

From Obsolescence to Sustainability: Exploring University Students' Preference on the Lifetime of Devices

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Abstract

This study investigates university students' electronic device consumption behaviors, focusing on sustainability awareness, device obsolescence perceptions, and purchasing decision factors. A quantitative survey was conducted among university students, utilizing a Likert scale to assess attitudes towards device usage, sustainability, and upgrade decisions. The research employed descriptive statistical analysis to examine factors influencing device consumption. Results revealed performance specifications (4.47/5) and durability (4.43/5) as primary purchase drivers. Students demonstrated moderate environmental awareness (3.58/5) but showed a strong preference for new devices (82.6%) over refurbished options (17.4%). The average laptop age was 3.06 years, with students expecting devices to remain functional for 5.22 additional years. The study provides unique insights into the disconnect between environmental awareness and actual device consumption behaviors among university students, highlighting the complex interplay between technological expectations and sustainability considerations. The findings suggest a need for targeted educational interventions, marketing strategies, and policy recommendations to bridge the gap between environmental consciousness and device purchasing decisions.

Introduction

The rapid advancement of digital technologies has transformed the landscape of electronic device consumption, particularly among university students. This demographic represents a highlight of technological innovation, environmental awareness, and consumer behavior. The proliferation of electronic devices has not only revolutionized personal and academic experiences but has also raised significant environmental and sustainability challenges.

Electronic waste (e-waste) has evolved into a global environmental concern, driven by an accelerating pace of technological innovation that continuously shortens device lifecycles and increases replacement frequencies. University students are at the forefront of technological adoption. They play a crucial role in determining future consumption patterns and sustainable practices. Their purchasing decisions are not made in isolation but are intricately influenced by complex socioeconomic factors, technological expectations, and emerging environmental awareness. These young consumers navigate a challenging landscape where cutting-edge performance, financial constraints, and growing ecological consciousness intersect, making them key stakeholders in reimagining sustainable technology consumption.

Students navigate a challenging landscape where cutting-edge performance, financial limitations, and growing environmental concerns intersect. Their decisions are influenced by multiple variables: technological specifications, battery performance, manufacturer updates, peer recommendations, and an emerging awareness of electronic waste's environmental impact.

Previous research has explored various dimensions of electronic device consumption, but there remains a common theme, there is always a significant gap in understanding the specific motivations, decision-making processes, and education of university students. This study aims to bridge this knowledge gap by providing a comprehensive examination of students' attitudes

towards device obsolescence, sustainability awareness, and purchasing behaviors.

The research seeks to understand the intricate relationship between technological expectations and environmental awareness. By investigating factors that drive device upgrades, perceptions of obsolescence, and the alignment between sustainability awareness and actual consumption choices, the study offers critical insights into a demographic that will shape future technological and environmental landscapes, as university students are a crucial demographic in how people use electronic devices.

Through a detailed survey methodology, this research delves into the multifaceted world of student device consumption. It challenges existing narratives by examining not just what drives technological choices, but also the underlying psychological and environmental considerations that inform these decisions.

As digital technologies continue to evolve at a rapid pace, understanding the consumption patterns of university students becomes increasingly vital. This study provides a timely and crucial exploration of how emerging generations interact with technology, balance performance needs with environmental considerations, and potentially reshape future approaches to sustainable device consumption.

Research Objectives

The research objectives of the study are as follows:

1. To examine university students' awareness and attitudes towards electronic device sustainability and obsolescence
2. To analyze factors influencing device purchasing and upgrade decisions among university students, including their preferences between new and refurbished devices
3. To evaluate the relationship between expected device lifespan and actual usage patterns among university students

4. To investigate how environmental awareness influences students' device consumption behavior

Research Questions

Following are the research questions of the study:

1. What factors influence university students' decisions in purchasing and upgrading their electronic devices?
2. How do students perceive and define device obsolescence, and how does this affect their usage patterns?
3. What is the relationship between students' environmental awareness and their device consumption behavior?
4. How do students' expectations of device lifespan compare to their actual usage patterns?

