a difficult process to manage the risk of trading potentially toxic materials. While the market for secondhand electronics is somewhat wary in a Canadian context, the Basel Convention remains a useful international regulation to prevent dumping electronics for reasons of environmental and social justice.

5.1.3 Literature Gaps

While many of the results relate to literature and theories referenced earlier in this thesis, there were two notable ideas that appeared during the interviews but were not accentuated in scholarly research on e-waste and CSR. Firstly, two participants mentioned that generational differences might have a cause and effect relationship with how e-waste is circulated. They suggested that a younger generation is more motivated to recycle electronics compared to their older peers. The researcher has no evidence to support this notion, but future research may include a study on how demographic differences affect e-waste recycling. Secondly, the timeline of e-waste cycles was discussed with numerous participants. It is evident that e-waste processing and circulation has a temporal cycle, whereby there are times when the amount of e-waste being processed fluctuates. Some scholars mentioned that collection of e-waste increased on Earth Days and related environmentally-focused events, where there existed amnesty drop offs of e-waste; however, further attention to the timing of when e-waste is downcycled would be noteworthy for implementing strategic e-waste policies. By downcycling, this refers to how the electronic device moves from being utilized to ending up as waste, and how that e-waste is treated.

5.1.4 Outcomes of the Theoretical Approach

The researcher drew on Stakeholder Theory (ST), Social Contract Theory (SCT), and the Value Belief Norms Theory (VBN) to offer a more comprehensive analysis of the issues at stake.

ST helps explain the variety of power dynamics that unfold when examining how e-waste is managed. Public perception of a given company proved to be a motivating factor on a surface level, in terms of how a company's e-waste policies conveyed a sense of environmental responsibility. Interestingly, how risk was viewed at different companies had different consequences. For example, when it came to viewing the risk of liability for data on devices that were to be disposed of, two companies in the same industry treated the risk of their data being accessed with contrasting perspectives. One company was adamant that their hardware destruction is a security measure, which serves to improve their company's reputation. The other company also viewed the destruction as a security measure but did not make the connection about their waste being something to publicize.

ST proved highly relevant at identifying key players involved in the transition of e-waste, whether it was an IT personnel, manager, or facilities operator, there exists a variety of employees involved at a company which facilitate e-waste management. While it was found that the personal perspective of a manager at a given company was perceived by other employees to expedite the clarity of an e-waste policy, previous literature did not highlight the key role of people in non-managerial positions who have a direct impact on e-waste outcomes. This is a significant factor to pay attention to for developing future e-waste policies and how to best disperse e-waste information.

The use of SCT was practical for bringing forth a structure to help conceptualize how decisions are made with regard to e-waste. For example, the process of encouraging

employees to share their knowledge with other employees in meaningful ways to help educate their labour force is a practical means to disperse knowledge of waste. This typically involved the role of eco-heroes at a given company conveying information to other employees, sometimes with the aid of another employee's directives. This is important because the social dynamics builds the strength of a labour force to effectively approach e-waste problems.

In regards to VBN theory, the logic of applying it to understanding e-waste has limited merit. The values an employee has in regard to topics like recycling is important, but the practical means of following through on those actions was controlled by larger factors such as employee hierarchy, company culture, and factors like waste receptacles or billing procedures. Overall, the culture of e-waste recycling still lacks popularity or policy with firm teeth for accountability.

5.2 Recommendations

5.2.1 Relevant Planning Policies and Frameworks

5.2.1.1 Waste Management Master Plan

The mission statement of the Region of Waterloo's November 2013 Waste Management Master Plan (WMMP) is, "To develop a sustainable waste management master plan, in consultation with the community, that is environmentally, socially and fiscally responsible while meeting the current and future needs of Waterloo Region" (Region of Waterloo, 2012, p.2) The guiding principles behind the WMMP are to define and enable strategic plans for waste management within the Region (Region of Waterloo, 2012).

Despite being a new document, the WMMP 2013 has excluded an increasingly growing e-waste stream from its plans. Formal guidelines do not exist in regard to e-waste management under the Region's WMMP. There is mention of electronic waste only once in the entire document, when referencing By-law E-04-092, June 6, 2005 "Landfill and Curbside Waste Collection of Electronic Waste Ban" (Region of Waterloo, 2012, p.17). Essentially, this by-law states that e-waste was banned from landfills in June 2005. Alternatively, it is suggested that residents and businesses consult the website www.recycleyourelectronics.com for information on disposing of their e-waste, which is monitored by Ontario Electronic Stewardship (OES). Furthermore, the WMMP acknowledges the Region lacks data available to the public on e-waste contributions for the industrial, commercial, and institutional (IC&I) sector because it is accounted for in the private sector. Additionally, the WMMP mentions a need to improve the enforcement of Ontario Regulation 103/94; however, it is not a priority (Region of Waterloo, 2012, p.19). Overall, there is a significant gap in how the WMMP addresses e-waste.

Under the Environmental Protection Act, Ontario Regulation 102/94 requires waste audits to be performed that outline plans to reduce, reuse, and recycle waste. Various standards exist based on the type of establishment, size of building, and employee work hours amongst other factors (Province of Ontario, 1994). Similarly, the Ontario regulation 103/94 requires industrial, commercial, and institutional source separation, likewise segregated by categories of IC&I building infrastructure (Province of Ontario, 2011). For

example, under section 9(1) of Ontario Regulation 103/94, an office building that has at minimum 10, 000 square metres in floor area requires a source separation program (Province of Ontario, 2011). Comparatively, under section 14(1) of Ontario Regulation 103/94, source separation is required at an educational institution if there are over 350 people enrolled (ibid). There are different metrics in place that indicate whether or not source separation is a requirement. However, neither regulation Ontario Regulation102 nor 103 denotes the source separation of electronic waste, which is a weakness in the monitoring and evaluating of e-waste for the Region.

