SUSTAINABILITY TRANSPARENCY: SCOPE FOR DIGITAL SERVICES

TRANSPARÊNCIA PARA SUSTENTABILIDADE: ESCOPO EM SERVIÇOS DIGITAIS

TRANSPARENCIA EN SOSTENIBILIDAD: ALCANCE EN SERVICIOS DIGITALES

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ABSTRACT
Transparency for sustainability in digital services represents an emergent challenge for organizations. In addition to the technological push to operationalize digital infrastructure and information systems, knowledge to support service designers in approaching transparency challenges is limited. An understanding of what sustainability transparency means and how to inform the scope for its application in service design is needed. A literature review of the historical evolution and key conceptualizations was used to provide a theoretical framework. Then, an exploratory multiple case study (ex-post-facto) (representing the different contexts of practice) was conducted to help validate and refine the framework. The provided framework can help in understanding the ethical, communication, and value creation implications of the concept from the digital service-encounter to more systemic levels.

KEYWORDS
Transparency; sustainability; digital services; service design; responsible design.

RESUMO
Transparência para a sustentabilidade em serviços digitais representa um desafio emergente para as organizações. Além do avanço tecnológico para operacionalizar a infraestrutura digital e os sistemas de informação, o conhecimento para apoiar designers de serviço em desafios de transparência é limitado. É necessário entender o que transparência para sustentabilidade significa e como orientar o escopo de sua aplicação no design de serviço. Uma revisão da literatura sobre a evolução histórica e principais conceituações no tema foi usada para fornecer uma estrutura teórica base. Em seguida, um estudo de caso múltiplo exploratório (ex-post-facto) (representando os diferentes contextos de prática) foi realizado para ajudar a validar e refinar a estrutura. A estrutura fornecida pode auxiliar na compreensão das implicações éticas, de comunicação e de criação de valor do conceito, desde o ponto de contato digital do serviço à níveis mais sistêmicos.

PALAVRAS-CHAVE
Transparência; sustentabilidade; serviços digitais; design de serviço; design responsável.

RESUMO
La transparencia para la sustentabilidad en los servicios digitales representa un desafío emergente para las organizaciones. Además del impulso tecnológico para poner en funcionamiento la infraestructura digital y los sistemas de

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información, el conocimiento para ayudar a los diseñadores de servicios a abordar los desafíos de transparencia es limitado. Se necesita una comprensión de lo que significa la transparencia de la sostenibilidad y cómo informar el alcance de su aplicación en el diseño del servicio. Se utilizó una revisión de la literatura sobre la evolución histórica y las conceptualizaciones clave para proporcionar un marco teórico. Luego, se llevó a cabo un estudio exploratorio de casos múltiples (ex-post-facto) (que representaba los diferentes contextos de la práctica) para ayudar a validar y refinar el marco. El marco proporcionado puede ayudar a comprender las implicaciones éticas, de comunicación y de creación de valor del concepto desde el encuentro de servicios digitales hasta niveles más sistémicos.

PALABRAS CLAVE

Transparencia; sostenibilidad; servicios digitales; diseño de servicio; diseño responsable.

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1. INTRODUCTION

There are different types of transparency studies in literature, from abstract meanings of the concept to more practical ways to operationalize it efforts, in fields such as philosophy, sociology, political science, corporate governance, information systems, among others (ALLOA and THOMÄ, 2018). This study aligns with publications arguing for the importance of exploring transparency in a more critical and holistic perspective, considering its role in reshaping socio, environmental and economic relationships (EGGERT and HELM, 2003; MCCARTHY and FLUCK, 2017; ALBU and FLYVERBOM, 2019).

Transparency for sustainability has been tightly pushed in production and supply chain contexts, by organizational regulations and information technologies such as traceability (SCHIEFER and DEITERS, 2013; NICASTRO, 2020). Although in digital service contexts such initiatives remain relevant, they are no longer sufficient to provide the active transparency demanded by the customers. Within this perspective, a more active transparency strategy can play a role in service value creation, influencing the success of sustainability efforts through digital services (EDVARDSSON et al. 2005; SANGIORGI and PRENDIVILLE, 2017).

In that sense, Dennett and Roy (2015) argues that we are currently witnessing a period of "transparency explosion" with individuals and organizations exposed for better and for worse, impacting notions such as knowledge, belief, illusion and trust. For Dennett and Roy (2015), this will pressure the evolution of novel organizational arrangements that are more open, responsive, and decentralized.

Ethical issues play a major role in transparency and are gaining relevance in design for services, concerning what to stand for, what are the impacts and unintended consequences, and how people are included on services to promote a more sustainable society and new business offerings (MAGER et al., 2020).

The transition to the digital age, also called Fourth Revolution, is opening space for reshaping both society and people's lifestyles, behaviors, realities, values, and beliefs. Besides making use of information technology for automating basic processes and speeding up the exchange of information, the digital age has been characterized by a convergence of multiple technologies happening today (mobile, location-based, virtual reality, blockchains, artificial intelligence (AI), wearable technologies, chatbots, Internet of Things (IoT), etc.), that is blurring the lines between the physical, digital, and biological spheres (WEF, 2017; ZAKI, 2019).

On the organization side, digital capabilities can create new ways of serving customer's needs and enhance service value. On the customer side, the demand for transparency and engagement is growing, pressuring organizations to adapt the way they design relationship, communication, and collaboration-based experiences (WEF, 2017; ZAKI, 2019; NICASTRO, 2020).

An understanding of sustainability transparency characteristics in digital services and how to inform the scope for its practical application in service design is needed, leading to the goals of this study. Due to the broad range of definitions and the multidimensional characteristic of transparency, a range of classifications is present in the literature. However, it lacks linking the levels of intervention for service design.

2. THEORETICAL FOUNDATION

2.1. Understanding transparency

The term transparency can have a different meaning according to context or science, being a broad concept that applies to many areas such as engineering, business, humanities, etc. (PASQUIER and VILLENEUVE, 2007). Also, these areas can adopt a specific use of the concept, such as organizational transparency, budget transparency, transparency government actions and responsibilities, document transparency, among others. However, the emphasis in the literature on transparency definitions is from Organizational Governance and Accountability, also from International Relationships, and Politics areas. Those conventional definitions vary according to the scope and meanings (MICHENER and BERSCH, 2013).

