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Guillén, Georgina; Hamari, Juho; Quist, Jaco

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The hurdles of saving the world: conflicts and survival tactics of gamified sustainable consumption app creators

Georgina Guillén
Gamification Group, Tampere University, Tampere, Finland
Juho Hamari
Gamification Group – Research Center of Gameful Realities, Tampere University, Tampere, Finland, and
Jaco Quist
Faculty of Technology, Policy and Management, TU Delft, Delft, The Netherlands

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Abstract

Purpose – This study aims to increase our understanding of the value and ethical conflicts faced by sustainable consumption app (SCA) creators when applying gamification to support individual sustainability practices. The results include practical strategies and recommendations toward responsible innovation and sustainable human–computer interaction.

Design/methodology/approach – This study consists of semi-structured interviews with 21 SCA creators, an online survey on moral foundations and thematic mapping.

Findings – The apps' content, expected impact, managerial issues and external aspects influencing their survival emerged as the four areas across which resources, the creators' intentions, growth and trust-building strategies and gamification as a value destroyer and source of ethical tensions represent the main conflict areas. These tensions comprise engagement vs individual agency loss; third-party involvement and partnerships; rewards vs oversimplification; mandatory use vs personal drive; current knowledge vs further education; learning from others; stakeholders' risks; experience vs unwanted outcomes and the meaning of value and collaborative design. The strategies to address these represent responsible innovation practices and are this study's main contribution.

Research limitations/implications – Including insights from non-European SCA creators and users could help identify additional opportunities for SCAs to meet their objectives.

Originality/value – While studies on SCAs from the user perspective are abundant, this study takes the creators' perspective to understand the dilemmas behind such tools. Focusing on ethical concerns and the value of gamification as a strategy to achieve the apps' objectives offers a unique perspective for improving some of the most popular tools that enable sustainable consumption.

Keywords Gamification, Responsible research and innovation, Mobile app design, Ethics, Sustainable human–computer interaction

Paper type Research article

1. Introduction

Sustainability has emerged as the pinnacle theme of the millennium with the rapid onset of the effects of climate change, overconsumption, political turmoil, and their impact on resource availability and overall societal well-being. As one of the measures to tackle this wicked

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problem, changing individual consumption patterns is part of the global sustainable development agenda (United Nations, 1992). A tenet of these efforts consists of developing a better understanding of the role of consumption and how it binds complex issues, including ethical considerations for decision-making processes that comprise science, technology, businesses, and innovation (Boon *et al.*, 2015; Burget *et al.*, 2017). In the current context of "there is an app for that," mobile applications (apps) represent an opportunity to bridge existing awareness-action gaps, motivating users to consume differently, encouraging less wasteful or more mindful lifestyles (Guillen *et al.*, 2021). Many of these apps feature *gamification*, "an intentional process of transforming any activity, system, service, product, or organizational structure into one which affords positive experiences, skills, and practices similar to those afforded by games" (Hamari, 2019, p. 1) to better engage users in the practices advocated by the apps' creators.

Studies about gamification and sustainability present apps as promising tools to modify individual behavior because of the possibilities they offer to break up routines and inspire reflection, reducing ignorance barriers and enhancing additional motivation (Ouariachi *et al.*, 2020). Developing sustainable consumption behaviors means that users are conscious of what influences their consumption choices and act accordingly (Boon *et al.*, 2015), generating impact for living well today having a future-oriented outlook (Geiger *et al.*, 2018); hence, this study considers sustainable consumption apps (SCAs) as *mobile applications that aim at enabling individual choices that satisfy needs through different consumption stages without compromising the living conditions of people and other species today and in the future*. Most SCA-related research focuses on the apps' functions (Cudok *et al.*, 2022; Guillen *et al.*, 2022), emphasizing user experience, consumer demands, and expected impacts on users' behaviors (Stevens *et al.*, 2017; Mu *et al.*, 2019; Mulcahy *et al.*, 2020; Ouariachi *et al.*, 2020; Ochs and Schmitt, 2021). It is also well-documented that users demand attractive, efficient, and trustworthy apps that provide value for money and manage data transparently (Stevens *et al.*, 2017; Hunger *et al.*, 2023). Although the body of research on sustainability apps continues to increase, there is a notable lack of information about how creators balance their personal values and ethics with the challenges of maintaining a business. These dilemmas include the choice of applying gamification, as it may have unintended consequences that can harm users and contradict the app's intention (Garaialde *et al.*, 2021; Al-Msallam *et al.*, 2023).

We address this situation by aiming to answer the following research questions: RQ1 "What value or ethical conflicts do sustainable consumption app creators face when applying gamification (or not), and how do they reconcile them?" and RQ2 "What tensions arise from considering the ethical implications of applying gamification, and how can SCA creators deal with these responsibly?" *By doing so*, this study seeks to increase the understanding of this phenomenon and present its contribution to the relevant fields of ethical, responsible innovation and sustainable human-computer interaction. This study explores the creative and managerial journeys of 21 SCA creators, elaborating on their design processes and ethical considerations and analyzing the tensions and dilemmas that emerged through their practice.

2. Background

While most gamification designs for sustainability research focus on the behavioral-motivational and functional aspects (Mulcahy *et al.*, 2020; Whittaker *et al.*, 2021), sustainable consumption research emphasizes the challenges related to shifting everyday practices, creating cultural and structural conditions to facilitate these into more sustainable ones. These transformations increasingly rely on the concept of responsible innovation, which aims to provide access to information, enabling choices and generating long-term engagement (Asikis *et al.*, 2021). This engagement is communicated under the notions of behavior change, self-empowerment, system change, and discourses encouraging individual transformation (Fischer *et al.*, 2021). The present study departs from the broader notion of Information and Communication Technologies (ICT) platforms and the ethical dimension of sustainability, contextualizing the discussion about ethical concerns related to the implementation of

responsible gamification for habit formation. To this end, the following section presents SCA within the app platform economy, including the current landscape of gamified SCA, followed by some user characteristics and their requests influencing SCA. This subsection also elaborates on the notions of ethics and sustainability, the ethical concerns of gamification, the significance of value-based design and its relevance for creating apps aiming at shifting individual consumption habits. The third part presents two perspectives to explore the SCA creators' answers.

2.1 The app-platform economy and SCA

In the ICT sector, "platforms are technological and managerial constructs that mediate our relationship to our worlds, that create habits, addictions, and impulses, and just generally vie for our attention and shape our lives" (Steinberg, 2019, p. 3). Mobile apps share information and real-time insights, integrating value and resources throughout the user journey, and are susceptible to market pressures (Stocchi *et al.*, 2022). To choose their commercialization strategies, app creators must generate a loyal user base if they plan for cross-platform diversification (Roma and Vasi, 2019). The factors for measuring the app's performance and survival strategies encompass *evolution by refinement* – improvement of existing features, and *evolution by innovation* – adding new features such as appearance and functions, which also impact the market (Liu *et al.*, 2021). Besides these strategies, app creators should also consider perceptions of quality, motivational experiences, and a mixture of cognitive, emotional, and behavioral aspects to engage individuals with the platform (Stocchi *et al.*, 2022). Gamification appears as a chance to make this possible (Nkwo *et al.*, 2021). However, creating an enjoyable and functional app requires careful consideration of the desired outcomes and the type of value created for the user (Mulcahy *et al.*, 2020).

