

UNIVERSIDADE FEDERAL DO PARANÁ

MARCELLA LOMBA NICASTRO

INTEGRATING TRANSPARENCY FOR SUSTAINABILITY
ON THE DESIGN OF DIGITAL SERVICES
FOR CIRCULAR ECONOMY

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INTEGRATING TRANSPARENCY FOR SUSTAINABILITY
ON THE DESIGN OF DIGITAL SERVICES
FOR CIRCULAR ECONOMY

Tese apresentada ao exame de doutorado do Programa de Pós-Graduação em Design no setor de Artes, Comunicação e Design da Universidade Federal do Paraná, como requisito para obtenção do título de Doutor em Design.

Orientador: Prof. Aguinaldo dos Santos, PhD
Co-Orientador: Prof. Fausto Medola, PhD

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RESUMO

A transparência é um dos conceitos-chave para possibilitar o desenvolvimento sustentável, implicando numa comunicação mais ética em relação às dimensões social, ambiental e econômica em todos os níveis das organizações. Comunicação é uma parte fundamental dos serviços digitais, onde a transparência pode permitir a criação de valor para a sustentabilidade por meio de interações digitais. Particularmente no contexto emergente dos serviços digitais para a economia circular, a transparência pode ajudar a apoiar suas estratégias e a expor os fluxos de recursos a serem vistos e com os quais interagir. Este contexto tem proporcionado novas oportunidades para a área do Design, no desenvolvimento e melhoria de serviços digitais para sustentabilidade. Para explorar a falta de suporte teórico e metodológico para designers, o objetivo geral desta pesquisa foi propor um Modelo e Diretrizes para apoiar a integração da transparência para a sustentabilidade nas fases iniciais do processo de Design. Mais especificamente, a pesquisa abordou essa integração nas atividades de diagnóstico do Design de Serviços. A pesquisa foi conduzida sob o método *Design Science Research*, organizada em três fases. A primeira fase ajudou a compreender o problema a partir de uma perspectiva mais ampla através de uma revisão da literatura, análise de soluções digitais, oficinas temáticas e observações participante. Os principais resultados informaram o desenvolvimento da versão preliminar de um Framework Teórico. A segunda fase da pesquisa foi construída a partir dos resultados da primeira fase e é caracterizada por trabalho de campo em ciclos progressivos de workshops baseados em *Action Design Research* para propor, desenvolver e avaliar o Modelo e Diretrizes por meio de ferramentas auxiliares. Foram realizados um total de 5 ciclos em contextos educacionais e em serviços digitais reais de empresas, ajudando a avaliar as potencialidades e limitações das propostas. A terceira fase da investigação teve como objetivo apoiar uma análise cruzada e obter um conjunto de recomendações finais. Os resultados forneceram um Modelo multinível e modular, com 24 Diretrizes organizadas em 4 Guias de Atividades como ferramenta auxiliar. A pesquisadora conclui que uma abordagem de design estruturada para a transparência pode encorajar as organizações de serviços a terem uma atitude mais ativa em relação à transparência e à sustentabilidade, e que a transparência para a sustentabilidade pode ser abordada como um critério de qualidade ao articular ofertas de serviços.

Palavras-Chave: Transparência para Sustentabilidade; Design de Serviço Digital; Economia Circular; Diagnóstico em Design; Educação em Design.

ABSTRACT

Transparency is one of the key concepts to enable sustainable development, implying a more ethical communication in relation to the social, environmental, and economic dimensions at all levels of organizations. Communication is a fundamental part of digital services, where transparency can enable value creation for sustainability through digital interactions. Particularly in the emergent context of digital services for circular economy, transparency can help to stand for its strategies and to expose the flows of resources to be seen and interacted with. This context has provided new opportunities for the field of Design, in the development and improvement of digital services towards sustainability. To explore the lack of theoretical and methodological support for designers, the general goal of this research was to propose a Model and Guidelines to support the integration of transparency for sustainability at the early stages of Design process. More specifically, the research addressed this integration on Service Design diagnostic activities. For that, the research was conducted under the Design Science Research method, organized in three phases. The first phase helped to understand the research problem from a broader perspective through a literature review, assessment of existing digital solutions, thematic workshops, and participant observations. The main results informed the development of the preliminary version of a Theoretical Framework. Then, the second phase of the research was built upon the results from the first phase and characterized by field work activities with progressive cycles of workshops based on Action Design Research for proposing, developing, and evaluating the intended Model and Guidelines through auxiliary tools. A total of 5 cycles were conducted within educational contexts and within real digital services from companies, helping to evaluate the potentialities and limitations of the propositions. The third phase of the research aimed to support a cross-analysis and obtain a set of final recommendations. The outcomes provided a multilevel and modular Model, with 24 Guidelines organized into 4 Activity Guides as an auxiliary tool. The researcher concludes that a structured design approach for transparency can encourage service organizations to have a more active attitude towards transparency and sustainability, and that transparency for sustainability can be approached as a quality criteria when articulating service offerings.

Keywords: Transparency for Sustainability; Digital Service Design; Circular Economy; Design Diagnosis; Design Education.

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LIST OF ACRONYMS AND ABBREVIATIONS

AI	— Artificial intelligence
B2C	— Business to Customer
CE	— Circular Economy
CNPq	— National Council for Scientific and Technological Development
CO ₂	— Carbon dioxide
DfS	— Design for Sustainability
DSR	— Design Science Research
ESG	— Environmental, Social, Governance
ICTs	— Information and Communication Technologies
IoT	— Internet of Things
ISO	— International Organization for Standardization
LGPD	— Brazilian General Law for the Protection of Personal Data
MSW	— Municipal Solid Waste
PPGDesign	— Design Post-Graduate Program
SD	— Service Design
SDG	— Sustainable Development Goals
SME	— Small and medium-sized enterprises
TCLE	— Free and Informed Consent Form
UN	— United Nations
UX	— User Experience

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PROLOG

This thesis is part of to the research line “Production and Usage Systems” of the Postgraduate Program in Design at the Federal University of Paraná. It was carried out within the research group “Design & Sustainability Center”, with studies associated with the contribution of Design to the migration of society's consumption and production practices towards more sustainable standards.

The doctoral researcher Marcella Lomba Nicastro has been studying transparency for sustainability in the design of digital services since her master's degree, with the same research group. The master's research focused on digital services in the context of food sector, exploring consumer transparency in food shopping experiences. The project was conducted in partnership with a local organic food company and resulted in a conceptual framework aimed at supporting design diagnosis, and creative activities.

Continuing the studies, in this doctoral research, the researcher's focus has been to gain a deeper understanding of transparency concept, evolving the previously proposed propositions in the context of digital service design enabling the circular economy.

The development of this thesis was supported by a national cooperation project named "Strategic Design Research: Enabling Technologies" with Federal University of Paraná (Curitiba/Brazil) and São Paulo State University (São Paulo/Brazil), with funding provided by CNPq (Brazilian funding agency). That particular project aimed at fostering research partnerships between the institutions in the area of strategic design and innovation. Also, this thesis was supported by an international cooperation project named “Zero Waste Co-Lab” with Federal University of Paraná (Curitiba/Brazil), Paulista University (São Paulo/Brazil), Aalborg University (Copenhagen/Denmark) and BOFA - Waste Management Company (Bornholm/Denmark). That project aimed to jointly develop research activities among Danish and Brazilian partners with thematic focus on resource streams and strategies for circular economy.

Chapter 1 – Introduction

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1.1 Context

Historically, the understanding of transparency evolved from a visibility attribute (GRIMMELIKHUIJSEN, 2012; ALLOA and THOMÄ, 2018) to a moral ideal and political instrument (BALL, 2009; KOSACK and FUNG, 2014; MEIJER, 2015), and more recently, to a form of interaction between organizations and individuals for reshaping relationships and the balance of power in society (FUNG et al., 2007; GRIMMELIKHUIJSEN, 2012; CHRISTENSEN and CHENEY, 2015; ALBU and FLYVERBOM, 2019). This thesis acknowledges the historical evolution of transparency and focus the research on its more recent perspective, approaching transparency as an enabling concept to promote sustainability goals and strategies through digital services in organizations.

In this thesis, transparency is understood as one of the key concepts to enable sustainable development, implying more honest, open, and inclusive communication in relation to social, environmental, and economic aspects at all levels of the organizations (HOFSTEDE et al., 2004; HOSSEINI et al., 2018; ALLOA and THOMÄ, 2018; ALBU and FLYVERBOM, 2019).

Communication is a fundamental part of conceiving, implementing, and maintaining sustainability strategies. It helps in establishing common visions about a more sustainable society, enables building up social cohesion, and can contribute to valuing diversity, raising awareness, and making informed decisions towards more

sustainable standards (HOFSTEDE et al., 2004; GRIMMELIKHUIJSEN and WELCH, 2012; PARRIS et al., 2016; UN, 2021).

At the time of this thesis, the demand for transparency on sustainability has widespread in contexts as diverse as public governance, politics, technology, and across a variety of sectors such as textile, food, tourism, and so on (ALLOA and THOMÄ, 2018).

Particularly on the waste management sector when promoting a more circular economy, most of the urban waste flows, their associated services and sustainability impacts are invisible for the population (SANTOS et al., 2022; EMAF, 2023). Transparency is fundamental to bringing light to the invisible information of “waste as resources” flows that needs to be seen and interacted with through processes like maintenance, reuse, refurbishment, remanufacture, and recycling (GEISSDOERFER et al., 2017; PAES et al., 2019). More transparent communication through digital services has a strategic role in the circular economy since it can connect end-users and key stakeholder of the waste system (e.g.: manufacturers, retailers, and municipal services) to promote behavior changes (KAZA et al., 2018; HEYES et al., 2018).

However, initiatives aimed at increasing transparency for sustainability have emphasized corporate communication (e.g., sustainability reports and certifications) and product communication (e.g., information disclosure, value chain traceability)(SCHIEFER and DEITERS, 2013). Although relevant, such conventional practices are not sufficient.

Digital technologies have changed the service environment, providing new challenges for organizations in approaching transparency for sustainability. In addition to offering new modalities of services, there are new sources of data that can be transformed into new forms to communicate and create value for sustainability through digital interactions. Powered by technologies such as mobile applications, social networks, e-commerce, artificial intelligence, sensors, among others, digital services can enable new forms of transparency.

Indeed, the transparency literature that supports this area of study comes mainly from research exploring openness and trust-building in artificial intelligence systems (EIBAND et al., 2018; FELZMANN et al., 2019; FELZMANN et al., 2020), and supply chain data traceability systems for sustainability (HOFSTEDE et al., 2004; WOGNUM, 2011; SCHIEFER and DEITERS, 2013). While the integration of ethical issues (such as transparency for sustainability) within the Design field can be considered an emergent area for research, associated with the “Responsible Design” movement, having roots in Design for Sustainability, Inclusive Design, Participatory Design, Systems/Systemic Design, Design Futures and Decolonising Design (VERMAAS, 2019; BOEHNERT et al., 2022).

This context has provided theoretical and methodological opportunities for the field of Design, in the development and improvement of digital services towards circularity and sustainability. In this regard, this thesis explores the theme “*transparency for sustainability in the design of digital services enabling circular economy*”. Specifically, this thesis explores the adaptation of transparency concept to the field of Service Design, focusing on those organizations that are in transition towards sustainability.

1.2 Research problem and question

Despite the potential of transparency for sustainability identified in literature, more in-depth studies are needed to shed further light and enhance our understanding about what means transparency for sustainability when designing digital services. The next sub-sections presents some of the main arguments that explain the research problem tackled in this thesis (Figure 1.1).

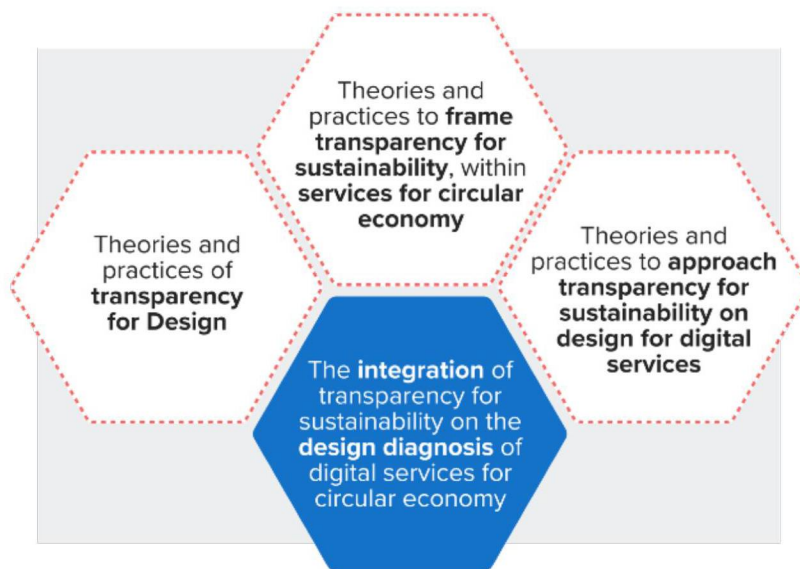


FIGURE 1.1 – The research class of the problem

Source: the author

Theories and practices of transparency for Design is limited

In face of the emerging needs to increase transparency for sustainability in the design of digitally enabled services, the revised literature shows that there is a lack of theories, methods and tools in the field of Design. Most of the discussions are limited to empirical practices oriented to meet compliance. Depending on the managerial maturity of the organization, transparency may be limited in practice to be solely an instrument for

avoiding regulatory-political conflicts and penalties, or a marketing instrument for brand differentiation (SCHIEFER and DEITERS, 2013; MABILLARD, and ZUMOFEN, 2017).

Recent contributions intended to support the digital design of transparency are more focused on the data engineering of Information and Communication Systems (including those enabled by artificial intelligence). Hence, the focus is on “infrastructuring” an informational layer to support digital transparency (JANSSEN et al., 2017; FELZMANN et al., 2020; MATHEUS et al., 2021).

Thus, this thesis approaches transparency not as a reactive response to customers or compliance standards, but exploring its **potential as a catalyst for change when designing service** (MCCARTHY and FLUCK, 2017). It implies that the focus is less on how users perceive transparency itself during the service experience (since the signals and meanings may vary according to a wide range of factors), but on **how to support designers in strategically articulating this concept in a more systemic and critical way** when striving to guide organizations towards sustainability.

Theories and practices to frame transparency for sustainability within services for circular economy is limited

Communication is a fundamental part to conceive, implement and maintain sustainability strategies, both in business, government and civil society contexts (GENÇ, 2017). It helps in establishing common visions about a more sustainable society, enables building up social cohesion whilst it can contribute to value diversity, raising awareness and promoting societal transformations (GENÇ, 2017).

The consumers growing demands for transparency about sustainability in various sectors (e.g: fashion, food, electronics, among others) (IDEC, 2013; BOF, 2020; AKATU, 2022), has pushed new communication and ethical requirements for the organizations. However, most communications addressing sustainability are limited to corporate stakeholders, with the adoption of indicators and standards for reporting environmental/social/economic impacts, or product-oriented concerns regarding environmental attributes and their perceived impact when communicated to social media (CADARSO, 2015; GENÇ, 2017; ROBERTSON, 2019).

It is also possible to identify emerging initiatives such as transparency activism movements acting as curators to educate and support consumers with information about trusting and suspicious brands, products, and services (FASHION REVOLUTION, 2021); and the internal reorganization of companies with the creation of new areas and positions on topics such as ESG (Environmental, Social, and Governance), responsibility, and ethics (WEF, 2021). In addition to these initiatives, there is also the use of bad practices such as “green/social washing”, due to a lack of knowledge or malice in

creating an unfounded brand image (IDEC, 2019).

More specifically in the context of services enabling a more circular economy (CE), it implies in changes at all stages of the product's life cycle, and also the types of business models and service offerings for supporting new forms of value-creation (HEYES et al., 2018). In terms of transparency, the awareness and knowledge of the service end-users about the social, environmental and economic impacts of adequate ways of obtaining, using and disposing the products is one of the most important aspects for achieving a successful implementation (SKOUBY et al., 2014; MA and HIPEL, 2016; SANTOS et al., 2021; WBCSD, 2023). However, according to Schöggli et al. (2020), circular economy studies lack of considering the end-users or citizens perspective and their role in promoting circular transitions and sustainability outcomes.

Also, the revised literature showed that organizations face many barriers to transition their business models and service offerings to CE, specially small and medium-sized enterprises (SME) (HEYES et al., 2018; TAKACS et al., 2022). Among the barriers, the most critical for transparency efforts are: the lack of data, knowledge, technologies and technical skills to increased information sharing through digital platforms; cultural issues with open collaboration and communication practices; conflict of interest, values and modes of operation between different stakeholders regarding transparency (HEYES et al., 2018; TURA et al., 2019; WBCSD, 2023).

In Design field, according to Ceschin and Gaziulusoy (2020), sustainability focus has broadening from material, component and product levels, with an environmental emphasis, towards other levels which encompass a range of socio, economic, political and ethical aspects. Such expansion demands a correspondent increase on interdisciplinary collaboration to achieve changes at socio-technical-ecological systems level, specially for organizations facing business transformations to address sustainability in a more effective way. Despite its relevance, DfS's approaches to dealing specifically with transparency are limited or nonexistent.

Thus, this thesis approaches **transparency as a means to sustainability and circularity goals** exploring **what does it means for design** in terms of theories, models, and tools to support its application, considering a systemic perspective.

Theories and practices to approach transparency on design for digital services is limited

The service sector has a strong relationship with digital technologies in the processes of value creation, from information management, transaction processing applications and connectivity, to service intelligence capabilities for enhancing performance of services (MAGLIO et al., 2019).

However, design for more transparent digital services implies a more systemic

perspective than the usual information visibility, data traceability, or compliance with sector-specific norms and rules (GRIMMELIKHUIJSEN and WELCH, 2012; SCHIEFER and DEITERS, 2013). It needs to consider how to approach transparency since services mediate different levels of digital interactions, in different moments and contexts, between end-users, digital and non-digital stakeholders, based on digital and non-digital processes and resources from a system (MORITZ, 2005; PENIN, 2017).

The theoretical and empirical results from the first phase of the research (Chapters 3 and 4), reinforced that there are many factors and elements of a service that could influence the conditions for organizations to approach sustainability transparency and the corresponding opportunities for design intervention. However, that knowledge is limited to sufficiently inform design practice, and as a consequence, despite the relevance of the concept, Design is limited to pre-defined or tech-driven solutions (e.g.: transparency websites, QRCode/traceability), while risking to remain reactive, by not attuned to the real contextual needs.

Hence, transparency for sustainability has been tightly pushed in supply chain contexts by regulations and advances in information technologies (HOFSTEDE et al., 2004; SCHIEFER and DEITERS, 2013; MOL, 2015). While the market and technological-push is growing, there is a gap on scopes of design practice. Hence, approaching transparency for sustainability on digital services can be an opportunity for a design-driven perspective to support a more empowering, collaborative, and sustainable society (SANGIORGI, 2011; VERGANTI, 2012; MAGER et al., 2020).