Along the history, different concepts emerged and became associated with the term transparency, which gained multiple meanings and uses until more recently. Each distinct theoretical approach has generated a specific understanding of transparency. Due to that, there is an emerging consensus that no unified transparency theory has been put forward, and that transparency can exist across different contexts and domains of research, resulting in not having a single well-articulated definition (MICHENER and BERSCH, 2013; MEIJER, 2015; SCHNACKENBERG and TOMLINSON, 2016; MABILLARD and ZUMOFEN, 2017; ALLOA and THOMÄ, 2018; JANNING et al., 2020).

In this sense, Michener and Bersch (2013) argues that transparency has historically served less as a theoretical gathering point and more as a descriptive heuristic, suggesting that scholars have tacked on adjectives and

metaphors to describe transparency and analyzed its directionality or correlated it with social values.

Despite the general manifestations, one way to approach transparency is as an intrinsic value (implying it is an end in itself) (GRIMMELIKHUIJSEN, 2012). For a long time, transparency was etymologically and semantically associated with visibility, as a quality or attribute of a material object. Another one way to approach transparency is as an enabling state (implying a means to achieve other important goals) which is the focus of this study (GRIMMELIKHUIJSEN, 2012).

From the eighteenth and nineteenth century, it can be observed that more metaphorical derivative usages of transparency as a normative concept in the fields of ethics (or moral philosophy) as a matter of an ethical principle for democracy. According to Fieser (2021), normative ethics involves arriving at moral standards that regulate right and wrong conduct. This may involve articulating the good habits that we should acquire, the duties that we should follow, or the consequences of our behavior on others.

The sociopolitical developments from the Enlightenment period in the 18th century influenced debates about new forms of citizen involvement in politics and public affairs. According to Meijer (2015), these movements contributed with basics of transparency: open decisions, open meetings, and open information.

In this context, transparency as openness would become one of the main metaphorical uses in domains of democratic govern reforms, as a morally laudable character trait, indicating someone who is not withholding secretive intentions and signaling the trustworthiness of the actor in negotiations (BALL, 2009; ALLOA and THOMÄ, 2018). For Alloa and Thomä (2018) openness can take various forms, and in part it overlaps with some of the varieties of transparency: an openness in terms of accessibility of information ("seeing it all"); an openness in terms of sincerity ("saying it all"); an openness in terms of potential participation and transformation ("doing it all"). According to Janning et al. (2020), transparency as openness was most characterized by an ex-post transparency, like an act of justification in face of legislation.

Although the moral idea of transparency became popularized from the 18th century on, the concept as a matter of an ethical principle for democracy, also dates back from ancient Classic Philosophy 6th century BC (ALLOA and THOMÄ, 2018). It was mainly in the 19th century that the term transparency was explicitly used for the first time, representing a "right to know". According to Michener and Bersch (2013), the term transparency became popularized when political and economic changes began to take shape in the 20th century, mainly in the political and organizational domains, for open decision-making and for counter corruption.

Contemporaneously, the most common form of transparency as a political practice is through "freedom of information" (FOI) or "right to information" (RTI) legislation (KOSACK and FUNG, 2014). According to Kosack and Fung (2014), transparency based on FOI/RTI legislation is related to conceptions of democracy, in which for citizens to express their preferences effectively, they require access to the information and arguments.

From the 1990s (20th century), transparency became a major emphasis of research and used as an attribute of negotiations. Transparency meaning extended from a mean to counter corruption to a mean to encourage open public decision-making and disclosure, to increase accountability, foster responsible corporate action (including social and environmental corporate responsibility), and as a value to incorporate in policies and by which to evaluate policies (BALL, 2009; KOSACK and FUNG, 2014).

For Fluck (2016), the second half of the 20th century was also especially important for transparency in the emergence of security cooperation, which involved various verification measures to ensure compliance. In this view, the appeal of transparency was accompanied by new standards of authority and legitimacy and, ultimately, by new forms of power.

Only more recently that transparency was extended into the private sector. To Alloa and Thomä (2018, p.39) and Mabillard and Zumofen (2017), by making decisions available to the public, stakeholders are meant to develop a sharpened sense of responsibility and improved accountability.

In this context, transparency usually focuses on clarity of roles and responsibilities, public availability of information, and assurances of integrity (OLIVER, 2004). The organization aims to legitimize itself and ensure that it is in line with regulations and policies or "what is right".

Besides public and private organizations evolving practices on transparency, Meijer (2015) highlights the role of intermediaries and third parties such as media and interest groups, in divulging and putting into practice the concept of transparency.

According to Kosack and Fung (2014), a new paradigm of transparency is emerging as activists, investors, and customers have increasingly pressed companies to behave in what they regard as more socially responsible and beneficial ways by compelling corporations to become transparent

about their products, services, and governance.

Adding to that, Michener and Bersch (2013) highlights that during the 1990's (20th century), the use of the term transparency also gained prominence with the emergence of the Internet. The more recent growth of digital systems presents new challenges and opportunities for transparency, by inventing new ways to collect, process, and distribute information (KOSACK and FUNG, 2014; FELZMANN et al., 2020).

In face of this context, a more recent evolution in the use of transparency, is called by Fung, Graham and Weil (2007) as collaborative transparency. It is viewed more as a potential socio-cultural phenomenon pivotal in reshaping the relationships and balance of power in society, where people as individual customers or beneficiaries of services can participate more actively in transparency efforts, to catalyze improvements — in areas such as healthcare, urban planning, environmental decisions, and educational quality — leading to improvements in individual's capacities and well-being (EGGERT and HELM, 2003; MOL, 2010; GRIMMELIKHUIJSEN and WELCH, 2012; KOSACK and FUNG, 2014; FLUCK, 2016; MCCARTHY and FLUCK, 2017; ALLOA and THOMÄ, 2018; ALBU and FLYVERBOM, 2019). Albu and Flyverbom (2019) suggest that transparency projects may be a force in the reshaping of objects, subjects, and relations.

According to Kosack and Fung (2014), this will result from closer collaboration between the designers of transparency and their beneficiaries. This reflects transparency trends that seeks to provide enhanced participation and engagement, facilitating the co-production and use of information by the customers themselves.

Albu and Flyverbom (2019) highlights conflicts and tensions as inescapable conditions for collaborative transparency strategies, and emphasis negotiations as inherent to transparency practices, as these can shape relations and boundaries across domains of organizations.