2.1.1 Gamified SCA – state of the art. Gamified apps are among the most popular, but short-lived approaches to incentivize sustainable consumption (Guillen *et al.*, 2021) because of the effects of rewards (Garaialde *et al.*, 2021), poor presence in online stores, and limited game design implementation (Beck *et al.*, 2019). The main objective of most of these apps is to create positive environmental impacts; to a lesser degree, the apps also intend to have some social impact (Guillen *et al.*, 2022). Although engaging, most gamified SCA leave many gamification features unexplored, which are likely to improve the user experience, encouraging more sustainable behaviors (Beck *et al.*, 2019; Guillen *et al.*, 2022; Doğan-Südaş *et al.*, 2023).

The implementation of gamification includes decisions beyond choosing the mechanics suitable for the target users, which is a persuasive strategy to motivate and help them to adopt different behaviors (Nkwo *et al.*, 2021); thus, ethical concerns arise since people's psychological states and behaviors are prone to be influenced (Al-Msallam *et al.*, 2023). The creators are often forced to choose between success and ethics, for example, how to safeguard their users' privacy considering how platforms collect and use individual data (Shilton and Greene, 2019). Hence, ethical issues should be included in the app design process and overall business strategy, not only as a potential objective (e.g. promoting ethical consumption) but also by presenting the creators' stances as part of the app's unique selling proposition.

The following section briefly describes the SCA users, the "sustainable" consumers, and their expectations before introducing the ethics of sustainability and gamification as a preamble to the design of SCA and the analytical frameworks applied in this study.

2.2 The SCA user

Empowering individuals to live more sustainably conveys tapping into their sense of agency to demand and choose more socio-environmentally friendly products and services, including the possibility to reduce their consumption altogether (Peyer *et al.*, 2017). This study understands "sustainable consumer" as individuals who care about the implications of their choices beyond their well-being (Vargas-Merino *et al.*, 2023; Phan-Le *et al.*, 2024), a notion that considers "responsible," "conscious," "mindful," "green," and "ethical" consumers as interchangeable concepts, although these allude to different attitudes, interests and orientations.

To tackle the "intention-action" gap (the difference between what consumers say they care about and what they really consume (Kilian and Mann, 2021)) and encourage changes, White *et al.* (2019) identified five key actions—using social influence, shaping good habits, leveraging the domino effect, deciding whether to talk to the heart or the brain, and favoring experiences over ownership—all of them attainable via mobile apps. Thus, it is crucial to understand what helps create apps that respond to users' particular needs and personal approaches to sustainability. Consumers also request that SCAs be available on mainstream platforms and reflect their ethical stances without making them feel guilty. Additionally, these apps should be rewarding, functional, simple, reliable, and capable of safeguarding users' privacy (Mu *et al.*, 2019; Hawkins and Horst, 2020; Hunger *et al.*, 2023).

The prerogative of using gamification adds an extra layer of responsibility for the creators, who should respect consumers' autonomy while introducing social elements that enable collective action (Huber and Hilty, 2015). Mulcahy *et al.* (2020) suggested offering "low-order" behavioral recommendations and incorporating enjoyment and knowledge to translate the app learning into real-life changes. Furthermore, the interactions between the user and the app should balance the provision of information with the overall enjoyment and value (Hunger *et al.*, 2023). In parallel, SCA creators must bear the ethical implications of gamification and potential harmful consequences (Al-Msallam *et al.*, 2023).

2.3 Ethical consumption and gamification

Ethical consumption (EC) is based on the meaningfulness and influence that human activities have on other individuals, the society at large, and other beings we share the planet with, being aware of the impact of one's choices as an act of responsibility (Sánchez García and Díez Sanz, 2018). EC-advocating apps provide information to facilitate decision-making processes, inviting users to reflect on ethics, thereby prompting app creators to consider how users conceptualize ethical consumption (Hawkins and Horst, 2020).

Earlier studies present a series of ethical codes to consider when designing persuasive concepts that observe moral standards regarding privacy issues and potential user deception (Zichermann and Cunningham, 2011). Recent studies highlight several ethical pitfalls that gamification designers may face, such as taking unfair advantages and/or manipulating users, intentionally or unintentionally harming them, and even damaging people's moral characters (Kim and Werbach, 2016). Therefore, designers of solutions for sustainable living require ethical considerations as part of the creative process, particularly because responsible innovation is based on assessing and effectively prioritizing social, ethical, and environmental risks, opportunities, and impacts (Sutcliffe, 2011).

2.4 Ethical considerations of gamification from the conceptualization and design stages

At the app design level, the absence of a standout model or framework for creating SCAs reaffirms the diversity and practitioner-specific nature of this field. Hawkins and Horst (2020) noted that the app design structures limit how individuals conceptualize ethical consumption; however, prescriptive approaches may contradict the principle of giving users (and creators) the freedom to choose "better" ways to live their lives. Fuentes and Sörum (2019) mapped four types of "ethical consumer actions": get informed, scan the barcode, pledge to green and share your commitment, and contribute to the map. Guillen *et al.* (2022) showed that most SCAs are about getting informed, and are also the least gamified apps. SCAs share similar objectives, reflecting what the creators believe sustainability is about and where the action should start, allowing the user to act according to what the creators assume is a shared understanding of sustainable consumption. This situation highlights the relevance of understanding the SCA creative path, including how gamification is applied to encourage sustainable behaviors.

2.5 Ethical considerations of gamification as an element of design

This study takes a dual analytical approach to bring forward the ethical aspects of gamifying SCAs. The first consideration comes from the design process, examining the implications of applying gamification through a value-centered gamification design process. The second consideration comes from the user-engagement perspective, specifically through a marketing questionnaire designed to explore the suitability of gamification, its benefits as an intervention to encourage ethical consumption, and the inherent risks involved.

2.5.1 The design perspective. Raftopoulos (2014) presented the "Sustainable Gamification Design (SGD) Framework", a human-based approach to gamification design that builds upon ethical values toward the creation of responsible and sustainable gamified systems. This framework, developed to implement gamification in workplaces responsibly, offers the possibility to adapt to ever-evolving user needs, platforms, and legislative demands through iterative feedback loops, encouraging revisiting the values and ethical stances that led to the creation of the apps in the first place. The SGD presents seven value-destroyers that jeopardize gamification's ethical implementation and help pinpoint risk areas (Table 1).