Including e-waste as a metric in source separation policies has potential to make waste management more accountable and build a rich data set that is currently lacking for the IC&I sector. In a report commissioned by the Ministry of Environment (MOE) to measure the environmental benefit of WEEE diversion, it was reported that, for every tonne of WEEE reuse, 36 tonnes of greenhouse gas emissions are avoided (Morris, Morawski & Matthews, 2009, p.109). If the majority of companies in the IC&I sector produce a given amount of e-waste per year, that information is helpful to establish a critical mass to make it worthwhile for future e-waste operations to invest in the Region. As articulated in the Results Chapter, there was a sense of disappointment expressed by some participants over the limited e-waste processing vendor options for companies to work with in the Region. It is important to have a measure of current e-waste production if the Region is to be aware of how they will meet future demands.

To help address the first research question, it is recommended that to fill this gap in the WMMP, the Region recognizes the gap and makes a plan to hold a summit about e-waste. This could provide an opportunity to gather people with expertise regarding e-waste to come together and build a conversation regarding ideas of best practices for e-waste.

5.2.1.2 Endorsing green audio-visual (AV) infrastructure

The Planning Act (PA), R.S.O. 1990, describes how land use is managed in Ontario municipalities. Section 17 provides authority for Official Plans to be operationalized, whereas section 28 allows municipalities to have provisions for a Community Improvement Project (CIP). Section 28(1) states that improvement of energy efficiency is one of the criteria in which a CIP is relevant. In addition, it is the Regional council's responsibility to designate an area to be a CIP. In practical terms, section 28(7.1), outlines the eligible costs related to environmental site assessment for provisions of energy efficient uses. The researcher recommends the Region develop a set of design standards as part of a CIP to develop more energy efficient electronic infrastructure in IC&I buildings. The goal of these standards would be to aid in the reduction of the e-waste produced. This recommendation addresses the first research question concerning how e-waste is mobilized and also provides guidance for motivating companies to reduce their e-waste output.

Under the PA, it is clear that only the building, and not its users, can be monitored. One of the participants interviewed introduced me to the Sustainable Technology Environments Program (STEP) Foundation**,** an organization that seeks to include green audio-visual (AV) criteria into building infrastructure. This is similar to how Leadership in

Energy and Environmental Design (LEED) building standards are implemented (STEP Foundation, 2014). As an area for future research, the feasibility of including building infrastructure such as green AV standards should be evaluated. The purpose of this would be to incorporate environmentally friendly and efficient electronic infrastructure as part of building standards metrics.

The Regional Official Plan (OP) outlines how waste management should be handled[6]. Under section 5.E.2 the guidelines outline that the Region will promote sustainability and public health while providing opportunities for future adaptive reuse standards. Furthermore, section 5.E.6 states, "All Regional departments and agencies are encouraged to select products that have the least environmental impact, including products that: (a) contain a high proportion of recycled materials; (b) contain the least amount of packaging; (c) can be readily recycled or re-used; and (d) contain no hazardous chemicals and/or substances and minimal toxic substances" (Region of Waterloo, 2010). These high level policies set the ground for implementing criteria to promote environmental stewardship as it relates to e-waste for new construction. It is recommended that green AV standards be approved by the Chief Building official, and subsequently be incorporated into the *Building Code Act, 1992*.

Another recommendation is to implement an e-waste by-law to promote minimum requirements for e-waste source separation and handling. As society becomes aware of the

[6] As of January 24, 2011 the OP is under review with the Ontario Municipal Board (OMB), however there is nothing to indicate changes to waste management strategy on the Region's website that would influence the OP's directions regarding waste management at this point in time.

long-term effects of fast technology turnover, waste management policies need to be updated. This could be constructed in a similar means as the Green Roof by-law in the City of Toronto if the Region were to adopt something akin to Toronto Green Standards, which is secured in a site plan (City of Toronto, 2010). This by-law was implemented to legislate green roofs in Toronto, as a form of sustainable development policy. If an exemption to the by-law is required, it must be approved by the City Council and in lieu of following the by-law, cash is accepted (ibid). Using the Green Roof by-law as precedence for a more sustainable development, I am proposing that a type of e-waste by-law could be implemented to instigate comprehensive e-waste disposal criteria. Similarly to the Green Roof by-law, cash would be paid towards OES to further develop an incentive program for e-waste if an exemption to the by-law is required. This collection of funds would help fuel rebates for e-waste to motivate companies to have an environmentally friendly e-waste policy, conceptually similar to eco-fees. This recommendation addresses the second research question.

Additionally, to address the issue of storage concerns surrounding e-waste within IC&I buildings, it is recommended that secure storage space be incorporated into building designs. This could be incorporated as part of a site plan approval process if the e-waste by-law were to be approved. In developing secure storage space, it would address the first research question, in relation to the transportation process of e-waste.

5.2.1.3 E-Waste Regional Registry

As described in the Results chapter, there is little collaboration between companies regarding e-waste policies. A recommendation for planners in the Region is to begin with

producing an e-waste registry, which will make collaborating with local companies easier. This recommendation addresses the second research question, concerning motivational factors. Having an e-waste registry will also enable the Region to develop a competitive advantage to gain e-waste processor and refurbishing vendor options. The objective of a registry is to increase the capacity of planners to disseminate information and guide local companies in their options for understanding and dealing with the byproducts of consuming and producing electronic devices.

5.2.2 Corporate Strategy

5.2.2.1 E-waste scorecards

In 2008, Länsiluoto and Järvenpää conducted a study in Finland, investigating the benefits of integrating environmental or 'green' aspects into a scorecard for companies to measure their business activity. They found that environmental certification is a driving force for developing EMS standards while environmental authorities are another force because they require environmental documents which legitimize their companies' operations with legal requirements (Länsiluoto et al., 2008). While the research did not prove certification standards lead to different e-waste recycling motivations, conceptually the idea of adopting a green scorecard for e-waste is appealing for the purpose of developing metrics for e-waste.