This historical review can be understood as a progressive movement, from highly abstract principles to more concrete and practical approaches to operationalize transparency efforts (MEIJER, 2015). All these movements are complementary and relevant, building upon each other, influencing different levels of intervention for design.

2.2. Framing transparency for sustainability in digital services

Sustainability is a widely shared concept referencing an evolving ideal of development efforts with no end known in advance (BAGHERI and HJORTH, 2007). The nature of sustainability challenges is considered complex and systemic, with wicked problems characteristics, a type of problem that cannot be formulated or solved definitively, because it is always changing in different scales and implications (BAGHERI and HJORTH, 2007).

Sustainability concept can be seen based on three dimensions: a) environmental: preventing, regenerating, and mitigating biosphere-geosphere degradation; b) social: ensuring a more fair, cohesive, and inclusive society; c) economic: promoting new business paradigms based on fair trade, cooperation, and decentralization (SANTOS et al., 2018; SANTOS et al., 2019; CESCHIN and GAZIULUSOY, 2020).

Framing transparency for sustainability can be considered a "moving target", as a relationship that can change overtime, rather than a problem for solving (OLIVER, 2004; BAGHERI and HJORTH, 2007). It implies standing for its principles and approaching transparency for sustainability in a more continuous, iterative, and systemic way.

To bring that to the context of services means that transparency needs to address sustainability at a systemic scale, considering its role in how input, processing and output flows influences social, environmental, and economic dimensions (SPOHRER et al., 2008; GIANNETTI et al., 2019; CESCHIN and GAZIULUSOY, 2019).

The service-system represents the organizational setting or the configuration that makes the service delivery possible, including the resources and actors connected through activities, to co-create experiences and value in a certain context (SPOHRER et al., 2008; MAGLIO et al., 2010; PATRÍCIO et al.; 2011; WETTER-EDMAN et al., 2014; MORELLI et al., 2021).

The resources include all materials, artifacts, products, processes, technology, digital platforms, data, and information, among others natural, renewable, and non-renewable resources that are operated on by the actors (SPOHRER et al., 2008; GIANNETTI et al., 2019). It also includes the traditional physical channels, as well as digital channels. Touchpoints represent the service interfaces that enable the interactions between actors (WETTER-EDMAN et al., 2014; PRESTES JOLY et al., 2019).

The actors include all individuals as customers, and stakeholders that are service beneficiaries or workers, including digital intelligence-agents. They can also have a role in service as co-designer, consumer, customer, provider, etc. Service actors can be seen as resource-integrating, service-exchanging, value co-creating based on an actor-to-actor network logic (LUSCH and NAMBISAN 2015).

The context is where the service interactions take place and can also be viewed as part of a mediated activity, emerging from people's experiences and the service ecologies in which they participate. Wetter-Edman et al. (2014) argues that service contexts can coincide with the "servicescape" concept. Value is perceived and assessed in a context, as a situated activity or use situation. Contexts are influenced by external factors (such as social, aesthetics, cultural, environmental, economic, political) and individual factors (such as emotions, routines, motivations).

The individual customer/user experience emerge from service interactions at a specific point in time, shaping the way people perceive situations and make decisions (WETTER-EDMAN et al., 2014). Thus, they are a subjective and invisible phenomenon, triggered by previous experiences and expectations, influenced by context, functions, and time. Also, the experience can be viewed as a source for value creation (SANGIORGI and PRENDIVILLE, 2017).

The value proposition can be viewed as a specific package of benefits and solutions that a service intends to offer. Lusch and Vargo (2014) argues that an organization can only provide a value proposition and not independently create it, since value connotation is determined by the service beneficiary. Although value is not always co-created, it is context specific.

Adding to that, the term "digital service" or "digitally enabled services" have been used to refer to services based on Information and Communication Technologies (ICT), where the degree of digital dependence can vary according to the type of technology and adoption by the customers and organizations (PENIN, 2017; HARTWIG and BILLERT, 2018). Digital services are characterized by a direct customer interaction with the service through digital touchpoints, such as a website or mobile app with internet access, serving as a mediator for the service provision (digital and non-digital).

Due to the vast complexity of digital interactions and domains, the most information-intensive services are those with few or no requirements for physical and personal interactions, or where interactions are focused on the information exchange needed to make decisions and apply other information (GLUSKO, 2010). In addition to "experience-intensive" that usually require information interactions to specify and co-produce the service (e.g., healthcare, dining, or transportation services).

Rather than introducing technology to assist a human service worker, technology can be used to transform person-to-person service into a self-service (GLUSKO, 2010). This implies giving to the customers, access to information that was previously visible only to the service worker. Thus, the digitalization of sustainability transparency in services also deals with how people make sense of quality, privacy, integrity, accountability, consumption patterns, social and environmental impacts.

3. METHOD

The study was conducted based on a Systematic and Non-Systematic Literature Review aimed to identify the current knowledge foundations. As a result, an initial version of the theoretical framework was developed describing sustainability transparency characteristics and key service elements to be considered for a design approach. Then, an exploratory multiple case study (ex-post-facto) was conducted to verify the adherence of the theoretical framework with real-world phenomena, supporting the external validation. After individual and cross-analysis of the cases, the results were used to validate and refine the theoretical framework. The details of the procedures are described next.

3.1. Literature Review

A preliminary non-systematic literature review was conducted, to obtain a broader understanding about sustainability transparency in the context of digital service design, and to help with the refinement of the initial keywords for a systematic literature review. The type of materials used were reports, subject, books, and articles published on the subject. Theses and dissertations were also incorporated into the unsystematic review. From this preparatory review, it was possible to identify a preliminary list of keywords.

Then, a systematic literature review was conducted, and the search criteria considered peer-reviewed articles published in international journals between 2011 and 2021. The approach to carry out the review adopted the proposition of 3 reading filters (CONFORTO et al., 2011): a) filter 1: reading the title, keywords and abstract; b) filter 2: reading the introduction and conclusion of the article, again reading the title, keywords and abstract; c) filter 3: full reading of the text. The search was centered on the journals available on Capes Journals platform (a Brazilian aggregator with over 49,000 full-text journals and 455 databases, including ScienceDirect, Scopus, Emerald, SAGE and SciELO).

The preliminarily mapped keywords were recombined in the form of search strings and tested to ensure the combination of the best words referring to the subject covered. More than 15 strings were tested, and the final strings

selected were the ones with the strongest results and directly linked to the topics under study, as shown in Table 1. The other tested and discarded strings presented no relevant or repeated results compared to the selected ones.