Based on a design innovation process that integrates elements of value-sensitive and values-conscious design, the SGD is one of the earliest approaches to the issue of gamification ethics. As a framework, the SGD aims to develop ethical, responsible gamification strategies that are relevant to designing and implementing sustainability-oriented solutions. Figure 1 shows how the design process begins and ends with the designer's ethical considerations and

Table 1. Gamification value destroyers (Raftopoulos, 2014)

Value destroyer	Short definition
Coercive Participation	Developing a sense of obligation to play rather than to participate voluntarily
Leaky Containers	Personal data being shared to third parties without the users' consent
Technological Whip	Using gamification to control or penalize the users of the gamified strategy
Homogenization of the Workforce	Misuse of data to infer information about a person in a different context than the game's
Loss of Agency	Using computational systems that take away individual autonomy to act
Illusion of Change	Deceptive sense of accomplishment without leading to a real transformation
Shallowness and Inauthenticity	Incorporation of the "fun" factor that becomes distractive and can backfire from the original intention

Source(s): Authors' own work

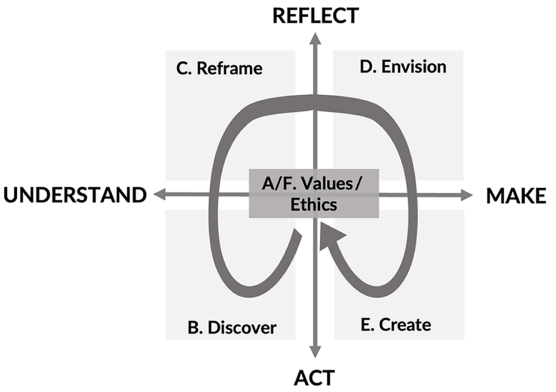

Figure 1. Sustainable gamification design framework (Raftopoulos, 2014)

establishing the project needs and objectives (Steps A and F), taking the creators through a (Step B) *discovery* journey to map the project motivations, outcomes, methods, and stakeholders. Next, the creative teams (Step C) *reframe* the problem and ideate solutions before considering the gamification strategy elements (e.g. technology, game mechanics, etc.) that better suit their purposes. These (Step D) *envisioning* activities lead to the last step, the (Step E) *creation* of the gamified solution, which entails prototyping and various testing iterations before its implementation.

2.5.2 The marketing perspective. Gamification engages consumers psychologically, and it is widely used for persuasive purposes, raising several ethical dilemmas related to manipulation and transparency (Thorpe and Roper, 2017). This study used the Thorpe and Roper (2017) questionnaire for organizations planning to use gamification to analyze how SCA creators appraise their gamification knowledge, its suitability for the overall purpose of the app, and provide a multi-stakeholder perspective on the ethical nuances of gamification (Appendix 1).

Applying the SGD and Thorpe and Roper's (2017) questionnaire as analytical frameworks assisted the identification of value conflicts and tensions, as well as opportunity areas and strategies to facilitate responsible, cooperative design practices for SCA creation.

3. Methods and data

This study applies mixed qualitative and quantitative research methods, focusing on participants' sense-making, emotions, and other expressions while considering broader contextual factors. Participants completed an anonymous online survey that collected demographic data, self-reported moral traits, and basic human values using parts of the Moral Foundations Questionnaire (MFQ). This self-report tool helps identify how societal and cultural values and moral beliefs influence behaviors and attitudes (Graham *et al*., 2011), creating a broader picture of their shared characteristics.

3.1 About the apps and study participants

Drawing from the database created to analyze SCA in 2021 (Guillen *et al*., 2022), it was possible to identify SCA in different stages of an app life cycle and create four sample clusters:

(1) - "most popular" apps due to their downloads and ratings;

(2) - apps that disappeared during the systematic analysis of 2021;

(3) - apps that presented at least three sustainable consumption and/or gamification elements different from the average sample of the 2021 study; and

(4) - apps from the general sample that were not analyzed as they were not gamified. Gamified SCAs that appeared after the 2021 study were also included in this cluster.

The database comprised 52 apps (13 per cluster). Table 2 presents the respondents according to their clusters, current location, position at the entity behind the app, time investment, and geographical reach. Regional and national outreach indicate that the apps work in limited locations due to their type of content or language.

3.1.1 About the creators' backgrounds. The creators introduced themselves, alluding to their former and current work and educational experiences, helping to depict four background-related groups. These groups showed consistent patterns with the reasons behind the creation of the app and their chosen business models (Table 3).

Most creators were born in Europe and continue operating there; 79% of them are (or were) fully employed in the apps' activities, although one is behind an app that operates as a not-for-profit. The creator who chose "other" organization type noted that the app was not registered anywhere.

Table 2. Overview of the interviewees

Interviewee	App type (cluster)	Current location	Position	Involvement in the app	App reach	Interview length (min.)
1	3	Europe	CEO and Founder	Full	Worldwide	63
2	3	Europe	Board member	Part	Worldwide	55
3	2	Africa	CEO and Founder	Full	National	45
4	2	Europe	CEO and Founder	Full	Worldwide	52
5	3	America	CEO and Founder	Full	Worldwide	58
6	2	Europe	CEO and Founder	Full	Regional	55
7	1	Europe	CEO and Founder	Part	Worldwide	60
8	1	Europe	CEO and Founder	Full	Worldwide	57
9	4	Europe	CEO and Founder	Full	National	52
10	3	Europe	CEO and Founder	Full	Worldwide	51
11	3	America	Manager	Part	National	48
12	4	America	Creator/manager	Part	Regional	62
13	4	Europe	CEO and Founder	Full	Regional	57
14	2	Europe	CEO and Founder	Full	Worldwide	55
15	2	Europe	CEO and Founder	Part	Worldwide	60
16	4	America	CEO and Founder	Full	Worldwide	70
17	2	Europe	CEO and Founder	Full	Worldwide	58
18	4	Asia	CEO and Founder	Full	National	59
19	4	Oceania	Board member (and founder)	Full	National	49
20	4	Europe	CEO and Founder	Part	National	40
21	3	Europe	CEO and Founder	Full	National	57

Source(s): Authors' own work

Table 3. Creators' backgrounds

	Group 1	Group 2	Group 3	Group 4
No. of creators	6	5	4	6
Academic/ professional background	Marketing, journalism, communication, and game development	Science, engineering and mathematics	Technology (including app development)	Business management, economics, accounting
Origin of the app	• Awareness of a problem and not finding something in the market • Open tender from donor organizations	• Friends and relatives asking for information • Business opportunity	• Personal use after not finding anything in the market • Part of services portfolio	• Business opportunity • Part of a larger project
Starting team size	1–2 people	3–5 people	2–8 people	5–15 people
App business models	B2C, not for profit publicly funded	B2C, B2B	B2C not for profit	B2C, B2B

Source(s): Authors' own work

Besides demographic information (Table 4), the online survey ($n = 19$; two interviewees did not answer the survey; see Appendix 2) included two segments of the MFQ, providing indicative results as they present self-reported identification with individual values and beliefs. Most creators identify themselves with the values of care for others, kindness, fairness, trustworthiness, and reciprocity. According to the MFQ (Graham *et al.*, 2011), these values are

Table 4. Survey respondents' demographic information

Survey respondent	Gender	Continent of birth	Age
1	Non-binary	America	41–45
2	Male	Europe	26–30
3	Male	Europe	26–30
4	Male	America	41–45
5	Male	Europe	<25
6	Female	Africa	>45
7	Male	Europe	>45
8	Male	Europe	31–35
9	Female	America	26–30
10	Male	America	>45
11	Female	Europe	26–30
12	Female	Europe	<25
13	Male	Europe	>45
14	Female	America	31–35
15	Male	Europe	36–40
16	Female	Europe	36–40
17	Male	Oceania	41–45
18	Female	Europe	26–30
19	Male	Africa	36–40

Source(s): Authors' own work

triggered by suffering, distress, neediness, cheating, cooperation, and deception as they respond to challenges related to protection, care, and reaping two-way partnerships. These traits are reflected in the SCA's creators' narratives, as they all elaborate on accounts about caring for others, the impact of their choices, and being able to do something. These values are also associated with the emotions of compassion, gratitude, anger, and guilt, sentiments often related to climate change awareness (Martin *et al.*, 2022), one of the topics all the creators discussed. Figure 2 illustrates how the creators identified themselves according to the Moral Foundations Theory.

