

GLOBAL GREEN TECH IN THE SMARTPHONE INDUSTRY: EXPLORING SUSTAINABLE PRACTICES AND BRAND IMAGE OF FAIRPHONE VS. APPLE

Abstract

The smartphone industry's environmental impact and the growing emphasis on 'Green Tech' solutions have prompted companies to adopt sustainable practices. This case study explores how Fairphone and Apple integrate green technology, its impact on their brand image, and hence, its influence on consumer perception. The study evaluates sustainable practices, consumer attitudes, and brand reputation by analyzing factors such as environmental footprint, resource consumption, ethical practices, and consumer perception. The study reveals that Fairphone has a slightly superior environmental impact, but Apple surpasses in utilizing renewable energy and reducing hazardous chemicals. Both companies are leading the charge in sustainable practices, striving to minimize their carbon footprint and promote circular economies. While both Fairphone and Apple have made strides, the future of green technology in the industry hinges on companies' dedication to sustainable practices across the supply chain, promoting consumer awareness, and advancing recycling technologies.

Keywords: Green Tech; Eco-friendly smartphones; Brand image; Sustainability practices; Environmental impact

Authors

Madhu Kumari

Research Scholar
Department of Commerce
University of Delhi
Delhi, India.



Dr. Harleen Kaur




Associate Professor
Mata Sundri College for Women
University of Delhi
Delhi, India.

I. INTRODUCTION TO GREEN TECH IN THE SMARTPHONE INDUSTRY

Ahmed, O. (2018) highlights the pressing need for eco-friendly solutions in the smartphone sector, with a growing focus on 'Green Tech.' As Bodenheimer, M. (2018) elaborates, 'Green Tech' entails the broad use of environmental science to preserve nature and resources, thereby reducing the detrimental effects of human endeavours. AL-YAFEI, H. M. (2022) states that the product's lifecycle yields maximum ecological benefits by integrating environmentally responsible techniques and leading-edge technologies. According to Deloitte (2021), the smartphone industry has two significant environmental challenges: waste and greenhouse gas emissions. As more companies begin to recognise the importance, they are actively working to transform their shipping and packaging processes. ZDNet's 2017 report shows that sustainability is a critical consideration for buyers. The primary environmental impact of smartphones arises from the emissions-rich manufacturing process. The key to decreasing a smartphone's carbon impact is prolonging its usable life. As a result, each smartphone would endure longer, with or without multiple owners throughout its lifespan. As per Deloitte's findings in 2021, buyers are more likely to purchase from businesses known for their eco-friendly practices.

Several eco-friendly smartphone companies are making efforts to build a sustainable brand image. Here are some examples:

S.No	Company	Details	Figure
1.	Fairphone	Fairphone is designed with sustainability in mind. Its eco-friendly smartphones have been popular with green enthusiasts, and currently, the company sells the Fairphone 3/3+ and the Fairphone 4. The Fairphone is Blue Angel certified to be sustainable and consistently recognized by B Corp for use in business to address social and environmental issues.	
2.	Teracube	Teracube makes environmentally friendly smartphones with a four-year warranty. The company says its phones are made from recycled materials meant to outlast the average smartphone.	

3.	Apple	Apple is one of the prominent companies to make eco-friendly smartphones. The latest iPhone 13 recycles 98% of scarce resources. Apple also requires suppliers to sign a code of conduct and submit to an annual audit.	
4.	Sony	Sony is another company recognized for its eco-friendly smartphones. Sony's eco-friendly smartphones often feature energy-efficient components, recyclable materials, and reduced packaging waste.	
5.	Google	Google is committed to sustainability by incorporating recycled materials into its devices and packaging. They also aim to make their operations carbon-neutral.	