The application of filters occurred in the 40 most relevant articles obtained from each string. In the articles that passed through filter 3, we sought to review the key concepts, definitions, historical context, and design elements. Articles which did not meet the criteria presented were excluded from the review. The review adopted a qualitative and mainly inductive logic of analysis, in which data was interpreted to generate and explore the theory.

The systematic literature review revealed a limited number of publications addressing the study central topics. A total of 10 articles were selected and incorporated in the study combined with the publications from the non-systematic literature review. Due to the limitations of the systematic review on the theme, the non-systematic literature review was essential to bring additional publications for supporting the theoretical foundation.

Search strings	Results	Filter 1	Filter 2	Filter 3
transparen AND sustain**	146	64	11	2
transparen AND design*	187	39	13	6
transparen AND service*	114	47	2	2
Total:	447	150	26	10

Table 01: Systematic literature review strings and filters.
Source: Authors.

3.2. Multiple Case Study (ex-post-facto)

A preliminary investigation was conducted to obtain a broader understanding of the categories of digital solutions about digital sustainability transparency and to help with the selection criteria of the cases. For this, a mapping of the most relevant and innovative companies on the subject was carried out through indirect documentation on the Internet. Three categories of solutions were identified as main clusters for the cases, representing the different contexts in which digital sustainability transparency has been practiced.

Then, the selection of the cases per category considered: startup companies (young companies) and already established companies with digital technology-based solutions implemented for business to customer models; national and international cases with a business orientation for sustainability and/or circular economy.

A total of nine cases (three cases per category of solution) were progressively incorporated in the study, until the increase in new observations does not lead to a significant increase in information and to enable data triangulation (GIL, 2002). An overview of the selected cases is presented in Table 2.

The selected cases represent a category of emergent platforms perceived as a reference in digital sustainability transparency, organized according to three categories:

The first category represents "manufacturer-solutions" which typically provides information about the brand and its products. Commerce website is the main digital channel, having a broad range of formats and areas such as institutional, commerce, customer service, sustainability, etc.

The second category "technology-solutions" represents third-party platforms ranging from sustainability curator, traceability, and digital passport. They are developed by technology companies to attend a variety of fashion and textile manufacturer brands in digital transformation. The focus of the analysis was the embedded part of the solutions for the end users, and not the administrative part.

The category "service-solutions" represents Software as a Service (SaaS) in mobile apps, developed by sustainability-oriented companies to address B2C and C2C markets concerned in promoting and measuring sustainable behaviors to achieve sustainability goals. The selected cases represent a category of digital services driven mainly by startups tackling sustainability and climate change communication and engagement.

According to the ex-post-facto modality, data collection was based on evidence obtained after the occurrence of the events, without interference from the researcher, using multiple secondary sources of evidence for internal validation (YIN, 2010). For that, the main source of data focused on the types of content and interactions used in sustainability transparency communication on the solutions websites and mobile apps. Data from observation of social media channels, solution's documentation, internal and external reports, and publications were also used for validation. The collected data was predominantly qualitative, organized and tabulated as an inventory of the types of content and interactions, favoring the subsequent analysis of each case itself and the identification of patterns between cases (YIN, 2010).

The individual analysis of cases considered the

Code	Local	Description
Manufacturer-solutions for sustainability transparency		
Case_01	United States	A company producing outdoor clothing and gear for sports addressing environmental and social responsibility causes, founded in 1973. The selected platform was the brand website, including shopping, customer service and blog areas.
Case_02	Brazil	A company producing vegan shoes made of recycled materials and upcycling, founded in 2014. The selected platform was the brand website, including shopping, customer service and blog areas.
Case_03	Finland	A company producing textile and clothing 100% from recycled waste, founded in 2013. The selected platform was the brand website, including shopping, customer service and blog areas.
Technology-solutions for sustainability transparency		
Case_04	Netherlands	A platform of pre-built transparency components for manufacturer brands to embed in their websites. Founded in 2020, it acts as a third-party verifier of auto-referential sustainability claims and data from the brands. The platform is based on technologies such as Machine Learning and Business Intelligence.
Case_05	Brazil	A platform for traceability of production chains and carbon footprint. Founded in 2021, through a QR Code it is possible to identify all production processes, sustainability attributes and product compositions. The platform is based on technologies such as Blockchain and Business Intelligence.
Case_06	United States	A platform to turn physical products into digital assets. Founded in 2016, the solution is a CRM cloud platform, connecting brand's physical products with a Digital ID to make them traceable and interactive, driving new business models and authentication mechanisms. The platform is based on technologies such as Big Data, Cloud Data Services, and Internet of Things.
Service-solutions for transparency sustainability		
Case_7	Scotland	A climate action platform that empowers people to fight climate change at home and work. Founded in 2019, the solution has built a series of features to engage people in carbon footprint reduction such as curated climate actions, carbon footprint calculator, educational content, and planet-positive discounts.
Case_8	Brazil	A social network to promote sustainable behaviors in the neighborhood. Founded in 2021, the solution connects citizens through sustainable challenges or tasks. The solution includes remunerable activities to citizens working as local leaders in their neighborhood, encouraging new habits, contributing to a social environmental education, and generating relevant data for cities and municipalities.
Case_9	England	An evidence-led app that helps people learn to live more sustainably and take action. Founded in 2017, the solution is based on a program to help people understand their personal carbon footprint and reduce it, bringing people together through challenges and events to encourage collective action.

Table 02: Case study overview.
Source: Authors.

theoretical framework as a starting point, confronting the adherence of the theoretical propositions with the case evidence (YIN, 2010). Then, the cross-analysis of cases was carried out in a comparative and qualitative manner. Through this analysis, it was verified the common aspects and divergences in the cases analyzed. For Yin (2010) this technique is used in multiple case studies to examine replications. The results were used to refine the theoretical framework.

4. RESULTS AND DISCUSSION

4.1. Preliminary Theoretical Framework

The framework was built upon the literature review and comprised two components: the description on the characteristics of sustainability transparency and the key digital service elements to consider when approaching it by design.

4.1.1. Sustainability transparency characteristics

Sustainability transparency can be understood as a resulted state or condition formed by ethical, communication and value characteristics. In digital services, it is built by different mediations of a service social, environmental, and economic reality, resulting in a situated state of that mediation that can enable value creation for sustainability or inhibit the parts.