Key Issue	**To integrate the environmental aspect of technology to achieve a sustainability development**
Objectives	*R&D of Green IT* **Measure(s)** • Number of new innovation • Number of patent • Percentage of budget allocated to new research and development
	Increase the degree of green commitment and motivation within the organization **Measure(s)** • Employees' green satisfaction index • Number of IT environmental certificates • Internal process improvement
	Improve the accessibility of green technology related knowledge from outside **Measure(s)** • Number of cooperation with local/international environmental association (e.g. ISO, RoHS, etc.) • Number of trainings related to green technology usage

(Yulia et al., 2011, p.7)

Figure 6: Example of a metric for Green IT.

The example of scorecard measurements depicted in figure six represents a place to start assessing electronic product reuse and recycling. Ebner et al., (2009) endorse six criteria for a scorecard, including manufacture effectiveness; reeducation or elimination of environmentally sensitive materials; information delivery effectiveness; energy use effectiveness; air quality; and waste reduction. Of their criteria, I would recommend measuring e-waste with an emphasis on the concepts of 'manufacture effectiveness', which they define as, "how well the device and its parts can be dealt with (not necessarily how they are actually dealt with) at end of life. This includes percent of the machine and the RU's that can be recycled or downcycled, mass percentage of recycled content, as well as material marking, and minimization of different types of materials" (Ebner et al., 2009, p.5). This

measurement would help provide an indicator for the feasibility of downstreaming electronics.

The researcher would also recommend focusing on "information delivery effectiveness" which they define as "measures how effectively the info-units are delivered to the customer over the functional unit" (Ebner et al., 2009, p.5). Incorporating these criteria in a type of scorecard or series of indicators could improve communication of e-waste handling strategies for producers and consumers alike. This recommendation along with the next one, addresses the second research question.

5.2.2.2 Labels and Waste

Another recommendation involves taking the e-waste scorecard a step further and integrating it into an online system to deliver user-friendly information on how and where to recycle electronics through new labeling techniques for electronic products. This would be implemented through a public-private partnership with private companies and OES. This can be achieved by using similar indicators as mentioned in some of the literature on green scorecards, but adapting it into a strategy, similar to a bar code which can be scanned using a phone or have a specific code that can be typed into a website to access up to date information on recycling procedures. OES uses the website recycleyourelectronics.com to provide users with information on e-waste recycling, and the researcher would recommend coordinating information that is already available with the system. This could provide a method of monitoring and evaluating data on e-waste production and consumption, while creating a user-friendly interface for users of electronics. Access to information on how and

where to properly recycle electronics can be hard to access, as expressed by participants in the Results chapter. This form of labeling electronic devices presents a new option to use technology to find out recycling information, similar to a barcode or asset tag, but for the end of life cycle of the product.

The researcher's vision for this application is to borrow a similar concept of a best before stamp that is labeled on food, but modifying the bar code to be a source of information for e-waste management and access to information when a product is deemed to be at the end of its lifecycle or a company wants to deploy it for reuse. Labeling materials properly makes it traceable, forms a system for data mining, and distributes knowledge to help resolve the problem of now knowing how to properly dispose of e-waste. It can function as a means to increase a company's accountability, as a form of extended producer responsibility.

Inspiration for this idea was conceptually formed based on a newspaper article in The Globe and Mail article titled "How to extend food's shelf life" published by Sylvain Charlebrois, a professor at the University of Guelph who focuses on food distribution and policy. In discussing the motives for consumers to change their behaviour, Charlebrois argues,

> "One affordable solution might be actively incorporating the consumer as part of the industry's food traceability scheme. QR codes, the common square bar codes that can be scanned with any smartphone, could be used to giver consumers more information about a product's manufacture and expected shelf life. Short of increasing food prices, giving consumers direct access to the data would help them make better choices, and in so doing reducing premature food disposal" (Charlebrois, 2013, A9).

Charlebrois advocates scanning food products using a smartphone to obtain disposal information on a product's manufacturers and expected shelf life. Similarly, the researcher thinks this strategy could be applied by corporations looking to endorse the longevity of their electronic products or at least increase access to recycling options for e-waste.

The researcher's idea entails a system that disperses information when an electronic device, such as a laptop is scanned; information would appear which would include, but is not limited to: the nearest e-waste processors and refurbishing companies; the materials' components inside the laptop; and a scoring system which details the ease or difficulty in the product's disassembly or recycling. Ideally, consumers would be able to scan this information at the time of purchasing, if that is a value that they are interested in. As the interest in learning about nutritional information from food labels varies among consumers, the researcher believes there would be some potential consumers that would want to know the information about e-waste recycling. At very least, the researcher thinks better labeling would allow for the customer to have the option to easily acquire information on the feasibility and ease of recycling their potential electronic at the purchasing stage, and also at the end of life point in time. Instead of simply having a certification, like a 'fair trade' label, this system would have up to date information on the specific disposal options for that particular customer and their electronic device.

Moreover, this data set would have a geocoding aspect to it, whereby the customer would have to input their residential or company postal code (if it is to be used at an office

space) into the application. This information would be gathered at the place where the electronic device is bought and subsequently disposed. The benefit of gathering this geographic information systems (GIS) data is that the Region could use it to develop an asset map depicting the geographic distribution of electronic devices. That information could then be used in planning for future infrastructure regarding waste management sites like e-waste processing companies or refurbishing locations. This information could also be connected with the e-waste registry suggested earlier on in this thesis.

