

Sustainable Technology Development in the Corporate Sphere

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The communication era has been characterized by a rapid growth of the personal technology market, with users' dependence on technology growing more and more. However, technological advancement is becoming more about iteration than innovation; many companies seem more focused on releasing the annual model of their smartphone line rather than releasing new models that innovate, excite, and promote sustainable engineering ideals. In doing so, the technological world can quickly shift from innovative to wasteful, as an oversaturation of products could lead to wasted resources and labor and could diminish the social impact of these revolutionary technologies. Companies like Apple have spearheaded this trend, and even if they claim that their corporate strategy is both socially and environmentally conscious, a deeper dive into the actions and mindsets of these companies is required to truly determine the validity of these statements. This is the central question of my research: how can Apple, and subsequently other technology companies, develop and market products that both appeal to customer's needs and generate a profit, while also promoting sustainable design and production?

STS Framework

Analysis of the role technology companies can play in sustainable progress is best viewed through the Social Construction of Technology, or SCOT, framework. The SCOT framework holds that societal atmospheres determine how technologies are used and adopted, rather than simply the technical function of the device. Supporters of SCOT “[focus] their attention on the social settings in which specific technologies have been developed and the ways users have often adapted innovations for their own purposes” (Norcliffe, 2009). In the context of sustainable development, key aspects of SCOT include prioritizing the environmental needs of a society and sharing knowledge with others to promote progress in other regions as well. In their research into

extending SCOT into the digital world, van Baalan et al. (2016) propose a variation of SCOT dubbed Social Construction of Digital Technologies, or SCODT. They aim to extend SCOT for several reasons, most notably to “extend the unit of analysis from information systems to digital ecosystems based on pervasive, global digital technologies” (van Baalan et al., 2016). Modern technologies affect a sphere of influence much larger than the area of origin; their consequences can have an effect across the world. Alongside SCOT and its applications, the Sustainable Development Goals (SDGs), discussed further in the next section, serve as both a measure of how well companies and technologies forward sustainable progress and a foundational set of standards held by societies looking to establish a healthier culture. These ideas provide a backbone to analyze Apple’s social and environmental effects and to propose better practices that they and others can follow.

Sustainable Development Goals: Origins, Purpose, and Realization

As technological progress is made, social progress would ideally move forward as well. This is no new idea; different theories as to how the two should (or shouldn’t) be associated date back to the Industrial Revolution. The technocratic framework disconnected the two ideas entirely, leaving technology to the scientists and the social impacts to the social scientists: “Technological progress would chart the route towards modernization, and social progress would follow in its wake” (Nowotny and Schot, 2018). This framework ultimately failed, as technology would inevitably contribute to issues such as pollution, health & safety, and an everchanging job market; technological and social progress cannot be effectively separated to such a degree if both are to progress. Technical artifacts are inherently political; attempting to separate technology from its political ramifications is unproductive and often pointless.

In the wake of this realization, the United Nations created “The 2030 Agenda for Sustainable Development,” which was finalized in 2015 after decades of development. The agenda revolves around 17 Sustainable Development Goals, described by the UN as “an urgent call for action by all countries—developed and developing—in a global partnership” (Sustainable Development, n.d.). The SDGs cover all forms of social progress, including eliminating poverty, widespread access to food and clean water, educational, economic, and innovative growth, and environmental goals such as clean energy, responsible production, and addressing climate change. All of the SDGs are built upon the bedrock of strong institutions and justice worldwide and a global partnership in accomplishing these goals.