This is particularly an issue at the early stages of the design process, since most of the existing approaches have an operational emphasis such as the design of open-data digital infrastructure and digital information and interface design to mitigate the lack of understandability, specially in artificial intelligent systems (JANSSEN et al., 2017; FELZMANN et al., 2020; MATHEUS et al., 2021).

Thus, this thesis approaches the **integration of transparency in digital service design process** in terms of theories, models, and tools to support its application in **activities intended to give strategic direction**, by analysing the context and understanding the needs, generating insights, and setting objectives, and strategies (MORITZ, 2005; PENIN, 2017).

Selected class of the problem

The literature has unveiled that the main constructs surrounding the research problem (Figure 1.2) already have individually sufficient knowledge in their respective fields of study to be used as a starting point in this research. Thus, this thesis addresses

the **gaps at the intersection and the synergies among those constructs**, contributing with an extension of the existing theory and practice.

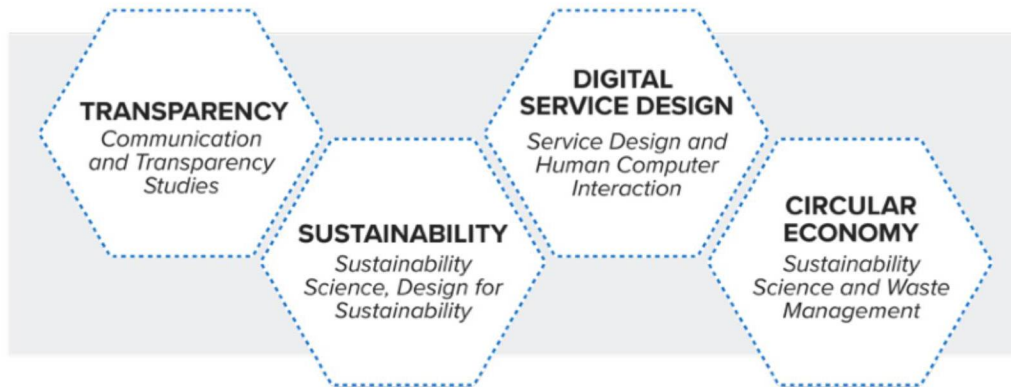


FIGURE 1.2 – Key constructs of the research problem

Source: the author

It had not been possible to identify in the literature an artifact that would sufficiently support the Design process when dealing with transparency for sustainability in digital services. The existing artifacts that present a closer connection to the scope of this thesis are intended to support the design of a transparent state as the end-goal (Chapter 3), rather than transparency as a means to achieve sustainability goals, as this is the ethos of this thesis. Also, literature unveiled that transparency for sustainability challenges can be considered a “moving target”, implying in approaching this thesis research problem as a *wicked problem* (when the problem don’t have a definitive formulation and there is no end to the number of possible solutions) (RITTEL and WEBBER, 1973; BAGHERI and HJORTH, 2007; OLIVER, 2004).

There is a lack of theoretical and methodological support for designers in organizational and educational contexts, in approaching transparency for sustainability challenges. This is particularly relevant when articulating the concept at the early stages of the service design process, where the integration of transparency faces a more reduced amount of barriers, and is an opportunity in the development and improvement of services towards circularity and sustainability.

The literature unveiled that *design diagnosis* is a strategic activity at the early stages of service design process, to inform redesign practices for service improvement and optimization. This is relevant to understand how a service satisfies certain transparency criteria and to learn what are the opportunities for improvement (MAFFEI et al., 2013; POLAINE et al., 2013; FOGLIENI et al., 2018). However, literature focus on new service development, rather than existing services (FOGLIENI et al., 2018).

Hence, the fundamental class of the problem selected as the focus of this thesis was **to integrate transparency for sustainability on the design diagnosis of digital services enabling the circular economy**.

Based on the research problem characterization and identified knowledge gaps, this research aims to investigate: “**How can transparency for sustainability be approached at the early stages of Design, in the context of digital services as enablers of circular economy?**”.

Specific questions:

RQ1) What are the **theoretical foundations** of transparency for sustainability?

RQ2) How to **integrate** transparency for sustainability on **Service Design diagnostic activities**?

RQ3) What are the **key strategies** to consider when intending to increase transparency on digital services within the context of circular economy?

1.3 General and specific goals of the research

In order to address the research question, the general goal of this thesis is: “**To propose a Model and Guidelines to support the integration of transparency for sustainability on the design diagnosis of digital services, in the context of circular economy**”. To achieve the general goal, the following specific goals were established:

Specific goals:

RG1) To **propose a Theoretical Framework** which describes the knowledge foundations of transparency for sustainability in the context of the Design field;

RG2) To **propose an Auxiliary Tool** to articulate the Model and Guidelines on Service Design diagnostic activities in organizational and educational contexts;

RG3) To **identify the key strategies to articulate the Theory, Model, and Guidelines** in practice to enhance the effectiveness of the impact of transparency on sustainability goals.

1.4 Rationale for the research

This section presents some of the main arguments that explain the relevance of the research problem tackled in this thesis (Figure 1.3). The arguments presented in this

section detail the direct relationship of this thesis and the Sustainable Development Goals (UN, 2021): SDG10 - Reduce Inequalities; SDG11 - Sustainable Cities and Communities; SDG12 - Responsible Consumption and Production; SDG16 - Peace and Justice Strong Institutions; SDG17 - Partnerships for the Goals.

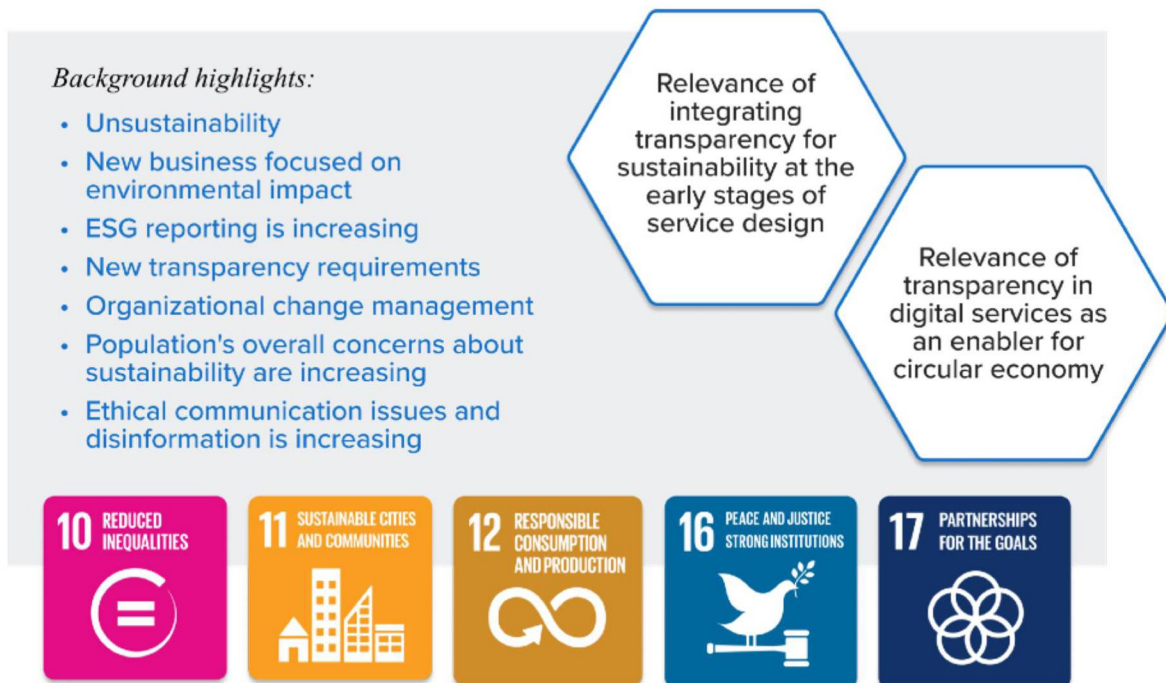


FIGURE 1.3 – The overall research relevance
Source: the author

In 2018, the United Nations Development Programme (UNDP) reported that we are entering a new geologic age, the Anthropocene, where the most serious and immediate risks are human made with impacts at planetary scales. One of the implications for organizations around the world is the call to redesign what development means by fully accounting for the pressures put on the planet (SSIR, 2018).

Gaziulusoy (2010) argues that organizations are one of the major causes of unsustainability, but they are also one of the most important agents of technological and social change. Transparency as an ethical principle which dialogs with the notion of responsibility mainly through socio-political lens, may influence the success of sustainability efforts through services in organizations (STILGOE, OWEN and MACNAGHTEN, 2013).

In Brazil, according to the Pipe.Labo (2021) national research, it was noticed that there was an increase on new ventures with business proposals focused on environmental impact, from 136 businesses in 2016 to 536 in 2021.

Wu et al. (2019) argue that increasing transparency is a potential means for promoting sustainability practices. Organizations are more likely to moderate their relationship with key stakeholders and obtain the necessary support to implementation.

At the corporate level, according to KPMG (2022), globally, ESG reporting is growing incrementally, from voluntary initiatives to the use of standards, but yet favoring quantity over quality. Although the companies reporting have been focusing on quantified environmental data, they are also starting to describe the social aspects. However, less than half of companies disclose their governance risks associated with business compliance, integrity, and anti-corruption (KPMG, 2022).

Also, new transparency requirements are being included in policies for sustainability such as: the introduction of a transparency framework in the Paris Agreement on climate change, to report and review information on emissions, progress made, adaptation actions, among others (WEIKMANS et al., 2019); the inclusion of an European directive to make it mandatory for businesses (large, medium and small-size) that are listed on the stock exchange, to report their impact on people and the planet while giving the public access to comparable, reliable and easily accessible information on sustainability (WWF, 2022). Also, in 2021 the United Nations Development Programme (UNDP) developed the SDG Impact Standards (2021), as decision-making support to help organizations operate responsibly and sustainably. Corporate transparency is among the core themes, including Strategy, Management Approach, and Governance — *“Being transparent is an important element of being accountable to stakeholders - all interested parties including those affected or potentially affected in the future by the organization's decisions and activities. It also helps Stakeholders make more informed decisions, for instance about whether they want to work with or for the organization, invest in or lend to the organization, or buy or use the organization's products and services.”*

From the perspective of consumers, the effective impact of sustainability communication on decision-making can be considered an ambivalent issue. There is a gap between what consumers say they care about and what they actually do, especially when faced with financial trade-offs (O'ROURKE and RINGER, 2015). Interestingly, according to GlobeScan (2020), the overall level of public trust in how companies communicate their sustainability impacts is increasing around the world. In 2020, it has increased to a record of 51% of agreement, the highest level since 2003 (30%). In Brazil, it has increased to 47% of public agreement in 2020, while the last consultation in 2016 was 35% (GLOBESCAN, 2020). In Brazil, the population's overall concerns about sustainability are also increasing (NIELSEN, 2019; CNI, 2022). At least 59% of the population has already boycotted a brand or company due to violations of labor rights; animal testing or mistreatment; environmental crimes; discrimination of any kind; political

positioning (NIELSEN, 2019; CNI, 2022).

The improvement of population awareness and education on sustainability also influences the notions of business responsibility and transparency demands (CHRISTENSEN and CHENEY, 2015; PARRIS et al., 2016). But although the Internet and Social Media facilitated access to a broad variety, quantity, and quality of information, they also reinforced unprecedented ethical communication issues. *Misinformation* is defined as information that is false, but not created with the intention of causing harm, while *disinformation* is deliberately created to harm (WARDLE and DERAKSHAN, 2017). Both are considered a global information disorder. In the context of sustainability, it has negative implications on individuals and organizations notions of knowledge, belief, truth, and trust (DENNETT and ROY, 2015; CHRISTENSEN and CHENEY, 2015; WEF, 2022; UN, 2023). For Dennett and Roy (2015), this will pressure the evolution of novel organizational arrangements, that are more open, responsive and decentralized.

Relevance of integrating transparency for sustainability at the early stages of service design

In Brazil, according to the Pipe.Labo (2021) national research on new ventures focused on environmental impact, 51% of them were at the early stages of solution development (pilot, optimization, grow) and business organization. Besides investment support, mentoring and communication were the main types of support needed. Also, despite the nature of the business, 42% did not had impact governance tools and internal controls in place, mostly due to the lack of competences.

With the demand for sustainability consulting capabilities rapidly growing, the business consulting market has undergone transformations such as the acquisitions of expert companies (more than 18 acquisitions occurring from 2020 to 2022 (VERDANTIX, 2022). The consulting capabilities includes: sustainability strategy; business model transformation; operation and impact transformation; digital transformation; sustainability reporting. This movement also reflected in design consulting and communication agencies, with the inclusion of new sustainability offerings in their portfolio, such as: sustainable futures; digital transformation; customer centricity; innovation by design; sustainable behaviour design; design for circular services; design for resilient system (FORBES, 2022; LIVEWORK, 2023; KOSS, 2023).

Ethical and sustainability issues are gaining relevance in Service Design field, concerning what to stand for, what are the impacts and unintended consequences, how people are included on services, among others topics (MAGER et al., 2020).

From an academic perspective, Service Design (SD) education and practice are intertwined, because the changes in education will influence the capacity for the industry to support sustainable transitions (PONTIS and WAARDE, 2020; BOEHNERT et al., 2022).

Despite the industry and academic relevance of SD, education is still scarce, specially in the Brazilian context. In a survey carried out in Brazil higher education institutions, in 2014 none of the 255 institutions offered qualifications in SD. While in a more recent survey in 2018 with 18 undergraduate courses (in Rio de Janeiro and São Paulo), 5 had SD mandatory disciplines, and another 5 addressed SD indirectly through other disciplines (ANNARUMMA et al., 2022).

Transparency for sustainability research also can have a role in this process of evolving Service Design Education, extending the technical-focus to transdisciplinary engagement for dealing with real socio-political-ecological challenges such as climate change, social inequity, injustices, power asymmetries, greenwashing, disinformation, untrustworthy organizations, etc. (MEYER and NORMAN, 2020; PONTIS and WAARDE, 2020; BOEHNERT et al., 2022).

From a methodological perspective, it is at the early stages of the service design process where insights and requirements are gathered, problematized and decisions are made, informing a new design or the improvement of an existing service. The focus is not on the solution itself, but on the identification of a set of opportunities and gaps that the design should address. Hence, integrating transparency at these stages would be fundamental for it to be part of the initial design strategy and to be able to facilitate other stages of development (MORITZ, 2005; PENIN, 2017).

Also, a design diagnosis can be considered a more analytical approach to support understanding of key criteria for making sense and decisions on transparency. This is an opportunity to make transparency improvements a common cause for the service stakeholders, and benefit the people using the service by systematically reviewing the existing service and fostering a service evaluation culture for a continuous learning and innovation process (POLAINE et al., 2013; FOGLIENI and HOLMLID, 2015; MOULE et al. 2016).

Relevance of transparency in digital services as an enabler for circular economy

In recent years, Municipal Solid Waste (MSW) has become an increasingly urgent topic in Brazil and in the world, mainly due to economic growth and acceleration of consumption, as a result of linear production-consumption systems, with flows from raw materials, manufacturing, distribution, consumption and disposal of products and goods (PAES et al., 2019; HOANG and FOGARASSY, 2020).

To understand the challenge, according to Abrelpe report (2020), in Brazil, only 3% of waste is destined for recycling and less than 1% for composting, most of it goes to landfill. The generation of waste has registered a considerable increase, and by 2050 its expected an increase of almost 50% in the amount of MSW, compared to the base year

of 2019. One of the consequences is that the waste sector accounted for 4% of total greenhouse gas emissions in Brazil in 2019, which corresponds to 96 million tons of CO₂ emitted, a 23% increase in emissions compared to 2010, with two-thirds of these coming from final disposal activities, including sanitary landfills, controlled landfills and dumps (ABRELPE, 2020).

As an alternative, the concept of the circular economy has recently gained importance on the research and policymakers agendas (GEISSDOERFER et al., 2017).

In Brazil, the focus of circular economy strategies has been on services for the end of life of products including: collection (selective, reverse or not), transport, final destination (sanitary landfill or recycling cooperatives) (SANTOS et al., 2021). With the National Solid Waste Policy (Law 12.305/2010), reverse logistics was established as one of the main instruments for implementing circularity, by promoting actors shared responsibility and setting targets for companies with a focus on the weight of waste from what they placed on the market, and that is collected and correctly allocated (SINIR, 2022). Thus, for some types of waste such as textile and electronics the disposal depends on the existence of specific reverse logistics services. This is particularly relevant on large countries such as Brazil where the logistic distances are huge and needs to be managed in a collaborative effort between end-users and companies in order to be effective.

However, at the time of this research there were no legal instruments in Brazil that impose a more sustainable waste management at the early life-cycle stages of consumption and usage of products, which could influence business priorities and limit the available service offerings.

Regarding socio-technical relevance of this research, this situation has reinforced the need for practices associated with transparency for sustainability, since organizations and governments have been challenged by sustainability issues and creating new ways of communicating, serving needs and enhancing value for people. In that context, design is pointed as relevant for reaching goals of circular economy (SUAREZ-EIROA et al., 2019). This is particularly relevant when designing for services, since most of the contributions on CE Design focus on product level (WBCSD, 2023).

Another factor influencing the provision of services towards circular economy are the digital technologies. Information and communication digital technologies are affecting the various aspects of daily life. It is starting to affect sustainable living aspects through the digitalization of the city and household products and services, assisting people with different informational and activity needs (SKOUBY et al., 2014; U4SSC, 2020; MORATO et al., 2021).

In that context, the new Brazilian Digital Governance Strategy aims to ensure that most public services are provided digitally in the form of self-service (fully automated where processing is carried out by information systems) (BRASIL, 2016). In Brazil, according to the Pipe.Labo (2021) national research on new business focused on environmental impact, Waste Management was the largest sector, with 227 new ventures (42%) (most based on digital services).

Digital technology is pointed as a driver or trigger of change at business and organizational level, and at institutional and societal level (KRAUS et al., 2021). Indeed, on the organization side, digital capabilities can create new ways of serving needs and enhance service value. The growing technological-push affects the organizations from outside to inside, implying the need to be able to adapt quickly to new circumstances, and to transform strategically and operational (VERGANTI, 2012; ZAKI, 2019).

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). Design for digital services can affect how people make sense of privacy, accessibility, consumption patterns, etc. Concepts such as “quantified” self, or “smart citizen”, are being explored as a form of human augmentation (WEF, 2017). For instance, according to Gartner (2021), wearable devices and self-tracking applications are rapidly growing. They collect and process personal data, to allow people to monitor their activities (e.g., health, work, fitness). Among the devices available, end-user's spending with smartwatch increased 17.6% to reach \$21.8 billion in 2020.

Global digital technology development companies are starting to offer sustainability data-driven solutions to assist sustainability management (MICROSOFT, 2022; IBM, 2022). However, this indicates that sustainability data tends to become even more digitalized, and that transparency efforts needs to be constantly in alert with this digital-mediation, for not becoming dependent on what is “conveniently” digitized to be seen.

However, from an academic perspective, digitalization of sustainability still lacks in research. While the most tangent research areas focus on consumption in digital retail industry and e-commerce, not necessarily addressing digital technology as a trigger for sustainability (KRAUS et al., 2021), this can be a research opportunity (FIALKOWSKI, 2022).