First, transparency can be mediated according to its ethical characteristics, since it's not a neutral mediation and deals with revelatory functions of the elements (KOIVISTO, 2016). It is an ethical principle in its core, rather than a target state to achieve or an informational quality standard (ALLOA and THOMÄ, 2018). Which implies an ethical responsibility with the service sustainability in terms of:

- Honestly communicating sustainability with the service customers (ALLOA and THOMÄ, 2018), by digitally providing true, evidenced, and verifiable content, without deceiving people.
- Opening sustainability content so that the service customers can access and use it (ALBU and FLYVERBOM, 2019), by making social, environmental, and economic aspects of the service digitally available.
- Including the diversity of customers in the service (ALBU and FLYVERBOM, 2019), by digitally supporting people with different sustainability capabilities.

Secondly, transparency can be mediated according to its communication characteristics, since it's built on interactions with nonverbal and/or verbal messages, which produce meanings and some shared understanding of what the message is about (FISKE, 2011). Which implies an informational responsibility with the service sustainability communication in terms of:

- Informational quality (SCHNACKENBERG and TOMLINSON, 2016; ALBU and FLYVERBOM, 2019; MATHEUS and JANSSEN, 2020), by digitally providing complete, consistent, and accurate sustainability content.
- Usage context (OLIVER, 2004; MEIJER, 2015), by setting sustainability content and interactions according to the context of use.

Then, transparency can be mediated according to its enabling value characteristics, since it's a potential catalyst for supporting people's confidence, understanding and actions from the service communication (ALBU and FLYVERBOM, 2019). It needs to be effective for the customers, as a quality and differential criterion, or as a means for value-creation towards sustainability. Which implies a responsible value-proposition with the service sustainability in terms of:

- Enabling customers to gain confidence from the transparency (FLUCK, 2016; MABILLARD and ZUMOFEN, 2017), by digitally ensuring credibility, compliance and/or protection of rights on social, environmental, and economic aspects of the service.
- Enabling customers to gain a sustainability understand from the transparency (HOSSEINI et al., 2018; BUMBLAUSKAS et al., 2017), by digitally supporting knowledge-building on the social, environmental, and economic aspects of the service.
- Enabling customer to take actions towards sustainability from the transparency (HOSSEINI et al., 2018; BUMBLAUSKAS et al., 2017), by digitally supporting customization (individual) and collaboration (others) in social, environmental, and economic aspects of the service.

In summary, this characterization is derived from the key concepts identified in the literature review.

4.1.2. Scope and elements for sustainability transparency design in digital services

Due to the broad variety of services and organizational contexts, approaching sustainability transparency in service design can lead to different challenges, working scope and elements (Figure 1).

The "service digital-encounter" scope is very close to the real time and space of the customer interacting with the service. According to Morelli et al. (2021), value is perceived and determined by the customer accessing and interacting with a service. It means that designers and service organizations are not designing services — since they don't have full control of the value creation — but rather a number of digital interaction instruments that could facilitate the development of value in a specific time and context. When improvements or interventions remain focused on digital interactions, the potential of impact for changes addressing sustainability may remain contingent (SANGIORGI, 2011). At this scope, transparency initiatives primarily focus on content and interaction design and how to make it relevant, comprehensive, reliable, and usable for the customer (SCHNACKENBERG and TOMLINSON, 2016; MCCARTHY and FLUCK, 2017). It comprises verbal and visual types of content and interactions (BUELL et al., 2017), interested in promoting transparency for the customer in their context of use. This level also represents an emphasis on literature. Approaching transparency only at this scope can be limited in terms of impact for sustainability.

Because of that, the second scope is proposed as a transition from dealing with transparency as an end in itself to dealing with transparency as a means for change. At "service system-configuration" scope the role of designers is on setting the conditions for customers to create value from the service infrastructure (MORELLI et al., 2021). This involves articulating the actor's network, processes, resources, and impacts associated with social, environmental, and economic aspects of the service-system (MCCARTHY and FLUCK, 2017; SANGIORGI and PRENDIVILLE, 2017; MORELLI et al., 2021). Approaching transparency at this scope could focus on improving the service, exploring new service ideas, and fostering organizational change. Although the digital transparency experience can be part of the design, at this scope the focus is on the value proposition and arrangement of the service elements, rather than the digital interface.

The "service institutional-context" scope implies a broader scale of impact for designers, which according to Morelli et al. (2021) is quite new for the service design discipline. It reflects a service design evolution, becoming more transformational, as a means for supporting the emergence of a more collaborative, sustainable, and creative society and economy (SANGIORGI, 2011). It is proposed for when sustainability transparency initiatives are already integrated in the organizational strategy and could foster transparency at the socio-technical-ecological systems in which the service organization is inserted (SANGIORGI, 2011; CESCHIN and GAZIOULOSOY, 2020). At this scope the design deals with elements such as social paradigms, culture and values, political and technological systems, and climate and biodiversity. Morelli et al. (2021) argues that although designers have no control of these systems, they can play a role in triggering change and possibly steer it in preferred directions.

In summary, this characterization integrates the key elements for sustainability transparency design in digital services. The levels of scope are built upon each other,

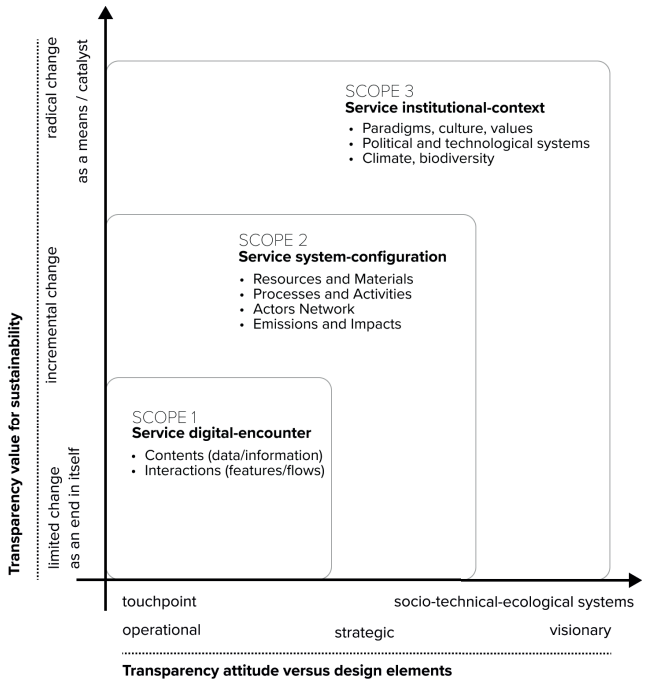

Figure 01: Scope of digital service elements for sustainability transparency.
Source: Authors, adapted from McCarthy and Fluck (2017), Albu and Flyverbom (2019), Ceschin and Gazioulosoy (2020), Morelli et al. (2021).

implying that the same service could address more than one group of elements at the same time, contributing to different transparency outcomes.

