Understanding Consumer Behavior and Sustainability Perception for Digital Technology Products and Services: Addressing End-users' Unmet Sustainability Concerns

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Abstract. In today's digital economy, sustainability concerns for digital products and services have become critical for governments, businesses, academic institutions, and the general public. The complex phenomena of digital transformation and environmental stewardship pull stakeholders to sustainability in different directions. Although there are extensive studies on technology and sustainability, much of the research has focused either on digital technologies themselves or on the companies behind them. Through a global survey of 490 technology end-users, this study investigates the sustainability perception and behavior of digital technology end-users, including their unmet expectations. The study thus provides key insight into the end users' sustainability perspectives and unmet sustainability needs. The results showed that product durability, transparency, legitimacy, ethical concerns, right to repair, water and energy consumption, and pollution were the most pressing unmet end-user needs. Our findings indicate that technology and software businesses need to engage with their end users and bridge the communication gap about their efforts towards sustainable digital transformation. The study contributes to the theory of consumption value and offers practitioners insights to take actions that promote end-users' sustainable consumption.

Keywords: Consumer behaviour, end-user sustainability perception, unmet sustainability concerns, sustainable production and consumption.

1 Introduction

In the digital age, rapid innovations in the information and communication technology (ICT) industry remain crucial for strengthening the global digital economy, securing future survival and supporting business growth and survival [1], [2], [3]. ICT products and services are considered necessary for achieving sustainable development [4]. However, the growth of software and hardware innovations, including large-language models and data centers, raises sustainability concerns such as pollution, water use,

biodiversity loss, and carbon emissions, among others. Most scholars in diverse disciplines, including software engineering and information systems, acknowledge the importance of addressing digital sustainability [5], [6], [7] as an ethical and existential calling of our time [8]. Digital sustainability concerns the "design, development, configuration, deployment, and decommissioning of digital resources and artifacts toward improving the environment, and economic welfare" [9]. Thus, the use of ICT products and services to satisfy consumer needs without jeopardising the needs of future generations [10]. These sustainability concerns can be economic, social, environmental, technical or individual [11].

There has been increasing recognition that many sustainability challenges, such as climate change, biodiversity loss, carbon emissions, and e-waste, result from human activities [12]. This acknowledgment requires a rethink of how products and services, including digital technologies, are produced and consumed. Following the famous sustainable development definition in a post-Brundtland world "Our Common Future" [13], achieving digital sustainability therefore becomes the responsibility of everyone [9], including consumers.

While scholars have investigated the sustainability efforts of leading technology companies [14], research from an end-user sustainability perspective remains scarce. We address this gap through a global survey of technology end-users' sustainability perception, consumption behaviour, and unmet sustainability needs. Thus, the study aims to deepen understanding of end-users' digital technology consumption behavior and sustainability concerns by exploring the following research questions: RQ1: What does the sustainability of digital products and services mean to end-users? RQ2: How do end-users perceive the current technology firms' sustainability claims? RQ3: What are the current unmet sustainability needs of digital technology consumers?

The study builds on the theory of consumer behavior (TCB), the theory of consumption value (TCV) and the theory of importance-performance analysis (IPA) to deepen our understanding of end-users' unmet sustainability concerns. In this study, we identified that sustainability issues such as product durability, transparency and legitimacy about company sustainability practices, ethical issues concerning social impacts, right to repair, water and energy consumption as well as pollution were among the most pressing end-users' unmet sustainability concerns.

The remainder of the paper is organized as follows. In the next section, we develop the theoretical background. The subsequent section describes the methodology. Next, we present the results, followed by the discussion. The last section concludes with the paper and provides directions for future studies.

2 Background and related work

Public sustainability expectations of ICT and software businesses emphasize transparency, credibility, and responsibility. However, diagnostic approaches, such as Importance–Performance Analysis, reveal persistent gaps between what sustainability concerns end-users regard as important and their perception about technology

companies' efforts towards addressing sustainability challenges, highlighting the need for more transparency and close collaboration with broader ICT ecosystem actors.