Source: Authors elaboration using the company’s website (Fairphone, Teracube, Apple, Sony and Google)

As the smartphone market experiences rapid growth, Guastello, S. J. (2023) highlights that it has a significant environmental impact, mainly resulting from resource-intensive manufacturing and the quick replacement of products. As a result, companies like Fairphone and Apple are significantly updating their production and operational methods with green technology to reduce their carbon footprints (Nguyen, 2020). Renewable Energy Magazine (2017) highlights Fairphone as the environmentally friendly choice in the smartphone market. Fairphone prioritizes sustainable energy sources and reduces hazardous materials to create ecologically friendly smartphones. In contrast, Apple, a prominent smartphone producer, has actively worked towards environmental sustainability. Nevertheless, their devices have been criticised for their high resource consumption and brief lifespan (ZDNet, 2017).

Examining the integration of 'Green Tech' in the smartphone industry, this research evaluates how these two companies are raising their environmental consciousness and its influence on their brand reputation and consumer attitudes. Furthermore, the study proposes practical guidelines for environmentally friendly practices in the industry, fostering mutual benefits between businesses and consumers.

II. CONCEPTUAL BACKGROUND- IMPACT OF GREEN TECH ON BRAND IMAGE

In light of heightened competition, it has become imperative for companies to prioritize their environmentally friendly practices to mitigate the detrimental impact of human activity on the environment and implement green technology to attain this objective.

By adopting green tech, companies can better position themselves as environmentally conscious and enhance their brand image. When employed effectively, this strategy can boost both CSR and customer loyalty. Human actions' effects on global climate change are significantly mitigated by green technology's reduction of greenhouse gas emissions. The implementation of green technology can dramatically enhance a brand's reputation. According to a research paper published in *Environmental Science and Pollution Research*, authored by Bradu et al. in 2022, it has been found that incorporating green technology and sustainable practices can enhance a company's green brand image. Companies must prioritize eco-friendly products and actions as customers are highly aware and observant of such rules, often expecting these to exceed those of their competitors. As the study suggests, a company's reputation can benefit from integrating green technology. A green brand identity can signify a company's commitment to modern, caring practices.

Dwivedi et al., (2022) underscore the significance of environmental awareness and leadership commitment in fostering engagement in green information systems and technology use. Using green technology attracts eco-conscious customers, increasing sales and leads. Sustainability is crucial in their decision-making process (Bradu et al., 2022). It is essential to prioritize advancements in green technology to boost productivity. Developing new and better tools and devices resulting from such progress is necessary for taking productivity to new levels. Moreover, green technology also saves money. These measures can bring cost savings and promote environmental sustainability. Cheng et al., (2022). The integration of green technology can have a considerable impact on a business's reputation and consumer appeal. Using green technology can lead to improved productivity and cost savings.

By leveraging green technology, many prominent businesses are strengthening their brand image. Bashir et al.'s (2020) study, discovered that a company's sustainable image can be constructed by improving consumer views on its environmental responsibility. Entrepreneurs must acknowledge the vital role sustainable materials play in elevating product branding. Incorporating green branding strategies is a surefire way to attract more customers and maximize profits. The advantages of promoting a sustainable brand image are undeniable, benefiting the environment and the company's bottom line, as illustrated by the following examples. Consumers are becoming more discerning and are paying closer attention to how companies produce their products and treat their workers. This has put a spotlight on these topics. Sustainable businesses receive consumer praise and financial benefits, as many customers prefer supporting environmentally responsible companies.

Top companies must implement eco-friendly practices, sustainable branding, and green marketing, and demonstrate their unwavering commitment to the environment to boost their brand reputation through green technology. Despite their attempts to improve their green reputation, companies could encounter challenges such as high initial investments, limited access to green technologies, resistance to change, inadequate knowledge, integration issues, and the possibility of greenwashing when integrating green technologies into their brand image. (Bashir et al., 2020). Companies must concentrate on research, collaborations, consumer education, and certification acquisition to successfully integrate green technology and build a robust brand. (Bashir et al., 2020)

III. FAIRPHONE: A CASE STUDY IN GREEN TECH

Fairphone, a social enterprise based in the Netherlands, has revolutionized the smartphone industry with its eco-friendly and sustainable technology. Their phone, introduced in 2013, incorporated innovation and social responsibility. Fairphone has always prioritized responsible sourcing of raw materials, steadfastly committed to ethical practices and protecting the environment. They have achieved this by exclusively utilizing conflict-free minerals. (Fairphone, 2020). Introducing new features in smartphones has also resulted in a modular design. This means the device can last longer and produce less electronic waste, as Molitch-Hou (2018) noted.

