Obstacles to Recyclability: The Mounting E-waste Problem

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The 1990s brought about a technology boom that has come to affect all aspects of life. These systems have improved quality of life, but have also caused long term challenges. One of these challenges is the waste from old devices that are no longer used. The problem has proliferated in recent years, as the first generation of electronics become unusable. This technology often contains dangerous chemicals and materials that rarely get disposed of in a safe way (Seeberger et al., 2016). The supply chain and lifetime of electronics involves many groups with competing interests. Electronics manufacturers make design and repair decisions that affect how long devices can be used. Recyclers handle the end of life disposal of electronics. They decide whether the process is completed in an environmentally friendly manner or not. Some organizations fight for sustainable electronics practices. Efforts include lobbying for policies that increase the usability of devices, and promoting sustainability awareness. Individuals and businesses with electronics to recycle are also relative. Reusability of devices and how long they are in use for are affected by them.

Specific electronic manufacturers include companies like Apple and Lenovo. Apple actively fights against sustainable policies that would reduce waste. Lenovo promotes reusability of their devices to allow consumers to use them as long as possible. Recyclers include companies such as Closed Loop Recycling and Securis. Closed Loop profits off of unsustainable practices. Securis attracts customers through environmentally friendly methods. Organizations lobbying for sustainable practices include iFixIt and the Repair Association. These groups fight for legislation supporting consumer rights and investigate unsustainable practices. The discussed manufacturer and recyclers are based in the United States. Implications of their decisions on other countries

will be discussed. Analysis of lobbying practices and attempted legislation focuses on the state on federal levels of the United States.

Electronics manufacturers and recyclers have resisted efforts to reduce waste. E-waste volumes are rising worldwide, and the trend is accelerating (Rasnan, et al., 2016). Despite growing participation in recycling programs, Seeberger (2016) states that in 2012 consumers were still disposing as much as 71 percent of their e-waste in landfills. According to Seeberger (2016), in 2012 48.9 million metric tons of e-waste were produced; 65.4 million were projected for 2017. Much of this waste finds its way to poor communities in places far away from where it was first disposed (Beaudrie, 2014). Device manufacturers and other interest groups have resisted efforts to improve recyclability (Westervelt & Beckham, 2015). As electronics have proliferated and as device longevity has declined, disposal rates have risen (Gabrys, 2011).

Lack of regulation and profitability in unsustainable practices have led manufacturers and recyclers to oppose efforts at reducing e-waste. Manufacturers have influenced consumers to quickly dispose of electronics. Recyclers are incentivized to find the cheapest methods of disposal. As these groups expand their influence, it becomes difficult for organizations fighting for sustainability to accomplish their goals.

Review of Research

Current research on e-waste revolves around how much is being produced, and where it ends up when disposed of. Rasnan (2016) contends that e-waste volumes are rising, and the trend is accelerating. Beaudrie (2016) discusses the export of e-waste to countries of low socioeconomic status. They reference the impacts this has on the environment, and how it harms the residents of those countries. Seeberger (2016) substantiates the claims that a large amount of

e-waste is exported to poor countries. Westervelt and Beckham (2015) point to a lack of regulation to explain why recyclers are emboldened to export waste. They also discuss how much e-waste ends up in landfills rather than being disposed of safely. Hopson (2016) conducted a study that tracked the movement of e-waste after it was given to recyclers. This work synthesizes claims about e-waste movement and increasing volumes. It furthers this research by identifying the specific efforts that allow these actions to continue.

Some research discusses incentives of different participants in the e-waste supply chain. Beaudrie (2016) contends that manufacturers actively hide data on e-waste to reduce criticism. Gabrys (2011) discusses the decreasing longevity of electronics. They contend that this trend has caused consumers to dispose of more devices. Organizations like IFixIt and the Repair Association publish research on why e-waste is increasing. Members such as Hopson (2016) write about manufacturers fighting against the right to repair. Westervelt and Beckham (2016) discuss the efforts of manufacturers to reduce recyclability. This work continues research into the motives of participants. It documents the efforts of groups involved in e-waste disposal.

Some Manufacturers Resist Sustainability

Despite accelerating e-waste trends, electronics manufacturers have made their products less reusable. Planned obsolescence has shortened the lifespan of electronics. Products are made to break after a certain amount of time, which encourages purchasing new items (Fisher, 2017). Schaffer (2017) notes that manufacturers utilize hard to work with components to deter repair. Contributing factors include strong glues, specific battery designs, components that cannot be upgraded, and difficult to access casings. Manuals for repairs are hidden from public view so that consumers do not know what can be fixed (IFixIt, 2021b).