2.1 Consumer Behaviour

Scholars have studied consumer behaviour towards technological innovations [15] and have proposed different models and frameworks such as the widely used technology acceptance model (TAM) [16], [17] and diffusion of innovations [18]. Information and communication technologies such as mobile phones and laptops are not only useful for most people, providing essential services such as connecting people across the globe, online shopping, learning, working or even entertainment [19], but also a crucial tool for policymakers and non-governmental organizations to develop innovative solutions and stimulate socioeconomic growth for the vulnerable and society at large [20]. With billions of technology consumers worldwide, the cell phone is positioned as crucial to the future of digital media [21]. While studies show that young adults are making sustainable consumption decisions driven by health awareness, lifestyle choices [22], the situation seems different with technology. According to World Bank data, in some countries, the number of mobile phone subscriptions exceeds the population [23]. This means there are more people with access to mobile phones worldwide than safe sanitation [20], [24]. It is projected that in 2026, global ICT spending will reach about $6.08 trillion, a 9.8 percent increase from $5.54 trillion in 2025 [25]. These projected expenditures include data center systems, hardware devices, software, IT and communication services, with software expenditure experiencing the most significant growth of 15.2 percent from 2025. According to [25], the trend is driven by consumer spending on mobile phones and the availability of AI devices. Although consumer behaviour is influenced by numerous factors from personal and psychological, to social, economic and cultural [26], [27], as spending on ICTs increases, so do other unintended consequences. For instance, in 2022, global e-waste generated totaled 62 million tons, equivalent to 1.55 million trucks, and is forecast to reach 82 million tons by 2030 [20], [24].

2.2 Theory of Consumption value

The rapid digital and emerging technology innovations as well as penetration of e-commerce in rural areas is driving consumption [28]. Similarly, people's purchasing power continues to increase as a result of global economic development leading to increased unsustainable consumption and waste in the apparel industry [29], food [30] and electrical and electronic products [31]. Scholars posit that consumption decisions are complex phenomena influenced by personal, psychological, and social factors [32]. The theory of consumption value developed by [33], builds on three principles: (1) multiple consumption values drive consumption behavior, (2) each consumption value affects every consumption decision differently, and (3) each of the consumption values function autonomously. The theory identifies functional, social, emotional, epistemic and conditional values as the five values that influence consumer behavior. They defined the functional values as the perceived satisfaction a consumer gets from patronising a product or service to solve direct or immediate need. Social values are the

perceived benefit or satisfaction derived from an alternative's relationship with one or more specific social groups. With digital products, end-users may choose a specific technology brand or possess multiple technologies to gain symbolic social prestige rather than its functionality [26], [34]. The emotional value refers to the perceived emotional feelings derived from patronising a specific product or service. For consumption of digital technologies, the emotional feeling might mean the feeling of belonging to a particular ecosystem. For example, studies found that incidental emotions can shape whether consumers rely more on peripheral or central cues, depending on how well the emotional tone matches the message content [35]. Epistemic value refers to the perceived benefit gained from an alternative's capacity to invite curiosity or satisfy a desire for knowledge. Finally, conditional value refers to the perceived satisfaction a consumer derives from an alternative product in each situation or a set of circumstances confronted by the consumer [33].