Literature Review

Sustainability

There are currently so many barriers when it comes to e-waste recycling and under-recycling globally (Echegaray & Hansstein, 2017; Favot and Grasseti, 2017; Nnorom et al., 2009; Wang et al., 2016). Which can affect socioeconomic factors such as income and education. This is prevalent when buying refurbished devices like refurbished smartphones.

E-waste contains valuable metals that are used in electronics, such as platinum-group metals (PGMs) like copper. And as well as environmental metal contaminants like lead, mercury, cadmium, and chemical compounds like polybrominated diphenyl ethers (PBDEs), and polychlorinated biphenyls (PCBs). Unfortunately, developing countries in Sub-Saharan Africa have fell victim into becoming a digital dumping site for e-waste (Amoyaw-Osei et al., 2011; Asante et al., 2011; Oteng-Ababio, 2010; Prakash et al., 2010) which is a really concerning development where electronic technology has played a key role in today's modern world.

Steps to take and addressing obsolescence is to follow the Sustainable Human-Computer Interaction (SHCI) Model which researchers have identified two key areas. The durability of the materials that should last a minimum 10 years (Remy & Huang, 2014). And upgradability in terms of modularity of hardware (Blevis, 2008), and repurposing devices through software upgrades (Remy & Huang, 2014).

As a solution, second-hand and refurbished technology was a way for students to keep up, with the reasons being budget constraints, keeping up with technological demands, and educational requirements (Esmailian et al., 2021). Socioeconomically for the students, refurbished devices provide increased accessibility to technology, enhanced educational opportunities, and a more affordable option for post-secondary students (Kissling et al., 2012).

To address e-waste issues, proposed research methods include surveys on e-waste awareness, assessments of sustainability knowledge, and comparative studies across different time periods (e.g., 2012–2020). By focusing on university students, these studies can enhance understanding of sustainable Waste Electrical and Electronic Equipment (WEEE) management practices, promote environmentally friendly behavior, and support the development of effective strategies for managing e-waste (Sustainability, 2022).

The production of electronics contributes to 56% of global warming, underscoring the importance of sustainable production practices (Prakash, 2012). Replacing devices with energy-efficient models is not always beneficial, as it may take 33–89 years to achieve environmental advantages at current rates of adoption. Research implications include enhancing user competency for longer device use, promoting the "right to repair" (Hielscher, 2019), and examining factors that influence the phases and longevity of device use. Emphasizing sustainable models for consumers is vital to reducing environmental impacts and extending the life cycle of electronics.

Consumer Views

Currently, there is a knowledge gap between consumers, especially when it comes to e-waste and the environmental impact it can cause (Lu et al., 2014). Consumer e-waste awareness and disposal behaviors tend to be largely ignored in research (Borthakur and Govind, 2017). There are certainly ways to influence an effective strategy in behaviors when it comes to handling e-waste, such as convenience (Meneses and Palacio, 2005; Rousta et al., 2015), financial aspects (Hornik et al., 1995), motivational factors (Klockner, 2013), and simple knowledge components about e-waste.

Consumer involvement is crucial and essential for a more effective strategy in handling e-waste. The Engal-Kollat-Blackwell (EKB) model outlines the decision-making process of a consumer which needs recognition, information search, evaluation of alternatives, purchase, and post-purchase. Understanding these processes gives an idea of what influences the consumer when deciding on a product that they are being offered with (Stankevich, 2017). There is a gap that exists between purchase intentions and their actual behavior. Young et al. (2010) and Khor and Hazen (2017) highlighted discrepancies on consumer expectations like in pre-purchase and actual behavior.

Obsolescence refers to objects being outdated or loss of usefulness. This is different from "planned obsolescence" where it is deliberately designed to shorten the lifespan of the device (Remy & Huang, 2014). In consumer electronics, it is because of rapid advancing and relevant technologies, such as new features or faster and efficient performance. E-waste is simply defined as a certain electronic equipment that is almost near the end of its useful life, or at a certain point that can be rendered obsolete or no longer functional for its intended purpose.