Producers have also fought against legislation regarding the right to repair movement. This cause arose from groups lobbying for better accessibility to electronic repairs. Companies such as Apple do not allow third parties to repair devices (Apple, 2021e). Representative Claire D. Cronin of Massachusetts told the Huffington Post: "It has certainly come to [her] attention that Apple is opposed to this bill," regarding proposed right to repair legislation (Beres & Campbell, 2016). The company similarly lobbied against a bill in the New York State Legislature (LobbyWatch, 2015). This bill never made it out of the committee phase of the legislative process. Similar bills were introduced in 2016 and 2019 which met the same fate (NYSS, 2016).

Manufacturers tout their environmental policy, but rarely put in the effort to back their promises. Regarding their environmental impact, Dell Technologies states their "responsibility to recover used electronics and recycle them properly," (Dell Technologies, 2021a). They partnered with Goodwill for the Dell Reconnect program. According to Dell this allowed consumers to "donate unwanted technology... and help protect the environment," (Dell Technologies, 2021c). Basel Action Network investigated this program by equipping GPS trackers to electronics, and donating them to the program. The findings showed that 21 percent of the donated electronics were exported rather than recycled. Four electronics recyclers were also implicated (Hopson, et al., 2016). Apple promotes its energy and recycling programs (Apple, 2020a). In reality, they limit the repairability of devices and the ability to recycle them without Apple's involvement (Apple, 2021g).

Some Manufacturers Use Sustainability as a Marketing Point

In response to calls for environmental responsibility, some manufacturers have made sustainability a cornerstone of their efforts. HP simplifies device repair through robust support

websites that help consumers keep their products working (HP, n.d.). The company thereby earns standing with its consumers and with its business clients. In a 2017 statement, HP claims a commitment to reducing its products' environmental impact and to promoting easy reuse and recycling (HP, 2017). Dell Technologies brings attention to sustainable practices in its supply chain. They point to their efforts at using recycled materials for their products (Dell Technologies, 2021c). Lenovo provides hardware manuals for all of its products (Lenovo, 2021a). This allows consumers to make their devices last as long as possible. Revenue from repairs is lost, but customers are attracted to consumer friendly devices. Apple also points to its use of recycled materials and clean energy. They provide environmental report cards for their own devices, highlighting the sustainable aspects (Apple, 2021a). These companies offer trade in programs. Devices are able to be refurbished and used again by another customer.

Marketing environmentally friendly practices draws attention away from unsustainable methods. Apple publishes environmental responsibility reports. It discusses transitioning to clean energy, using responsibly sourced packaging, and use of safe cleaning products (Apple, 2021b). These efforts allow Apple to continue unsustainable practices. It makes it seem that they are moving towards environmental policies. The briefings fail to discuss Apple's battle against the right to repair, or efforts to curb other unsustainable practices. Apple advertises its trade in program as waste reducing (Apple, 2021a). Consumers are drawn to these claims of environmental friendliness. Many do not realize that programs like this can increase waste. Dell utilizes similar tactics. It directs attention towards its worker friendly policies and sustainable supply chain (Dell Technologies, 2021c). Hopson (2016) conducted a study that showed Dell is not as committed to environmentalism as they claim. They failed to ensure their recycling

program disposed of electronics properly. Money is saved by taking short cuts. Public attention can be directed away from such scandals.

Profitability in Unsustainable Practices

Consumers are forced to repair devices through certified vendors, which allows manufacturers to inflate costs. A simple screen replacement can cost as much $329 if the consumer does not pay $8/month for Apple's damage insurance (Apple, 2021a). Apple purposefully throttled battery performance, while not allowing consumers to use third party replacements (Apple, 2021c). They charged more for batteries than other vendors would have, profiting off replacing batteries they purposely slowed. Other consumers were unaware, and purchased new devices entirely (Apple, 2021d). Nintendo gaming company designed their joysticks in a way that caused them to degrade quickly. The company's president stated "We will do our best to ensure that our customers can use our services and products with peace of mind," (Smajstrla, 2020). Yet a California lawsuit alleges that Nintendo has not addressed the issue. Replacement parts for the joystick are not available at retail stores or repair shops (TBS PLLC, 2019). Consumers have to purchase a new controller from Nintendo, as there are no other options on the market. These questionable business practices allow manufacturers to make more money despite the increasing waste that they cause.

Controlling all aspects of the electronic supply chain allows manufacturers to increase profits, but limits consumer's options. Companies are able to sell new devices, while reacquiring the old devices. Apple promotes its trade-in program to customers, allowing them to receive a discount on a new phone by returning their old phone (Apple, 2021h). Other manufacturers participate in similar programs, such as Lenovo and Dell (Lenovo, 2021b; Dell, 2021). This

allows them to resell the old device to a new customer, and sell a new device to the customer trading in.