2.3 Importance-Performance Analysis Theory

The success of every business lies in understanding its customers' pain points and the features of its product or service that make them satisfied [36]. The pain points or sustainability concerns of end-users are what they consider to be direct or indirect value, ranging from economic and individual concerns (e.g., price, health) to social, environmental, and technical concerns (e.g., relations, pollution, functionality) [11]. In services and product marketing, Importance–Performance Analysis (IPA) is a well-known diagnostic technique for locating where firms under-deliver on what users value [37], [38]. In a traditional IPA, consumers provide the average value of importance and performance of different service attributes, which is then calculated in a four-quadrant coordinate system to ascertain their satisfaction [36]. However, in this study, we do not estimate an IPA outcome model, instead, we report user-stated importance, perceived firm efforts, and expressed barriers to sustainable digital consumption, and we synthesize unmet needs from thematic and descriptive evidence. We position IPA as a follow-on approach for attribute-level gap quantification and outcome modeling in future research. Applying the IPA concept to digital sustainability is a helpful exercise due to sustainability concerns regarding greenwashing, transparency, product durability, limited right to repair, and social and environmental concerns, which map directly onto known antecedents of trust and satisfaction [39], [40], [41], [42]. The capacity to act on sustainability information is not uniform. Differences in access, skills, and usage, the "beyond access" layers of the digital divide, can shape whether disclosure and design cues translate into sustainable behaviour.

Following ongoing discussions, the link between values, digital sustainability, and consumer behavior depends on several factors, including conflicting goals and individual differences in self-regulation [43]. As such, adopting consumer-centered sustainability concerns into ICTs and software requires integrating consumers into digital processes, such as retailing and specifically purchasing and consuming products and services [44]. Digital technologies are unique and distinct from many other consumables due to their ability to acquire data, process and transmit data, their updating capability while still with the end-user, their reinforcement learning feature,

such as an AI-powered device, and the power to provide and enable value or satisfaction to multiple people from a single device [45].

3 Methodology

This study employed a qualitative survey approach [46] to explore end-users' sustainability behavior and concerns to digital technologies. We identify these sustainability concerns descriptively and thematically, focusing on issues such as end users' perception, behaviour, and unmet sustainability expectations. While Importance–Performance Analysis offers a structured way to quantify attribute-level gaps and link them to outcomes such as trust and satisfaction, we position this as a direction for future research. Two reasons informed us of our methodological choice. First, we wanted to examine digital technology consumers from different parts of the world with diverse educational and socio-economic backgrounds, not just end users from one particular geography. Second, end-user unmet sustainability concerns and expectations have not yet been studied in the software engineering context, making exploratory qualitative study more appropriate and positioning our study as a foundation for future work. The study established methodological rigor and robustness by designing relevant research questions to address the phenomenon under investigation, pilot testing the questionnaire for clarity, selecting an appropriate sampling strategy thoughtfully, using multiple data collection strategies and adopting a systematic data analysis process for reliability [47], [48], [49]. In the subsequent paragraphs, we detail the questionnaire design, sampling process, data collection strategy, and data analysis techniques.

3.1 Questionnaire Design

The survey instrument was developed based on a comprehensive review of prior literature on technology consumer behavior and motivation, sustainable consumption, and development. Open-ended questions were constructed to elicit nuanced insights into consumers' current sustainability practices regarding ICT product and service patronage, their sustainability perceptions, and expectations of technology companies. Some constructs, for instance, perceived ICT companies' sustainability efforts, were measured using a 10-point Likert scale (ranging from 1, "very poor," to 10, "excellent"). The questionnaire also included a 4-point Likert scale to measure the level of importance that end users assign to how technology is produced in terms of sustainability. The survey questionnaire was divided into three parts. The first part collects demographic and socioeconomic data, including nationality, gender, field of study, level of education, profession, and frequency of technology use. The second part focused on end-users' sustainability perceptions and technology use. The third part focused on the sustainability concerns and expectations that end-users have concerning the ICT and software business. The researcher adopted a reflexivity strategy to reflect on the analysis and discuss among themselves to resolve any differences.

3.2 Sampling

Our research employed multiple sampling strategies, including convenience, snowball, and purposive sampling [50]. First, the researchers randomly recruited study participants through their social and professional networks who possess the relevant information to address the phenomenon. Next, the researchers relied on snowballing from the initial set of respondents or to recruit more respondents. These two sampling strategies resulted in 190 responses. To mitigate the tendency of bias from the data, the researchers employed the service of Prolific, a data collection platform that helps researchers to recruit online participants for conducting surveys or experiments [51]. Prolific was used to collect an additional 300 responses, bringing the total to 490. Table 1 provides characteristics of the study participants. The respondents consist of 252 men and 232 women, with 6 identified as non-binary. Also, the respondents were distributed across the globe, providing representativeness of the sample and generalizability of the findings.