One of the largest challenges in forwarding the SDGS is that the state of social progress is defined differently based on different cultures and institutions. While diversity of thought and lifestyles is certainly a positive, there is no consistent global scale on which to base social progress. For instance, the United States, one of the most powerful and influential countries in the world, is based strongly upon the institutions of capitalism. The massive increase in globalization thanks to technical advancements has allowed the market economy to expand well beyond the borders of America, and American ideologies are spread alongside it. Unfortunately, along with the benefits of capitalism, negative impacts have been spread as well. For example, “International agencies which previously operated to contain the destabilizing effects of cross-border flows of goods and resources, now actively promote the removal of social and environmental protections which are described as ‘non-tariff barriers’ to trade” (International Panel on Social Progress, 2017). Economic profit can be put to good use, but when profit is far and away the primary motivation, social and environmental progress is stifled. If the SDGs are to be realized at a worldwide scale, technological progress “must play a key role in ensuring that all

countries continue to move forward on the path toward sustainable development while having the requisite capacities to contribute to meeting one of humanity's most crucial challenges" (United Nations, 2010). Technology development plays a part in the forwarding of all the SDGs, but especially "Affordable and Clean Energy," "Industry, Innovation, and Infrastructure," and "Responsible Consumption and Production," just to name a few. When society is constructed solely around profit margins, members will view technology as nothing more than a tool for economic growth, ignoring the other valuable goals for societal advancement.

Apple's Customers, Culture, and Compounds

Global Dependence of Consumers

In order to visualize how today's technical world could pivot more towards sustainability, it is important to understand the current state of the agents involved: the consumers and the producers. Society has evolved in such a way that technology has become a crutch for many people's lifestyles. In the information age, efficiency and productivity are emphasized more than ever before; we have moved past our basic needs of food, shelter, community, and stability, and now we seek to optimize our lifestyles. This ideology has provided an opportunity for technology to fill a much larger role in our lives; we will consume whatever will satisfy our daily need and are willing to pay the price for it. In a study of Asian smartphone users, Wang and Lee (2020) collect data on users' smartphone use and dependence, along with how important security, privacy, and innovativeness is to each user. Across the board, the numbers show that on a 1 to 7 scale, the average user rates their level of smartphone dependence at a 4.43 (Wang and Lee, 2020). While not extortionately high, the numbers show that most users maintain a consistent dependence on their phones in their day to day lives.

Where there is demand, there must be supply; this is the most basic law of economics and business. As customers have clamored for better, sleeker, and newer technology, especially in the world of smartphones, tech companies have constantly evolved how they advertise their products to the public. Businesses pursue more efficient technology to fuel a simple process: efficient technology leads to more output, more output leads to higher profits, higher profits lead to even better technology, etc. Companies are fully aware of their consumers' desire and reliance on modern technology and design products for consumers to fulfill those needs. A culture designed around an ever-growing reliance on technology is not inherently good or bad, but it shows how much influence technologies, and the companies that develop them, have on the societal norms and subsequently the direction of social progress of that culture.

The Tendency to Buy, Buy, and Buy Again

Verbeek and Slob (2006) detail the stages that most customers go through before deciding whether or not to upgrade their current tech, and if so, what product to buy. They write, “[Consumers] will purchase a product only after the target group has gained knowledge (exposure, attention, understanding) and has developed a more positive attitude (attitude change) about the product or the behavior” (Verbeek and Slob, 2006). Different companies will apply this method in different ways. For example, Apple promotes usability and comfortability in their products, which can make up for a lack of technological prowess. Meanwhile, Samsung is well known for introducing bold, unique designs in the hopes that customers didn't know what they wanted out of a technology until they saw it. Both of these approaches, and many more, recognize a value amongst the customer base, and if the producer cannot align with that value, they appeal to other values so that customers will alter their behavior to match the product in front of them.