Additionally, Fairphone is committed to improving working conditions in the electronics industry. By partnering with suppliers who prioritize labour rights and safe operations, Fairphone upholds ethical standards of production (Fairphone, 2023). Fairphone's inventive strategies highlight its dedication to environmentally friendly procedures and ethical materials acquisition, serving as a striking example of the successful integration of green technology.

Fairphone is a company at the forefront of integrating eco-friendly technology in the smartphone industry. They have implemented several innovative practices, including responsible acquisition, economic sustainability and circularity, fair labour practices, recycling and reuse, and software updates. Fairphone is committed to ensuring that its products are conflict-free and that its supply chain respects human rights and the environment. Their new modular design allows users to easily replace or upgrade individual components, extending the life of their products and reducing electronic waste. They prioritize partnerships with suppliers who enforce labour rights and safety standards in their manufacturing facilities.

Fairphone also encourages recycling old devices, reducing electronic waste and consumption. For every Fairphone sold, they donate €3 to programs in Ghana that recycle electronic waste. Furthermore, they offer extended software support for their devices, reducing e-waste by reducing the need for frequent hardware upgrades. In conclusion, Fairphone is unwavering in its dedication to creating sustainable and socially responsible products. Fairphone's commitment to transparent and sustainable manufacturing practices has greatly increased customer confidence, encouraging people to make more sustainable choices. Their modular design allows each component to function seamlessly as part of the system, resulting in a truly remarkable lifespan.

IV. APPLE: A CASE STUDY IN GREEN TECH

Apple Inc. has made significant strides towards sustainability in the smartphone industry, demonstrating its understanding of the importance of addressing the environmental impact of its operations. Their efforts in reducing emissions through responsible material procurement, fair labour practices, and the use of renewable energy have earned them praise from Greenpeace in their 2017 report. Renewable Energy Magazine has reported this achievement. Greenpeace USA (2017) has recognized Apple as the only company thus far to commit to powering its entire supply chain with renewable energy, setting a groundbreaking example for others to follow. Apple has taken a significant step towards reducing its carbon

footprint. The company has achieved carbon neutrality for its global corporate operations, which is commendable. However, more work is still needed in other company areas. Apple is committed to achieving a net-zero climate impact on its devices by 2030. This is an ambitious goal, but the company has a plan. By incorporating renewable energy in its supply chain and improving production methods, Apple aims to reduce emissions and positively impact the environment. With such a strong commitment, we can look forward to a more sustainable future.

According to Forbes in 2022, Apple's sustainable practices have attracted consumers who are worried about the environment. However, there have been criticisms about the company's consumption of resources and the limited lifespan of its machines. Nevertheless, ZDNet reported in 2017 that Apple has taken steps to tackle these issues by promoting recycling and extending the lifespan of their devices. Apple's sustainability strategy revolves around three main elements: reducing their impact on the environment, recycling, and using renewable energy sources.

Reduction	Apple's dedication to reducing its environmental impact is evident through its use of energy-efficient materials and software in its devices. The company has successfully shifted the iPhone, iPad, and Apple Watch to 100% recycled tin solder on the main logic boards, significantly reducing tin ore emissions. This commendable action showcases Apple's commitment to sustainability and is a role model for other companies to emulate.
Recycling	It's worth noting that Apple has some great programs available to help customers sustainably dispose of their old devices. "Apple Trade-In" and "Apple Recycling" are one of them, they're both excellent options to consider. Moreover, Apple has gone above and beyond by creating a robot named Daisy. Daisy can break down materials from up to 200 iPhones per hour, recovering valuable resources that traditional recycling methods cannot. It's just another way that Apple is leading the charge in sustainability.
Renewable Energy	Apple has fully committed to utilizing 100% renewable energy to fuel its operations. In its 2020 Environmental Progress Report, Apple boldly declared its objective to attain carbon neutrality throughout its supply chain and product life cycles by 2030.