5.3 Summary of Key Points in the Discussion

- There is a gap in the information on best practices for managing e-waste
- There is a need to develop a comprehensive framework for companies to be motivated to have an e-waste policy
- A recommendation for planners is to develop an e-waste by-law, instigate green audio-visual building codes, and provide rebates for companies be incentivized to become e-waste stewards
- Better labeling of electronic devices is another recommendation for facilitating practical e-waste management strategies

Chapter 6 Conclusion

This research focused on the issues surrounding the management of e-waste by various companies located in the Region of Waterloo. The problem of e-waste is a widespread issue with an escalating risk due to fast technology turnover and the increasing consumption of electronic devices.

Vendors for electronic devices present the consumer with an easy and enticing opportunity to upgrade their devices. For example, the phone company Roger's has a new campaign where they compel their customer to, "upgrade to a hot new device every year with *Rogers Next*™" (Rogers Communication, 2014). To the consumer who is disconnected from the end point of where this device goes and the amount of energy it will take to potentially recycle it, this advertising campaign is tempting. In order to understand the market for electronic devices, it is important to examine the social pressures that contribute to the demand for electronic devices. This type of data provides an indication of how the public relates to some of the purchasing choices that drive the demand for new technology.

A primary factor identified in the reuse and recycling of e-waste, concerns access to waste receptacles. This is significant from a social aspect, in terms of having a company whose labour force understands the benefits of e-waste recycling and overall consumption reduction. To some extent, the age of electronic devices at a given company provides insight into a narrative of how a company manages their e-waste. For example, if one company is acquiring new cell phones for its staff on a yearly basis, because a vendor is offering a deal,

this action conveys a company's disregard for sustainability, as measured by the by-product of their consumption, their e-waste.

The financial costs of e-waste management are a contentious issue. Eco-taxes are often passed onto a consumer, which counteracts efforts to incentivize manufacturers of electronics to design for the environment. Having a formal commitment, for example, through an environmental management certification system, provides some means of accountability for a given company to develop protocols to become better environmental stewards. However, the variation between electronic consumers and producers is minimal as depicted in the Results chapter in terms of the policies in place for reuse and recycling of e-waste. Further attention to the details of what matters to corporate managers would be beneficial for an overall measure of the state in which decisions to internally disperse, auction off, or have rollover policies for old electronics is worth investigating for the Region. For example, looking to see if the decision to have a rollover policy is a consequence of a social environment or perhaps economic or environmental reasons can be useful data.

As a result of surveying the fifteen companies, it is apparent that companies do have a strategy to reuse 'old' electronics through a variety of methods. A central issue to the ease of recycling electronics is the security of the data that may be transferred when the electronic device is circulated. Therefore, there is a high demand for an e-waste processor who can guarantee the safety of how a company's e-waste will be treated and disposed of. For some

companies, this also serves as a motivating factor for how reputable a company is with their products and services.

Ultimately, it has been recommended that Regional regulations be developed to provide opportunities to develop building infrastructure to help minimize electronic consumption. One suggested method is to have building code criteria for implementing green audio-visual equipment into a built environment. Furthermore, it is recommended that a corporate strategy be undertaken for better labeling of electronic devices. These labels are meant to be an educational tool to communicate information about an electronic device with the goal of reducing e-waste while also clearly informing a person how to dispose of that specific electronic.

Overall, the research for this thesis has provided a snapshot of how some companies in the Region manage their e-waste. There are independent and dependent factors that lead a given company to choose to downcycle their electronics in a particular way. This thesis is meant to provide insight on the experiences of those people involved in the managerial decisions of how policies and practices are developed, and can continue to evolve in the future. As the problem of e-waste expands, it is the researcher's hope that conversations about disposal options will gravitate towards a central focus of how companies view risks of purchasing new electronics (or leasing them) in a short time-span. Lastly, I hope the communication of how to properly dispose of e-waste becomes more convenient so that decisions on what to do with e-waste are a simpler process.

Appendix A: Interview Guide

Research Questions	Interview Guide Questions	References
How is electronic waste mobilized in the Region of Waterloo?	1. What do you think e-waste management is?	
	2. Do you have an e-waste policy? 2.1.1. Who collects it? 2.1.2. What are the fees involved ($/tonnes)? 2.1.3. How much time is involved? 2.1.4. Is it part of the company culture to set aside e-waste or do people casually dispense of it?* 2.1.5. Has there been any discussion about improving practices in your company?	* (Uzzell et al., 2009) - EPR concept
	3. How do you measure the effectives of your companies waste policies? 3.1.1. Is there a common sourcebook your company uses to implement policy?	(Lam et al., 2012) - Valuation of e-waste
	4. Are there certification standards that your company operates its business under concerning waste disposal? 4.1.1. For example, the ISO 14001 certification is a popular type of environmental management system with third party certification. 4.1.2. Another example, B-corporations certification	(Morrows et al., 2002) - Licence to operate
Which motivational factors are most effective in triggering a company's e-waste policies?	5. What motivates your company to have a policy? What are the incentives? 5.1.1. Is environmentally-friendly waste management a corporate priority? If so, what are they? If not, how come? 5.1.2. Who inspires this policy? 5.1.3. Is it a personal value system for a director? 5.1.4. What gives it momentum?	(Seacat et al., 2010) (Werner et al., 2009) - VBN Theory
	6. Is there an associated profit margin for e-waste disposal? (i.e.	- Verifying policy

	incentive? certain tax break for delivering X tonnes of waste?)	
	7. Have other local companies (Region of Waterloo) played a role in determining your companies e-waste policies? 7.1.1. Is it trendy to have an environmentally friendly e-waste policy in Waterloo?	- Merits of geographic cluster of IT companies
	8. What do you think your company can do to optimize its recycling measures?	
	9. Have waste disposal options had an impact on the design of your companies products? How so? 9.1.1. Are disposal costs accounted for at the production stage?	
	10. What perceptions do you have of the consequences of poor waste management strategies? 10.1.1. What perceptions do your customers have of your e-waste management practices (are they aware of your policy)? 10.1.2. If yes, do your policies have any impact on the marketing success of your product?	(Madhu et al., 2002) - Social Contract theory
	11. What privacy measures are taken when transforming an electronic product for reuse? i.e. new product, waste, other? 11.1.1. What are security concerns about disposing e-waste, if any?	(Bouvier et al., 2011)

Appendix B: Consent Form

By signing this consent form, you are not waiving your legal rights or releasing the investigator or involved institution from their legal and professional responsibilities.