Consumers play a critical role in determining the lifespan of electronic devices through their usage habits, repair decisions, and declaration of end-of-life (EOL) cycles (Wieser & Troger, 2018). Research highlights that user behavior influences whether consumers opt to repair or replace devices and whether they are affected by "planned obsolescence" or their competency in extending device longevity. A deeper understanding of

consumer practices is essential for promoting sustainable behaviors and longer use phases.

Research on these young consumers including students are identified to be key decision-makers in disposing e-waste (Nowakowski, 2016; Zhang et al., 2019), are likely to replace their electronics because of trends or obsolescence (Colesca et al., 2014), and a really crucial demographic for e-waste management strategies. China, with its massive manufacturing capacity, including electronics, plays a significant role in the global e-waste issue.

University Students

University students, as young consumers, are critical to this discussion due to their exposure to technology and long-term consumption habits. However, they are often overlooked in environment-related research despite being a key demographic for promoting better WEEE (Sustainability, 2022).

Environmental education plays a key role in preventing such cause, yet, its integration into educational institutes like universities have been very minimal, and such university-level programs tend to be largely overlooked, especially in the field of natural and applied sciences disciplines (Brigden et al., 2008; Oteng-Ababio, 2010). Involving universities can nothing but be pivotal and can serve as hubs for innovation and knowledge-sharing about e-waste, such as creating policies and methods in creating a more effective way in handling e-waste (Prakash et al., 2010).

In Australia, university students tend to also show low awareness about e-waste issues (Edumadze et al., 2013), and students would frequently replace their phones annually, and they are a part of a demographic that creates a significant amount of e-waste (Ongondo & Williams, 2011). Students worry and face pressure from technological advancements and its implementation in educational settings (Kumar et al., 2017).

University students are identified as long-term users of electronics and significant contributors to e-waste due to their reliance on technology. Research highlights the importance of addressing their understanding of WEEE management systems and the dynamics of their e-waste

awareness over time. They represent a crucial group for examining long-term consumption trends, contributing to sustainable e-waste practices, and providing temporal data insights from 2012 to 2020 (Sustainability, 2022).

University students, as significant users of electronics, are impacted by shorter device lifespans, with most devices designed for a maximum use of ten years but typically used for just three to six years (Hennies & Stamminger, 2016). Their exposure to frequent upgrades and technological trends further reinforces the need to study their behavior and preferences. Improving awareness of repair options and sustainable practices among students could contribute to more responsible consumption patterns.

Research Methodology

Research Design

This study employed a quantitative research approach with the use of surveys to examine the university students' perspectives on device lifetime and sustainability. This approach was chosen to gather measurable data about students' behaviors and attitudes towards device obsolescence. The following audience will be students within Bath Spa University only and will rely on the basis of the device of a laptop.

The primary data collection method will be through the use of an online survey through Google Forms. Majority of the questions will contain the 5-point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree). This particular method was selected to effectively understand the students' attitudes, behaviors, and decision-making patterns regarding electronic device usage and sustainability.

Participants

The following participants are students that are only within Bath Spa University, and totals to 144 respondents.

Here is a summary of the respondents

Demographic Information	
Response Summary	
Gender	Number (Percentage)
Male	63 (43.75%)
Female	78 (54.17%)
Prefer not to say	3 (2.08%)
Age	
Average Age	20.67
Year Level	Number (Percentage)
Level 3	13 (9.03%)
Level 4	39 (27.08%)
Level 5	29 (20.14%)
Level 6	63 (43.75%)

Data

Following are the responses for the short quantitative survey |

Survey queries	Mean
Section 1: Device Obsolescence and Upgrade Patterns	
1.1 I consider my device obsolete when:	
It becomes too slow for my needs	3.26
The battery life significantly decreases	3.46