Table 1. Characteristics of study participants.

Variables	Components	Frequency
Gender	Male	252 (51.4%)
	Female	232 (47.3%)
	Non-binary	6 (1.2%)
Education	Graduate level	215 (43.9%)
	Bachelor's degree	189 (38.6%)
	Some college courses	43 (8.8%)
	High school courses	28 (5.7%)
	Associate degree	15 (3.1%)
Time spent interacting with technology	10+hours	217 (44.3%)
	6-9 hours	147 (30%)
	3-6 hours	88 (18%)
	1-3 hours	38 (7.8%)
Geographical distribution	North America	202 (41.2%)
	Africa	188 (38.4%)
	Asia	45 (9.2%)
	Europe	43 (8.8 %)
	South America	3 (0.6%)
	Unclear category	9 (1.8%)

3.3 Data collection

The surveys were administered online from February to June 2025 using Google Forms, a free and convenient platform [52]. The survey was first pilot tested with three participants, which led to a few minor streamlining of the questionnaire. Purposive sampling based on demographic characteristics was not used to mitigate researcher bias, ensure representativeness, or increase generalizability [53]. Particularly, we focus on the following open-ended and closed questions: (i) What does ICT sustainability mean to you as an end user? (ii) How are you currently contributing to sustainability

through mindful and responsible tech usage? (iii) How would you rate the current sustainability efforts by tech and software businesses? (iv) How important is it to you that ICT products and services are developed with sustainability in mind?

3.4 Data Analysis

A two-step data analysis strategy was adopted to maximize the breadth and depth of insights. Following recent scholars [54], we used a reflexive thematic analysis (RTA) [55], an approach used for identifying, analysing, and reporting patterns or themes. We first familiarized ourselves with the data and manually coded them. The authors employed a thematic coding technique [56] and the Gioia method [57] to thematically organize and interpret the qualitative data as shown in Figure 1.

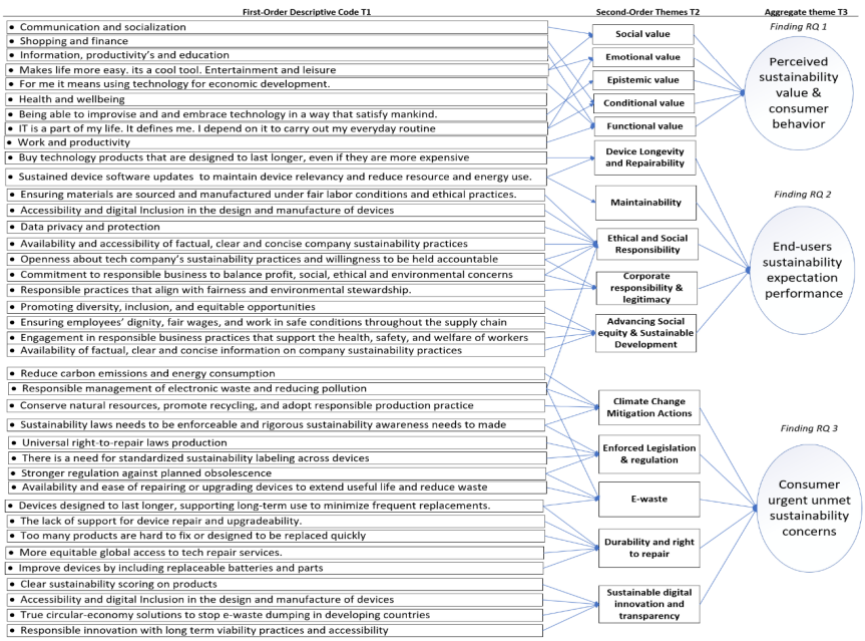

Fig. 1. Thematic analysis.