I have read the information presented in the information letter about a study being conducted by Carly Rosenblat of the Department of Planning at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted.

I am aware that I have the option of allowing my interview to be audio recorded to ensure an accurate recording of my responses.

I am also aware that excerpts from the interview may be included in the thesis and/or publications to come from this research, with the understanding that the quotations will be anonymous.

I was informed that I may withdraw my consent at any time without penalty by advising the researcher.

This project has been reviewed by, and received ethics clearance through a University of Waterloo Research Ethics Committee. I was informed that if I have any comments or concerns resulting from my participation in this study, I may contact the Director, Office of Research Ethics at 519-888-4567 ext. 36005.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.
___ Yes ___ No

I agree to have my interview audio recorded.
___ Yes ___ No

I agree to the use of anonymous quotations in any thesis or publication that comes of this research.
___ Yes ___ No

Participant Name: _____ (Please print)

Participant Signature: _____

Witness Name: _____ (Please print)

Witness Signature: _____

Date: _____

Appendix C: Information Letter

January 9, 2014

Dear [person of interest],

This letter is an invitation to consider participating in a study I am conducting as part of my Master's degree in the Department of Planning at the University of Waterloo under the supervision of Dr.John Lewis. I would like to provide you with more information about this project and what your involvement would entail if you decide to take part.

With the increasing consumption of electronic equipment, there has been an emergence in electronic waste on a global scale. Electronic waste (e-waste) refers to a product, which has been discarded that utilized an electric current to operate, like an old computer or mobile telephone. The Region of Waterloo is known as Canada's technology triangle - hosting a variety of information and technology companies. The purpose of this study is to gain insight on how corporations within the Region relate to the management of e-waste. In order to better understand how leading technology companies view their role within the circulation of e-waste, I would like to include your organization as one of several organizations to be involved in my study. To better understand the paradigm of how e-waste is developed, it is important to gain knowledge on the driving forces companies are influenced by when producing electronic equipment. I believe that because you are involved in the management and operation of your organization, you are best suited to speak to the various issues, such as the process of electronic equipment disposal your company operates under.

Participation in this study is voluntary. It will involve an interview of approximately 30 to 60 minutes in length to take place in a mutually agreed upon location. If at any point in time, you wish to stop participating in the interview, you have the right to do so and withdraw your information from the study. No personal identifiers will be recorded with the interview information and you will not be identified in the thesis or any publication, nor will the name of your company. With your permission, the interview will be audio recorded to facilitate collection of information, and later give you an opportunity to confirm the accuracy of our conversation and to add or clarify any points that you wish. All information you provide is considered confidential. With your permission anonymous quotations may be used. Data collected during this study will be stored for five years in a locked cabinet in my house. After five years, all sensitive paper records will be shredded before being disposed of. Electronic data will be removed using a data wiping software. Only researchers associated with this project will have access. There are no known or anticipated risks to you as a participant in this study.

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact me at 226-600-8467 or by

email at crosenbl@uwaterloo.ca. You can also contact my supervisor, Dr.John Lewis at 519-888-4567, Ext. 33185 or by email at j7lewis@uwaterloo.ca.

I would like to assure you that this study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. However, the final decision about participation is yours. If you have any comments or concerns resulting from your participation in this study, please contact Dr.Maureen Nummelin, the Director, Office of Research Ethics, at 1-519-888-4567, Ext. 36005 or maureen.nummelin@uwaterloo.ca

I hope that the results of my study will be of benefit to the future of electronic waste management within the Region, to those organizations directly involved in my study, as well as to the broader research community.

I very much look forward to speaking with you and thank you in advance for your assistance in this project.

Yours Sincerely,

Carly Rosenblat

Bibliography

Andersson, Maria., von Borgstede, Chris. (2010). "Differentiation of determinants of low-cost and high-cost recycling" *Journal of Environmental Psychology* 30: 402-408

Babbitt, Callie., Williams, Eric., Kahhat, Ramzy. (2011). "Institutional Disposition and Management of End-of-Life Electronics". *Environmental Science and Technology* (45):5366-5372

Bathelt, Herald., Kogler, Dieter., Munro, Andrew. (2011). "Social Foundations of Regional Innovation and the Role of University Spin-Offs: The Case of Canada's Technology Triangle" *Industry and Innovation* 18(5): 461-486

Bhattacherjee, Anol. (2012). "Social Science Research: Principles, Methods, and Practices (2nd Ed.)" USF Tampa Bay Open Access Textbooks Collection (3)

Bocking, Stephen. (2006) Constructing Urban Expertise: Professional and Political Authority in Toronto, 1940-1970. *Journal of Urban History, 33(1)*

Boudier, Fabienne., Bensebaa, Faouzi.(2011). "Hazardous Waste Management and Corporate Social Responsibility: Illegal Trade of Electrical and Electronic Waste" Business and Society Review 116(1):29-53

Bouvier, Rachel., Wagner, Travis. (2011) "The influence of collection facility attributes on household collection rates of electronic waste: The case of televisions and computer monitors" *Resources, Conservation and Recycling* 55: 1051-1059

Bowen, Glenn. (2008). "Naturalistic inquiry and the saturation concept: a research role" *Qualitative Research* 8(1): 137-152

Bryman, Alan, James J. Teevan, and Edward Bell. (2009). *Social Research Methods* (2nd Canadian ed). Don Mills: Oxford.