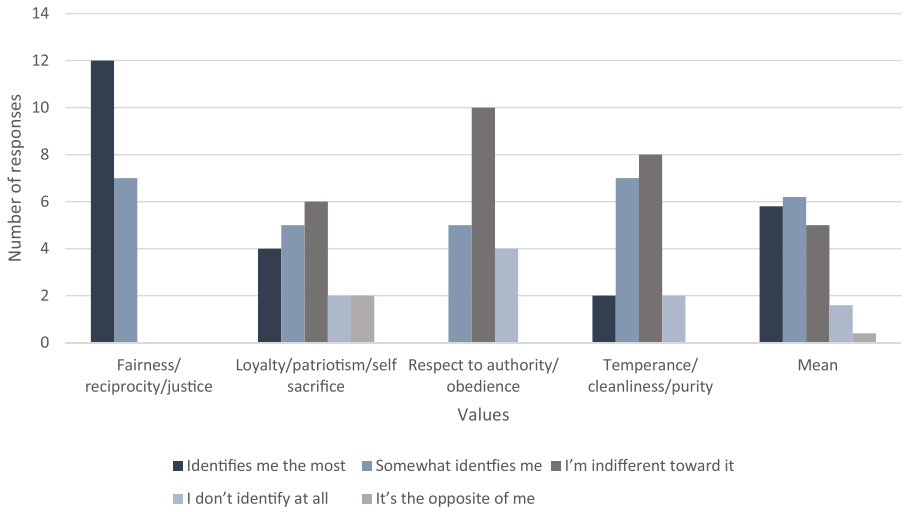

Figure 2. Values the creators identify themselves with the most. Authors' own work

3.2 Methodological description

3.2.1 Data collection. Interviewees are considered "key informants" (Tremblay, 1982), indicating they are carefully selected individuals with a solid link to the study's subject. The interviews (Appendix 3) were designed as semi-structured to facilitate data collection while allowing the respondents to elaborate on their personal experiences. The interviewing period was from April to August 2022, and all the interviews took place online via Zoom and MS Teams, using Microsoft Word for the transcription. Adhering to the Finnish institutional and national data management and protection guidelines, all participants provided consent declarations before the interviews, which were recorded and anonymized for their analysis.

3.2.2 Data analysis. The principal researcher evaluated each transcript and conducted a thematic framework analysis (Attride-Stirling, 2001) using MAXQDA. The theme saturation was reached at the fourteenth interview. The higher-level associations were organized into a preliminary list of tensions, dilemmas, and strategies as a basis for further analysis, using the SGD (Raftopoulos, 2014) and the gamification ethics questionnaire (Thorpe and Roper, 2017). Figure 3 outlines the steps undertaken.

4. Results

This study aims to present and estimate the value conflicts that the creators of sustainable consumption apps face when applying gamification and how they reconcile them responsibly. The process identified four main areas where conflicts and tensions are present:

(1) Content,

(2) Expected impact,

(3) Managerial issues, and

(4) External issues.

Table 5 offers excerpts from interviews illustrating these areas. The conflicts and tensions identified through this inductive reasoning process constitute a series of trade-offs to balance these four areas.

The section first presents the drivers and struggles of creating an SCA and keeping it in the market. Section 4.2 zooms in on the specific value and ethical conflicts related to gamification and how they are addressed.

4.1 The big picture

While most conflicts are not unique to sustainability apps, they tend to be more nuanced than those faced by other habit-changing apps because SCA users should remain hopeful that their actions make a difference in a larger context today and in the future, adding an extra layer of

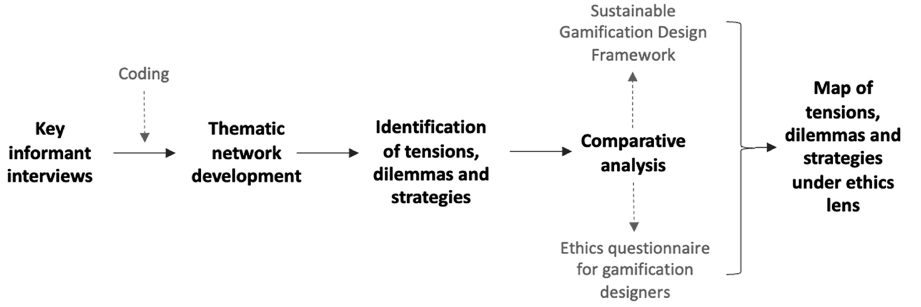

Figure 3. Methodological overview. Authors' own work

Table 5. Interview excerpts illustrating the main areas

Main areas		Data extract (examples)
1	Content	"Most people don't want to change their habits [. . .] they need to understand why it matters and how easy it is. This is why we have to get the content right" (interviewee-s9d4)
2	Expected impact	"We need to be constant in our efforts, and probably, or hopefully, we'll become more sustainable every day. We'll be doing our part" (interviewee-e1z6)
3	Managerial issues	"If I ever get into developing another app like this, I'd make sure to get someone to do the public relations work, the marketing. It is not as easy as it looks; it's not just sending a tweet or creating an Instagram post. It's a lot of work and time that I don't have" (interviewee-y3o2)
4	External issues	"Competition is very high; investors tend to have a degree of sustainability drive, but [. . .] they want results; they want them fast, they want to boast about them [. . .] it's not about developing an app for it to become better, at some point is just adjusting the app to please your investors" (interviewee-h9i5)

Source(s): Authors' own work

complexity in their design as some of the expected results may seem unattainable. The interviews distinguished two primary motivations for creating an SCA: personal interest and commitment to a broader cause (environmental impact, climate change, etc.) and the opportunities of the sustainability wave (more people interested, more infrastructure available). This section answers RQ1, presenting the main conflicts identified and the reconciliation strategies SCA creators have implemented to overcome these.

4.1.1 Conflicts and reconciliation strategies. All but two interviewees reported starting their apps out of different concerns about sustainability-related issues; the exceptions noted how different sustainability discourses make a strong business case. Most SCA creators denoted highly idealistic notions, and the conversations about what was behind their involvement in the apps revealed three key conflicts to reconcile where responsibility and ethical values play a relevant role:

4.1.1.1 Conflict 1: resource availability. This conflict was emphasized across areas 1 and 3, specifically three resources: content knowledge (i.e. research skills to provide accurate information), technical, and operational skills (i.e. business development, personnel, legal issues, sales, and marketing). The relevance of each resource varied per type of creator, app function, and actions undertaken to resolve these challenges.

Conflicting resource 1: knowledge and skills. While all creators noted the importance of having a team to handle the app properly, three declared feeling deterred from working on the app due to the time to gather information. All creators with technical backgrounds mentioned the need to cooperate with at least one other person to handle the scientific content and sales/marketing activities. Non-tech creators behind many purely informational, educational, and impact quantification apps echoed this plight, as providing transparent and reliable information is part of their value proposition. The apps focusing on performance tracking and choice-editing (e.g. presenting plastic-free alternatives) invest more in their marketing and research operations than scientific fact-finding. Four creators emphasized the need for external legal advisors to comply with GDPR, local regulations, and the app market rules. However, according to another four creators, the data management specifications of the platforms suffice.