Thus, from a socio-technical perspective, the introduction of digital technologies will leverage new sources of data from the services from which information, knowledge and insights can be transformed into new forms to communicate and interact with sustainability (BRESSANELLI et al., 2022). But, it will not automatically lead to higher

transparency. In fact, some digital technologies do present a threat to sustainability. For instance, according to FORRESTER (2023) report, datacenter energy consumption in 2021 was around 0.9–1.3% of global final electricity demand, while data transmission networks consumed 1.1–1.4% of global electricity use. In 2019, the world generated 53.6 million metric tons of e-waste.

From the academic perspective, in Service Design this movement has already being pointed as a priority for design research (OSTROM et al., 2015; PATRÍCIO; GUSTAFSSON; FISK, 2018).

1.5 Assumptions of the research

In line with the research specific goals, this research is based on the following assumptions:

Assumptions related to the theoretical specific goals:

- The current literature, combined with empirical knowledge, can provide initial insights into how to approach transparency for sustainability in the context of the Design field. Although transparency studies focus on disclosure of data and information on sustainability through single digital touchpoints, this research is more aligned with theories that argues for exploring the concept of transparency in a more critical and holistic perspective, considering its role in the mediation and reformulation of socio-environmental relationships (EGGERT and HELM, 2003; MCCARTHY and FLUCK, 2017; ALBU and FLYVERBOM, 2019).

Assumptions related to the practical specific goals:

- It is possible to integrate transparency for sustainability in the activities of diagnose in the early stages of Service Design process (POLAINE et al., 2013; FOGLIENI and HOLMLID, 2015). Thus, a transparency for sustainability approach for the diagnose of digital services, can support the reformulation of the service's value propositions, enhance stakeholder participation through higher governance, identification of problems and opportunities (OLIVER, 2004; BAGHERI and HJORTH, 2007).
- There are contextual and operational limitations for conducting the practical applications of the artifact. Since the research deals with an emergent theme, the introduction of new concepts and instruments can imply adopting a more didactic approach, favouring learning and reducing complexity. It was also assumed that the selection of the organizations and the participants according

to research criteria would be a challenge due to availability, maturity, and potential tensions regarding the transparency theme. The operational limitations include the flexibility to deal with the low availability of quality time from the participants.

- Transparency for sustainability in services can contribute to create conditions to broaden the organization perceptions on how to improve the customer experience (and learning) with sustainability (INBAR; TRACTINSKY, 2012). Rather than considering transparency as a quality criteria for services (SCHNACKENBERG and TOMLINSON, 2016; ALBU and FLYVERBOM, 2019), it is assumed that a transparency design approach could be approached as an enabler for sustainability, helping service organizations in promoting awareness, and more sustainable practices (including the ones associated with circular economy), while stimulating the continuous evolution towards sustainability. Besides information visibility, transparency in services can also have a role in raising awareness, educating and engaging customers (and stakeholders in general) about the ethical and pragmatic implications of sustainability, and also supporting informed decision-making and trust-building on sustainability (SCHIEFER; DEITERS, 2013; WEF, 2018; LOMBA, 2020).

1.6 Scope and limitations of the research

According to the selected class of the research problem (Section 1.2) and the educative and diagnostic requirements of the artifact, this thesis contributions focused on the initial stages (**Discover** and **Define** in blue) of the design process in **existing services**, based on the evaluation framework proposed by Foglieni et al. (2018) and Design Council (2019)(Figure 1.4).

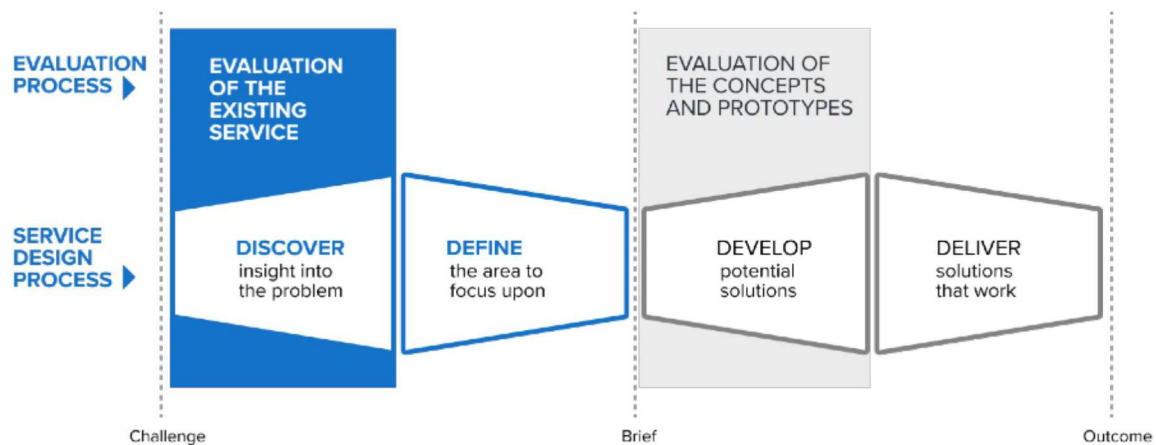


FIGURE 1.4 – The selected stages of the design process

Source: the author, adapted from Foglieni et al. (2018) and Design Council (2019)

Foglieni et al. (2018) framework embeds a service evaluation strategy into the service design process focusing on service value. This framework was selected to clarify the position of diagnostic study on the overall design process. It is also easily linked with the Diamond model from the Design Council (2019). The main models for Service Design process derive from the Diamond model (MORITZ, 2005; STICKDORN et al., 2011), and since it is more commonly used in design practice, it facilitates knowledge transfer at the end of the research process. The other stages of the process concerning the development of the concepts, filtering ideas, prototyping and the implementation of the propositions were not addressed in this research, as well as the study of new service offerings.

Additionally, this thesis considers improvements in services ranging from digital **touchpoints, user journeys and service system-configuration**. Structural or cultural changes at organizational level was not addressed in this research (LOMBA and SANTOS, 2023).

This research focused on the general outline of digital services, but not in the study of the usability of the digital interaction and technologies per se. The investigation is limited to the service conditions /infrastructure on each organization in the field study (MORELLI et al., 2021). The observation of the field, focuses on the **elements of service-system** such as processes, stakeholders, and resources, rather than the actual user experience and behaviour, as both were not addressed in this thesis. In other words, it deals with the general principle that govern the operation of the service rather than specific user requirements.

Based on Sangiorgi and Prendiville (2014), this thesis was more aligned to service studies with emphasis on “**facilitators**” for Service Design such as models, methods and tools. It also focuses on studying existing digital services, rather than creating new

service offerings (SANGIORGI and PRENDIVILLE, 2014). This is line with Edvardsson, Gustafsson and Roos (2005) proposition that puts “**service on a perspective of value creation**”, from the service user’s lens based on context and use, rather than a market offering perspective (SANGIORGI and PRENDIVILLE, 2014).

The research did not address transparency regarding policies and regulations adherence, organizational/corporate and accountability aspects were not addressed in this research. Similarly, the state or perception of transparency itself in a service from a user perspective was not the focus of this research.

Although digital transparency studies are more concentrated on data and information disclosure through digital systems, this thesis is more aligned with studies arguing for the importance of exploring the concept of **transparency in a more critical and holistic perspective**, considering its role in mediating and reshaping socio, environmental and economical relationships (EGGERT and HELM, 2003; MCCARTHY and FLUCK, 2017; ALBU and FLYVERBOM, 2019).

Considering the key categories of circular economy strategies (POTTING et al., 2017), this thesis focused on the implications of transparency for sustainability in the context of services supporting the use of **waste as resource at post-usage stage with recycle strategies**. Also, this research considered services supporting the **usage stage with focus on reuse, repair and remanufacture strategies**.

The application of the proposed artifact in the studies was limited to **companies with teams managing digital services for sustainability**, and with **practitioners and students in an educational context**. The end-customers/users of the services under study were not part of the sampling.

At last, part of this thesis was developed during the COVID-19 pandemic, and due to that, most of the research strategy was adapted to enable **remote** data collection and the participation of people with **limited available time**.

1.7 Overview of the research strategy

Based on the characteristic of the research problem, demanding the development and application of an artifact as an instrument to seek solutions to the problem and knowledge building, the researcher selected Design Science Research as the main method for this thesis. The research strategy was organized into three main phases, as shown in Figure 1.5.

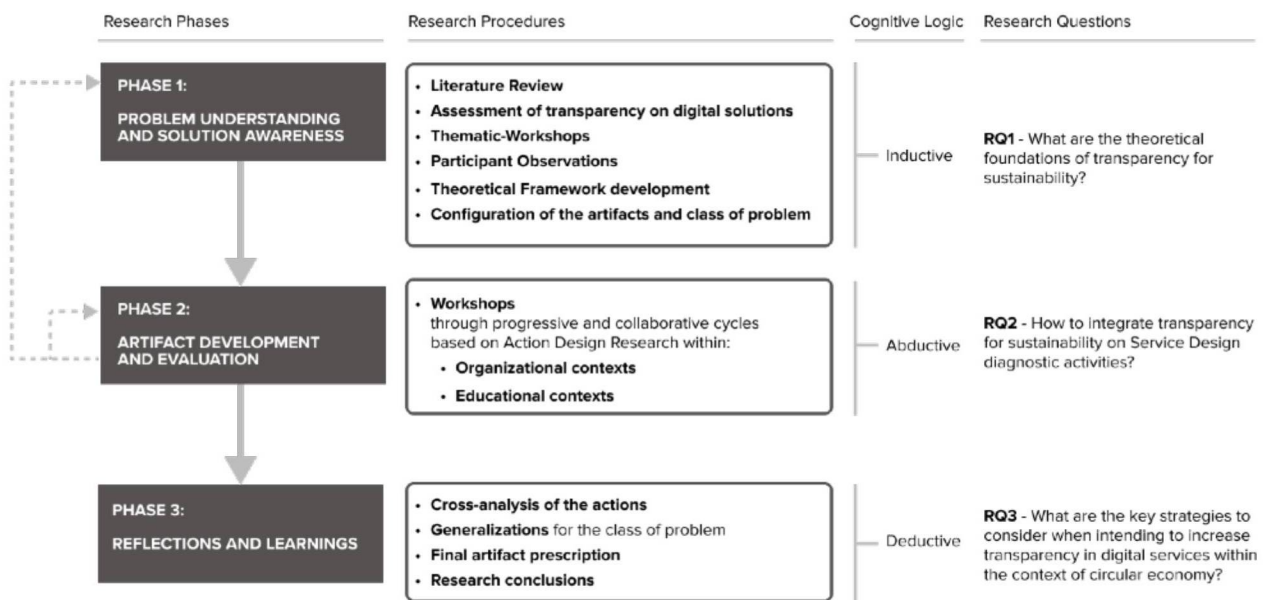


FIGURE 1.5 – Research strategy
 Source: the author, based on Dresch et al. (2015)

The purpose of the research first phase is to understand the research problem from a broader perspective, while identifies existing artifacts and classes of problems that have addressed similar problems to the one being studied. This phase aimed on answering RQ1. Then, Phase 2 is based on progressive cycles with focus on the artifact studies (proposition, development and evaluation) to solve the problem being studied. This phase aimed on answering RQ2. The last phase of the research aims at formalize a conclusion of the cross-studies, showing the results and the decisions made during its conduction. This phase is focused on answering RQ3.

1.8 Knowledge contribution of the thesis

This thesis contributes to the advancement of research in “Production and Usage Systems” of the Postgraduate Program in Design at the Federal University of Paraná. This thesis was intended to evolve the propositions from the previous master’s dissertation (LOMBA, 2020) in the same program and research line.

The general research goal was to support the integration of transparency for sustainability on design diagnostic activities of digital services in the context of circular economy by proposing a process *Model* and *Guidelines*. This thesis contributes with a theoretical and methodological perspective to approach transparency for sustainability on Design field with these artifacts.

The *Theoretical Framework* brings together the body of existing knowledge (Chapter 3) and reinterprets and integrates it with knowledge acquired through empirical

learning from field work. The framework organizes the theoretical components (inter/multi/cross disciplinary) in scopes as the levels to approach transparency in digital services. **This multidimensional and multilevel characteristic of the *Theoretical Framework* is a contribution, providing a systematized new perspective to identify, describe, and classify the critical components to consider when approaching transparency for sustainability at the early stages of the design process.**

The literature unveiled that transparency can be addressed more as a spectrum, implying that different strategies contribute to overall types of transparency and outcomes (MOL 2015; SCHNACKENBERG and TOMLINSON, 2016; MABILLARD and ZUMOFEN, 2017). The theoretical and empirical results of this research helped to evolved the understanding of the key levels to approach transparency for sustainability on digital services. Hence, the ***Theoretical Framework* contributes with a proposition of the *Transparency for Sustainability Scope of Strategies* organized in three categories:** a) **governance scope** to foster the required competencies for service designers; b) **practice scope** to enable the end-user value-creation for sustainability through transparency digital interactions; c) **relational scope** to build relationships with key stakeholders that have a role on transparency for sustainability. More specifically **at *Practice Scope*** in the context of digital services enabling the circular economy, this thesis contributes with a proposition of transparency strategies organized in three sub-categories: **institutional-oriented communication** typically concerning the governance of sustainability and circularity; **product-resource-oriented communication** of the flows of resource handled by the service; **individual-oriented communication** concerning the end-users and collaborators of the service circularity.

Among the elements that comprise the *Theoretical Framework* a **contribution to be highlighted is the proposition of *Design Principles* to help acknowledge the ethical, communication, and value dimensions that should be considered when integrating transparency for sustainability into the design of digital services.** The proposition of Design Principles **can be used to guide the characterization of existing transparency practices and make decisions on how to operationalize transparency practices for sustainability.**

The Literature Review has shown that, so far, no similar process model to the one proposed in this thesis was identified. Most models for approaching transparency (CAPPELI et al., 2013; EIBAND et al., 2018; FELZMANN et al., 2020; LOMBA, 2020), have not considered the combined peculiarities of digital service design and sustainability, with a diagnostic approach.

The proposed *Model* was initially built based on the elements of the *Theoretical Framework*, the service evaluation guidelines proposed by Foglieni et al. (2018), and the

general design process model from Design Council (2019). Then, the initial propositions evolved along the cycles of fieldwork study with empirical data. **The proposed process Model describes the key phases, activities and modules to conduct a design diagnostic of transparency for sustainability on digital services, contributing with a new form of practice on Design field. The Model can be used as a guide to the strategic pathways to be considered to enhance the impact of transparency on sustainability, in line with the more recent generation of studies approaching transparency as an enabling concept for value-creation** (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).

The proposed set of *Guidelines* describes the components of the *Theoretical Framework* and provides an indication of action to support the activity modules in the process *Model*. The *Guidelines* were presented through an Auxiliary Tool named *Activity Guides*. The Literature Review has shown that, so far, no practical instrument has been proposed to support the integration of transparency on Design. The contributions to design practice from the set of *Guidelines* include: structured guidance for conducting a critical analysis of the current situation and improvement opportunities with a focus on transparency for sustainability in digital circular services; educational instruments to foster learning and competence building on the key related themes; and the format of the *Activity Guide tool*, which provides a description of each theoretical component, examples, and practical recommendations that can be used as a checklist.

1.9 Audience of the thesis

This thesis deals with a theme that can be of interest of a broad audience, including:

- **Design practitioners, digital design teams and students**, mapping the current state of transparency for sustainability, understanding gaps and opportunities for improving services from a transparency for sustainability perspective. Also, for those interested in aligning service capabilities, or even having more parameters for analysis, when facing transparency for sustainability issues.
- **Private, public, and third sector organizations**: that are shifting offerings towards sustainability and that are interested in strategic transformations aimed at services, relationships and systems; fostering continuous improvements and reformulation of value propositions.

- **Educators, Academic and Research communities**, contributing with knowledge of the field, Design education and pathing the way for future research.
- **Digital Technology companies**, developing solutions for transparency and sustainability.

1.10 Structure of the thesis

This thesis document is organized as follows:

Chapter 1 - Introduction: presents the research context and problem subsequently, the objectives of the work, theoretical assumptions, justification and delimitation. It also presents a brief description of the general strategy adopted to conduct the research as well as, expected knowledge contribution and audience for this thesis.

Chapter 2 - Research Method: presents the method and procedures used to fulfil the research objectives, describing the characterization of the problem, the selection of the research method, the strategy for conducting the research and the data collection and analysis protocols, including the internal and external validation strategies.

Chapter 3 - Foundations of transparency design for sustainability in digital services: this chapter essentially constitutes the theoretical foundation of the thesis, addressing the themes of Transparency, Digital Service Design and Design for Sustainability, introducing definitions, principles, strategies, as well as discussions about the integration of these approaches. At the end of the chapter, it is presented a review of existing transparency approaches for design.

Chapter 4 - Research Phase 1: Problem understanding and solution awareness: presents the findings obtained by applying the research procedures for problem understanding and solution awareness.

Chapter 5 - Research Phase 2: Artifact development and evaluation: presents the findings obtained by applying the research procedures for the artifact development and evaluation fieldwork studies.

Chapter 6 - Research Phase 3: Reflections and learnings: presents the findings obtained by applying the research procedures for the reflection on the research results.

Chapter 7 - The Final Artifact: presents the final version of the artifact developed under the research.

Chapter 8 - Conclusions: presents the final conclusions of the research regarding the problem and the proposed goals, considerations about the research method and future work recommendations.

Chapter 2 – Research Method

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2.1 Characterization of the research problem

To characterize the research problem in relation to the state of the art, a Bibliometric Analysis was adopted within the scope of scientific research. The analysis included the master's dissertation and doctoral thesis published in the main Brazilian database ("CAPES Thesis and Dissertations Catalog") from 2013 to 2023.

Bibliometric Analysis has unveiled an increasing number of publications since 2013, ten years prior to this research, dealing with the topics addressed in this thesis (Figure 2.1). Critical analysis of the evolving knowledge on the topic has shown a lack of studies approaching it in the Design field, more specially with the theme of "transparency and sustainability" and "design of digital services".

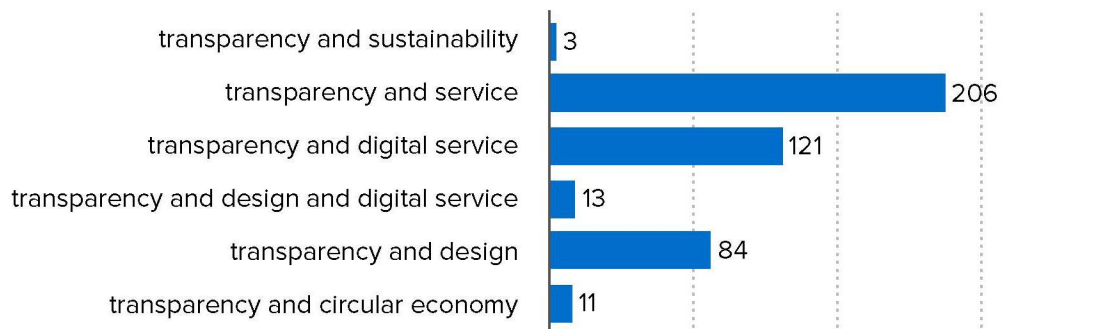


FIGURE 2.1 – Number of Brazilian master's dissertations and doctoral thesis related to this thesis topics
Source: the author

To illustrate that in the Brazilian context, a search on master's dissertations and doctoral thesis concerning “transparency and sustainability” brought most of the results from the fields of Administration, Law, Engineering and Computer Science. In the fields of Administration and Law, “*transparency*” was addressed more as a secondary outcome than a central research object. As an example, Sartori (2017) studied transparency in corporate governance and sustainability reporting within the sugarcane ethanol industry. The outcome of the research was a set of principles, criteria and indicators to evaluate the organizational performance on sustainability. Jordão (2021) recently studied transparency in public administration, connecting it with the themes of smart cities and sustainable development, proposing normative indicators to assist municipal managers in decision-making.