Bryman, Alan. Bell, Emma. (2011). *Business Research Methods, 3rd Ed*. Oxford University

Canada's Technology Triangle Inc (CTTI). 2013. "Canada's Technology Triangle" http://www.techtriangle.ca/en/index.asp Date Retrieved: April 2, 2013

Canadian Business for Social Responsibility (CBSR). 2010. "Collaborating for Sustainable Value Creation" http://www.cbsr.ca/sites/default/files/file/2010-10-18-CBSR-Collaboration-Full-Research-Presentation-FINAL3.pdf Date Retrieved: March 23, 2013

Carroll, Archie. (1999). "Corporate Social Responsibility: Evolution of a Definitional

Construct" *Business and Society.* 38(3): 268-295

Castro, Paula. (2012). "Legal Innovation for Social Change: Exploring Change and Resistance to Different Types of Sustainability Laws" *Political Psychology* 33(1): 105-121

Cava, Anita., Mayer, Don. (2007). "Integrative Social Contract Theory and Urban Prosperity Initiatives" *Journal of Business Ethics*. 72: 263-278

Cerin, Pontus., Karlson, Lennart. (2002). "Business incentives for sustainability: a property rights approach" *Ecological Economics* 40: 13-22

Charlebois, Sylvain. (2013, October 14). How to extend food's shelf life. *The Globe and Mail* A9

Charmaz, Kathy. (2006). Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis. Los Angeles: Sage Publications.

City of Toronto (2012b), *Green Roof Bylaw.* Retrieved from http://www.toronto.ca/greenroofs/overview.htm

Corbin, Juliet.,Strauss, Ansels. (1990). *Basics of qualitative research: grounded theory procedures and technique.* Newbury Park, California: Sage Publications

Cragg, Wesley. (2002). "Business Ethics and Stakeholder Theory" *Business Ethics Quarterly* 12(2):113-142

Creswell, John. (2009). Research design: Qualitative, quantitative, and mixed methods Approaches (3rd ed.). Thousand Oaks, CA: Sage Publications.

Deathe, Ashley L.B., MacDonald, Elaine., Amos, William. (2008). "E-waste ' Management Programmes and the Promotion of Design for the Environment: Assessing Canada's Contributions". *Blackwell Publishers Ltd* 17(3): 319-334

Desrochers, Pierre. (2008). "Did the Invisible Hand Need a Regulatory Glove to Develop a Green Thumb? Some Historical Perspective on Market Incentives, Win-Win Innovations and the Porter Hypothesis". *Environ Resources Econ* (41):519-539

Diefenbach, Thomas. (2009). "Are case studies more than sophisticated storytelling?: Methodological problems of qualitative empirical research mainly based on semi-structured interviews". *Qual Quant* 43:875-894

Doelle, Meinhard. (2006). "IT Waste Management In Canada: From Cost Recovery to

Resource Conservation?" *Canadian Journal of Law and Technology*

Donaldson, Thomas., Dunfee, Thomas. (2002). "Ties that bind in business ethics: Social contracts and why they matter" *Journal of Banking and Finance 26:1853-1865*

Ebner, Fritz., Chang, Shu., Knapp, John., Deyoung, Victoria., Latko, Wendi. (2009).

"Development of a Green Scorecard to Identify Research Projects for Eco-Efficient Print Engines". *Sustainable Systems and Technology* 1-6

EPR Canada (2013) <http://www.eprcanada.ca> Date Retrieved: October 7, 2013

Epstein, Marc., Roy, Marie-Josee. (2001). "Sustainability in Action: Identifying and Measuring the Key Performance Drivers" *Long Range Planning* (34): 585-604

Fontenelle, Isleid Arruda. 2010. "Global responsibility through consumption?" *Emerald Group Publishing Limited* 6 (4): 256-272

Garkowski, Jeffrey, Hostovsky, Charles. (2011) Policy versus Practice in Municipal Solid Waste Diversion: The Role of the Waste Crisis in Ontario Waste Planning. *Canadian Journal of Urban Research, 20 (1) 81-102*

Halcomb, Elizabeth., Davidson, Patricia. (2006). "Is verbatim transcription of interview data always necessary?" *Applied Nursing Research* 19: 38-42

Halluite, J., Linton, D., Yeomans, S., Yoogalingam, R. (2005). "The Challenge of Hazardous Waste Management in a Sustainable Environment: Insights from Electronic Recovery Laws" *Corporate Social Responsibility and Environmental Management* 12: 31-37

Hickle, Garth. (2013) "Comparative Analysis of Extended Producer Responsibility Policy in the United States and Canada" *Journal of Industrial Ecology* 17(2): 249-261

Hischier, R., Gauglhofer, Wäger. (2005). "Does WEEE recycling make sense from an environmental perspective? The environmental impacts of the Swiss take-back and recycling systems for waste electrical and electronic equipment (WEEE)" *Environmental Impact Assessment Review* 25: 525-539

Hodge, Gerald., Gordon, David. (2008). "Planning Canadian Communities" *Fifth Edition.* Toronto: Nelson Education Ltd.