Monopolizing the market for selling electronics allows manufacturers to charge more. A private phone trade-in company, Gazelle, was forced to shut down the mail-in portion of its operation according to an email from the company (Statt, 2020). Consumers do not have access to repairs that make devices attractive for resale. A broken device can not be resold through private vendors who cannot repair it. This forces the consumer to either dispose of it or return it to the manufacturer. Manufacturers also utilize the fact that many people can not afford devices outright. AT&T offers a rental program called AT&T Next Up that allows consumers to rent devices with monthly payments (AT&T, 2021). Apple has a similar iPhone Upgrade program with monthly payments, that allows participants to upgrade to the newest phone every year (Apple, 2021f). These programs also ensure that devices never leave the control of the manufacturer, and are an attractive offer to many consumers. Consumers are incentivized to frequently trade-in and acquire new devices without the option to sell on their own. A lack of a free market for the resale of devices increases the amount of waste created.

Some Recyclers Cheat the System

Electronics recyclers have cut corners at the expense of the environment. Seeberger (2016) estimates that 23 percent of U.S. e-waste is exported to developing countries. Westervelt and Beckham (2011) contend that since such exports are unregulated, the actual rate may be far higher: perhaps 80 percent. These developing countries lack the resources to properly address the incoming waste. Conditions are harmful for workers, and detrimental to the environment (Beaudrie, 2014). A Basel Action Network study tracked electronics that were donated to

charities and given to recyclers. It found that overall 32.5 percent of the electronics were exported, while 39 percent of those given specifically to recyclers were sent overseas (Hopson, et al., 2016). The researchers caution these numbers could be understated, as trackers lost battery in the process.

Avoiding environmental standards allows recyclers to save money, often illegally. Based in Ohio and Arizona, Closed Loop Recycling disposed of lead filled CRT monitors. An investigation found more than 90 million pounds of these toxic devices stockpiled in warehouses. The company had no environmentally safe method of disposal or cleanup. (OEPA, 2016 & Elliot, 2016). Consequently, Closed Loop was forced into bankruptcy, but was able to profit off of this illegal activity for years. Another investigation into the largest east coast recycler of the time resulted in prison time for the owners. Prosecutors stated "each co-owner made 7.8 million dollars from the business during the seven-year period, they also saved $2.6 million they would have had to spend to properly dispose of the material," (Rosenberg, 2019). According to the EPA "8.3 million pounds of monitors were shipped to Hong Kong," (Cottom, 2018). A concerning aspect of this case is that the owners were only arrested for fraud. Had they not lied to customers, they could have legally exported the goods.

Lack of regulation in the United States allows recyclers to practice in ways harmful to the environment. The United States regulates trade of hazardous waste with developed nations, but does not do so with developing countries. This allows recyclers to cheaply dispose of e-waste in places least capable of handling it (Westervelt & Beckham, 2015). Conditions are harmful for workers, and detrimental to the environment (Beaudrie, 2014). The Basel Convention established standards for international movement of hazardous waste. It states that the country importing waste must provide written consent. They must also be able to dispose of it in an

environmentally friendly way (USDOS, 2021). The United States has not ratified the convention. This allows recyclers to legally export hazardous waste to developing countries without their consent. These developing countries lack the resources to properly regulate the incoming waste (Beaudrie, 2014). Although this is illegal under international law, the lack of domestic consequences emboldens recyclers to continue the practice (Hopson, et al., 2016).

Some Recyclers Do Things Right

Recyclers can attract customers by using environmentally responsible disposal methods. Sustainable Electronics Recycling International provides recyclers with R2 certifications. R2 certifications independently confirm that recyclers are environmentally responsible. They have certified 952 facilities in 33 different countries (SERI, 2021a). These businesses are then able to give proof to customers that their methods are sustainable. Securis is an east coast recycling provider that uses sustainable methods. They hold an R2 certification, showing consumers that electronics are handled properly (Securis, 2021b). Their website displays their commitment to refurbishment and reuse. It also lays out the chain of custody that a disposed device will go through (Securis, 2021a). SecurShred is another electronics recycler that promotes its sustainable methods. They bring attention to hazardous practices that are detrimental to public health (SecurShred, 2021).