Conflicting resource 2: time. Teams of 10 people or less comprise 57% of the SCA creative teams. The smaller the team, the more time the creator spends juggling content development, app functionality, and business operations. All five apps that are no longer in the market were either crafted by one individual or pairs. The single creators and those from teams with fewer than six people mentioned how complicated it is to choose priorities for their daily activities. The challenges related to managing time to meet all necessary milestones for an updated, functional, and interactive app are numerous and demanding.

Conflicting resource 3: financing. Except for the project-funded apps, 18 creators faced financial constraints at some point. Those who started with start-up funding from third parties were concerned about the urgency of becoming self-sustaining. The creators must meet their investors' expectations, which are often unrealistic (e.g. short-term), or too foreign to the app's purpose. Those creators who self-funded their apps soon needed to either generate revenue or attract additional investors.

These conflicts resulted in several reconciliation strategies, challenging the creators to reconsider what their apps stood for and what they meant for their daily activities.

Reconciling the knowledge and skills gaps. The creators sought collaboration with universities and learning institutions for trustworthy content. Collaborating with researchers often entails using personal networks and tight timelines; it can also be time-consuming and expensive when critical data is not readily available. One app was developed in a living-lab environment, a one-of-a-kind approach that most creators cannot access. Three apps had a person (or even a team) dedicated to information-seeking and cross-checking the data's veracity. Sixteen app creators noted that when funding was available, they would hire experts to fill the teams' missing skills, typically on part-time contracts.

Reconciling the time-related conflicts. Six interviewees emphasized the contradiction between doing proper development work, which requires testing and enough time to get significant results, and the need for fast and reliable results to present to funders and keep the users engaged. The most experienced creators claimed to have an estimate of the resources required for such projects. For the less-experienced app creators, time management has been one of the main learning points. The pressure is also closely related to the app's business model. While those relying on external investment need to be able to report specific results at given times, those with a self-revenue generation system (premium fees, licenses) or not-for-profit organizations understand that their growth could happen more organically and slowly if they choose to.

Reconciling financial conflicts. The financial aspects caused the biggest conflict between personal beliefs and the reality of running a business. The fifteen creators who reported a shift in their business models mentioned doing so around 18–24 months after launching the app to address their financial woes. Three apps did not survive the transition, while four were still in the initial stages of their activities under the new model. In the cases where the apps became employee engagement programs, the creators noted their resources were now focused on keeping these versions updated. While the option of including ads in their apps was discussed, 20 creators decided not to do it for reasons ranging from not compromising the apps' content to diminishing the user experience on small screens. Offering ad-free versions as a perk of their paid versions was unsuccessful for those who tried it out because the fees were too small to generate significant income.

4.1.1.2 Conflict 2: intention and orientation. This conflict lies between areas 2 and 4. Thirteen interviewees emphasized that their work is oriented toward the long-term outcome of sustainability and *generating impact today*, achieving short-term goals to keep the users engaged. The dilemmas related to this stance were associated with the application of gamification as a strategy to meet these goals, with two creators opposing it because it would distract the users. Contrariwise, seven creators praised the motivational benefits of gamification as a way of inviting people to return to the app and use it to generate impact. *"Keep it real"* was the expression commonly used by the three creators who believe that the process is more important than the long-term goal. These creators noticed that being ethical meant total transparency and understanding that, due to contradictory interests, we would never be entirely sustainable, but trying to do our best is worthwhile.

Reconciling the apps' intention and orientation. Five creators declared sustainability as a *goal and a means*, where the ethical approach is to give people tools to make their consumption choices considering their consequences. Communicating this message through an app entails a significant challenge, and gamification has proven helpful in addressing it. All these apps are gamified (three are games), and two are among the oldest.

4.1.1.3 Conflict 3: organic growth vs. survival strategies. This conflict delves into the creators' challenges to survive while dealing with the users' expectations and attitudes (areas 3 and 4). Twenty creators declared that their app's objective was to "encourage people to do

something good," "leaving users the choice," or "simplifying change." These goals mean that the apps' growth and survival largely depend on how much the users appreciate the content and what they gain from them. While the benefits are straightforward from the creators' perspective, the users' willingness to pay for these services is less certain. Eleven creators noted that their users think of sustainability as a common good, and they expect SCA to be free, fully functional, engaging, and valuable. One of the most experienced creators reflected that the company's motto was to make it simple but not free. Although most of the interviewed creators had experienced the conflict that emerges from providing free services, they would disagree with this mentality because they also see access to sustainable choices as a human right.

Reconciling survival strategies. One of the keys to reconciling this conflict lies in the *chosen business model*. Social enterprises (3 apps) need to produce specific results to keep receiving funding. None of the apps work purely on a business-to-business model. However, it is a strategy that 24% of creators adopted after experiencing financial distress and trying to stay alive. Five apps developed a "business" version, selling licenses to companies or public offices. Of the nine apps that still operate as business-to-consumer, two are publicly funded via projects; both creators noted that once the funding runs out, they may work on the app as part of the projects' follow-up. Another model is *voluntarism*, applied through two different approaches. The first is a strategy to prioritize the investment of existing resources. Two apps with start-up funding had the entire core team working voluntarily, with the funding covering the company's survival operations. The second approach, presented by one creator, consists of having the entire app built and run by volunteers. It is registered as a not-for-profit, and it values its status as an independent, cooperative entity. The creator acknowledged being the app's orchestrator in terms of managing the legal aspects and the technical details; the content development, marketing, and other tasks are entirely done by volunteers who donate their time and expertise as their commitment to the cause, creating a global community.

Besides the creator who decided to develop a sustainability app because it presented a good business opportunity, three interviewees noted that their app was a way to support the sharing economy. The ethical considerations were seen as part of the apps' core functions and their quality promise. These creators, or community-builders, used similar words to describe their apps' goals, explaining their apps were the response to various needs and opportunities that they found where they live. Two of these creators are willing to use gamification if it improves the user experience and strengthens community ties.

4.1.1.4 Conflict 4: staying true to the cause while gaining the users' trust. This conflict appears among areas 1, 2, and 4, emphasizing the relevance of gaining the users' trust through feedback loops, constant communication, and acknowledging the users' input. In their pursuit of trust building, the creators should be wary of how flexible they will be with the "give the users what they want" motto. Allowing the users to play by their own rules (e.g. using a platform to trade second-hand clothes for commercializing new products) may compromise what the app stands for and destroy its unique value proposition. Some creators also fear that using apps to engage in actions toward sustainability may be watering down the relevance of the problems tackled. Trust translates into engagement, yet it is important to draw some boundaries to the different gamified activities within the app, planning the activities so that the novelty does not wear off or that using the app becomes annoying.