The analysis started with familiarization with the data. Next, the authors identified relevant information from the response to generate initial descriptive codes. Open coding was performed to capture meaningful segments related to the research objectives with assigned descriptive labels [58]. Subsequently, the open codes were grouped into broader categories to organize the data into more coherent, manageable themes that aligned with the study objectives and the phenomenon under investigation. For instance, first-order descriptive codes related to "long-lasting device" and "ease of repair" were grouped under the theme "device longevity and repairability". Constant comparisons were made to ensure consistency and accuracy. Finally, the emerging themes are aggregated to form overarching concepts. Next, following recent studies

[59], the data were further analyzed using the Ailyze software, an emerging AI tool for qualitative research analysis. This allowed for triangulation of findings and identification of patterns that may not have been immediately realized through our manual coding [54]. Results from both analytic approaches were compared and synthesized to inform the interpretation and discussion of consumer perception and behaviour regarding sustainability.

4 Findings

As consumers' sustainability behaviour and practices are influenced by a combination of social, economic, psychological and political factors, we first present the contextual analyses of the participants, followed by the findings relevant to the research questions. The educational level of respondents skewed high, with 215 participants (43.9% of the total) holding a graduate degree or higher. Bachelor's degree holders accounted for 38.6% while other education levels included some college (8.8%), high school graduates or equivalent (5.7%), and associate degrees (3.1%). Overall, regardless of level of education, all respondents use technology for at least 1 to 3 hours daily. Specifically, more than 4 in 5 respondents report using one form of technology or the other for more than 3 hours a day, with almost half stating they use digital devices for more than 10 hours a day. The results show that software and digital technologies are being adopted in most fields, including education, health, entertainment, mobility, commerce, and communication. For instance, technology was primarily used for educational and learning purposes (86.5%), entertainment and leisure (85.7%), and work-related tasks (77.8%). Other significant uses included health and well-being (57.1%), communication and socializing (48.4%), shopping and finance (46.1%), and travel or navigation (43.7%).

4.1 RQ1 What does the sustainability of digital products and services mean to end-users?

Sustainability means different things to different end-users, ranging from social, economic, environmental, functional, technical, and personal reasons. For instance, majority (65.7%) said they choose durable, high-quality products even if expensive, and 46.5% preferred to repair devices before replacing them. This could be economically, socially or environmentally motivated. Few participants reported buying from sustainability-focused companies (28%), recycling or donating electronics (10.4%), enabling power-saving modes (8.6%), or managing digital waste like unnecessary emails or closing unused opened tabs. Sustainability awareness among technology end-users is still developing and means different things to different people. For some, it means "using it for interacting with friends and family," while for others, it means "using technology in ways that are environmentally responsible, socially ethical, and economically sensible over the long term". For a few others, they "...do not care about the relation between sustainability and tech use".

Another interesting consumer behavioral choice and sustainability practice concerns energy efficiency and waste prevention. For example, some respondents mentioned

performing simple but important sustainability actions such as "shutting down laptops overnight, unplugging devices when not in use, using battery efficiency modes," which reveal practical steps taken to reduce energy consumption. The acknowledgement that energy efficiency spans from "my phone charger to the data centers running the internet and AI" shows the depth and awareness of the energy implications of modern technology for consumers. Consumers also associated energy efficiency with product longevity, as one user noted the importance of "minimizing the environmental and social impact of the technology I use while maximizing its efficiency and longevity," suggesting the link between energy use, waste reduction, and extending device lifespan. These simple yet effective consumer behavioral choices collectively help reduce the negative impacts of digital technologies on the planet.

Finally, the idea of rewarding or punishing companies' ICT and software businesses for their engagement or otherwise in sustainability practices forms another critical aspect of respondents' sentiments. A respondent remarked that sustainability means "choosing companies that are eco-conscious and responsible," which highlights the demand for sustainable IT products and services and the role of consumer preference in driving sustainable production. Similarly, for another respondent, sustainability means "choosing energy efficient products, buying from ethical companies etc.," demonstrating how users incorporate values of corporate responsibility into their consumption decisions.