The manufacturer no longer provides updates	2.81
New models with attractive features are released	3.15
1.2 The following factors influence my decision to upgrade my device:	
Performance issues with my current devices	3.62
New features or technologies in newer models	3.17
Price drops or sales on devices	3.58
Recommendations from friends or family	3.17
Marketing or advertisements for devices	2.84
1.3 When considering a new laptop, how important are the following factors:	
Price	4.35
Performance specifications	4.47
Brand reputation	3.68
Environmental Impact	3.30
Durability and extended lifespan	4.43
Section 2: Laptop Types	Percentage
Consumer (Basic/Entry-level)	43.1
Gaming	31.2
Office (Business-oriented)	17.4
Premium (High-end/Professional)	8.3
Section 3: Laptop Usage Metrics	Mean (in Years)
Current Laptop Age	3.06
Expected Functional Life from Current Device	5.22

Upgrade Frequency	5.06
Section 4: Sustainability Awareness and Preferences	Mean
I am aware of the environmental impact of electronic waste (e-waste)	3.58
I consider sustainability aspects when purchasing a new device	3.36
Section 5: Future device preferences	Percentage
New device	82.6
Used/refurbished	17.4

Findings & Discussion

The findings of the data from the survey provided valuable insight and views when it came to understanding device consumption, sustainability awareness, and purchasing behaviors.

Let's start with Section 1 where it asks about when they declare their device obsolete and as well as their upgrade patterns. In Section 1.1, the significant factor when it came to declaring when their device is obsolete is battery life at 3.46. And the least of their concerns happen to be when the manufacturer doesn't provide software updates to the device. Section 1.2 asks what is the factor that influences in upgrading their device. The main factor is when performance significantly decreases with a value of 3.62. The least is marketing. Section 1.3 asks what factors they consider in upgrading the laptop. The highest and majority factor is performance at 4.47. The lowest is environmental impact at 3.30.

Moving on with Section 2, we ask the type of laptops they currently have, this is to understand their laptop demographic. Consumer laptops take about 43.1%, with gaming laptops behind with 31.2%.

Section 3 describes their usage metrics, the current age mean of the laptops for the students are about 3.06 years old, and their current expectation when their current laptop expect to last functionally is

5.22 years which totals around 8.28 years in functional expectancy, which is quite close to what one research study did on sustainability where a device's durability of the materials should last a minimum or maximum of 10 years (Remy & Huang, 2014) which just falls just roughly 2 years short. And it is more than the average in a case of a laptop where one study expects that the device they use is just around three to six years (Hennies & Stamminger, 2016). Which is more time than when they actually think they might buy for their next upgrade which is within 5.06 years time.

Section 4 asks sustainability related questions, people are in fact aware about e-waste at 3.58 which is higher than a study that was done in a university in Australia where they show low awareness about e-waste issues (Edumadze et al., 2013). And a decent amount would consider sustainability in their next purchase in a new device with a mean of 3.36.

Lastly, Section 5 discusses future device preferences and purchasing decisions. Unsurprisingly, 82.6% of people expressed a preference for buying a new device, while 17.4% indicated they would consider purchasing a used or refurbished device. This section also includes short responses from participants explaining their reasoning behind their next purchase choice.

Many prefer new devices for their reliability, performance, and longevity. They associate new devices with fewer risks of malfunction, better warranties, and access to the latest technology. Some also view new purchases as more secure, particularly regarding privacy and data protection.

On the other hand, those open to used or refurbished devices often highlight their affordability and eco-friendliness, acknowledging the role of such purchases in reducing e-waste. However, concerns about hidden defects, reduced performance, and potential maintenance costs were notable deterrents. Ultimately, the choice reflected a balance between budget, device purpose, and personal values, but new devices remain the dominant preference.