4.1.1.5.1. Overview. This study explores the conflicts SCA creators face when applying gamification and how they reconcile these responsibly. Therefore, the first step consisted of analyzing the phenomena behind the creation and maintenance of SCA, showing a continuous learning process where personal beliefs are often challenged by the creators' expectations toward the users versus the users' expectations when engaging with an SCA. Some conflict-reconciliation strategies entailed the creators reevaluating their apps' priorities and purpose. While there is no prescriptive formula to reconcile these conflicts, this study sheds light on some of the most common yet diverse ways these have been addressed with different degrees of success, underlining the nature of trade-offs behind sustainability-oriented decision-making processes.

The following subsection answers RQ2, highlighting the ethics-related conflicts emerging from applying gamification, accentuating areas 1 and 2, and revealing the tensions the SCA creators must face.

4.2 Value and ethical conflicts for applying gamification in SCA

The topic of gamification led to opposite views. Three creators perceived it as dishonest, manipulative, and unnecessary. "Our responsibility to save the planet should be motivation enough" (interviewee-g8w8). The three non-gamified app creators relied on the user's identification of the app's value as the reason for their loyalty. Persuading the user also means not jeopardizing the playing experience for monetization or making the user feel lectured. "The gamification elements should not feel like you're teaching yet should serve a purpose beyond just being there because they are fun" (interviewee-k7q1). These contradictory viewpoints led to two further conflicts related to gamification's implementation.

4.2.1 Conflict 5: gamification as a value destroyer. Raftopoulos (2014) argued that for every value-creation benefit that gamification may convey, there is a corresponding value destroyer of which designers must beware for ethically implementing gamification. Thus, the SGD framework has a values-ethics frame at its core as a proposal to structure and manage the impact of these value-destroying elements throughout the development process (Raftopoulos, 2014). The SGD highlights the relevance of respecting human capability and dignity as the core of the designed solutions, which should be built around elements of transparency and trust for involving other stakeholders (Raftopoulos, 2014). Analyzing the approaches to apply gamification and the reasons behind this choice unearthed the following tensions:

Tension 1 - Engagement versus loss of individual agency (Areas 1 and 2). Most interviewees (13) were concerned about this destroyer when talking about gamification. Five creators emphasized the need to provide information without making the player feel judged. Five creators noted that the apps were needed because users would not do anything independently. "Here's the information, you decide. We are making your path easier for doing positive things" (interviewee-a4r9). Two creators mentioned how their apps enabled individual agency: "We give options for users to calculate their impact, they compete against themselves, so they have total control of their actions" (interviewee-u6f9).

Tension 2 - Third-party involvement and partnership formation (Areas 1 and 4). This tension relates to teaming up with external organizations to address challenges such as financial resources. All creators expressed their concerns about data management and privacy, with 18 not collecting any personal data. Sign-up requests are or can be removed to make users entirely anonymous, although facilitating access through social media means their users abide by other platforms' privacy rules. Privacy is a priority for the apps involving in-app transactions (6) and underage users (2). Anonymity is part of the value proposed by all apps servicing businesses. The risk of having their users' data accessed by third parties via advertisement was noted by seven creators; however, none of them had ads in their apps. Only one app aims to provide its partners with anonymized user data – their business model is to provide "green consumers" insights.

Tension 3 - Encouraging and rewarding actions while avoiding oversimplification of real problems (Areas 1 and 2). Gamification could be perceived as a superficial approach that compromises the cause's authenticity or gravity of the problems, even jeopardizing the "purity" of the app's cause providing short-term gratification, a "dopamine rush." Over half of the creators showed uneasiness when questioned about the unsustainable impacts or potential risks their apps represented, with four bringing forward the issue of being perceived as inauthentic or too trivial, "you don't want to be too extreme, or you won't be taken seriously, but you can't water down the problems"(interviewee-u6f9). The authenticity issue was presented as a potential unethical behavior from the app users: "The rewarding system [. . .] may induce people to start cheating just to keep competing, totally missing the app's point" (interviewee-n3r7). The illusion of change is a cautionary tale that eight creators noted.

Gamification should be applied to the extent that it encourages the app's use as a tool to help an eventual habit change, ensuring that users know the real impact happens because of their actions, not the app. Most creators consider small gratification elements crucial for motivating users and triggering individual agency and expect that users acknowledge that the app rewards are just a symbolic

recognition for acting toward a more prominent, real-life goal. "People like to be recognized when they do something good, even small things. We are not lying about it. They are inspired to keep doing it, and in the end, they can see they achieved something bigger than they thought" (interviewee-a7d3). In some cases, the creators justified the use of gamification as the best way to visualize the change: "We decided to put fun first because the impact comes after people play the game [. . .] it can happen without the app, true, but it may not be half as fun" (interviewee-m3r5).

Tension 4 - Mandatory app use vs. personal drive (Areas 1, 2 and 4). This is a fundamental issue for apps designed for employee engagement or multilateral cooperation projects; after all, they are operating as action enablers, so they need to reach a certain number of users while, at the same time, participation must be entirely voluntary with no other incentive from the app than being useful. The creators should be aware of features that, instead of motivating, could be perceived as coercive, "we must be very context sensitive. [. . .] you can't just force people to play and like your app just because you've got the funding for it" (interviewee-e1z6). The creators are not aware of their apps being used for any purpose other than CSR strategies, presenting educational programs, or citizen consultation. Apps that rely solely on a personal drive may consider gamification a selling point for dealing with increasing competition. However, they should also find a way to deal with the challenges of implementing strategies that do not undermine personal engagement or lead to other value destroyers.

The strategies to tackle this conflict ranged from steering clear of gamification to having a person (or team) specialized in designing and continuously maintaining the app's gamified features. Notwithstanding that gamified SCAs tend to fare better in terms of usage and ratings than their non-gamified counterparts (Guillen *et al.*, 2022), this conflict is linked to the resources available to invest in a gamification strategy that serves as a trust builder and reinforces the app's purpose. While most creators already reported a transparent disclosure of information, five published their codes of ethics or sustainability reports, and only two, besides the game developers, made explicit statements about the gamified elements of their apps. This practice can build trust and show how gamification adds value to the app.

4.2.2 Conflict 6 – understanding gamification as a source of ethical tensions. Besides reflecting on the apps' gamification ethical aspects, the SCA creators elaborated further on their notions about ethics concerning their individual beliefs, apps, and functions. The interviewees were not asked the exact questions of Thorpe and Roper's (2017) questionnaire; however, their answers about ethical concerns, particularly the unintended impacts and use of gamification, allowed the identification of five overarching ethics-related tensions, depicting clear lines for further inquiry that gamification researchers can enable and SCA creators can pursue. Table 6 presents a summary.

Tension 5 - Current knowledge vs. additional education (Areas 1 and 3). The familiarity with using game elements to engage the user varied largely. Two creators are game developers, and seven reported being knowledgeable and directly responsible for the gamification strategies of their apps, even if they were not doing the technical aspects. Nine creators expressed insufficient knowledge to be involved in the gamification design process or its execution. Therefore, *the first step for SCA creators is to be educated about gamification and the ethical issues they will likely face as they explore the topic*. To understand the implications of applying gamification, the creators should be honest with themselves about how much they really know versus what they think they know and consider the investment to get properly educated on the topic.