Hostovsky, Charles. (2006). "The Paradox of the Rational Comprehensive Model of

Planning: Tales from Waste Management Planning in Ontario, Canada". *Journal of Planning Education and Research* 25:382-395

Huppé, Francoise., Turgeon, R., Ryan, T., Vanasse, C. (2006) Fostering pollution prevention in small businesses: the Enviroclub initiative. *Journal of Cleaner Production* 14(6): 563-571

International Organization for Standardization (ISO). "About ISO" http://www.iso.org/iso/home.htm Date Retrieved: October 26, 2013

Irvine, Annie., Drew, Paul., Sainsbury, Roy. (2012). "'Am I not answering your questions properly?' Clarification, adequacy and responsiveness in semi-structured telephone and face-to-face interviews" *Qualitative Research* 13(1): 87-106

Khanna, Madhu., Anton, William R. (2002). "Corporate Environmental Management: Regulatory and Market-Based Incentives" *Land Economics* 78(4): 539-558

Kiddee, Peeranart., Naidu, Ravi., Wong, Ming. (2013). "Electronic waste management approaches: An overview" *Waste Management* 33:1237-1250

Lam, Carl.,Lim, Seong-Rin., Schoenung, Julie. (2012). "Linking Material Flow Analysis with Environmental Impact Potential: Dynamic Technology Transition Effects on Projected E-waste in the United States". *Journal of Industrial Ecology* 17(2): 299-309

Lannelongue, Gustavo., Gonzalez-Benito, Javier. (2012). "Opportunism and environmental management systems: Certification as a smokescreen for stakeholders". *Ecological Economics* 82(2012):11-22

Länsiluoto, Aapo., Järvenpää, Marko. (2008). "Environmental and performance management forces: Integrating "greenness" into balanced scorecards". *Qualitative Research in Accounting and Management* 5(3):184-206

Leibovitz, Joseph. (2003). "Institutional Barriers to Associative City-region Governance: The Politics of Institution-building and Economic Governance in 'Canada's Technology Triangle'". *Urban Studies* 40(13): 2613-2642

Lepawsky, Josh. (2012) "Legal geographies of e-waste legislation in Canada and the US: Jurisdiction, responsibility and the taboo of production" *Geoforum* 43: 1194-1206

Lepawsky, Josh., Mather, Charles. (2011). "From beginnings and endings to boundaries and edges: rethinking circulation and exchange through electronic waste" *Royal Geographical Society* 43(3): 242-249

Lepawsky, Josh., McNabb, Chris. (2010). "Mapping international flows of electronic

waste" *The Canadian Geographer* 52(2): 177-195

Lifset, Reid., Atalay, Atasu., Naoko, Tojo. (2013). "Extended Producer Responsibility: National, International, and Practical Perspectives" *Journal of Industrial Ecology* 17(2):162-166

Lindgreen, Adam., Swaen, Valerie. (2010). "Corporate Social Responsibility" *International Journal of Management Reviews* 12(1): 1-7

Lyon, Thomas., Maxwell, John. (2008). "Corporate Social Responsibility and the Environment: A Theoretical Perspective" *Review of Environmental Economics and Policy* 2(2): 240-260

Madhu, Khanna., Anton, William Rose Q. (2002). "Corporate Environmental Management: Regulatory and Market-Based Incentives" *Land Economics* 78(4):539-558

Marston, Andrea.(2013). "Justice for all? Material and semiotic impacts of Fair Trade craft certification" *Geoforum* 44:162-169

Mayers, Kieren., Butler, Scott. (2013). "Producer Responsibility Organizations Development and Operations: A Case Study" *Journal of Industrial Ecology* 17(2): 277-289

McKerlie, Kate., Knight, Nancy., Thorpe, Beverley. (2006). "Advancing Extended Producer Responsibility in Canada" *Journal of Cleaner Production* 14:616-628

Melnyk, Steven., Sroufe, Robert., Calantone, Roger. (2003). "Assessing the impact of environmental management systems on corporate and environmental performance". *Journal of Operations Management* 21: 329-351

Miles, Matthew., A.Michael, Huberman. (1994). Qualitative Data Analysis (2nd edition). Thousand Oakes, CA: Sage Publications.

Ministry of the Environment (MOE). 2009. "Waste Diversion Act, 2002" http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_040393_e.html

Moir, Lance. (2001). "What do we mean by Corporate Social Responsibility?". *Corporate Governance* 1(2): 16-22

Moir, Lois., Webb, Deborah., Harris, Katherine. (2001). "Do Consumers Expect Companies to be Socially Responsible? The Impact of Corporate Social Responsibility on Buying Behavior" *The Journal of Consumer Affairs* 35(1):45-72

Morris, Jeffrey., Morawski, Clarissa., Matthews, Scott. (2009). "Measuring the Environmental Benefits of Ontario's Blue box, MHSW, and WEEE Diversion" Retrieved from http://www.ontario.ca/environment-and-energy/measuring-environmental-benefits-ontarios-blue-box-mhsw-and-weee-diversion

Morrow, David., Rondinelli, Dennis. (2002). "Adopting Corporate Environmental Management Systems: Motivations and Results of ISO 14001 and EMAS Certification". *European Management Journal* 20(2):159-171

Newing (2011) "Sampling" In H. Newing, Conducting Research in Conservation (pp. 65-82). New York: Routledge.

Nicol, Scott., Thompson, Shirley. (2007). "Policy options to reduce consumer waste to zero: comparing product stewardship and extended producer responsibility for refrigerator waste" *Waste Management and Research* (25):227-233

Northey, Margot., Knight, David. (2007). *Making Sense: A Student's Guide to Research and Writing"* Geography and Environmental Sciences: Third Edition. Oxford: Oxford University Press Canada

Offenhuber, Dietmar., Lee, David., Wolf, Malima I., Phithakkitnukoon, Santi., Biderman, Assaf., Ratti, Carlo. (2012). "Putting Matter in Place" *Journal of the American Planning Association* 78(2): 173-196

Patton, M.Q. (2002). Qualitative interviewing (Chapter 7) in *Qualitative Research and Evaluation Methods* (3rd ed). (pp.339-367). Thousand Oaks, CA: Sage Publications.