Source: Apple environmental progress report 2023

The company's efforts to reduce carbon emissions, use recycled materials, and ensure fair employee treatment have been commendably recognized in the market. These initiatives have resonated positively with environmentally-conscious consumers who prioritize the ecological impact of their purchases.

V. GREEN TECH AND CONSUMER PERCEPTION: FAIRPHONE VERSUS APPLE

Fairphone and Apple are prominent technology companies, but they have distinct approaches to environmental sustainability. This report comprehensively compares their green technology initiatives and how customers perceive them.

Table 1: Comparison between Fairphone and Apple

Sl.No	Point of Comparison	Fairphone	Apple
1.	Environmental Footprint	The analysis of published data reveals that Fairphone has a marginally superior environmental impact compared to Apple.	Apple is firmly committed to utilizing renewable energy and reducing hazardous chemicals in their products. This is a top priority for the company in 2021.
2.	Resource Consumption	Fairphone has an unwavering commitment to extending the longevity of its devices, thereby minimizing the frequency of replacements and decreasing resource usage. Our aim is to provide phones that are built to withstand the test of time.	While Apple has received a commendation for its utilization of renewable energy and attempts to decrease the utilization of dangerous chemicals, it has also been subject to censure over the rate at which its products are consumed and the diminished lifespan of its devices.
3.	Ethical Practices:	Fairphone puts the well-being of its employees first and takes strong measures to prevent equipment corrosion. The company's commitment to prioritizing people and the environment over profit is unwavering.	Apple is committed to ethical and sustainable practices, as evidenced by its ongoing efforts to enhance working conditions and minimize mineral usage in its supply chain.
4.	Consumer Perception:	The Fairphone brand is known for its high ethical standards in the mobile phone industry. They are committed to sustainability and reducing electronic waste, and this has been widely recognized by Ethical Consumer in 2021.	While Apple remains a highly regarded and popular brand, it has faced criticism in regard to its environmental practices and products.

Source: (Fairphone 2021, Apple 2021)

Fairphone strives to create environmentally friendly smartphones, but Apple surpasses them by utilizing renewable energy and chemicals in their production. However, Ethical Consumer acknowledges Fairphone as a highly ethical phone and critiques Apple for their accessories and short-lived equipment.

VI. COMPARATIVE ANALYSIS: FAIRPHONE AND APPLE'S SUSTAINABLE PRACTICES

In recent years, consumers and companies have been increasingly concerned about sustainability. Companies have been obliged to adopt more sustainable practices as the severe environmental repercussions of industrial manufacturing have become clear. This comparison research aims to look at the two organizations' sustainability practices. Fairphone and Apple have both incorporated environmentally friendly manufacturing practices in the production of their smartphones. In recent years, both corporations have made significant achievements in providing ethical, ecologically sustainable products. This comparison research will look at Fairphone's and Apple's sustainable practices and their influence on consumer views.

We may look at Fairphone and Apple's strategy for manufacturing and integrating sustainable products across their supply chain to learn more about their sustainable practices. Fairphone prioritizes ethical sourcing and production, emphasizing conflict-free materials and fair labour practices. Fairphone assures that their gadgets do not violate human rights or harm the environment in this way. This dedication to responsible sourcing distinguishes them from other smartphone makers that may disregard these ethical issues. Their smartphones are modular in design, which makes them easier to repair and reduces electrical waste. Fairphone's emphasis on accountability for source and labour conditions is aligned with the ideas of a circular economy, in which resources are reused and recycled for as long as feasible.

In contrast, Apple, a smartphone market leader, has also attempted to promote sustainability, but with a somewhat different strategy. Apple, like Fairphone, recognizes the value of environmentally friendly practices in the smartphone sector. They are dedicated to decreasing their carbon footprint and have set a target of using 100% renewable energy in their operations. Furthermore, Apple has established measures such as recycling programs and the use of recycled materials in its products. While Apple's sustainability efforts have been overshadowed at times by criticism of the throwaway culture fostered by ever-changing products, the company's dedication to green technology and sustainable operations has continued to progress in a good direction.