Tension 6 - Learning from others vs. learning by experience (Areas 3 and 4). Information about other apps' performance is not readily available, and "acquiring professional marketing insights is very expensive. I decided to do the research myself. It was highly costly regarding my time, but I knew what I was looking for and managed to get a lot from talking to people" (interviewee-u6f9). While four creators met at industry events and nine interviewees mentioned other apps or organizations they found an affinity with, four creators entered the app market because they could not find what they needed. There are lessons to be learned from similar apps. Some of the longest-existing app creators clearly expressed the relevance of keeping updated with what others offer and what users perceive: "We did our homework and noticed some try to make an app that fits all [. . .] We know everybody is different [. . .]" (interviewee-s9d4). More than spending resources on market studies, a key to

Table 6. Summary of the creators-related conflicts and reconciliation approaches

Driver	Conflict areas		Reconciliation approaches
Cause	Resources	‣ Knowledge and skills	‣ Subcontracting ‣ Teaming up with experts ‣ Self-learning
		‣ Time	‣ Priorities' management training ‣ Creating timesheets with calculations based on previous projects
		‣ Financing	‣ Using free services available for start-ups, students and NGOs ‣ Diversifying business models ‣ Creating premium services ‣ Licensing and membership schemes ‣ Considering add on- in-app services
	Intention and orientation	‣ Impact generation	‣ Communicating clearly what the objectives of the app are, both in terms of benefits for the user as for the ultimate goal to achieve ‣ Visualizing the steps toward achieving the desired goal
		‣ Realism	‣ Using only reliable, verifiable information ‣ Presenting narratives that highlight why the process is more relevant than the goal itself ‣ Encouraging users to realize that their individual actions play a relevant role
		‣ Systemic thinking	‣ Ensuring that the users are aware that the gamification features are motivational tools that they may not need when changing their habits
	Growth vs survival	‣ Revenue creation	‣ Taking proper time to explore the business model that suits the value proposition of the app and the capabilities of the creator(s) ‣ Being aware of the priorities to keep the app valuable to their users
		‣ Users' expectations and attitudes	‣ Keeping the play experience free for the users ‣ Being transparent about your costs for keeping the app free ‣ Voluntarism
Chance	Staying true to the cause while gaining the users' trust		‣ Enabling feedback loops to keep reminded of what the app stands for and what makes it different from others in the market ‣ Having clear key performance indicators to report about from the very beginning of the relationship with funders so they know what to expect ‣ Preventing fatigue when applying gamification ‣ Keeping a neutral, informative tone within the app and when communicating with the users ‣ Establishing communication channels and reply to the users' feedback
	Gamification as a value destroyer		‣ Using gamification as a prompter to action, giving the user the chance to choose the features they like ‣ Anonymizing all data collected ‣ Skipping sign-up features that may lead to third parties accessing the users' data ‣ Highlighting that the problems are real and the app facilitates small steps to achieve a greater, common goal ‣ Presenting how gamification is implemented in the app, the reasons and expected outcomes from using it ‣ Enabling opt-in/opt-out options for gamified features

(*continued*)

Table 6. Continued

Driver	Conflict areas	Reconciliation approaches
	Gamification as a source of ethical tensions	‣ Considering the implementation of gamification as a trial-error experience ‣ Continuously checking (and responding to) users' feedback ‣ Introducing ethical considerations into the design of their apps, even if they choose not to communicate about ethics ‣ Considering potential negative impacts of the app and including these in the design process ‣ Elaborating a risk management plan for all stakeholders involved ‣ Using local servers to reduce CO_2 emissions and a closer management of data

Source(s): Authors' own work

facilitating this learning consists of continuously checking the users' feedback and offering clear channels and opportunities to express suggestions and complaints about how the app works and what the users value.

Tension 7 - Risks transparency vs unexpected outcomes (Areas 1, 2 and 4). The conversations included issues of unsustainable outcomes, addiction, and overuse. For four creators, these were topics they had never considered before. For three, the notion of "overusing" the app was something positive, as it meant that more sustainable choices were happening. "The app calls for action [. . .] I feel that overusing the app just creates more positive impacts" (interviewee-a4r9). For two creators, the idea of addiction or overuse was not a possibility. Four creators mentioned the risk of cheating or misusing the apps. To address this situation, the creators have implemented solutions such as managing the rewards through in-app transactions with no validity in the "real" world. While all creators declared having risk assessment plans, clear user guidelines, mechanisms to adhere to regulations, accountable and transparent practices, and codes of conduct when dealing with partners, not all related these measures to their ethical values. This could be interpreted as the creator focusing on the app as its product, even if it was developed to express their personal beliefs and convictions. Hence, SCA creators need to be able to introduce ethical considerations into the design of their apps, even if they choose not to communicate about ethics.

Tension 8 - The engagement experience vs unwanted outcomes (Areas 1 and 2). Most apps aim to educate and inform. Three non-gamified apps provide lists clustered under different categories, sometimes illustrated with an image. In two cases, users can share comments. The gamified apps are more dynamic, presenting diverse engagement strategies. All creators highlighted the relevance of the user experience and the importance of feedback loops for improving their apps' content and discovering unexpected outcomes or instances where their apps could be misused. The latter was emphasized as a risk: "We have already had situations when a commercial brand wants to pay for our data or to feature on our website [. . .] selling out would be unethical, our users trust us for our transparency and impartiality" (interviewee-f6h1). For users' feedback collection, the approaches range from studying the metrics and online analytics to having someone working in customer relationships. Four rely on quantitative insights from in-app surveys and algorithms, while nineteen operate with written, qualitative feedback. All creators agreed on the relevance of responding to feedback, acknowledging its value, and, most importantly, acting upon it. Eight interviewees reported how their gamification strategies were developed or adopted from users' suggestions, leading to several questions they deemed ethical concerns: "opt-in is the ethical way to nudge, so gamification should be optional" (interviewee-h9i5).

Considering potential negative impacts and including these in the design process addresses this tension. Some of the most ideal-driven creators found this notion challenging. In contrast, all the opportunity-driven creators and the most seasoned ones had concise risk assessments and mitigation plans featuring unintended gamification-related outcomes, although no app had

any mechanism to make the users aware of these. Strategies to prevent or mitigate unintended outcomes should be made clear and feature in the communication within the SCA creative team and with their stakeholder groups.

Tension 9 - Team values vs. personal beliefs (Areas 3 and 4). Most 5- to 10-person teams started with the "core" group working pro bono, investing their resources to create and launch the app, and developing a shared understanding of its goals, objectives, and potential roadblocks. Half of the 1-creator apps noted mismatched objectives with their co-creators as a reason for working solo. Not all the teams had values or ethics discussions because sub-contracted individuals abroad do much of the work.

Tension 10 - Unrestricted and limited collaborations (Areas 1, 2, 3, and 4). Collaboration with researchers and creating partnerships with other agents helps to improve the apps' content, reach broader audiences, and generate revenue. Four creators noted that they would consider collaborating with companies with dubious sustainability credentials because "they are the ones who need help the most. If their employees are engaged in change, they can help reduce the companies' impact" (interviewee-a4r9). Another four creators declared having strict partnership guidelines, accepting contacts or requests for meetings with organizations with B-Corp certifications, for example. Two creators whose apps provide rankings and evaluations of companies and products performances steered clear of partnerships that could compromise their apps' integrity, alluding to their users' trust in the app. Eight creators noted that, while not having an explicit set of guidelines to choose partners, they were also not "open for all," mainly because of the objectives and the app's functions. Only one creator presented partnership-making with governments and businesses as its core business model.