Apple serves as an example of this practice, as their business model (and resulting success) resembles the modern integration of technology cycles. Apple products are undoubtedly of high quality, but their main selling points have always been product design and the user experience, specifically around the idea of an entire ecosystem of connected products. Their product announcements focus on delivering information in a fun, personalized way, rather than simply listing technological specifications, and the extravagance and elegance of the showcase makes up for any technical deficiencies the products may have compared to cheaper alternatives from competitors. Apple has been criticized in the past for overcharging the consumer, but their financial success shows that the consumer base is willing to repeatedly pay a premium for the products they desire. Pattuglia and Amoroso (2019) investigate this from both the company and consumer perspectives. They point out that price and quality are only two of many factors that consumers weigh when making decisions and developing brand loyalty; originality, trust, heritage, sincerity, and others also play a key role. They also show how different generations value different aspects of brands; they suggest that “brand image, over than other constructs, positively affects Millennials and Gen Z more than Baby Boomers and Gen X” and “Brand Heritage positively influences Boomers more than Millennials and Generation Z” (Pattuglia & Amoroso, 2019). Based on their research and many others’, the technology market is no longer controlled solely by the company with the most advanced product at the cheapest cost, but by the company that can effectively advertise to a consumer base that values much more than simply technological prowess. If this power is used correctly, Apple will be able to promote not only sustainable production but also sustainable use of their products. However, if too much emphasis is put on iteration and the yearly product cycle, they will have missed a crucial opportunity for real positive impacts.

Apple's Sustainable Infrastructure and Development

Recently, Apple announced that they are working to be fully carbon neutral for its supply chain and products by 2030. While this is certainly an applaudable (albeit lofty) goal, carbon neutrality is just one part of a sustainable design process. For example, several base metals, including some precious metals, are required to build an iPhone, according to a 2019 study. The study concludes that “10 to 15 kilograms of ore...would need to be mined to produce a single smartphone,” which is a large requirement for a 6.24 oz smartphone (Rasmi, 2019). Increase the production scale to billions of smartphones a year, and the negative impact of not having an effective method of recycling the leftover ore is environmentally significant. Apple may be “the industry leader for responsible cobalt sourcing—but the bar is low” (Amnesty International, 2017). While sometimes, there is little more Apple can directly do to verify their materials are gathered in an ethical and sustainable way, it is still their responsibility to promote and invest in movements dedicated to recycling raw materials to be repurposed elsewhere and ensure that suppliers are following environmental and ethical standards. In 2017, Apple announced an ambitious “zero-waste” strategy, largely involving new technology that can recycle and repurpose old Apple products instead of condemning them to the landfill. On the surface, their plan seems to promote the right ideals in terms of sustainability; however, when held under the microscope, it is hard to see any substantial change emerging from this approach. Vonk (2018) analyzes the zero-waste strategy through the scope of an older MacBook and comes to the conclusion that “their conception of zero-waste is not a viable way to significantly reduce the negative impacts the extraction, production, consumption, and disposal processes associated with the notebook,” and the strategy is, at its core, more of a marketing ploy than a real path forward in sustainability (Vonk, 2018).

Apple's supply chain requires an enormous amount of energy, materials, and transportation resources, simply due to its size and scope. iPhone parts are manufactured in no fewer than six separate countries spanning multiple continents, and all iPhones are assembled in China, where they are then shipped all across the globe (The Gateway, n.d.). Even if Apple partially falls short in regards to sourcing and recycling their materials, they have built a successful and sustainable supply chain that should serve as a model to tech companies of similar scale. Their global facilities are powered by renewable energy, and they have invested in clean energy as a more environmentally friendly solution. Apple also works to keep as little inventory as possible, which reduces the need to excess warehouse space, strengthens relationships with local suppliers and outsourced storage (Ross, 2020), and serves as an example of how to accomplish the SDG of "Responsible Consumption and Production."

All of these factors and more play a role in achieving sustainable design and production at a large-scale level. New products have to be useful, innovative, and provide the user with an advantage they did not previously have in order to justify the design, production, and marketing costs the product will incur. Roy (2016) highlights the difference between sustainable design and sustainable innovation; sustainable design "aims to provide the essential function of a product using the least environmentally harmful technical solution," while sustainable innovation "involves providing a particular function using environmentally optimal product-service mixes or socio-technical systems" (Roy, 2016). Infrastructures like Apple's supply chain are born from the overlap of sustainable design and sustainable innovation, and even if their actions can sometimes come across as nothing more than virtue signaling, more companies must follow suit if we are to achieve a healthier technological world.