Classes of Analysis		manufacturer			technology			service			Replicable
		1	2	3	4	5	6	7	8	9	
Service system-configuration elements											
E1	Processes/Activities	+	+	+	-	+	+/-	+	+	+	Yes
E2	Actors Network	+/-	+/-	-	+/-	-	+/-	+	+	+/-	Partial
E3	Resources and Materials	+	+	+	+	+	+	+/-	+/-	+/-	Yes
E4	Impacts and Emissions	+	+	+	+	+	-	+	+	+	Yes
Service digital-encounters											
E5	Purchase	+	+	+	+	+	+/-	+/-	-	+/-	Yes
E6	Usage	+	-	-	-	-	+/-	+	+/-	+	Partial
E7	Post-usage	+	+	-	-	-	+/-	+/-	+	+/-	No

ANALYSIS CRITERIA: + (complete adherence); +/- (partial adherence); - (not apply or not noticeable); NA (not applicable)
A replicable criterion is considered when it completely or partially applies to at least three cases.
blue (high emphasis); purple (medium emphasis); white (low or lack of).
Table 03: Case study: adherence of service elements.
Source: Authors.

4.2. Multiple case study results

This section describes the results from the multiple case study (ex-post-facto), conducted to verify the adherence of the theoretical framework with real-world phenomena. The individual and cross analysis enabled the identification of the main emphases in the cases studied, and the least noticeable.

4.2.1. Service elements

The types of content and interactions (at digital-encounter scope) identified from the sustainability communication of the cases were confronted with the service system-configuration elements to check their adherence (Table 3).

The cases from the manufacturer and service categories were the ones that obtained the higher adherence of the contents and interactions regarding the system-configuration elements. Technology cases obtained the least adherence.

The elements E3_Resources_Materiais and E4_Impacts_Emissions were substantially present among the cases and with focus on environmental sustainability. Footprint content (at different levels such as industry-sector level; production-chain and product level; individuals-communities level) and branding-governance content were the ones which mostly communicated these elements, followed by sustainability and circular support and visual contents. The types of interaction available to the users were mainly by features such as search and navigation, sustainable behavior tools, data verification, connectivity, and traceability, as a way to filter content according to the user preferences and to check the provided information.

The element E1_Processes_Activities was perceived with higher adherence among the manufacturer and service cases, emphasizing social and economic sustainability aspects. Within technology cases it was not sufficiently noticed. The E1_Processes_Activities element was mainly characterized by product-oriented content regarding production and distribution processes (such as materials production, transportation, etc.), followed by circular content (such as care, repair, and recycling activity guides) both supported by visual contents. Also, E1_Processes_Activities was mainly characterized by connectivity and traceability interaction features and user flows related to join circularity and behavior gamification.

The element E2_Actors_Network was perceived as having the least adherence among the cases, having social and economic sustainability aspects more emphasized. In manufacturer cases it was mainly characterized by footprint content at production chain level (such as

Classes of Analysis	manufacturer			technology			service			Replicable
	1	2	3	4	5	6	7	8	9	
Ethics Characteristics of Sustainability Transparency										
C1_Honesty	+/-	+/-	+/-	+	+/-	+/-	+	+/-	+	Partial
C2_Openness	+	+	+	+	+	+	+	+	+	Yes
C3_Inclusive	+	+	+	+	+/-	-	+	+	+	Yes
Communication Characteristics of Sustainability Transparency										
C4_InformationalQuality	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	No
C5_Contextual	+	+/-	+/-	+	+	+	+	+	+	Yes
C6_Aesthetics (new)	+	+	+	+	+	+	+	+	+	Yes
Value Characteristics of Sustainability Transparency										
C7_Confidence	+	+	-	+	-	+/-	+	-	+	No
C8_Understanding	+	+	+	+	+	+/-	+	+	+	Yes
C9_Actionability	+ BM	+/- BM	+/- UX	+/- UX	-	+/- BM	+ UX/BM	+ UX/BM	+ UX	Partial

ANALYSIS CRITERIA: + (complete adherence); +/- (partial adherence); - (not apply or not noticeable); NA (not applicable)
A replicable criterion is considered when it completely or partially applies to at least three cases.
UX (user experience level); BM (business model level); blue (high emphasis); purple (medium emphasis); white (low or lack of).
Table 04: Case study: adherence of sustainability transparency characteristics
Source: Authors.

where the products are made, by whom, manufacturing facilities, etc.), and it was also directly related to branding-governance contents (such as commitments and initiatives in terms of labor conditions and social responsibility). In service cases it was characterized by user's and communities self-quantified contents and participation (such as home or diet footprint, sustainability scoring, reviews, and stories). It was not possible to identify a type of interaction feature or user flow directed linked to E2_Actors_Network.

The study considered three types of service digital encounters (VOORHEES et al., 2017): a) purchase, which corresponds to exploratory navigation on the institutional pages, products page, and shopping pages; b) usage, which corresponds to the service pages supporting the effective use of the brand products and services; c) post-usage, which corresponds to the end of the product's life cycle.

Manufacturer and technology cases emphasized sustainability transparency at purchase encounters, while the cases from the service category emphasized usage encounters. It was not possible to identify contributions to post-usage encounters among the cases.

Most of the sustainability transparency contents and interactions were concentrated at the purchase encounters as a branding competitive differential and possible consumption support for users. In that sense, transparency in manufactured cases focuses on how innovative and less environmentally impactful some of the product materials are, as well as the performance related to the use of natural resources and respective emissions. Although both manufacturer cases embrace circular strategies in their business, Case_01 stands more clearly for consumption prevention and minimization, exploring transparency of consumption alternatives in their business ecosystem (e.g.: “Browse Used Jackets and Vests”; “Don't buy a new jacket”). At usage encounters from manufacturer cases, sustainability transparency was identified as a way to invite the customer to close the product cycle, reinforcing the importance of reverse logistics and the customer role for that to happen. Also, in service cases, sustainability transparency was identified as a way to learn about sustainability and guidance at individual level on how to act and the impacts of that.