5. Discussion

To answer its research questions, this study considers gamification as a value-generating opportunity for sustainable consumption apps. The conversations with 21 SCA creators revealed a relatively unexplored field of guiding principles and self-reporting approaches where specific ethics-driven design frameworks seem largely absent, maybe because ethics is perceived as a high-level topic often fused with the notion of responsibility, or because the creators fear that presenting their values may distract the user. Although the apps have different approaches to information provision and choice-making, they are all within the definition of (sustainable) ethical consumption as they represent a wide range of ethical stances, e.g. environmentalism, solidarity, fair trade, health, and community support (Fuentes and Sörum, 2019). All the creators spoke about several ethical concerns related to gamification and how they affect their work, and this section summarizes the theoretical and practical implications of the present research.

5.1 Theoretical implications

This study touches upon issues of responsibility and innovation, highlighting the intersection between personal values and the challenges of keeping an innovative service relevant, contributing to research on sustainable human-computer interaction through design (Scuri *et al.*, 2022), and value-centered gamification design for its strategic implementation (Raftopoulos, 2014; Thorpe and Roper, 2017). This study's experience-based approach shows that most SCA creators prioritize privacy and data safety, with most apps collecting minimum data for analytical purposes and shunning third-party interventions. The results highlight that a roadblock for gamified SCA lies in the "prejudice to gamification" (Al-Msallam *et al.*, 2023), resulting from the lack of in-depth knowledge of how gamification works, or the lack of resources to develop approaches that can meet the users' expectations (Huber and Hilty, 2015; Hunger *et al.*, 2023).

This study revealed that the dimensions of Responsible Research and Innovation (RRI) –anticipation, reflexivity, inclusion, responsiveness, and care (Burget *et al.*, 2017)– are embedded within the creation and survival strategies presented by the creators, hinting at a latent sense of responsibility and awareness of the potential ethical risks of implementing gamification needed for RRI endeavors. Therefore, for SCA creators, it is relevant to consider what they implicitly and explicitly convey about their personal values through their apps,

providing accurate information and helping users reflect their own ethical stances (Hawkins and Horst, 2020). Furthermore, SCA creators can benefit from familiarizing themselves with RRI dimensions and identifying their current and potential opportunities for their creative processes. Appendix 4 shows some of these possibilities.

5.2 Practical implications

Considering the creators' backgrounds and diversity, exploring their creative journeys through value-based design frameworks opens a multidisciplinary dialogue, presenting a series of hands-on strategies that may *serve as a guideline to any individual willing to create an SCA*, helping them to identify potential pitfalls and include issues to consider in the strategy and risk planning processes. This study's results contribute to research exploring the risks of applying gamification from the decision-maker perspective (Hammedi *et al.*, 2021) while also recognizing users as decision-making agents (Huber and Hilty, 2015; Hawkins and Horst, 2020). To tackle safety-related tensions, elaborating risk maps from the very early design stages and aligning the creator's values and ethical stances with those the app promotes offer a promising starting point.

The strategies to deal with the tensions of staying present in mainstream platforms, and being innovative and engaging while generating value for the users, highlighted practical and ingenious solutions (e.g. in-app mini games or seasonal challenges), most of them being gamification examples, reinforcing the argument in favor of gamification for user engagement (Mulcahy *et al.*, 2020) notwithstanding awareness of the risks and planning how to prevent unexpected or harmful situations (Hammedi *et al.*, 2021). Value for money is the user request that the creators find most challenging to reconcile because most seem to grapple with the ethical dilemma of creating a barrier to living more sustainably by requesting some monetary compensation. The practical approaches to circumvent these challenges include operating the apps as volunteer-based not-for-profits, creating premium programs for employee engagement, collaborating with schools, and partnering with public offices. From a user standpoint, this study brings forward the notion that, by understanding what is behind the apps, responsible consumers can identify the ones whose ethical stances reflect their own.

The qualitative approach offered by this study provides a more nuanced exemplification of gamification as an innovation, inviting multidisciplinary and collaborative efforts to investigate and measure the impact that different app designs have on habit formation over time, assessing the apps' mid- and long-term impacts.

6. Conclusion

Responsible research and innovation calls for the ethical development of technological solutions to meet their objectives responsibly. Analyzing the value or ethical conflicts SCA creators face when applying gamification revealed that they all feel responsible for providing transparent, reliable, and fact-based information. The creators' attitudes toward gamifying their apps offered several insights about their codes of ethics and their risk awareness. Arguably, the creation process of SCA and their survival strategies are the same as any other app in the market; however, the apps' purpose indicates the most critical differentiation factor: SCAs are meant to help shift individual behaviors toward a long-term, common societal goal (sustainable development). The analytical frameworks, which were not explicitly developed for app design or sustainable consumption issues, represent one of this study's limitations. Methodology-wise, the limitations include the relatively small, highly Eurocentric sample. Including SCA creators and users from other geographies may open other challenges and reconciliation strategies, particularly concerning cultural contexts and traditions. These limitations invite gamification researchers and app creators to work together to develop app-oriented ethical frameworks. Further research can help to incorporate the creators' moral notions and specific socio-cultural elements to define ethics and values, understanding the contexts where the apps will be operating to find engagement strategies and business models

that benefit the app creators and their users. Other research avenues include quantitative analyses and the inclusion of the consumers' voices through empirical means (e.g. surveys, focus groups) to understand the apps' impact and the role gamification plays.

Most SCA creators started as individuals trying to live more sustainably. Their efforts led them to identify needs (their own, in their communities) and opportunities to act, thus becoming change agents. Their journeys are fueled by hope and ingenuity to tackle adversity driven by the conviction that as consumers, entrepreneurs, developers, or simply concerned citizens, they can make sustainability happen.

About the authors

Dr Georgina Guillén is a postdoctoral researcher at the intersection of sustainability, gamification, and human behavior. At the Gamification Group, she has been exploring the implications of gamification as a responsible research and innovation approach to advance sustainability transitions and translate scientific research outcomes into everyday language. Her studies include sustainable human-computer interaction design and applications and the development of tools for practical implementation to facilitate transitions toward the circular economy.

Dr Juho Hamari is the head of the Gamification Group and vice dean of research at the Faculty of Information Technologies and Communication Sciences at Tampere University. He leads research on empowering technologies (e.g. gamification, XR, AI) under the Academy of Finland PROFI6, Flagship, and Center of Excellence programs. His research, cited over 40,000 times, focuses on the science and practice of using technology to tackle grand global challenges related to the planet, people, prosperity, or peace.

Dr Jaco Quist is an assistant professor of sustainable innovation and transitions at the Technology, Policy and Management Faculty at Delft University of Technology. His research and teaching revolve around sustainable innovation and transitions, particularly participatory visioning, backcasting, and transition management. His work centers on the fields of Sustainable Consumption and Production (SCP), Circular Economy, Renewable Energy, Climate Adaptation, and Urban Agriculture and Food.

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Supplementary material

The supplementary material for this article can be found online.

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Corresponding author
Georgina Guillén can be contacted at: georgina.guillen@tuni.fi