When the search uses the string “transparency and service” string resulted in 206 publications, most from the field of Public Administration, where *transparency* concept was not theoretically explored in-depth, because the focus were transparency solutions such as “transparency websites” and quality criteria. Similarly, “transparency and digital service” string resulted in studies exploring the concepts of “smart cities” and “Industry 4.0”, specially with digital technologies such as blockchain.

The search with the string “transparency and design” showed an emphasis of MSc/PhD research on the fields of Production Engineering, Civil Engineering, Computer Science and Design, where *transparency* was addressed more as a central research object. As an example, Brandalise (2018) studied Visual Management strategies for process transparency in Civil Engineering; Arruda (2019) studied open data active transparency, for public databases in relation to the Access to Information Law, Morassutti (2019) studied privacy by design and computer algorithm transparency; Lomba (2020) studied transparency in Design, proposing a model to assist transparency diagnosis for sustainable food consumption in the service design process.

At last, the string “transparency and circular economy” brought most of the results from the field of Engineering, with publications addressing concept transparency as a synonym for information disclosure.

The findings have demonstrated a growing but yet small attention of research to the theme of transparency on Brazilian context. Hence, most of the theoretical basis to support this thesis was found in international published articles and in a few international published books and thesis. Yet, similarly to the Brazilian scenario, the findings from international research on the subject have shown the existence of a reduced amount of research on the topic, with emphasis of application on the fields of Public Administration, Corporate Governance, Information Systems and Computer Science.

To support that, the Bibliometric Analysis included the systematic literature review, for an international perspective of the state of the art on the subject from 2013 to 2023, according to the criteria defined in Chapter 2. Table 2.1 presents a summary of the main search strings adopted and respective results obtained. The review was conducted in 2021, with a second round in 2023 to check for new publications during this interval.

TABLE 2.1 - Main search strings from the systematic literature review

Search String	Results:	Filter 1:	Filter 2:	Filter 3:
<i>2011 - 2021</i>				
<i>transparen* AND sustain*</i>	146	64	11	2
<i>transparen* AND design</i>	187	39	13	6
<i>transparen* AND service</i>	114	47	2	2
<i>transparen* AND "circular economy"</i>	7	1	1	0
Total:	447	150	26	10
<i>2021 - 2023</i>				
<i>transparen* AND sustain*</i>	95	8	6	2
<i>transparen* AND design</i>	64	1	1	0
<i>transparen* AND service</i>	24	2	1	0
<i>transparen* AND "circular economy"</i>	20	4	2	0
Total:	183	11	8	2
Total	630	161	34	12

Source: the author

The systematic literature review also unveiled a reduced number of articles addressing the research central topics. Due to that, from the search strings in Table 2.1 a

total of 10 articles were selected and incorporated in the thesis (Chapter 3). A secondary group of search strings (Appendix 1), was used during the review, but also lead to less than 10 publications selected and incorporated in the thesis. Due to the limitations of the systematic review on the theme, a non-systematic literature review was also conducted, to bring additional publications for supporting the theoretical foundation of this thesis, including articles, books, thesis and reports.

Based on the results from Filter 2 of the systematic review, it was possible to identify the evolution of the publications closer to theme of this thesis, in the last twelve years (Figure 2.2).

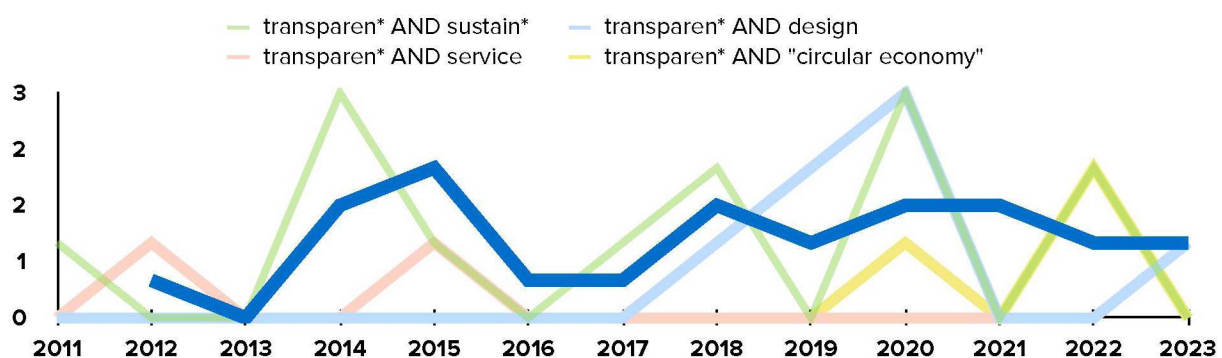


FIGURE 2.2 – Timeline of the publications from systematic review

Source: the author

The findings reinforce the emergence of the theme and shows a potential increase in the number of publications in the last 5 years. The existing literature has unveiled that knowledge to support designers in approaching transparency for sustainability is rather limited, specially in the context of digital services enabling circular economy.

Although individual topics such as “transparency”, “sustainability”, “service design” and “circular economy” already have satisfactory theoretical and empirical background that could support this thesis, the research problem being addressed requires an integrated perspective that demands an inter/multi/cross disciplinary approach. Such integrative and holistic perspective is still little explored in the literature which in itself is an opportunity if knowledge advancement (UU, 2021).

In conclusion, the findings suggest that the theme being addressed by this thesis leads to an **exploratory research**, considering the state of maturity of the knowledge on the topic. With such characterization the expectation is that the outcome of the research will provide enhancement of our understanding about key concepts, principles and heuristics on transparency, contributing to theory building on the subject as well as the exploration of new methodological approaches. Also, since the research objective

concerns the development of knowledge for practical application, this is an **applied research** from the point of its nature (PRODANOV and FREITAS, 2013).

2.2 Selection of the research method

According to Prodanov and Freitas (2013), Methodology refers to a discipline to study, understand and evaluate the various methods available to carry out academic research. The Scientific Method refers to a set of procedures adopted with the purpose of knowledge development or improvement.

Due to the characterization of this research, the author considered Design Science, Action Research, and Case Study as possible methods to be considered on the field research. A Case Study method is based in real world experiences and issues with this phenomenon, but it doesn't enable control over the events, limiting the research to descriptive contributions. As alternative, the methods Action Research or a Design Science would allow more prescriptive contributions, exploring the problem situation and building new theories or artifacts to improve it. However, in an Action Research approach the researcher focus is not on the artifact itself, but on the lessons learnt throughout its development, implying in risks of the participants changing the process and no longer result in the development of an artifact intended by this thesis.

Since this thesis aims to formulate prescriptive contributions to instrumentalize the transparency diagnose of services, Design Science research (DSR) was selected as the main method, considering the characteristics of the research problem and objectives that are more adherent to an artifact-oriented unit of analysis. At the same time, Action Research was selected as a procedure to guide the fieldwork studies, enabling a systematic approach for registering and analysing the learning process.

Thus, considering the exploratory characteristic of the research problem and the objective of developing an artifact as a way of evaluating theoretical propositions, the **Design Science Research (DSR) method** was selected.

The research adopted predominantly a **phenomenological qualitative approach**. The researcher positioning is oriented to the meanings and relevance of the content raised on the field research (PRODANOV e FREITAS, 2013). The researcher has maintained direct contact with the environment and the object of study in question, requiring more intensive field work, and the data collected are descriptive, portraying the greatest possible number and variety of elements in order to obtain a deep understanding about reality.

According to Dresh et al. (2015), Design Science *"is the epistemological basis for the study of what is artificial"*. While Design Science Research *"is a method that*

establishes and operationalizes research when the desired goal is an artifact or a recommendation”.

Design Science Research (DSR) is a rigorous process of designing artifacts to solve problems, to evaluate what was designed, or what is working and to communicate the results. It combines theory with practice, and is indicated when the objective of the study is to design, develop and test prescriptive solution concepts (named artifacts), to solve a class of problem, building knowledge that supports problem solving. It predominantly employs the abductive logic, aiming to conclude the best explanation and value creation, using the repertoire of knowledge acquired by the researcher on the studied themes, allowing new relationships to be established. Theory building focus on the discovery of how a set of design propositions (named artifact) works in a certain problem situation (DRESCH et al., 2015). DSR allows the collaboration between researchers and organizations, for testing new ideas in a real context, enabling producing scientific knowledge, helping organizations to solve real problems (DRESCH et al., 2015).

The artifact is a central concept to the DSR method. According to Simon (1996, p.29), *“an artifact can be thought of as a meeting point — an ‘interface’ in today’s terms — between an ‘inner’ environment, the substance and organization of the artifact itself, and an ‘outer’ environment, the surroundings in which it operates”*. Such definition reinforces the reasons for the choice of DSR since this study involves the creation and assessment of the effectiveness of a modality an artifact, designed to support practitioners in their quest for more sustainable results.

2.3 Unit of analysis

The *unit of analysis* in social research represents the main entities (objects or events) under study, for which the researcher collects, describe and analyses data. Thus, the unit of analysis determines which conclusions can be drawn from the study and that are intended to be generalized (SINGLETON et al., 1993).

Considering the research goal, the unit of analysis is the transparency diagnostic activities, analyzed from the application of the auxiliary tools within real digital services from companies and educational contexts.

2.4 Research development

Figure 2.3 illustrates the overall the research development, including the original DSR method stages, the selected theoretical and empirical procedures adopted, and the main outcomes from each phase.

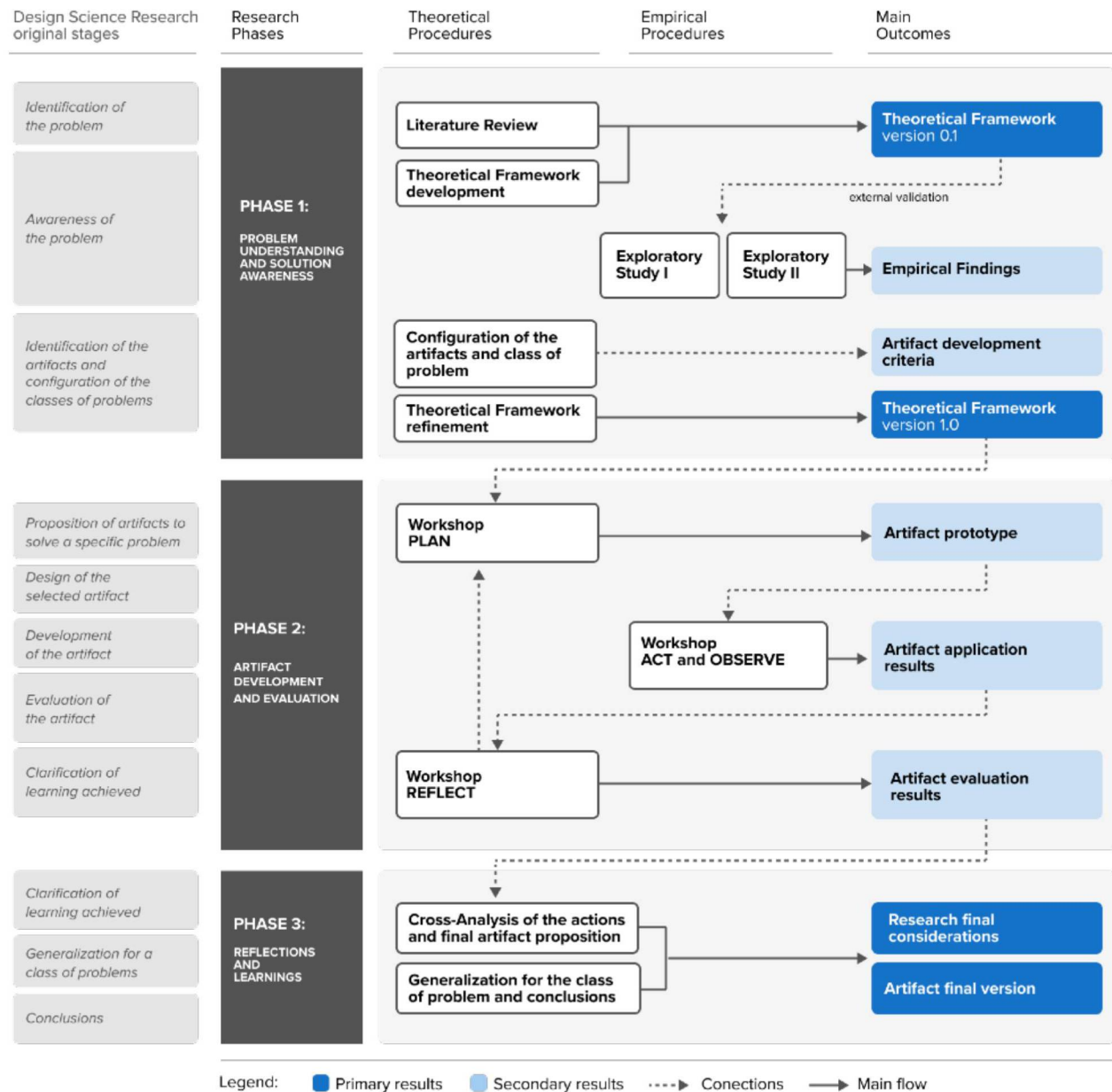


FIGURE 2.3 – Research development
Source: the author, based on Dresch et al. (2015)

Phase 1 - Problem understanding and solution awareness

The purpose of this phase was to understand the research problem from a broader perspective, while identifies existing artifacts and classes of problems that have addressed similar problems to the one being studied. For that, this phase mainly consisted of theoretical procedures, including, a literature review for understanding the key theoretical foundations and requirements for the artifact. Empirical procedures in this phase were adopted as an exploratory strategy aimed to provide greater familiarity with the research problem including an assessment of transparency digital practices, thematic workshops and participant observations. This initial empirical findings helped to validate, adjust and refine the theoretical framework that underpin the next phases of the research.

Phase 2 - Artifact development and evaluation

The purpose of this second phase was the iterative process of proposition, development and evaluation of an artifact as a prescriptive solution to the class of problem being studied. The main theoretical procedure in this phase was the artifact proposition based on the criteria derived from Phase 1, and further requirements to be adopted on the subsequent phase that involved empirical validation. The empirical procedures were based on workshops in organizational and educational contexts. The application and evaluation of the artifact contributed with insights for further improvements.

Phase 3 - Reflections and learnings

The purpose of this third phase was to assess the external validity of the artifact, by enabling a critical reflection and formalization of conclusions about the study, including those about decision process across the study. The procedures on this phase were mainly theoretical, including a cross-analysis of the artifact through comparative and qualitative approach, obtaining as a result a set of final recommendations for the artifact. The reflection that was carried out on this phase focused on the possibilities of generalization of the results for the selected class of problem.

This research development plan was submitted to the Social Sciences Ethical Committee for Research with Human Beings at UFPR, receiving its approval on the process number CAAE nº60925822.6.0000.0214, with the final assessment number 5.671.028 issued on September 28, 2022.

To summarize, Figure 2.4 illustrates the key aspects of the research outline, including the questions, goals, phases and respective procedures and results.

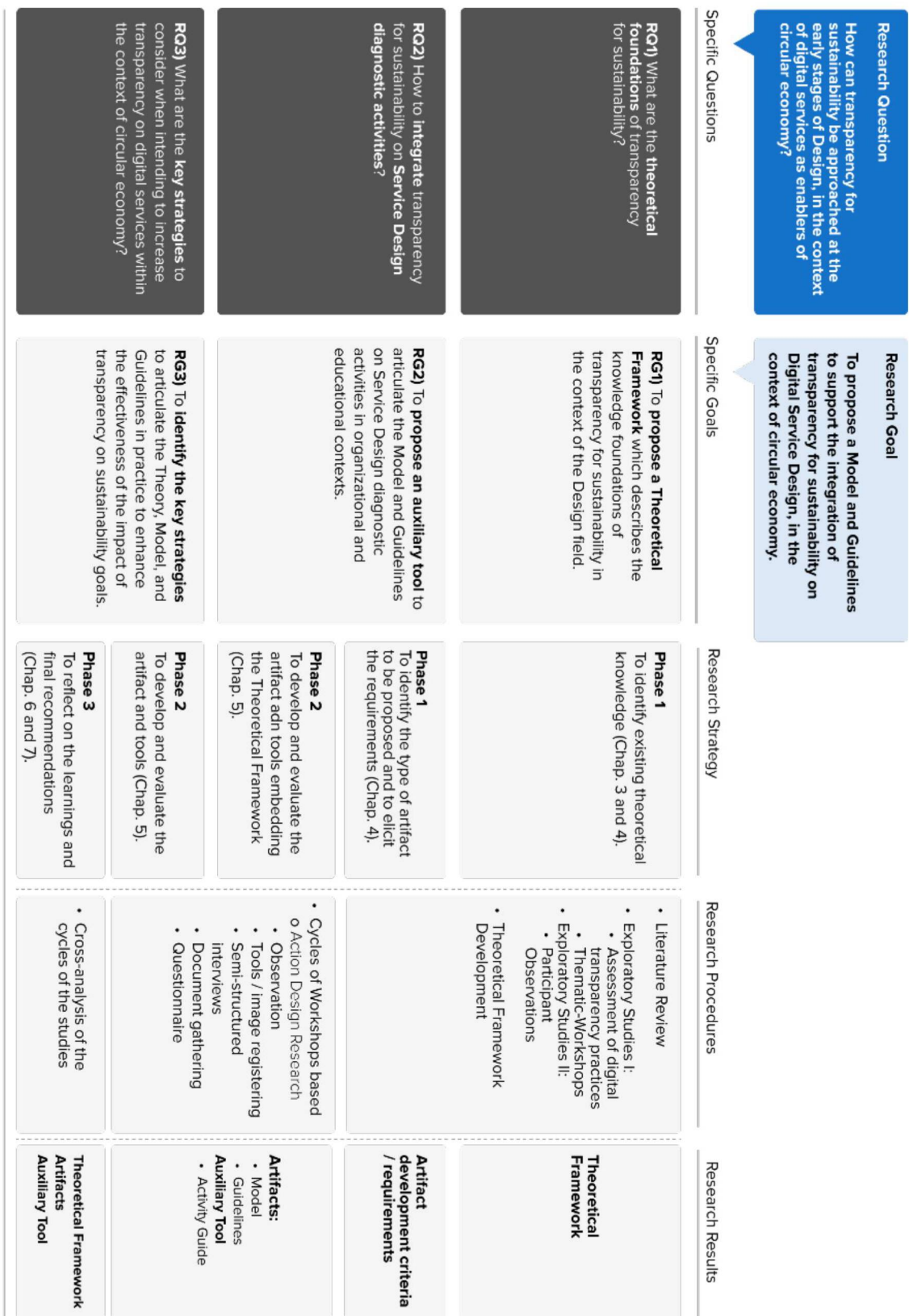


FIGURE 2.4 – Research summary
Source: the author

2.5 Validity strategy

The research analysis strategy was based on the evaluation of the developed artifacts, showing how they satisfy the identified artifact development criteria, research goals and artifact evaluation criteria (DRESCH *et al.*, 2015). It also included the systematic handling of the knowledge building process, from theory to artifact development and evaluation.