Table 2: Comparison between Fairphone and Apple's Sustainable Practices

Environmental Footprint:	Fairphone's environment is just somewhat superior to Apple's. Both firms, however, are working to minimise emissions through renewable energy, recycling, and fair employment practices.
Sustainable Design:	The modular architecture of the Fairphone allows for easy repair and replacement of parts, extending device life and reducing electrical waste. Apple has been attempting to extend the life of their gadgets and compel returns to promote use.
Use of Renewable Energy:	Apple has pledged to use only renewable energy in its supply chain. Fairphone has also made sustainable energy a priority.

Reduction of Hazardous Chemicals:	Both firms have attempted to decrease the usage of harmful chemicals in the production of devices.
Ethical Labor Practices:	Fairphone places an emphasis on ethical corporate conduct. Apple has also made an effort to support moral workplace conduct.
Consumer Perception:	Fairphone's environmentally and socially responsible practices cater to customers more concerned about their purchases' environmental and social effects. Consumers have also embraced Apple's sustainable practices.

Source: Author's elaboration

Indeed, determining the top firm in the market for eco-friendly smartphones can be a challenging task due to various factors. The landscape of eco-friendly practices and sustainability efforts within the smartphone industry is constantly evolving, and companies may have different approaches and levels of commitment to environmental responsibility. Moreover, the availability of accurate and up-to-date information on companies' sustainability practices can sometimes be limited. Nevertheless, Apple has a more significant market share and a better reputation than Fairphone. Apple has pledged to run its supply chain entirely on renewable energy, is working to decrease the use of dangerous chemicals in producing its devices, and has implemented recycling programs to encourage recycling and reduce electronic waste. While Fairphone is internally approved and B Corp certified to use business to address social and environmental concerns, it strives to produce smartphones that minimize the environmental effect, prioritise the use of renewable energy, and limit the number of hazardous chemicals in their products. However, Fairphone has a little lower ecological impact than Apple.

In conclusion, Fairphone and Apple have commendably pursued ecological friendliness and sustainability in smartphone production. Apple's larger market share and stronger brand, however, lend it greater influence. The impact of their choices on environmental practices rests on their industry sway. Both contribute to eco-friendliness, with Apple's scale granting it a significant platform for broader change. The ultimate determination of the leading eco-friendly smartphone producer hinges on a company's decisions, industry response, and collaborative efforts across the tech sector.

VII. CONCLUSION: THE FUTURE OF GREEN TECH IN THE SMARTPHONE INDUSTRY

In response to the increasing environmental concerns of consumers, the demand for smartphones that are not only durable but also eco-friendly is gaining substantial momentum. Although some businesses are starting to acknowledge this shift, the IT sector remains a significant contributor to the global electronic waste crisis and accounts for around 2% to 3% of the world's greenhouse gas emissions (Deloitte, 2021).

Fairphone has emerged as a notable player in this landscape by undertaking a remarkable mission: to create smartphones that leave minimal environmental footprints. Their approach involves prioritizing the use of renewable energy, reducing the presence of

harmful chemicals in their devices, and extending the life cycle of their products (Renewable Energy Magazine, 2017; Ethical Consumers, 2022). This multifaceted strategy underscores their commitment to sustainability and responsible manufacturing.

On the other hand, Apple, while making significant strides in environmental friendliness, has faced criticism for its perceived practice of intentionally shortening the lifespan of its products and gadgets. Despite this criticism, Apple maintains a larger market share and enjoys higher brand recognition compared to Fairphone (Statista, 2023).

The evolution of green technology within the smartphone sector will undoubtedly be shaped by the collective efforts of manufacturers. This encompasses not only the production process but also considerations around shipping and packaging logistics. As technology continues to advance and recycling methods improve, a crucial aspect of this paradigm shift is consumer awareness. Many consumers may not fully recognize the significance of choosing greener and more sustainable electronics as technology progresses. Hence, it becomes imperative to foster greater consumer awareness to effectively achieve the overarching goal of sustainability in the smartphone industry.

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