4.2 RQ2 Consumer expectations relating to ICT and software business?

Public scrutiny of organizations continues to increase. Of the 490 respondents, almost half (46.5%), said that it is very important to them that ICT and software businesses are conducted with sustainability as an integral component, while 37.3% rated it as extremely important. Only 1.4% believed it was not at all important, signaling strong overall concern about the social and environmental impacts of technology. When asked to rate the performance of technology companies' sustainability claims on a 1–10 scale, with 1 being the worst and 10 being excellent, most respondents rated ICT and software businesses at 6, as shown in Figure 2.

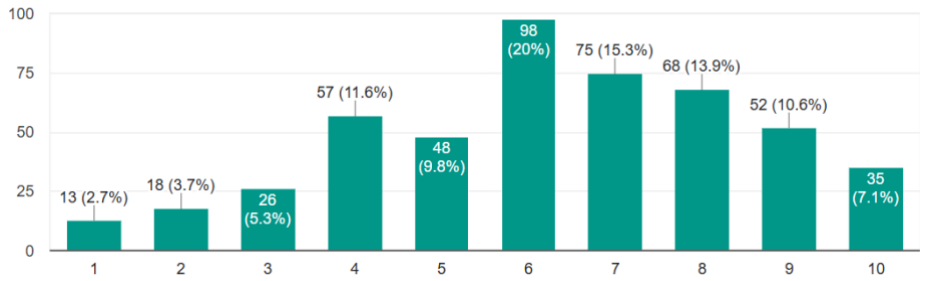

Fig. 2. End-users' perceived sustainability performance of ICT companies.

Most respondents' ratings clustered between 6 and 8, indicating moderate satisfaction but room for improvement as captured in the following quote “While many IT companies have made visible progress in addressing sustainability, such as committing to carbon neutrality, using recycled materials in devices, or investing in renewable energy, there’s still a long way to go”. As depicted in Figure 2, consumers express mixed sentiments regarding the perceived sustainability of ICT and software businesses. End-users perceive tech businesses to be engaging in greenwashing, as mentioned by some consumers in the following quote: “The majority of tech companies pretend to care about sustainability, but in actuality, only care about money”. Consumers expect more transparency and genuine commitment to taking concrete actions towards addressing sustainability challenges, as expressed by some consumers in the following quote “many companies talk about sustainability, but very few follow through with transparent and measurable actions. Most still produce electronics that are hard to repair, use rare materials, and generate huge amounts of e-waste”. Others expect energy “efficient code that doesn’t demand excessive processing power or storage, reducing the need for constant hardware upgrades,”. Similarly, consumers think tech companies “...want us to buy products every year, yearly release of products”, and that they need “technological devices that can be updated and not needing to be replaced every year,”. Thus, the need for digital technologies to be “durable, repairable devices,” indicating longevity and reparability as key to reducing e-waste and conserving scarce resources. Furthermore, consumer expectations from technology companies concern social and ethical responsibility. For instance, they highlight social justice concerns, noting, “It’s important that the informal sector, who are mostly involved in producing resources used for these IT products, are paid fairly and involved in sustainability discourse to ensure social justice”. The social dimension includes “ethical AI development, fair labor practices in supply chains, and digital inclusion.” This underscores the need for ICT and software businesses to ensure fair labor practices and protect vulnerable workers, often overlooked in the mining and manufacturing of digital devices throughout the supply chain.