4.2.2. Sustainability transparency characteristics

The sustainability transparency characteristics were identified and analyzed from the cases based on the data collected on the types of content and interactions (encounter and system-configuration elements) as signals or indicators (Table 4).

The cases from the service category were the ones that obtained a higher adherence to transparency ethical characteristics, followed by the manufacturer cases. The technology cases were the least adherent or unidentifiable. Among the three ethical characteristics, the one that obtained higher adherence among the cases was C2_Openness, followed by C3_Inclusive and C1_Honesty at last.

The analyzed cases communicate with different degrees of C2_Openness, varying the system-configuration element being opened (with emphasis on E1_Processes_Activities and E2_Actors_Network elements). Manufacturer and service cases open branding and governance content, followed by sustainability and circular support content. C2_Openness is mainly characterized by connectivity and traceability interactive features, circular and gamification interactive user flows, both as a way of getting access to available content.

Similarly, the C3_Inclusive characteristic was higher adherent in manufacturer and service cases. It was not possible to identify a type of content directed linked to C3_Inclusive characteristic, all types of content could have a contribution to that. Thus, the C3_Inclusive was mainly characterized by search, navigation, and sustainable behavior interactive tools, both as a way to filter content according to the user preferences.

C1_Honesty characteristic was perceived with partial adherence among the analyzed cases, being mainly characterized in service and technology cases by footprint indicators content (at different levels, from industry to individual level), by credentials and certifications content. Also, C1_Honesty was mainly characterized by evidence-based content (such as data verification) and user review features, as a way to check the provided information by an external source which could be a third-party company or the other users/customers.

The cases from the service and technology category were the ones that obtained higher adherence to transparency communication characteristics, followed by manufacturer cases. From the analysis of the selected cases a new transparency communication characteristic was identified, with total adherence among the cases, named C6_Aesthetics. The C4_InformationalQuality was the least noticeable.

Besides textual format, sustainability transparency communication among the cases were enhanced by different types of visual contents, including pictures and videos (e.g., places, actors, materials etc.) and graphic symbols, illustrations, and diagrams. The C6_Aesthetics characteristic of sustainability transparency concerns the how rather than what to communicate, by making content and interactions attractive, identifiable, and meaningful to users. Also, it can support other transparency characteristics, in special C8_Understandability and C3_Inclusive. It was not possible to identify a type of interaction feature or user flow directed linked to C6_Aesthetics characteristics.

The C5_Contextual characteristic was perceived with higher adherence among the service and technology cases, mainly due to the dynamic nature of the platforms. Thus, C5_Contextual characteristic of transparency was mainly represented by custom navigation, connectivity, and traceability interactive features. Also, the types of sustainability actions, habits, or challenges in gamification interactive user flows, were perceived as a way to set custom content and interaction alternatives available to the user in a certain moment and situation.

Although the sustainability communication among the analyzed cases was perceived as having a high quality in terms of completeness, consistency, and accuracy, it was not possible to identify a type of content linked to C4_InformationalQuality characteristic, all types of content could have a contribution to that. Also, C4_InformationalQuality was mainly characterized by data verification, connectivity, and traceability interactive features, as a way to support a quality assurance on provided content.

The cases from the service category were the ones that obtained the higher adherence to transparency value characteristics, followed by the manufacturer cases. Technology cases obtained the least adherence. Among the three value characteristics, the one that achieved total adherence among the cases was C8_Understandability, followed by C9_Actionability and C7_Confidence.

The C8_Understandability characteristic was substantially present among the cases, being characterized by specific sustainability educational content (varying from blogs to product or task descriptions), by more specific circular content guides on product care, repair and

recycle. It was not possible to identify a type of interaction feature directed linked to C8_Understandability characteristics, but it was mainly perceived in circular and gamification interactive user flows, both as a way of guiding the user through a learning journey (with emphasis on E1_Processes_Activities and E2_Actors_Network elements).

C9_Actionability characteristic was perceived with higher adherence among the service cases (mainly due to the nature of the platform such as quantified-self and gamification) and among manufacturer cases. Within technology cases it was partially noticeable. C9_Actionability was mainly characterized by user's footprint scoring and ranking content, besides user generated content by features such as reviews and surveys from the experiences with the brand, products, and services. These enable the user participation at the user experience level concerning the interface. But the cases also enable the user participation at business model level by integrating circular services, gamifying, and volunteering interactive flows, as a way of enabling users' collaboration within sustainability and transparency for a group/community (with emphasis on E1_Processes_Activities and E2_Actors_Network elements).

At last, the C7_Confidence characteristic was the least perceived among the cases. In manufacturer cases, normative credentials and certifications were the main type of content used to address credibility. But in service cases, although some of them declared credentials, the main type of content perceived was the footprint calculation methodology, since those platforms offerings are more dependable of the calculation's credibility. It was not possible to identify a type of interaction feature or user flow directed linked to C7_Confidence characteristics.

4.2.3. Discussion

The analysis of the cases showed that the main value proposition linked to sustainability transparency among the digital solutions was related to supporting customers with informed decision making, for a more responsible consumption and usage of products and services (C8_Understanding).

The cases from the service category were the ones that had the greatest adherence to the transparency characteristics obtained from the literature. One of the possibilities is the nature of platforms, which provides greater personalization and interactivity for the end-user. Also, the value proposition from the service cases were characterized by promoting sustainable behavior, which may imply the use of more active transparency strategies as encouragement.

Cases from the manufacturers and technology category had similar results between them. Unlike service cases, digital sustainability and transparency was not identified as core value proposition of manufacturers (e.g., textile, clothes, consumer goods, etc.), but to meet this criterion in their services, they rely on technological third parties. Supply chain or production chain transparency was the focus among the cases from manufacturers and technology categories. In these cases, the study showed that sustainability transparency was approached as a form of brand legitimacy and competitive differential.

Regarding the service system-configuration elements, the analysis of the cases showed a granular sustainability transparency, varying from a generic industry/sector level (manufacturer cases) to more detailed levels considering a specific product, production chain or even individual consumption or usage. Across this granularity, sustainability transparency was mainly associated with E3_Resources_Materiais and E4_Impacts_Emissions content and interactions. The analysis of the cases helped to validate and refine the sustainability transparency characteristics (Figure 2).