Conclusion

This study provided really critical insights into university students' understanding of their electronic device consumption behaviors,

sustainability awareness and e-waste, and future purchasing decisions. The research revealed a complex landscape of technological preferences and environmental awareness.

Performance specification emerges as the main factor in device decisions (4.47/5) with students primarily motivated by technological advancements. Battery life and performance issues are the most significant triggers for device obsolescence, while marketing and software updates have minimal influence. There is also a clear dominance of consumer (43.1%) and gaming (31.2%) laptop types.

The findings highlight a notable gap between environmental awareness and consumption behavior. Students demonstrate moderate e-waste awareness (3.58/5) and sustainability consideration (3.36/5), yet overwhelmingly still prefer new devices (82.6%) over refurbished options (17.4%). This suggests that while being aware about e-waste and sustainability, practical and performance considerations consistently outweigh such concerns.

In a section of the survey when asked on the reasoning behind it, they explained that reliability, longevity, and access to the latest technology are the primary drivers for choosing new devices. Many participants emphasized the assurance of warranties and lower risks of malfunctions as critical factors influencing their decision. Meanwhile, those who favored refurbished or used devices cited affordability and eco-friendliness as their main motivations, acknowledging the role such choices play in reducing e-waste.

However, concerns about the potential drawbacks of refurbished devices, such as hidden defects, reduced performance, and lack of long-term support, deterred many from considering them as viable options. This divergence highlights a significant barrier to adopting more sustainable consumption behaviors, where practicality and performance demands continue to outweigh environmental awareness.

These findings underscore the importance of bridging this gap through education and initiatives that promote the benefits of refurbished devices, alongside advancements in quality assurance and transparency within the refurbished market.

It also revealed that there is a clear disconnect between environmental awareness and purchasing behavior among students just as it aligns with other

research. While there is moderate awareness of e-waste and sustainability, the overwhelming preference for new devices underscores the dominance of reliability, performance, and technological advancements in decision-making. Refurbished devices, though recognized for affordability and eco-friendliness, are hindered by concerns over quality and durability. Bridging this gap requires efforts to enhance consumer confidence in refurbished products through better quality assurance, transparency, and education. By addressing these barriers, it is possible to align consumption habits with sustainability goals, fostering a more environmentally responsible approach to technology usage.

Device lifecycle expectations are particularly interesting. Students anticipate their current laptops to remain functional for 5.22 years, resulting in a total expected lifespan of 8.28 years. This aligns closely with a research relating to sustainability suggesting a minimum or maximum device durability of 10 years, though falling slightly short. Interestingly, planned upgrade cycles (5.06 years) are shorter than expected functional life, indicating a proactive approach in replacing their device.

The study underscored the need for strategies that align technological advancement with sustainability goals, bridging the gap between environmental awareness and consumer behavior in a rapid technological landscape.

Limitations and Recommendations

This study has several limitations that should be addressed in future research. Firstly, the scope was limited to a single university in the UAE, which may not fully capture the perspectives of students at other universities or in different regions, thus limiting the generalizability of the findings. The sampling process also presents a potential bias, as the demographic data may not be fully representative of the broader student population. Additionally, the study heavily relied on a Likert scale in the survey, which may have oversimplified complex issues and influenced responses in certain ways. The focus was also solely on laptops, excluding other devices like smartphones, tablets, and gaming consoles, which could offer broader insights into consumer behavior. Furthermore, the study did not delve into specific performance specifications of devices, which could play a role

in user decision-making. Socioeconomic factors, aside from price, were minimally addressed, which means other influences, such as income or cultural factors, may not have been considered.

To build on these findings, future studies could broaden the scope to include multiple universities globally and expand the demographic to include a wider variety of age groups and professional backgrounds. It would also be beneficial to investigate other electronic devices and develop more nuanced tools for measuring sustainability awareness. Implementing educational programs on e-waste and sustainability, creating marketing strategies that highlight the longevity of devices, and promoting policies that encourage sustainable consumption and repair would all contribute to a more comprehensive understanding of the issue.

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