Phonebloks. (2013) "Phonebloks - The ultimate phone". Retrieved from www.phoneblocks.com Date retrieved: October 4, 2013

Poland, Blake. (1995). "Transcription Quality as an Aspect of Rigor in Qualitative Research" *Qualitative Inquiry* 1(3): 290-310

Pope, Catherine., Zielbland, Sue., Mays, Nicholas. (2000) "Qualitative research in health care: Analysing qualitative data" *British Medical Journal* 320(1): 114-116

Portney, Paul (2008). "The (Not So) New Corporate Social Responsibility: An Empirical Perspective" *Review of Environmental Economics and Policy* 2(2): 261-275

Province of Ontario. (1994). *Ontario Regulation 102/94 Waste Audits and Waste Reduction Work Plans*. Toronto, ON: Legislative Assembly. Retrieved from http://www.elaws.gov.on.ca/html/regs/english/elaws_regs_940102_e.htm

Province of Ontario. (2011). *Ontario Regulation 103/94: Industrial, Commercial and Institutional Source Separation Programs.* Toronto, ON: Legislative Assembly. Retrieved from https://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_940103_e.htm

Region of Waterloo. (2010). *Regional Official Plan*. Kitchener, ON: Strategic Policy Development. Retrieved from http://www.regionofwaterloo.ca/en/regionalGovernment/resources/CHAPTER_5_FINAL_MODIFICATIONS.pdf

Region of Waterloo. (2012). *Region of Waterloo Waste Management Master Plan: Mission Statement & Guiding Principles.* Kitchener, ON: Waste Management Division Retrieved from http://www.regionofwaterloo.ca/en/aboutTheEnvironment/resources/WMMPMissionAndGuidingPrinciplesJul122012.pdf

Reinhardt, Forest., Stavins, Robert., Vietor, Richard. (2008). "Corporate Social Responsibility Through an Economic Lens". *Review of Environmental Economics and Policy* 2(2):219-239

Reis de Oliveira, Camila., Bernardes, Andrea Moura., Gerbase, Annelise Engel. (2012). "Collection and recycling of electronic scrap: A worldwide overview and comparison with the Brazilian situation" *Waste Management* 32: 1592-1610

Rogers Communication. (2014) "Wireless" Retrieved from: http://www.rogers.com/web/Rogers.portal?_nfpb=true&_pageLabel=WRLS_HOME&asc_refid=wireless Date Retrieved: May 24, 2014

Rowley, Jennifer. (2012). "Conducting research interviews" *Management Research Review* 35(3/4): 260-271

Rubin, Herbert., Rubin, Irene. (2012). *Qualitative Interviewing: The Art of Hearing Data*. Los Angeles: SAGE Publications.

Seacat, Jason., Northrup, Denine. (2010). "An information-motivation-behavioral skills assessment of curbside recycling behavior" *Journal of Environmental Psychology* 30: 393-401

Seasons, Mark. (2003). "Monitoring and Evaluation in Municipal Planning: Considering the Realities". *Journal of the American Planning Association* 69(4): 430-440

Seyedhosseini, Seyed Mohammad., Taleghani, Ahmad Ebrahimi., Baskhsha, Arash. Partovi, Solmaz. (2011). "Extracting leanness criteria by employing the concept of Balanced Scorecard" *Expert Systems with Applications* 38:10454-10461

Statistics Canada (2013). "Households and the Environment Survey, 2011" http://www.statcan.gc.ca/daily-quotidien/130318/dq130318b-eng.pdf Date Retrieved: October 21, 2013

Statistics Canada (2013). "Table 19: Disposal of electronic waste (e-waste), by province" http://www.statcan.gc.ca/pub/11-526-x/2013001/t018-eng.pdf Date Retrieved: October 21, 2013

Statistics Canada (2013). "Waste management industry: Business and government sectors, 2010" http://www.statcan.gc.ca/daily-quotidien/130821/dq130821b-eng.pdf Date Retrieved: October 21, 2013

STEP Foundation. 2014. Retrieved May 15, 2014, from http://www.thestepfoundation.org

Strauss, Ansels. (1987). *Qualitative Analysis for Social Scientists.* Cambridge: Cambridge University Press.

Region of Waterloo. (2011). "Waste Management Master Plan – 2011 Update" http://www.regionofwaterloo.ca/en/aboutTheEnvironment/resources/DOCS_ADMIN-974845-v1-WMMP_UPDATE_2011___REPORT__CONTENT___PDF.pdf

Thorpe, Jodie., Prakash-Mani, Kavita. (2003). "Developing Value: The Business Case for Sustainability in Emerging Markets" *Greener Management International* 44:17-32

Tomko, Geoffrey., McDonald, Karen. (2013). "Environmental fate of hexabromocyclododecane from a new Canadian electronic recycling facility" *Journal of Environmental Management* 114: 324-327

Uzzell, David., Rathzel, Nora. (2009). "Transforming environmental psychology" *Journal of Environmental Psychology* 29:340-350

Wang, F., et al., (2012) "The Best-of-2-Worlds philosophy: Developing local dismantling and global infrastructure network for sustainable e-waste treatment in emerging economies". *Waste Management*

Wati, Yulia., Koo, Chulmo. (2011). "An Introduction to the Green IT Balanced Scorecard as a Strategic IT Management System". *Proceedings of the 44th Hawaii International Conference on System Sciences* 1-10

Weber, Manuela. (2008). "The business case for corporate social responsibility: A -level measurement approach for CSR" *European Management Journal* 26: 247-261

Werner, Carol., White, Paul., Byerly, Sari., Stoll, Robert. (2009). "Signs that encourage internalized recycling: Clinical validation, weak messages and "creative elaboration". *Journal of Environmental Psychology* 29: 193-202

Whitmarsh, Lorraine., O'Neill, Saffron. (2010). "Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours" *Journal of Environmental Psychology* 30: 305-314

Wilhelm, Wendy., Yankov, Alice., Magee, Patrick. (2011). "Mobile Phone Consumption Behaviour and the Need for Sustainability Innovations" *Journal of Strategic Innovation and Sustainability* 7(2): 20-40