Based on the eight characteristics identified preliminary in the literature, four had total adherence with the analyzed cases (C2_Openness, C8_Understanding, C3_Inclusive, and C5_Contextual) and two had partial adherence (C1_Honesty and C9_Actionability renamed as C9_Agency). A new characteristic was included (C6_Aesthetics), as it presented total adherence among the cases. Two characteristics were not able to notice enough evidence (C7_Confidence and C4_InformationalQuality). C4_InformationalQuality lacked adherence among the cases and a possibility was that this characteristic requires a study with primary data collection from the organizations operationalizing communication.

The analysis also showed that sustainability transparency was mediated in an asymmetric way, focusing more on certain characteristics and elements than others, resulting in different states and limited forms of value from the transparency delivered. For example, although the cases had a high degree of openness and communication, the degree of honesty was not equivalent (especially when communicating processes and actors), compromising the degree of ethical responsibility. Similarly,

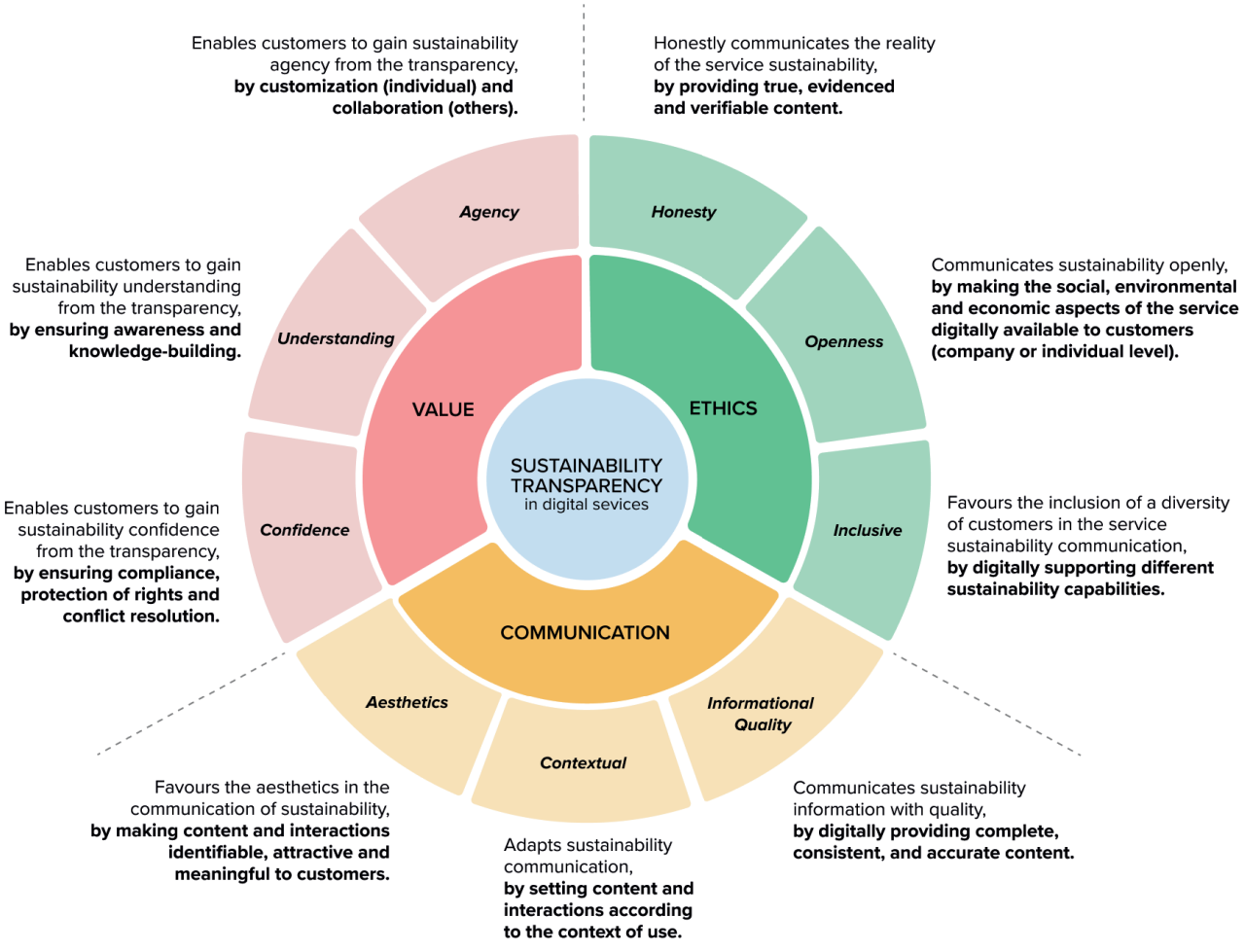

Figure 02: Scope of sustainability transparency characteristics for digital services
Source: Authors.

most of the cases emphasized the disclosure of sustainability content, rather than the possible user interaction, resulting in limited forms of value from transparency experience.

Transparency is an opportunity to bring the customer closer to the service and awaken a bond with the places, activities, and people. The more detached the customer is from that reality or production-consumption system, the more it becomes necessary to explore the different transparency characteristics and service elements through digital mechanisms. According to Bizzocchi and Woodbury (2003), the level of interactivity and the expression of a customer's choice are central aspects in the design of more iterative narratives, where the focus is not on the design of the sequence of events but on the configuration of an environment (world) for the user to explore.

5. FINAL CONSIDERATIONS

This paper presented a study proposing a framework that describes the characteristics of transparency for sustainability and the key elements for a design approach in digital services. For that, the study conducted a literature review to understand the historical evolution of the concept and the key constructs that supported the development of the framework. Then, an exploratory multiple case study (ex-post-facto) was conducted to help validate and refine the framework.

The framework can be used to understand what transparency for sustainability means, the implications and scope for approaching the concept in service design. The types of content and interactions from the platforms can be used as signals or indicators of sustainability transparency in digital services, supporting a preparatory approach to map the current sustainability transparency scenario. Although this case study was limited to secondary data sources, it's also recommended to extend the study

with primary data sources (company and user) to confront the results. From that, transforming the framework into practical instruments such as tools, protocols, and guides for the design processes could be a future direction.

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