Many recyclers advertise sustainable practices, making it difficult for customers to differentiate those with unsustainable methods. SERI is an independent organization that is supposed to give unbiased reviews of facilities. This did not stop them from giving Closed Loop Recycling an R2 certification. Closed Loop lied to consumers about having safe methods of disposal. It proceeded to stockpile hazardous material without any disposal solution (OEPA,

2016 & Elliot, 2016). The Basel Action Network conducted a study reviewing recycling practices of recyclers that marketed sustainability. It found that many of those goods were exported rather than disposed of safely (Hopson, et al., 2016). Seeberger (2016) substantiates this point, stating that recyclers export at a rate of 23 percent. Nothing stops these businesses from advertising their practices as sustainable. Lack of regulation allows them to continue their unsustainable practices while lying to consumers. This makes the quality of independent review from groups like SERI pivotal.

Some Groups Fight For Electronics Sustainability and Efforts at Regulation

Since the proliferation of e-waste, groups have formed to protect the interests of consumers and the environment. The Repair Association is a group made up of repair industry stakeholders. They believe an open market for repair and resale of devices would provide the best rates for consumers while helping the environment (Repair Association, 2021b). IFixIt is another advocacy group working to curb e-waste. This organization makes their own repair manuals for products that do not have one available (IFixIt, 2021a). Suggesting that recycling is not as efficient as repair, they educate consumers on the advantages of the right to repair (IFixIt, 2021b). Sustainable Electronics Recycling International and e-Stewards are organizations that provide recyclers with sustainability certifications. These give consumers and businesses confidence that their e-waste will be recycled responsibly (e-Stewards, 2021 & SERI, 2021b).

Advocacy groups sponsor legislation that supports consumers rights to repair devices they have purchased. The Repair Association is on the forefront of pursuing legislation fighting for the right to repair. Their website provides a template for legislation and information on how individuals can get involved (Repair Association, 2021a). It also outlines the major

accomplishments they have made to date. In 2018 they successfully lobbied the US Copyright Office to acknowledge that fixing a purchased device is not a violation of copyright law. Working with the Copyright Office, they found that End User License Agreements are the basis of manufacturers legal standing against repair. This gave states the power to legislate on repair law (US Copyright Office, 2016). The association also filed an Amicus brief to the Supreme Court regarding a right to repair case. It was ruled that manufacturers can not tell new owners what to do with their devices once sold (Repair Association, 2021a). IFixIt is another advocacy group that worked with the Repair Association on legislation. They focus on creating a community that fosters discussion and spreads information about the right to repair. Their work was used extensively when lobbying the Copyright Office (Wiens, 2018).

Spreading information and getting consumers involved in the repair community are goals of these organizations. IFixIt provides community written repair guides for devices where the manufacturer does not provide one. They maintain public forums where members can ask each other questions about repairs. Its members publish articles with information about current events regarding repairs (IFixIt, 2021c). The Repair Association provides simple steps to becoming a member. Their members are provided with regular updates on their efforts. They are also informed about ways to get involved in their community (Repair Association, 2021a). It also provides its members with information on where to get electronics repaired. There are articles available on their website detailing repair information for many different devices (Repair Association, 2021b).

The Effect of Consumers and Business on E-waste

For consumers, recycling can be inconvenient or expensive. People disposing of electronics are often surprised that disposal costs money. One told a reporter: “Some places charge you to drop off, other places have very strict hours, while others only accept certain things.” “The whole thing needs to be easier” (Ioffee, 2019). These inconveniences discourage consumers from putting in the effort to dispose of electronics properly. Securis notes that most businesses are more concerned with securing data than the environment. Once data has been secured, businesses are often indifferent to where those devices end up (Securis, 2018). There is no profit that comes from recycling devices properly. Businesses are not incentivized to follow sustainable practices.

Conclusion

Incentives to act unsustainably outweigh the benefits of acting sustainably for most stakeholders in e-waste disposal. The inconvenience of disposing e-waste safely leads participants to find easier, less sustainable methods. Increased profits are made by manufacturers who encourage consumers to upgrade to new devices faster while disposing of the old. Recyclers would rather save money by exporting e-waste, or stockpiling it, than disposing of it safely. Businesses and individuals would rather spend money upgrading to new devices than paying to dispose of the old.

There is still hope that the e-waste problem can be handled properly. Groups fighting for consumer rights are trying to provide the needed incentives to reduce waste. Instead of buying new devices, they want to educate consumers on making their current devices last. People want to be environmentally friendly, but do not have the knowledge necessary to act. Manufacturers

and recyclers that act sustainably provide an example for the rest of the industry. As public awareness increases, the other actors in the industry will have to adjust their practices. Legislation to protect consumers and the environment will also cause participants to be more sustainable. The e-waste problem can be managed, but it will require sacrifices from participants to get there.

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