4.3 RQ3: Consumer unmet sustainability concerns.

Unmet digital sustainability concerns refer to the gap between end-users’ current assessments of ICT and software businesses’ sustainability efforts and the future digital environment they would like to see. These concerns include addressing climate change, responsible resource and energy use, and fostering sustainable development. Addressing these gaps requires coordinated action across various sectors and stakeholders, as the end-users themselves acknowledge they are part of the solution. In their efforts to advance sustainability, end-users cited barriers such as the cost of purchasing high-quality technology, mentioned by 73.3% of respondents. It is worth noting that buying quality, expensive technology might not be for sustainability reasons, but to meet any of the five consumer values supported by the TCV. Other challenges included concerns about planned obsolescence (30.4%), limited availability of sustainable technologies (16.5%), lack of clear sustainability information and awareness (11.6%), and lack of transparency regarding tech businesses’ actual

sustainability efforts (10.8%). Thus, consumers require transparent and credible information about the origins of components in digital devices, energy consumption, supply chain management, and corporate sustainability practices to make decisions aligned with their values.

5 Discussion

Technology sustainability is a complex and evolving paradigm that integrates environmental stewardship, ethical considerations, and user engagement to foster a responsible digital ecosystem. Our survey highlights that sustainability is highly valued by end-users, with over four in five rating it is very or extremely important. Yet, perceived firm performance was only moderate. This gap reflects prior research showing that while eco-labels and CSR claims shape consumer attitudes, they only influence behavior when firms are seen as credible and transparent [26], [60].

Transparency and legitimacy emerged as another key unmet sustainability concern that serves as a barrier for user awareness and sustainable consumption, echoing findings that vague communication and greenwashing erode consumer trust by increasing consumer confusion and perceived risk [41], [61]. Several respondents emphasized the importance of ethical sourcing, with one associating sustainability with "the mines in Congo and Bolivia," underscoring the need for firms to demonstrate responsible supply chains. We argued that without such openness, users are constrained in their ability to make informed and sustainable choices. The transparency requirement promotes user autonomy and responsibility, encouraging behaviors that reduce environmental destruction and promote social equity.

Our findings also emphasize durability and repairability as central to sustainable digital consumption. More than 65% of respondents reported choosing durable devices, and nearly half preferred repair over replacement. This resonates with [40], who stress the significance of lifetime extension for ICT sustainability. At the same time, relatively few respondents reported consistent recycling, donating, or using energy-saving features. This pattern supports prior observations of an intention–action gap in sustainable behavior, cautioning against the assumption that awareness automatically translates into practice [62], [63]. Sustainable digital consumption thus lies in understanding the ramifications of end users' technology habits and in a proactive effort to align them with sustainability principles.

Cost was cited as the most pressing barrier (73%), far surpassing information gaps or lack of transparency. While earlier work placed strong emphasis on information provision and eco-feedback mechanisms, our evidence suggests that affordability is a binding constraint that cannot be overlooked. This finding broadens the discourse on sustainable consumption by shifting attention from informational interventions to economic accessibility. Many consumers are willing to reward or punish ICT and software businesses by patronizing or boycotting their products. These sentiments highlight a broader systemic impact of sustainable digital consumption and a willingness to align personal use with organizations that prioritize sustainability, thereby fostering a more responsible digital ecosystem. Our respondents highlighted

expectations that extend beyond environmental impact to include software efficiency, updated policies to avoid premature obsolescence, and privacy protection. These perspectives expand the scope of sustainability in ICT by placing software engineering and data stewardship alongside hardware design. This shift reflects a growing recognition that digital sustainability encompasses not only material practices but also ethical and social dimensions of technology use [39].

The study shows that consumers have expectations about which sustainability concerns they perceive as valuable. However, their perceptions and realities often do not match, resulting in dissatisfaction and unmet needs. Based on our study, we conceptualize the importance of consumer sustainability and company performance outcomes as shown in Figure 3.