Extending the Impact: Long-Term Sustainable Practices

Every corporation, no matter what product they sell, exists for the same core reason—to make a profit for itself and its shareholders. That doesn't mean, however, that the corporate world can't pivot to focus more on sustainability in the future. Any successful movements towards a more sustainable world require that environmental and social consciousness are made primary objectives. Corporations can do the same, and while some like Apple already do, a lot of sustainable efforts are more for business image than an actual desire for change (Vonk). Instead of front-facing business campaigns, there are concrete steps companies can take that will both help themselves and the future of the world around them.

The main shift of thinking requires that corporations focus much more on the long-term health of their business and their customer base. Every company has the challenge of balancing short-term and long-term goals, growth, and expectations, and focusing too much on the short term is an easy pitfall, as in a moment of crisis, being in business tomorrow can feel more important than being in business in ten years. It is crucial, then, for companies to continuously implement sustainable efforts in their long-term plans and find actionable ways to achieve them in the short term as well. In a study published by Harvard Law School Forum on Corporate Governance, de Araujo and Robbins look into the dilemma of balancing short- and long-term pressures, especially due to the standard practice of quarterly reporting. One company they highlight is Hitachi, an electrical and industrial manufacturer that aims to “deliver value to society and customers over a long period by using the know-how and expertise in products and operational technology it accumulated for over 100 years.” They have two main action platforms for doing so: specifically identifying which SDGs pose challenges for the company, and formulating a “value creation model” to document their social efforts, especially in regards to

SDGs (de Araujo and Robbins, 2019). Maintaining short-term growth and a profitable business model are still high priority for Hitachi, but they have successfully integrated sustainable efforts into their main business plan while maintaining a healthy corporate structure.

A shift towards long-term sustainable business models might seem daunting or impractical to some corporations, but at a global scale, technology corporations stand to reap massive benefits from sustainable thinking. For example, a large-scale shift to renewable energy sources could be costly, but it increases the company's future longevity, as clean energy continues to grow cheaper and more efficient, and governments around the world move away from non-renewable energy sources. As mentioned, Apple powers their global supply chain facilities completely by renewable energy, so it is feasible for other large companies to follow their lead. In the end, corporate investments in sustainability are just investments in the corporation's own future. A healthy Earth, global societal growth, and a sustainable plan for the future would only help companies to increase in value—both financial value and societal value.

Conclusion

Continued technological innovation could lead to a safer, more efficient lifestyle for millions of people in America and across the world. As labor costs decrease, so too would costs of living, allowing those in poverty a greater chance of escaping. Cities, states, and countries could implement green technology on a greatly increased margin, leading to cleaner living situations and a much stronger environment. In this ideal scenario, the SDGs and other metrics of environmental progress could be accomplished. Like in most cases, those at the top of the economic and social ladders would probably feel the most benefit, but there wouldn't be any real losers either.

In the same breath, this ideal future could be just that—ideal. While technologies may continue to iterate, no one technological innovation can repair a broken system, and the social problems that persist around the world are far from a Band-Aid away from healing. As Nowotny and Schot write, “[Science and Technologies Studies] and [History of Technology] colleagues often call for a democratization of science and technology and new ways of relating democracy to technocracy. However, to succeed, STS and HoT will have to address issues of social progress head on” (Nowotny and Schot, 2018). Without social progress, technological advancement could only strengthen the current social atmosphere: a world where the rich get richer, the poor stay poor, and consumers buy products they don’t need at massive profits for the companies. This is not progress; this is merely an illusion of progress. We live in an age of endless potential—now it’s up to us to ensure that we remain socially, environmentally, and morally conscious as we push the boundaries of what science can accomplish. If we can manage that, maybe that ideal scenario could become reality after all.

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