The research validity in DSR is directly dependent of the artifact evaluation (DRESCH *et al.*, 2015). A set of procedures can be adopted to ensure that the obtained result with the artifact is aligned with the required conditions for which it was developed. In this research the following procedures were adopted: to accurately and explicitly define the artifact proposition and construction criteria; to describe how the artifact should be evaluated and the mechanisms that will generate the results to be controlled/monitored;

2.6 Phase 1: Problem understanding and solution awareness

This section describes the procedures adopted for operationalizing the research, referring to the theoretical studies, empirical studies and the definitions for the intended artifact (Figure 2.5).

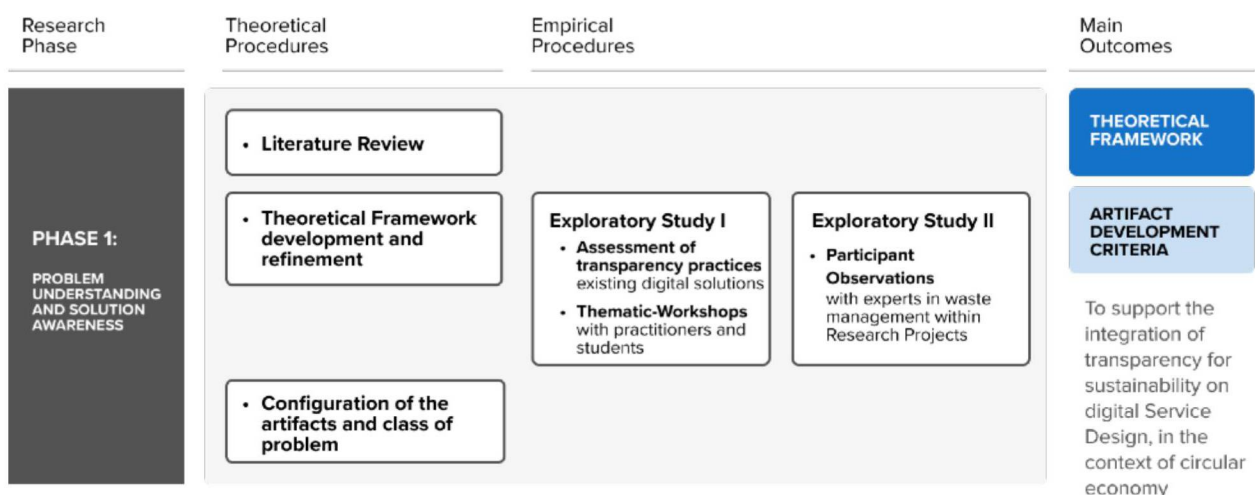


FIGURE 2.5 – Procedures of the research Phase 1

Source: the author

For each procedure it is provided the general definition and characteristics, the criteria adopted, as well as techniques and protocols for data collection and analysis.

2.6.1 Literature Review

The Systematic Literature Review has contributed to frame the problem, familiarizing the researcher with the theme, and enabling contact with new perspectives on the issue. This procedure is related to the Design Science Research stages, as proposed by Dresch et al. (2015), denoted “*awareness of the problem*” and “*systematic literature review*”. Hence, in this research, the literature review was conducted to identify key theoretical foundations, and also existing artifacts that could be used for solving similar problems.

The literature review resulted in the core theoretical foundations, including concepts, principles, heuristics, and at the same time, identification of existing similar artifacts (Chapter 3).

A preliminary unsystematic literature review was conducted, to obtain a broader overview of the research context and help with the refinement of the initial keywords for the Systematic Literature Review. The type of materials used on this stage included reports published by the main national and international organizations on trends and agenda priorities on the theme. It also included books, articles, doctoral and master thesis. The preliminary review, enabled the identification of initial keywords. From then on, based on the procedures described by Conforto, Amaral and Silva (2011), the Systematic Literature Review was conducted in three stages: Input, Processing and Output.

On the Input stage the researcher determined the objective of the systematic literature review and definition of search criteria as described in Table 2.2.

TABLE 2.2 - Systematic Literature Review criteria

Databases and Inclusion Criteria		Capes Journals (Periódicos Capes) (aggregator platform with over 49,000 full-text journals and 455 databases, including ScienceDirect, Scopus, Emerald, SAGE, SciELO and Google Scholar) - Publication date: last 12 years (2011-2023) - Type of material: articles - Language: english - Peer-reviewed journals - Domains: interdisciplinary - Cycle 1: Contains the string in the subject / all results - Cycle 2: Contains the string in the title / first 30 results - Filter 1: Title, abstract and keywords reading - Filter 2: Introduction and conclusion reading - Filter 3: Full article reading
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		CAPES Theses and Dissertations Catalog - Publication date: last 10 years (2013 - 2023) - Type of material: master's dissertations and doctoral theses - Domains: interdisciplinary - Contains the search strings in the abstract - Filter 1: adherence to the string, by reading the title and abstract - Filter 2: adherence to the string, by reading the title and abstract
Classification Criteria	Publications that address the different aspects of the themes, quality and relevance of work.	

Source: the author, based in Conforto, Amaral and Silva (2011)

The mapped keywords were recombined in the form of search strings and tested to ensure the combination of the best words referring to the topics covered.

Like the unsystematic review, it was also an iterative cross-search process where relevant keywords and publications were identified through citations and related references.

The review adopted a qualitative and mainly inductive logic of analysis, in which information gathered from the literature was interpreted to generate and explore, in an interactive process, the theoretical framework underpinning the concept of transparency (DESCH et al., 2015).

The Processing step was carried out based on the filters, documentation and analysis of the articles (COMFORTO, AMARAL and SILVA, 2011). Additionally, a bibliometric analysis was also conducted, using data obtained on the results of the systematic literature review. The aim was to characterize the research problem in relation to the state of the existent knowledge, analyzing the density and evolution of the central research theme of this thesis in the field of Design scientific research.

2.6.2 Theoretical Framework development and refinement

The Theoretical Framework was a type of “knowledge artifact” developed in this research (GREGOR and HEVNER, 2013; DRESCH et al., 2015). The Theoretical Framework describes the fundamental knowledge foundations aimed to answer RQ1, RQ2 and RQ3, systematizing key components to inform its practical approach through an artifact (Figure 2.6). The formulation of the Theoretical Framework involved an inductive reasoning process to structure and interpret the meanings that could be derived from saturation of thematic data, based on a Thematic and Grounded Theory analysis (LEHMANN, 2001; ABDULKAREEM, 2018; SANTOS, 2018).

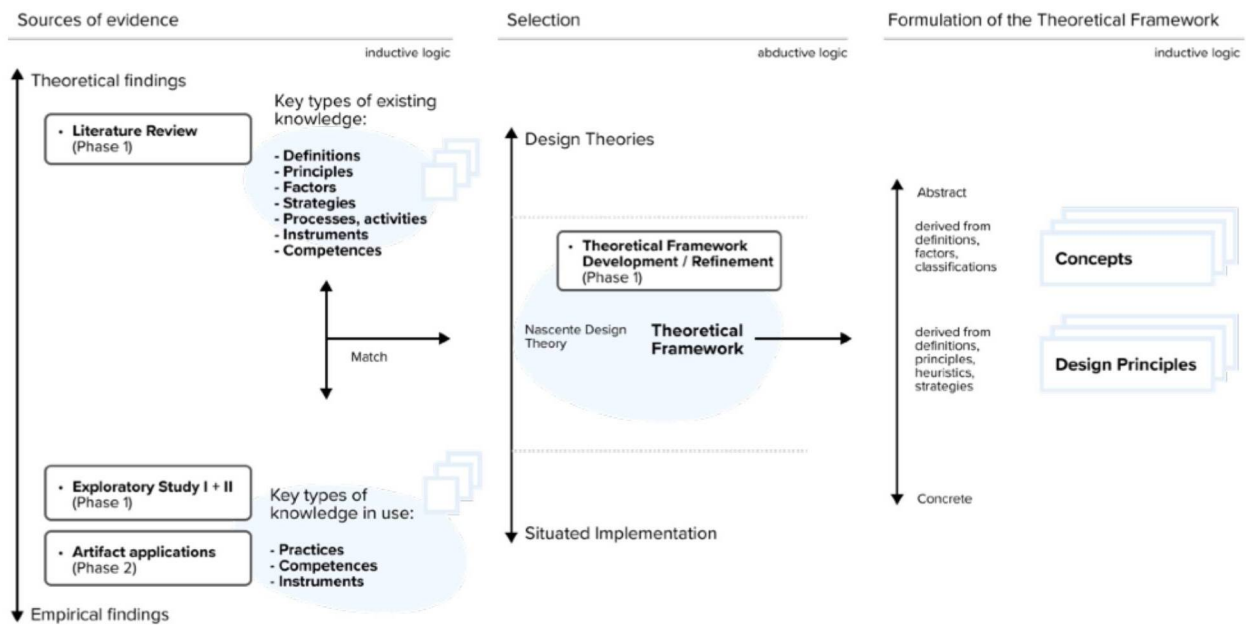


FIGURE 2.6 – Theoretical framework building strategy
Source: the author

The preliminary version of the Theoretical Framework (version 0.1) was confronted with the findings from the Exploratory Studies I and II, contributing to enhance its external validation and enabling its refinement. The resulting second version (version 1.0) was then used in Phase 2 of the research to support the development of the artifact from this thesis (model and guidelines). Finally, a final version of the Theoretical Framework was prescribed in Phase 3 of the research, now integrating the lessons learned from the model and guidelines developed on the field research.

According to the data analysis, the Theoretical Framework components were based on concepts (including typology of concepts) and design principles (see Glossary), which are described in Chapter 4 and 6.

2.6.3 Exploratory Studies

From the literature review, it was identified that there is a need for conducting empirical exploratory studies to support the understanding of the research problem from different perspectives. The researcher has conducted two phases of exploratory studies, as illustrated on the next Figure 2.7, one focusing on digital context and another one focusing on waste management contexts:

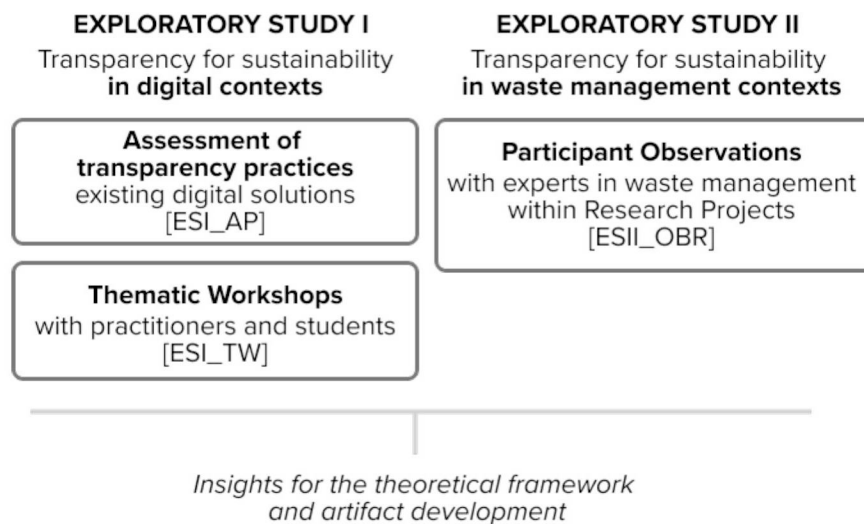


FIGURE 2.7 – Exploratory Studies overview

Source: the author

- **Exploratory Study I:** to explore the pragmatic and theoretical perspectives of transparency in the context of digital services. This empirical and qualitative study mainly resulted in insights to validate the criteria that supported the intended artifact development and problem delimitation. This exploratory study was conducted based in: a) assessment of the transparency practices on existing digital solutions from relevant companies in the market; b) short remote thematic-workshop sessions with a broad audience of participants representing the potential users of the intended artifact to be developed on research Phase 2;

- **Exploratory Study II:** to explore the limitations and opportunities for transparency in contexts of Circular Economy and Waste Management for Sustainability. This empirical and qualitative study mainly resulted in insights to validate the criteria that supported the intended artifact development and problem delimitation. This exploratory study was conducted based in remote and in person participant observations as part of other projects being conducted within the same research group.

2.6.4 Exploratory Study I: Assessment of transparency on digital solutions [ESI_AP]

This empirical study was conducted during the first phase of the research and aimed to confront the theoretical findings obtained from the Literature Review, with the dynamics of a real-world context. The study aimed to enhanced the researcher's understanding of the research problem, contributing to the refinement of the requirements for the intended artifact (to be built on Phase 2 of the research) and the

adherence of the theoretical framework to real-world phenomena. This study was also conducted as part of a scientific initiation research project, with the undergraduate design student Eduardo Serraglio.

The study was characterized by an *ex-post-facto* assessment of transparency for sustainability practices on existing digital solutions. The study aimed to analyse the “state of the art” of transparency practices from innovative companies in the market.

For that, 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 of digital solutions. For this, a mapping of the most relevant companies in the market was carried out through indirect documentation on the Internet, resulting in categories of solutions identified as main clusters for the cases.

Then, the selection of cases per category considered: both startup companies (young companies), and already established companies with digital technology-based solutions implemented for business to customer models (B2C); national and international companies with a business orientation for sustainability and/or circular economy. Table 2.3 presents a summary of the criteria adopted for the study.

TABLE 2.3 - Criteria adopted for the study

Cases selection criteria	- At least 2 years of foundation - National and international companies - Business offerings for sustainability and circular economy (companies with B Certification or similar) - Service circular stages: purchase, usage and post-usage - Active transparency posture - Service experience based on digital technology (e.g. web, social networks, artificial intelligence, Internet of Things, BigData, etc)
Question to be answered with the procedure	What are the characteristics of the sustainability transparency enabled by the digital solutions? What are the service elements comprising the sustainability transparency of the digital solutions?
Unit of analysis	Characteristics of the sustainability transparency in digital solutions
Sources of data	Primary: - data from the sustainability transparency communication of the digital solutions on their websites and mobile apps Secondary: - data from the publications on the company's social networks - data from the newspaper publications and articles published in media

Source: the author

According to Gil (2002), it is recommended to use four to ten cases, to enable data validation by triangulation. The same author proposes that the most adequate practice is to progressively incorporate new cases, until "theoretical saturation" is reached, that is, until the increase in new observations does not lead to a significant increase in information.

According to the *ex-post-facto* modality, data collection is carried out on events that already happened in the past, without interference from the researcher, using multiple secondary sources of evidence for internal validation (YIN, 2010). 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 as well as publicly available reports and publications were also used for validation.

The data collected was predominantly qualitative, organized and tabulated as an inventory of the types of content and interactions, favouring the subsequent analysis of each case itself and the identification of patterns matching among the various cases (YIN, 2010).

Data analysis consisted of examining, categorizing and classifying the evidence, in view of the study's propositions (YIN, 2010).

The individual analysis of cases considered the initial 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, the common aspects and divergences between the theory and the evidence gathered on the cases were verified. For Yin (2010) this technique is used in multiple case studies to examine theoretical and literal replications. The results contribute to refine the theoretical framework and the requirements for the intended artifact.

2.6.5 Exploratory Study I: Thematic-Workshop sessions [ESI_TW]

This empirical study was conducted during the first phase of the research as a "thematic workshops", aimed to support the researcher understanding of the problem, and to refine the criteria to develop the intended artifact (at Phase 2), based on the external validation of the potential users.

These thematic-workshops were held entitled "Design for Transparency in Sustainability" intended for people from different areas of Design and, also, people from other fields interested in knowing and exploring the theme of transparency for sustainability in a strategic way through Design. The selection of participants included:

design students (undergraduate and postgraduate), design professors, entrepreneurs, innovation managers, product managers and design practitioners (UX Designer, Graphic designer, Digital Designer, Strategic Designer) in consulting and private companies from different sectors.

A call for joining the workshop was published in the main Brazilian professional groups related to Service Design. For joining the workshops, people were asked to read and accept the research ethical terms to participate.

The dynamic of the workshops was conceived in a way that a larger number of people could understand and participate.

In the first part of the workshop, the researcher presented an introduction to the main concepts and examples associated with transparency for sustainability and its implications for Design, with a focus on digital services. The content was derived from this ongoing doctoral research. In the second part of the workshop, a practical exercise was applied with the participants for discussion.

In the second part, participants were invited to carry out an idea generation activity consisting on a hands-on exercise in group, aimed at stimulating discussion. The briefing provided (see Appendix 7) included a user persona with transparency needs, and respective journey for shopping organic food using a digital service — as an easy to relate scenario for the workshop participants — based on data from Lomba (2020) research related to transparency. The main transparency goals-states (Normative, Formative, Participative)(see Theoretical Framework section 4.1) were used to support the ideation and discussion.

The researcher facilitated the practical exercise. For that, it adopted an online collaborative platform (Miro and Mural), to enable the participants to do the exercises remotely. Also, a video conferencing online platform (Zoom and Microsoft Teams) was used along all the workshop as a communication channel, allowing to split the participants in groups during the practical exercises. The sessions were recorded and the exercise boards saved for future analysis.

After the workshop, the participants were invited to answer a few questions for clarification. The questions dealt with: a) current context of work and experience; b) perceptions and experience with digital service design; c) perceptions and experience with sustainability; d) perceptions and experience with transparency. See Appendix 8.

The analysis of these workshops has adopted a thematic approach, with a triangulation of data strategy to obtain internal validation. It used data from the exercise boards, recording audios and the reflective notes from the researcher. The analysis consisted in a qualitative technique for identifying and analyzing patterns (themes) in the data by means of thematic codes (ABDULKAREEM, 2018).

The focus of the analysis were the participants contextual aspects and perception about the research theme. Data from both sessions were cross-analysed to identify insights for the subsequent artifact development criteria. The insights were organized in three groups: a) content; b) ideas; c) practical implications.

2.6.6 Exploratory Study II: Participant Observations [ESII_OBR]

The second type of exploratory studies aimed to explore the existing factors, conflicts and tensions, that could influence the integration of transparency for sustainability in the specific context of services addressing the Circular Economy. Such studies were conducted as part of the activities of two other research projects (Figure 2.8): Research Project#1 - “Policies and Solutions for Sustainable Cities Project” under a partnership of the Observatory for Innovation in Sustainable Cities and the Design & Sustainability Center of the Federal University of Paraná; Research Project#2 - “Zero Waste Co-Lab Project” under a research international collaboration between Federal University of Paraná, Paulista University, Aalborg University (Denmark) and BOFA - Waste Management Company (Denmark).