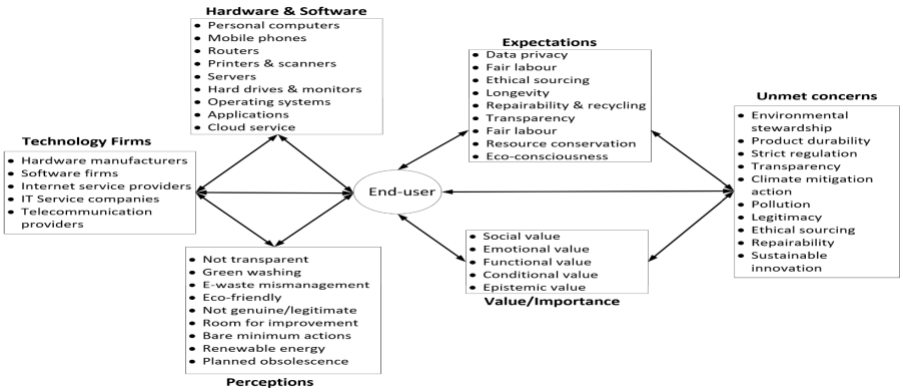

Fig. 3. Digital technology sustainability value-expectation outcome model.

5.1 Theoretical and managerial implications

One of the key characteristics of the sustainable transformation of current ICT and software businesses is continuous innovation, agility, data-driven decision-making, connectivity, extensive use of energy and water, and a deep focus on customer experience. ICT and software businesses are under pressure to advance sustainability, yet our findings show that end-users have mixed perceptions of technology and software firms' sustainability performance. Theoretically, this study highlights the persistent gap between consumer expectations and organizational delivery, reinforcing prior work on the depth of the intention–action gap while extending it by showing that energy efficiency, resource utilization, and environmental stewardship are now central attributes of digital sustainability. It also broadens the concept of sustainability in ICT by incorporating software-level practices, such as green coding as well as social factors, such as accessibility and fairness. The study also contributes to the theories of consumption value (TCV) and importance-performance analysis (IPA) by proposing a digital technology sustainability value-expectation model.

For practitioners, our findings highlight that end-users are not passive recipients of sustainability messaging, but rather relatively active evaluators of firm practices. To strengthen trust and satisfaction, ICT and software businesses should provide verifiable disclosures that demonstrate transparency and legitimacy, since opacity and greenwashing quickly undermine credibility. They also need to prioritize product longevity and repairability, which users rated as more influential than downstream practices like recycling. At the same time, affordability emerged as the most pressing barrier, suggesting that sustainable transformation requires business models that make greener digital choices financially accessible. We call on an ecosystem approach towards advancing digital sustainability and promoting sustainable production and consumption in the ICT sector.

5.2 Limitations and future research opportunities

To the best of our knowledge, this is the first study to understand end-users' sustainability perception and unmet sustainability concerns. While it offers timely insights into consumer behavior toward sustainable digital consumption and expectations from ICT and software businesses, several limitations also point toward future research opportunities. First, the study relied on thematic analysis of survey responses to capture end-user perspectives. Although valuable, future research could adopt a comparative design to examine differences between the Global North and Global South. Such analysis may uncover important nuances in how affluent and developing contexts interpret sustainable technology consumption, and the extent to which economic constraints shape consumer behavior. Second, our focus was limited to end-users, one of many stakeholders in the ICT ecosystem. Sustainability transitions require collective engagement; therefore, future studies should include multi-stakeholder perspectives, integrating insights from firms, policymakers, civil society, and other actors to generate a more systemic understanding. Third, the sample was skewed toward educated participants, as all respondents had at least a high school qualification. Education level and professional background may have influenced the findings, potentially limiting their generalizability. Future research should examine more diverse populations to better understand how socioeconomic background influences sustainable consumption behaviors and motivations. Furthermore, the study relies on self-reported perceptions and behaviors, which may be subject to bias. Consumer perception of sustainability impacts or performance may not necessarily reflect the actual impact. Future research could combine multiple data sources to gain a deeper understanding of perceived and actual end-user contributions to digital sustainability. Finally, there seems to be a dichotomy between the actual sustainability activities of ICT and software business and end-users' perception and awareness of these activities. Future research could combine studies involving both tech companies and end-users to bridge the information gap and build trust and satisfaction.

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