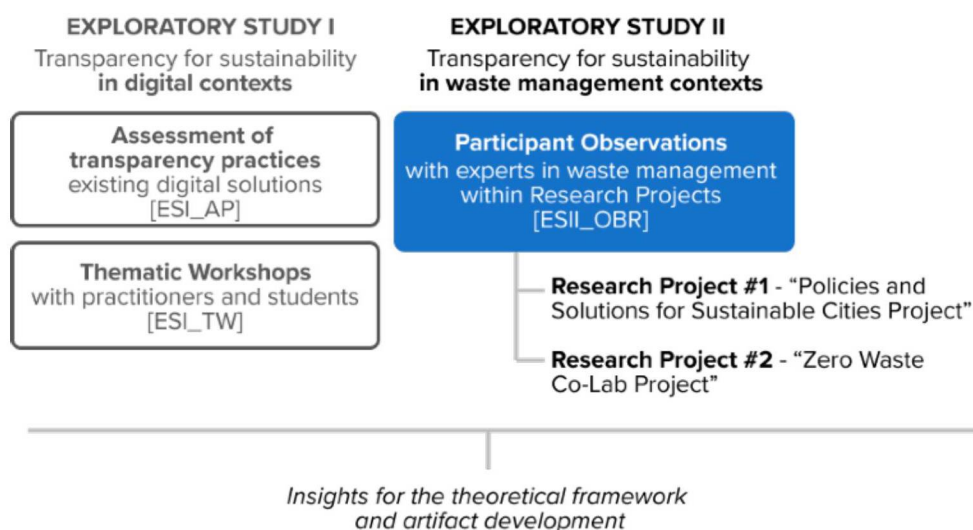


FIGURE 2.8 – Exploratory Studies II overview

Source: the author

The projects were selected because they were able to provide conditions for the researcher to gain a more deep understanding of Circular Economy in Brazilian context and the critical factors to consider when approaching transparency on digital services within that context.

The findings helped the researcher in gaining familiarity with the implementation issues around transparency, contributing to refine the artifact development criteria, enabling an expansion of the external validation of the study.

This stage of the study was conducted based on direct observational methods, where the researcher acted as an active observer (participant observation) (BLESSING and CHAKRABARTI, 2009). The observations were carried out during technical visits, workshops (remote and in person), as part of other research projects. Qualitative data collection was based on descriptive data of the content and materials produced in the observations, participant's statements and the researcher's notes (GIL, 2008; DRESCH et al., 2015).

The primary source of data were the content and materials produced during the observations, while the participant's statements and the researcher's notes were subsequently triangulated.

The study predominantly adopted a phenomenological qualitative approach. The researcher's positioning was oriented towards the meanings and relevance of the content raised from the field observation (GIL, 2008; DRESCH et al., 2015). The analysis involved an inductive reasoning process to structure and interpret the meanings that could be derived from the field observation, based on a Thematic analysis approach (ABDULKAREEM, 2018).

2.6.7 Configuration of the artifacts and class of problem

DSR has the potential to make different types and levels of research contributions, depending on its problem configuration class of problem (GREGOR and HEVNER, 2013). Bases on such assumption the research protocol included a stage of "*general characterization of the artifact and classes of problems*". According to Dresch et al. (2015), this is the stage at which the researcher begins to understand and define satisfactory solutions to a class of problem.

Since in DSR the artifact is a representation of knowledge prescription, the artifact selection procedure adopted as criteria a typology of Design Knowledge, from more abstract to more operational ones. The range of possible types of artifacts considered during this selection are shown in Figure 2.9. The type of contribution selected was the "*Level 2. Nascent design theory*".

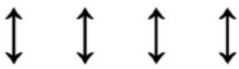
	Contribution Types	Example Artifacts
More abstract, complete, and mature knowledge  More specific, limited, and less mature knowledge	Level 3. Well-developed design theory about embedded phenomena	Design theories (mid-range and grand theories)
	Level 2. Nascent design theory—knowledge as operational principles/architecture	Constructs, methods, models, design principles, technological rules.
	Level 1. Situated implementation of artifact	Instantiations (software products or implemented processes)

FIGURE 2.9 – Design Science Research Contribution Types

Source: Gregor and Hevner (2013)

As Figure 2.6 illustrates, artifacts situated on an intermediate level need to be operationalized in a number of other contexts in order to increase their external validity (GREGOR and HEVNER, 2013).

The *Theoretical and Empirical findings* were the main outcomes from the research Phase 1, serving as a basis for the “*general characterization of the artifact and classes of problems*”.

The first part of the analysis adopted an inductive logic where the researcher reviewed the findings from the research, considering the characterization of existing artifacts, their missing components, and their value contributions, always considering the connections of such findings with the main research problem. Subsequently, based on an abductive logic, the researcher prescribed the types of problems and correspondent types of artifacts to be developed as potential solutions.

TABLE 2.4 - Criteria adopted for artifact development

Artifact Value Criteria	the benefits of this artifacts to its users and why this artifact will be developed instead of any other;
Artifact Feasibility Criteria	to ensure that what is being proposed in the research can indeed be implemented, considering all of the criteria for it to occur;
Artifact Format Criteria	to determine the most appropriate format to communicate the artifact's concepts to the users;
Artifact Application Criteria	to prepare the artifact instance for its use in the real environment;

Source: the author

In order to carry out a preliminary assessment of the novel of the artifact, the research has adopted Gregor and Hevner (2013)'s propositions, as described in Table 2.10.

2.7 Phase 2: Artifact development and evaluation

This section describes the procedures adopted for operationalizing the second phase of the research (Figure 2.10).

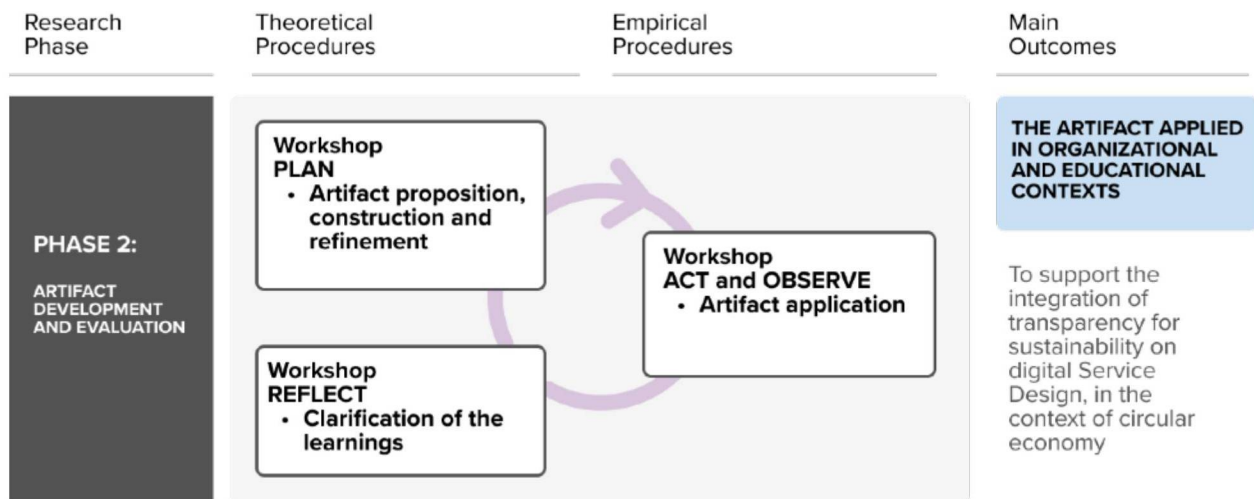


FIGURE 2.10 – Procedures of the research Phase 2

Source: the author

The Phase 2 was built upon the results from Phase 1 and was characterised by a **field work with progressive cycles of workshops based on Action Design Research** (“Workshop-action”) for proposing, developing and evaluating the artifact (model + guidelines) in a collaborative way (LEWIN, 1946; DRESCH et al., 2015).

Integrating Action Research within a Design Science Research (“Action Design Research”) can be a strategy when the cycles of artifact development and evaluation depends not only on the researcher perspectives but, also, on the critical collaboration of participants, which can directly influence the direction of the research. At the same time, the directions of the research is affected by this collaborative learning journey which is, in turn supported by the artifact. According to Ørngreen and Levinsen (2017, p.73), Workshop as a research method is an approach in studies that are emerging and unpredictable, “... designed to amplify certain elements while reducing others. From the perspective of authentic workshops, the researcher acts as the facilitator who prioritises participant needs. From the research perspective, the participants, along with their expected and performed agency, become part of the research design and the data-producing apparatus”.

The field research involved two types of investigations: **workshops in educational and workshops in business contexts**. The educational workshops were held with students and practitioners, in learning contexts that enable assessment of the

potentialities and limitations of the proposed artifacts. The business workshops were held with key stakeholders aiming to explore real world scenario situations.

The cycles of workshop started with the application of the first version of the artifact, and the results were used to refine the artifact for the next cycle in a progressive way, until the last cycle. The results and reflections from the last cycle were incorporated in the final version of the Theoretical Framework and artifacts (model + guidelines) (Chapter 7). The next sections describes the procedures adopted throughout this cycles.

2.7.1 PLAN - Artifact proposition, construction and refinement

This stage deals with the actual proposition of an artifact prototype which, in turn, comprises the conceptual and construction aspects to support its operational/functional application, described and represented with graphical abstracts for clarification. The inputs for this stage came from Phase 1 and, also, the outputs from each of the cycles in Phase 2.

In order to achieve this goal, the research involved an internal ideation process with a creative session conducted by the researcher, exploring ideas for the artifact or changes through sketches and graphic representations. On this respect, Dresch et al. (2015) argues that besides of creativity the researcher must use previous knowledge to propose solutions that can be used to improve the situation under study. Based on such premise, during the field research the most promising insights were regularly (re)combined and integrated into a single artifact proposition, considering all its components and internal relationships. The actual construction of the artifact adopted different approaches and tools such as computational platforms, graphical representations, prototypes, and scale models, among others.

This procedure also resulted in a workshop-action protocol, describing the sampling and activities planned for each cycle/iteration of the study. The expected performance requirements of the artifact had to be clearly stated to support its subsequent quality assessment. The artifact and the demands regarding its performance influenced the choice of evaluation technique.

An open call inviting people to join the research was published in the main Brazilian Design research networks. The call included a brief description of the activities and the expected profile of the companies and participants in both organizational and educational contexts. Subsequently, educational and companies organizations/groups were selected based on the selection criteria to guarantee the methodological validity of the study (Table 2.5).

TABLE 2.5 - Criteria adopted for the workshops

Type of study	Selection criteria	Participants	Source of data
Workshops in Organizational Context	- Companies of small to medium size in the private sector; - Companies with services for end-users or citizens (B2C); - Companies with core business offerings addressing sustainability and the circular economy in the context of waste management; - Companies with core business offerings enabled by digital technologies; - Companies at a developing maturity level in sustainability; - Companies that allow the researcher to have access to resources and stakeholders of the companies to conduct the research;	- Employees with a leadership role (directors, managers and coordinators) - Employees with an operational role (consultants, and analysts)	Primary: - Workshop direct observation - Workshop tools / image registering Secondary: - Semi-structured interviews - Document gathering - Questionnaire
Workshops in Educational Context	- Educational projects / courses on the key themes of the research; - Participants with different maturity levels in sustainability;	- Undergraduate or postgraduate students or practitioners as students;	

Source: the author

As a preparatory measure each of the participants received the research ethical terms (Appendix 2, 3, 4 ,5), explaining the protocol and conditions for onboarding the sessions.

2.7.2 ACT and OBSERVE - Artifact application

Once a version of the artifact was conceived, the next step in each interactive cycle was to evaluate its application with the intended public and context.

In this research, the evaluation of the artifact occurred through its application in workshops with the intended public and context.

During the workshop the data collection techniques involved semistructured interviews, direct observation, document gathering, image registering, and, at the end of each section, application of structured questionnaire.

Data was also recorded by taking notes and recording the computer screen. The information collected from each participant feedback was recorded in a spreadsheet, maintaining primary data for later triangulation and analysis.

2.7.3 REFLECT - Clarification of the learnings

After each artifact application through the workshop sessions, the lessons learned and identified improvements were then analysed by the researcher. Such reflections result on further improvements on the artifact itself, based on the criteria of relevance (importance), effectiveness (usage) and completeness (components).

The data analysis on this stage adopted a similar logic the one employed on Grounded Theory (LEHMANN, 2001; ABDULKAREEM, 2018; SANTOS, 2018), with a cumulative inductive reasoning approach, through a process of coding and categorization. Each new finding was confronted with the existing ones, analysing their convergence or, alternatively, included as new proposition. The new findings were reviewed and integrated into the following version of the artifacts.

For the artifact applications in the context of educational activities, the artifact evaluation included the observation of the participants learning with the workshops. This observation was based on the notion that a combination of learning situations can enable the transformation of capabilities (FLEURY and FLEURY, 2001). The learning situations were the activities conducted with the groups of participants during the workshops with the support of the developed artifact. The analysis considered the learning in terms of actions, questions/reflections, and outcomes (BLOOM et al., 1956) based on the criteria of know the content, know why to act in the projects/challenges, and know how to do the activities.

2.8 Phase 3: Reflection and learnings

This section describes the procedures adopted for operationalizing the last research phase, referring to final learnings and conclusions from the field studies (Figure 2.11).

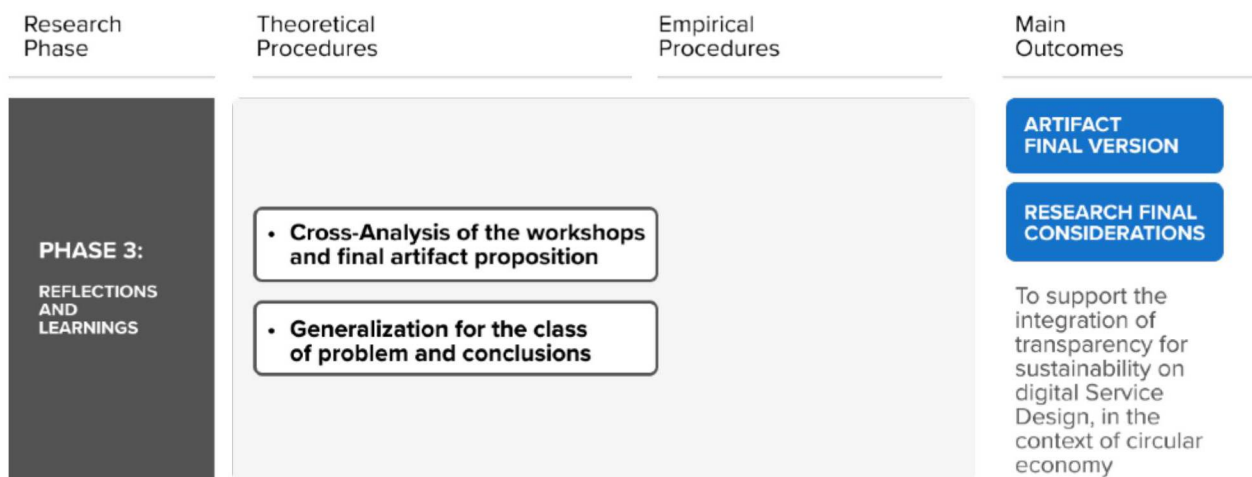


FIGURE 2.11 – Procedures of the research Phase 3

Source: the author

Phase 3 was built upon the results from Phase 1 and Phase 2, and characterised by **discussing and explaining the results according to the research questions and goals**.

Reflection was initially conducted through a cross-analysis of lessons learnt through the various cycles of artifact development in Phase 2, based on the logic of Thematic and Grounded Theory analysis (LEHMANN, 2001; ABDULKAREEM, 2018; SANTOS, 2018). The reflection involved discussing the artifact development criteria of value, format and representation, and the evaluation criteria of relevance (importance), effectiveness (usage) and completeness (components), and the learning criteria of know the content, know why to act in the projects/challenges, and know how to do the activities.

The final version of both artifacts (theoretical framework, practical model and guidelines — Chapter 7) derived from the integration of the cross-analysis findings. The final conclusions from the research and recommendations for future studies on the theme presented in Chapter 8.

Chapter 3 – Foundations of transparency for sustainability in design for digital services

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3.1 Understanding transparency

3.1.1 Defining transparency

Oliver (2004) explains that the word *transparent* is a compound word, created from the Latin preposition *trans* (across/through) and *parent* (coming into view). The English use of the word transparency as a noun means, “*the characteristic of being easy to see through*”, or “*the quality of being done in an open way without secrets*”, or also “*a situation in which business and financial activities are done in an open way without secrets, so that people can trust that they are fair and honest*” (CAMBRIDGE ENGLISH DICTIONARY, 2021).

Scholars who do attempt to define transparency offer a wide variety of definitions, usually to suit the distinct purpose of their work and domain (BALL, 2009). 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; VILLENEUVE, 2007). Also, these areas can adopt a specific use of the concept, such as organizational transparency, budget transparency, transparency of government actions and responsibilities, document transparency, among others. The emphasis of most literature on the topic comes from Organizational Governance and Accountability, as well as National and International Relationships, and Politics.

Transparency conventional definitions varies from discipline specific scopes to multiple embedded meanings, each of them addressing a variety of semantic and measurement-related conceptual dimensions (MICHENER and BERSCH, 2013).

To illustrate these definitions, Table 3.1 presents a perspective from different knowledge fields.

TABLE 3.1 - Transparency definitions from literature review

Definition	Reference	Domain
Transparency comprises the legal, political, and institutional structures that make <u>information</u> about the internal characteristics of a government and society <u>available</u> to actors both <u>inside</u> and <u>outside</u> the domestic political system.	Finel and Lord (1999)	<i>Political Sciences</i>
Targeted transparency is the <u>use of publicly required disclosure</u> of specific information in a <u>standardized format</u> to achieve a clear <u>public policy purpose</u> .	Fung, Graham and Weil (2007)	Science and Regulation
Transparency is the deliberate attempt to make <u>available</u> all legally releasable <u>information</u> —whether positive or negative in nature—in a manner that is accurate, timely, balanced, and unequivocal, for the purpose of enhancing the reasoning ability of <u>publics</u> and holding <u>organizations accountable</u> for their actions, policies, and practice.	Rawlins (2008)	<i>Organizational Governance</i>

Transparency is a property of institutions <u>efficiency</u> that sees them <u>grant outsiders</u> (in most cases the public) <u>access to information</u> about internal structures and procedures, thereby <u>increasing</u> their <u>legitimacy</u> and <u>accountability</u> .	Fluck (2016)	<i>Political Sciences</i>
Transparency is the <u>perceived</u> quality of intentionally shared information from a sender.	Schnackenberg and Tomlinson (2016)	<i>Organizational Governance</i>
Transparency is the <u>duty</u> of civil servants, managers, and trustees to <u>act</u> visibly, predictably, and understandably.	Transparency International (2021)	<i>Corruption Avoidance</i>
Transparency can be defined as the <u>ability</u> of a <u>process</u> to <u>communicate</u> useful information to people.	Santos (1999)	<i>Visual Management</i>
<u>Relationship transparency</u> can be defined as an <u>individual's</u> <u>subjective perception</u> of being <u>informed</u> about the <u>relevant</u> actions and properties of the <u>other party</u> in the <u>interaction</u> .	Eggert and Helm (2003)	<i>Marketing Management</i>
Transparency of a net chain is the extent to which <u>all the net chain's stakeholders</u> have a <u>shared understanding of</u> , and <u>access to</u> , the product-related information <u>that they request</u> , without loss, noise, delay, and distortion.	Hofstede et al. (2004)	<i>Supply Chain and Networks</i>
Transparency is defined as the <u>disclosure of information</u> by an organization that <u>enables external actors</u> to <u>monitor</u> and <u>assess</u> its internal workings and performance.	Grimmelikhuijsen and Welch (2012)	<i>Public Administration</i>
Transparency is being reached if <u>everybody with stakes and interest</u> in food production and consumption <u>understands the relevant aspects of products, processes, and process environments</u> that <u>allow to making informed decisions</u> .	Schiefer and Deiters (2013)	<i>Supply Chain and Networks</i>

Source: the author

A first group of definitions focus on information public disclosure regarding legal, political, or institutional aspects of specific practices. Also, these definitions are more concerned with standardized and comparability of the provided information. In line with Meijer (2009), Christensen and Cheney (2015), Albu and Flyverbom (2019), this **information-oriented** definitions are predominant on literature and are presented as “demands for information”, indicating **what transparency is (as a matter of information disclosure)**, but also **what it needs to do: demonstrate the good working of an institution**. Typically, in such definitions, the conditions of transparency are directly linked to the **quality** and **quantity of information; information transmission**, and the resulting **degree of observability** (ALBU and FLYVERBOM, 2019).

In Political Sciences, transparency has been associated with the principle of enabling the public to gain information about the operations and structures of a given entity. To Finel and Lord (1999), transparency is viewed independently of how information is interpreted. To Fluck (2016) transparency is a property of institutions in grant access to information that will increase their legitimacy and accountability. With a similar perspective, Fung, Graham and Weil (2007) propose the disclosure of missing information in order increase transparency and avoid hidden risks or service flaws that

could create serious problems for the public at large. Fung, Graham and Weil (2007) alert that only the government can compel the disclosure of information from private and public entities, legislate permanence in transparency, and create transparency backed by the legitimacy of democratic processes.

Applied to Organizational Management field, transparency is understood as the deliberate attempt to make available all legally releasable information, for the purpose of enhancing the reasoning ability of the public. It directly contribute to hold organizations accountable for their actions, policies, and practices (RAWLINS, 2008).

Another group of definitions **include both the organization and the individual's perspectives** on the **release of** and **access to information**, but also the **participation in the transparency process** in order to achieve an expected outcome (KOSACK and FUNG, 2014; MABILLARD, and ZUMOFEN, 2017; FELZMANN et al., 2020).

In the Supply Chain Management field (involving a diverse set of actors such a producers, distributors and/or retailer, who cooperate to bring a product/service to individuals), transparency started to be approached with a more systemic and multiple stakeholder's perspective. As a result, it connects with a wide set of disciplines: human behaviour, law, economics, engineering and information technology. In such context, knowing **what information the stakeholders need** is a precondition for transparency; stakeholders can only exchange information if they have a **shared understanding**, from **quality standards** for products to '**value-related**' **attributes** such as labor circumstances or environmental impacts (HOFSTEDE et al., 2004; SCHIEFER and DEITERS, 2013).

In line with such a perspective, McCarthy and Fluck (2017) introduces the concept of *transparency-as-dialogue* to strongly emphasize the involved actors in a shared understanding, rather than only transparency from simple disclosure and quantitative information flows (ALBU and FLYVERBOM, 2019).

Within the Operations Management field the issue of transparency is approached under the banner of Visual Management. Santos (1999) defines transparency as the **ability of a process** to communicate **useful information to people**. This definition is embedded with the notion of a **two-way communication** to achieve effective transparency, which is also adopted in the field of Marketing.

Eggert and Helm (2003) propose the concept of *relationship transparency* where transparency is based on the perception of information during an exchange with an interaction partner. Felzmann et al. (2020) argues that within a relational perspective, transparency is conceived as a **relation between an agent and a recipient**, implying that transparency cannot be understood outside this relationship. On the relational transparency concept, **people must be active participants if transparency is to occur**; it is not enough for organizations to simply disclose information. In line with that, Albu and

Flyverbom (2019) conceptualizes a *performativity approach to transparency*, characterized by a more a processual and critical perspective, facing complexities of communication, organizational, and social processes.

Due to these diverse and complementary definitions on transparency, Michener and Bersch (2013) alert to the danger of misuse and abuse of conceptual stretching, given the interdisciplinary enthusiasm for transparency as a concept. Accordingly, a definition of transparency must be broad enough to enable theorists from a variety of domains to incorporate it into their studies. At the same time, it must be specific enough to meaningfully inform its practice (SCHNACKENBERG and TOMLINSON, 2016).

Under such context, with the assumption that none of the definitions identified in the literature review are sufficient to fully support the scope of the present research, this thesis understands **transparency as an ethical principle implying in honesty, openness and inclusivity, enabling people to understand a given information, and of required, to convert this information into action**. The proposed definition is based on the following premises:

- **Transparency as an ethical principle:** it should be seen as an ethical principle, rather than a target state to be achieved or an informational quality standard to implemented. Implies a **situational perspective**, since it is not fixed in time; indeed, once transparency is reached, doesn't mean that it will remain permanent. Being transparent also implies **ethical and value requirements** for the involved actors in terms of: honesty or truthfulness; inclusivity for diverse people participation; openness for anyone freely access, use, modify, and share information (OKF, 2015). As an ethical principle it can impact both of positive and negative nature regarding the communication content and process (ALLOA and THOMÄ, 2018);
- **Transparency is mainly built on communication processes.** More than transmission or disclosure of information, it happens through social interactions via **nonverbal and/or verbal** messages that produce meanings, noises and involves some shared understanding of what the message is about (FISKE, 2011). This implies contextual, relational and cognitive abilities for the involved actors;
- Transparency is a potential **catalyst for supporting people's reflections, learning and actions from communication processes**. The main outcome or expected consequence of transparency is an effective communication, which according to Hosseini et al. (2018), it is meaningful and useful. Meaningful can be considered “*static*”, while useful can be thought as “*dynamic*”, by changing a perception and supporting the development of an action.

Under these assumptions, the definition adopted on this thesis for transparency critically integrates the key elements identified in the literature with a view on enabling it on digital service design for sustainability.

3.1.2 Historical background of transparency

At the time of this thesis, the interest in the topic of transparency was risen both in the public, as well as on the private sector, although with more emphasis on the public sector. Despite this interest, it is important to look back in history to understand how it evolved since it is not a new concept, and to bring insights and reflections about its potential for the present and future.

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.

In spite of the general manifestations, one way to approach transparency is as an intrinsic value (implying it is an end in itself or, alternatively, a moving target) (GRIMMELIKHUIJSEN, 2012). For a long time, transparency was etymologically and semantically associated with visibility, as a **quality or attribute** of a material object. According to Alloa and Thomä (2018), since Classical Greek Philosophy, rather than transparency, *diaphanês* was a term used to describe translucidity, referring to something that shines through. *Diaphanês* was considered a resulting effect, from a medium or an instrument that let something come into view. Similarly, for natural scientists from the 17th century, transparency was a material property, something through which the gaze could peer freely.

Another one way to approach transparency is as an enabling state (implying a mean to achieve other important goals) which is the focus of this thesis (GRIMMELIKHUIJSEN, 2012; CHRISTENSEN and CHENEY, 2015). To briefly understand the origin and evolution of the concept Figure 2.1 synthesizes a representation of different evolution streams that coexisted until the time of this thesis.

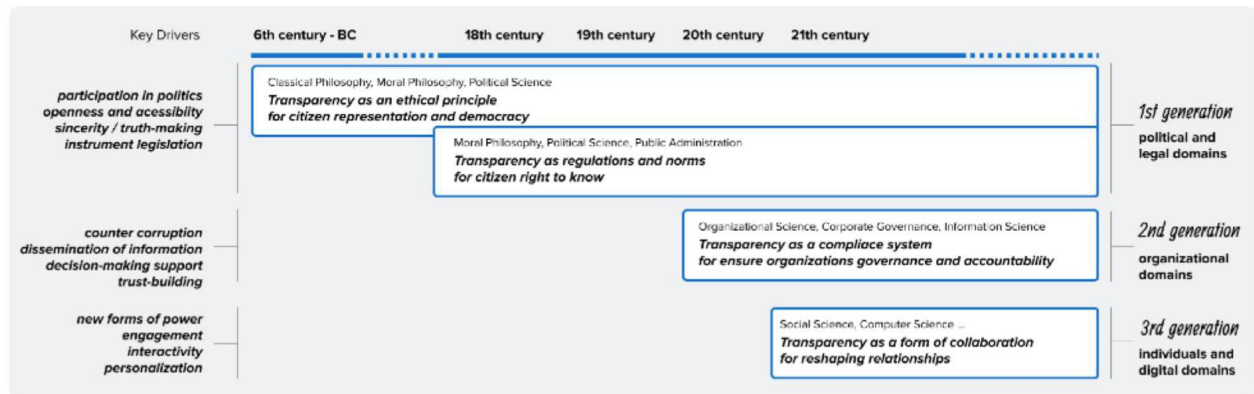


FIGURE 3.1 – Transparency conceptual evolution.

Source: the author, based on Meijer (2015); Alloa and Thomä (2018).

According to Alloa and Thomä (2018), from the late 1590s on (16th century) the earliest occurrences were recorded of a metaphorical use of transparency, and consequently not only materials, but also situations, schemes, argumentations or personalities could be characterized as transparent.

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 behaviour 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), this movements contributed with basic fundamentals 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 signalling 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 legislations.

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*'. Examples of such movement can be traced on expressions such as '*lifting the veil of secrecy*' or '*the ability to look clearly through the windows of an institution*' (ALLOA and THOMÄ, 2018). The general idea was that something is happening behind curtains and once these curtains are removed, everything can be seen.

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 the "*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.

It was not until the 1990s (20th century) that transparency became a major emphasis of research and used as an attribute of strategic negotiations. As scholars became aware of transparency, they interpreted, reinterpreted, and expanded its meaning 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).

These moves reflect the evolution of the prevailing conceptions, from a '*right to know*' to a '*what is right*' policies for governance based on transparency. According to the Cambridge English Dictionary, governance is "*the way that organizations or countries are managed at the highest level, and the systems for doing this*".

For Fluck (2016), the second half of the 20th century was also especially important for transparency in the emergence of security cooperation among organizations, 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. In the 1980s the term found its first niche as an

accounting principle. For Michener and Bersch (2013), transparency as a potential antidote to corruption added to the concept the role of a tool for '*accountability*'.

Only more recently that transparency was more heavily extended into the private sector, to include information that individuals could use in regulating the market and as consumers of its products and services (KOSACK and FUNG, 2014). 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 divulge and put in practice the concept of transparency.

According to Kosack and Fung (2014), a new paradigm of transparency is emerging as activists, investors, and consumers have increasingly pressed companies to behave in what they regard as more socially responsible, compelling corporations to become transparent about their products, processes, and services.

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 recently grow of digital systems presents new challenges and opportunities for transparency, by inventing new ways to collect, process, and distribute information, including reaching autonomous decisions (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 consumers 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 *users*. But also, from a higher demand for transparency from users and society as a whole. This reflects transparency trends that seek to provide *enhanced participation and engagement*, facilitating the production and use of information by users 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 organization and governance. The content and direction of transparency will depend on the values and political views of the people and organizations that jointly collaborate for its implementation and maintenance.

Currently, the demands for transparency are more widespread than ever, in fields and contexts as diverse as corporate and public governance, finance, scientific research, technology, media, healthcare, food chains, pharmaceuticals, and so on. Despite the growing number of publications on transparency issues in those fields, especially in 21st century, the academic community shows no systematic effort to produce a unified theory around this concept (ALLOA and THOMÄ, 2018). Indeed, until the time of this thesis, no unified transparency theory has been put forward. Thus, to better understand this concept, Alloa and Thomä (2018) introduces the emergence of a new and rapidly growing field called *Critical Transparency Studies*, dedicated to questioning transparency semantic core, and determining what transparency stands for. The emerging field combines influences from various knowledge fields (philosophy, sociology, social psychology, intellectual history, political science, cultural theory, media studies, literary studies, corporate governance, etc.) to look to it in all its diversity and broader perspective (Figure 3.2).

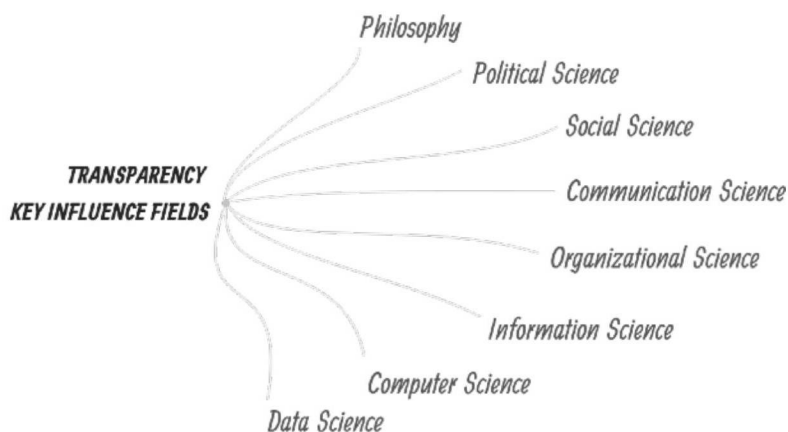


FIGURE 3.2 – Transparency main influence fields of knowledge.

Source: the author

As this section has shown, transparency historical evolution 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.

3.1.3 Norms and regulations associated with transparency

According to Martins Júnior (2010), legal transparency in Brazil materializes through publicity, motivation, and popular participation in which the rights of access, information, due legal process is articulated as forms of action.

In the Brazilian Public Administration, the Democratic Rule of Law conceived by the Federal Constitution of 1988, establishes that *“everyone has the right to receive information of their private interest, or of collective or general interest, from public bodies”*.

The Brazilian Law No. 131 of 2009 (also named *Transparency Law*), aimed to increase transparency in public administration. The law requires that the Union, states and municipalities should disclose their spending on the Internet in real time; they should provide incentives for popular participation and public hearings during the processes of preparation and discussion of plans, the law on budget guidelines and budgets; and it determines the adoption of an integrated financial administration and control system, which meets the minimum quality standard.

The Law on Access to Information (LAI) (No. 12.527) has been regulated by Decree No. 7724, of May 16, 2012. The LAI is the result of an effort of the Public Administration to bring more transparency to the Government and to make public information available to the citizen, establishing obligations, deadlines and procedures for the disclosure of data, provided for by the Federal Constitution of 1988. It established mandatory accountability by anybody or entity of the Direct and Indirect Administration (including public companies, mixed capital companies and other entities directly or indirectly controlled by the Federal Government) and a non-profit private entity that receives public funds.

The LAI in Brazil provides for information classified by authorities as confidential and personal data, exceptions to the access rule. Personal Data is considered information related to an identified or identifiable natural person. Its treatment must be done in a transparent manner and with respect for intimacy, private life, honor and image of people, as well as individual freedoms and guarantees. Personal information is not public and will have restricted access, regardless of confidentiality classification, for a maximum period of 100 (one hundred) years from its production date. Information

classified as confidential is those with some access restriction, classified by the competent authority, as it is considered essential to the security of society (the life, safety or health of the population) or of the State (national sovereignty, international relations, intelligence activities).

The Brazilian General Law for the Protection of Personal Data (LGPD), Law No. 13.709, of August 14, 2018, provides for the processing of personal data, including in digital media, by a natural person or by a legal entity governed by public or private law, with the objective of protecting the fundamental rights of freedom and privacy and the free development of the natural person's personality. To art. 5 of the LGPD, personal data is all information related to an identified or identifiable natural person.

In the international scenario, International Organization for Standardization (ISO) has developed various transparency related, which includes: ISO 5116:2021 Improving transparency in financial and business reporting; ISO/IEC TR 24028:2020 Information technology — artificial intelligence; ISO/IEC 27001 Information security management; ISO/TC 308 Chain of custody - traceability.

3.1.4 Drivers of transparency within organizations

This section describes the drivers that triggers transparency initiatives in organizations, and consequently in services.

For Christensen and Cheney (2015) the calling for knowledge, accountability, and trustworthiness are the essential drivers for transparency. Prompted, especially, by scandals, crises, public negativity, distrust, unfavorable reputation, etc (CHRISTENSEN and CHENEY, 2015; PARRIS et al., 2016). **Suspicious** drivers such as *lack of trust or credibility, reduced confidence, opacity and being exposed to public*, can pressure organizations to become more honest and open, invest in trust building, compliance protocols, conflict resolution and sensitive communication issues (MERLO et al., 2017; ALLOA and THOMÄ, 2018; MATHEUS AND JANSSEN, 2020).

In response to that events, **politics and legislation drivers** are predominant when it comes to organizational contexts. *Mandatory information obligation, accessing secret information, revealing hidden practices, and information on consumer's protection*. It can pressure organizations to make information available to the public, improve responsibility and accountability (FINEL and LORD, 1999; FLUCK 2016; MEIJER et al., 2015; MABILLARD and ZUMOFEN, 2017; ALLOA and THOMÄ, 2018; SEIZOV et al., 2019).

There are also more practical and operational drivers related to **informational efficiency** such as *information gaps, inconsistency, communication risks or failures*. They can imply in reliability, integrity and traceability requirements for organizations handling

information quality, quantity, error reduction, risk management and information asymmetry (GRIMMELIKHUIJSEN and WELCH, 2012; SCHIEFER and DEITERS, 2013; FUNG, 2013; MEIJER et al., 2015; ALBU and FLYVERBOM, 2019; MATHEUS AND JANSSEN, 2020). Adding to that, **technological innovation** drivers have enabled new opportunities to enhance *traceability* (e.g.: *blockchain*) or *intelligence* (e.g.: *artificial intelligence systems*). These new technologies enable new forms of transparency, but also, they imply in new challenges and requirements for people and organizations handling them (SCHIEFER and DEITERS, 2013).

The needs of **individuals/users/citizens** is in itself a driver for transparency. These needs that can push transparency implementation include issues such as *well-being*; *safety*; *avoidance of warfare*; *being informed*; *support to make choices or informed decision-making*; *observe*; *understand and customize the transparency*. These can imply in requirements regarding improvements in visibility, accessibility, understandability, utility and actionability requirements for organizations (FUNG, 2013, MERLO et al., 2017; ALBU and FLYVERBOM, 2019; LOMBA 2020).

Marketing drivers such as the search for *competitive advantage and the need for promoting services/products*, can imply in specific transparency requirements for organizations managing branding and customer relationship (SCHIEFER and DEITERS, 2013; PARRIS et al., 2016; ALLOA and THOMÄ, 2018).

Although there is a broad range of transparency drivers, most of them carry the risk of resulting only on “*quick fix*” interventions. Janning et al. (2020) call attention that temporary solutions that tackle solely the symptoms of poor transparency, without proper investigation might not solve the underlying problem (JANNING et al., 2020).

“The value in being transparent is not for the benefit of looking good for others to see; instead, the gaze is turned to oneself” - Janning et al. (2020)

In this context, organizations and individuals play a key role in proactively fostering and empowering transparency initiatives. They decide what may happen, conduct **creative investigations** of the context, contribute to the identification of **opportunities for change**, and participate on the Design process of adaptive responses.

3.1.5 Barriers and qualifying factors influencing transparency

Due to its complexity, the issue of transparency is dynamic in nature, especially as priorities may change over time as a result of changing transparency requirements by the actors. In addition, the vision of transparency can vary depending on the evolution of lifestyles, politics, scandals, market scarcity, and the company's own managerial maturity, among others (SCHIEFER and DEITERS, 2013).

Thus, transparency initiatives face some barriers that can disrupt its implementation. The main barriers identified in literature are described in Table 2.2, based on Fung et al. (2007), Pasquier and Villeneuve (2007), Ball (2009), Wognum et al. (2011), Schiefer and Deiters (2013), Merlo et al. (2017), Alloa and Thomä (2018), Lomba (2020). The ones mostly influenced by the use of digital technologies, were indicated based on the categories proposed by Matheus et al. (2021).

TABLE 3.2 – Barriers to Transparency

Code	Transparency Barriers	Digital Factors
for the users (to perceive transparency)		
UB01	Lack of interest and cognitive ability	Human, Usage
UB02	Widespread underestimation of user's interest	-
UB03	The information already disclosed exists, but users are not aware of it	Usage
UB04	Certificate signs are mainly based on trust in the certification body, but users do not have access to additional information	Usage
UB05	The variety of users profiles, contexts, priorities and needs regarding transparency	-
UB06	Short time to make informed decisions	-
UB07	Losing confidence or interest, because don't understanding the provided information	-
for the service organizations (to implement transparency)		
SB01	Difficult to establish and measure transparency indicators	Data Quality, Technical
SB02	Fear of being challenged or questioned by individuals or organizations	-
SB03	Superficial communication based on friendly-marketing to misguide consumers into making them think that the company is transparent, when in fact they are not.	-
SB04	Lack of knowledge of the practices of the other stakeholders that are part of the ecosystem that the company is embedded, beyond their own	-
SB05	Lack of knowledge of available solutions and capabilities to approach transparency in the company	Organizational, Technical
SB06	Low level of technological integration	Organizational, Technical, Data Quality
SB07	Fear of disclosing confidential information to competitors, bringing greater concerns for privacy and secrecy	-
SB08	Being legally exempt from the obligation to disclose information or illegally prevents access to the information	-

Source: the author.

Transparency is influenced by the understanding of information, without loss, noise, delay or distortion. This implies that the information must be relevant, accurate, factual, reliable, timely and available in an appropriate amount, imposing strict requirements on communication (WOGNUM et al., 2011).

However, users often do not have access to the full set of information they are looking for to make informed decisions. Even when information is provided, they may not fully understand what it means due to inconsistency, information overload and misinformation. As a result, they typically do not fully understand and have lost significant confidence in brands to provide the right information.

According to Schiefer and Deiters (2013), users can be overwhelmed and confused by a lot of information and labels, to which they are exposed. Users can actively search in a limited way or understand only part of the information to which they are exposed and, eventually, make partial use of information. Although users are interested and concerned about what meet their needs, the short time they have to make decisions is an important factor that should be considered (SCHIEFER and DEITERS, 2013). The challenge of the high volume of information also proves a strain on *how much* users want to know, *how much time* they have to receive the information, *how much space* is available to communicate the information, and the cognitive ability to process the information.

Even if deciding what will be communicated to users is influenced in the first place by legal obligations around the provision of information (e.g. those found in marketing standards and mandatory regulations), in general, organizational communication strategy could balance: what legally should be shared, what users need to know, and what the organization wants to share (SCHIEFER; DEITERS, 2013). However, typically the user side of the communication process is rarely considered, assuming that information is easily discernible and legible; that users are able to comprehend it as intended (CHRISTENSEN and CHENEY, 2015). Transparency issues can be often too complex to understand without expert knowledge, implying that the users agency for interpretation might depend on the support of third-parties (CHRISTENSEN and CHENEY, 2015).

Also, according to Schiefer and Deiters (2013), transparency can be perceived by organizations as costly in the short term, due to the consequence of reviewing the organization's internal conduct due to not making misconduct transparent, for example, or to start communicating new information that was not used to. This can be a major barrier for implementing systems that make the impact of products, services and processes visible. Table 3.3 describes the key potential qualifying factors that facilitates or prevents transparency design application in digital services within organization, the locus of the present thesis.

TABLE 3.3 – Key qualifying factors for organizations to implement digital transparency

Categories	Code	Factors	References
Providing infrastructure	SF01	Organizational complexity level of (de) centralization of decision-making and intermediaries, influencing digital strategies.	Eggert and Helm (2003) McCarthy and Fluck (2017) Matheus and Janssen (2020)
	SF02	Organizational stakeholders such as legal, regulatory, social, political, institutional, operational, financial, public relationship, etc, influencing digital requirements.	Eggert and Helm (2003) McCarthy and Fluck (2017) Matheus and Janssen (2020)
Organizational motivations	SF03	Censorship or confidentiality influencing the level of digital transparency	Matheus and Janssen (2020)
		Level of external conflicts influencing requirements for solving problems via digital transparency	Koivisto (2016) Albu and Flyverbom (2019)
Digital systems characteristics	SF04	Usability, searchability, dynamic content features	Matheus and Janssen (2020) Lomba (2020)
	SF05	User content generation features	Matheus and Janssen (2020) Lomba (2020)
	SF06	Level of accessibility	Fung (2013)
Data/ information quality and integrity	SF07	Complete and Up-to-date	Matheus and Janssen (2020)
	SF08	Open and free access used, re-used and distributed without restrictions or cost.	Matheus and Janssen (2020)
	SF09	Trusted or reliable the conviction among users that data sets are reliable.	Schnackenberg and Tomlinson (2016) Matheus and Janssen (2020)
	SF10	Accuracy the correctness of datasets.	Schnackenberg and Tomlinson (2016) Matheus and Janssen (2020)
	SF11	Nature of the message positive, negative, neutral	Fung, Graham and Weil (2007)

Source: the author.

Additionally, Table 3.4 describes the key potential qualifying factors for design applications, enabling or impeding users' to experience transparency in digital services.

TABLE 3.4 – Key qualifying factors for users to experience digital transparency

Categories	Code	Factors	References
Digital capabilities	UF01	Ability to use digital technology the ability to understand and use digital technologies. Influence the ability to make use of information.	Matheus and Janssen (2020) Lomba (2020)

Motivations	UF02	Level of uncertainty or suspicious influence the user predisposition for transparency	Eggert and Helm (2003) McCarthy and Fluck (2017)
	UF03	Expectations and needs influence the user digital requirements for transparency	Eggert and Helm (2003) Fung (2013) McCarthy and Fluck (2017) Lomba (2020)
Cognition	UF04	Level of knowledge on the transparency subject influence the ability to interpret, understand and make use of digital information.	Matheus and Janssen (2020) Lomba (2020)
	UF05	Level of shared patterns and mental models conceptualizations of the objects, systems or processes that allows to explain and predict their workings, influencing the use of digital transparency	Hofstede et al. (2004) Eiband et al. (2018) Albu and Flyverbom (2019)
	UF06	Ability to interpret the transparency Misinterpretation and misuse lead to having a wrong understanding of the meaning. Influencing digital mechanisms to support interpretation.	Hofstede et al. (2004) Matheus and Janssen (2020) Lomba (2020)

Source: the author.

According to Matheus and Janssen (2020), the characteristics of systems that are used for transparency are rarely mentioned in the literature. Only recent literature, mostly after 2014, acknowledges that system quality also influences transparency. The simple release of data was not found to be sufficient, and characteristics such as usability, performance (for real time data provision) and comparability are found to be important for creating transparency.

3.1.6 Transparency elements

Transparency is a more multifaceted and multidimensional concept, associated with different elements (HOFSTEDE et al., 2004; ALLOA and THOMÄ, 2018). From the review, transparency application initiatives are based on key conceptual elements: actors, norms and regulations, policies, processes, data and information, digital systems.

The **actors** responsible, involved or influenced by transparency, with their different understandings and interests. Based on Schiefer and Deiters (2013), the core groups of actors concentrate on: a) individuals/users as the ultimate customers, consumers or citizens; b) organizations that are responsible for providing products and services to the users, with different business models including internal and external stakeholders such as investors, partners, managers and collaborators; c) political and legal institutions that represent society's interests, such as the govern and regulatory bodies that are more concerned about polices, regulations and inspection for public and private issues.

Norms and regulations are represented by government and regulatory bodies from different regions and economy sectors (e.g., food, health, govern, etc.), that are more concerned to legislation, standards and inspection for public and private issues (SCHIEFER and DEITERS, 2013; HOSSEINI et al., 2018; MATHEUS and JANSSEN, 2020).

Policies and principles are set of well-defined commitments and specifications used as rules, unifying practices across projects and organizations (MKUDE and WIMMER, 2013), primarily concerning motivations and reasons for transparency in organizations (FINEL and LORD, 1999; HOFSTEDE et al., 2004; RAWLINS, 2008; FLUCK, 2016; HOSSEINI et al., 2018).

Processes are a series of actions/activities taken in order to achieve a result, and transparency primarily answer how and where. For Buell, Kim, and Tsay (2017) it is a more operational object of transparency, which contributes to improvements in both perceived and intended organizational performance. There is a huge variety of processes in organizations that can be approached by transparency. The most recurrent mentioned in literature are: information systems process; algorithmic processes; general operational processes (HOSSEINI et al., 2018), including past, present and future lens (CHRISTENSEN and CHENEY, 2015) and the different types of information flows and interactions between the multiple actors.

Data and information transparency primarily answer what type of data and information is needed for transparency to be implemented/performed, according to the respective processes. For Buell, Kim, and Tsay (2017) visual information is often privileged in perception and decision making and can even dominate the use of more relevant metrics of quality. Thus, in considering different types of transparency, visual transparency has the potential to generate more substantive benefits than transparency based only on verbal information (HOSSEINI et al., 2018).

Digital systems are an instrument facilitating the transparency such as a digital platform, report, physical encounter, person, etc. (OLIVER, 2004; KOIVISTO, 2016). Hosseini et al. (2018) also advocate that medium-instilled transparency should also be considered. Frequently, the medium used to relay information between an information provider and an information receiver may lead to unwanted transparency as a result of information leakage. Adding to that, digital technologies such as mobile applications, internet, social networks, e-commerce, artificial intelligence, IoT sensors, etc.) are mediums for allowing different levels of transparency to be served. Information can be captured from different sources and stages of a service, processed, delivered, and used in real-time from and for different stakeholders.

3.1.7 Categories of strategies for transparency

Scholars suggest that transparency can be addressed more as a spectrum, implying that different approaches and strategies contribute to overall levels or types of transparency and respective outcomes (MOL 2015; SCHNACKENBERG and TOMLINSON, 2016; MABILLARD and ZUMOFEN, 2017).

There is a broad range of classifications in the literature that describe different types of transparency and the most recurrent are described in Table 3.5 in accordance with three categories identified: a) attitude-oriented to deal with transparency; b) function-oriented with the transparency; c) actors-oriented.

TABLE 3.5 – Categories of strategies for transparency

Categories	Classifications	References	Domain
attitude-oriented	Active transparency Passive transparency	Mabillard, and Zumofen (2017)	Public Administration Accountability
function-oriented	Transparency-as-disclosure Transparency-as-information Transparency-as-dialogue	McCarthy and Fluck (2017)	International Relationship
	Information-disclosure Information-clarity Information-accuracy	Schnackenberg and Tomlinson (2016)	Organizational Governance
	Normative transparency Formative transparency Participative transparency	Lomba (2020)	Product-service systems
	History transparency Operational transparency Strategy transparency	Hofstede et al. (2004)	Supply Chain and Networks
actors-oriented	Management transparency Regulatory transparency Consumer transparency Public transparency	Mol (2015)	
	Vendor relationship-transparency Buyer relationship-transparency	Eggert and Helm (2003)	Marketing Management

Source: the author.

Oliver (2004) states that an older, passive view of transparency has given way to a “new transparency”, from a reactive opportunity to a proactive requirement. Scholars use the terms “active”, “proactive” and “intentional” interchangeably, stating that a new posture for transparency is of more comprehensive and proactive disclosures instead of releasing information in “reactive”, “passive”, “unintentional”, or “coercive” way (MABILLARD and ZUMOFEN, 2017). According to Hosseini et al. (2018), coercively

complying with legal obligation can be classified in: a) Mandatory transparency referring to policies that oblige actors to disclose specific information; b) Discretionary transparency referring to policies that oblige actors to publish some information online, but do not specify what exactly should be disclosed; c) Involuntary transparency referring to regulatory responses to whistleblowers and information leaks. In contrast, actors-oriented focus on the type of actors requiring of providing the transparency. Figure 3.3 illustrate the spectrum of attitudes or motivations towards transparency for a service organization.

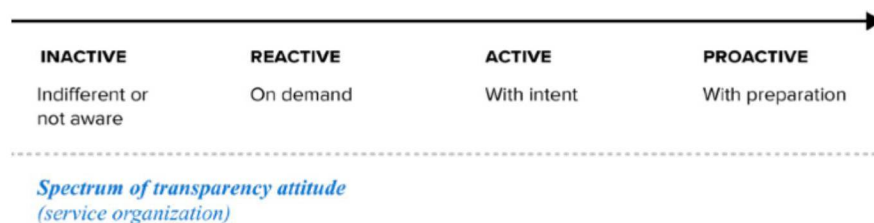


FIGURE 3.3 – Spectrum of transparency attitude
Source: the author, based on Mabillard, and Zumofen (2017)

Then, in the function-oriented classifications, the focus is on different types of transparency practices regarding information, outcomes or accomplishments. In McCarthy and Fluck (2017) and Lomba (2020) classifications are more concerned with the mutual role of the transparency actors, while Hofstede et al. (2004) brings a managerial perspective of transparency aims. While Schnackenberg and Tomlinson (2016) the focus is on the quality and types of data and information provided. Also, the function-oriented classifications don't have a focus on one transparency object such as dealing only with information or processes and, thus, it is, more broadly applicable.

3.1.8 Transparency outcomes and limitations

Although there is no universal propositions in the literature analyzed about the benefits of transparency, the findings so far indicate potential beneficial outcomes for individuals and organizations.

For individuals/users, transparency could support consumer's protection and rights, reduce information asymmetry and inequitable balance of power, encourage accountability, gain more confidence and trust-building, raise awareness and support more informed decision making, favouring attitudes and enhancing value creation, among others (HOFSTEDE et al., 2004; GRIMMELIKHUIJSEN and WELCH, 2012; MEIJER

et al., 2015; FLUCK, 2016; PARRIS et al., 2016; ALBU and FLYVERBOM, 2019; MATHEUS and JANSSEN, 2020).

For organizations, transparency efforts could encourage to better account for their actions and discourage corruption; to promote resilience to deal with sensitive communication issues and conflict resolution; encourage to perform better or more effective; to know the value chain to improve management and prevent calamities; being perceived as more trustworthy and valuable even when they perceive a firm's ability to be relatively low; increase perception of effort, reciprocity, and gratitude, etc (HOFSTEDE et al., 2004; OLIVER, 2004; FUNG, 2013; MEIJER et al., 2015; PARRIS et al., 2016; MERLO et al., 2017; BUELL, KIM, and TSAY, 2017; ALBU and FLYVERBOM, 2019; MATHEUS and JANSSEN, 2020).

However, scholars agree that in spite of the general praise for transparency, the concept also has limits and may lead to uncertainties, ambiguities, paradoxes, and unintended consequences that are introduced by transparency practices (OLIVER, 2004; FUNG, 2013; MEIJER et al., 2015; CHRISTENSEN and CHENEY, 2015; KOIVISTO, 2016; FLUCK, 2016; MABILLARD and ZUMOFEN, 2017; ALLOA and THOMÄ, 2018; ALBU and FLYVERBOM, 2019).

Metaphors have been used to describe transparency (MICHENER and BERSCH, 2013; KOIVISTO, 2016; ALLOA and THOMÄ, 2018), and the two most relevant ones from literature are the flashlight and the window, and a third one compares it to an open-kitchen (Figure 3.4).

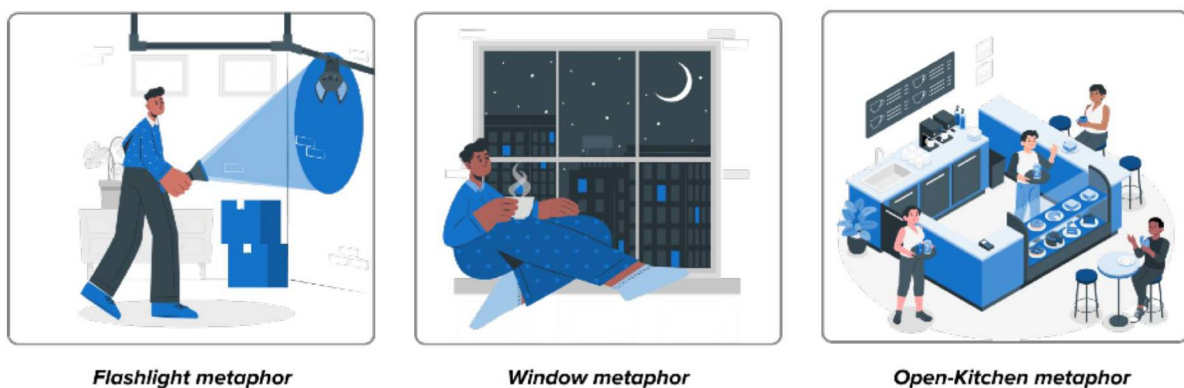


FIGURE 3.4 – Transparency metaphors
Source: the author, based on Koivisto (2016)
Image from storyset by Freepik

The flashlight alludes to a conscious agent who directs the beam to illuminate an object. The window alludes to allowing the objects to happen naturally. While the open-

kitchen alludes to a joint collaborative space to openness in terms of accessibility and participation.

But Koivisto (2016) argues that transparency cannot reveal everything. Since the reality itself is complex and socially constructed, any kind of mediating entity only adds to the **impossibility of full transparency**.

Also, Christensen, Cheney (2015) and Koivisto (2016) argues that **transparency is not neutral**, it expose and create the object to be seen — *“transparency is an ambiguous practice of representation, producing at once light and darkness, clarity and opacity, insight and ignorance”, “we do not only see things made visible by transparency, but we see the created transparency itself in the form of the practices labelled as transparency”*.

“Transparency oscillates between **constructive and revelatory functions**. One problem of transparency is that one can never be quite sure of the **level of mediation**, the ‘hand at work’. Transparency is at the same time something that naturally is and something that has been consciously created. A paradox of iconoclasm exists at the heart of transparency; transparency both **relies on mediation and is suspicious towards it**. That makes it hard to assess, **to what extent we can trust the scenery we are offered**.”

Thus, how we perceive what we see and how we are supposed to perceive calls for a certain kind of *performativity*, requiring a **conscious exposure and awareness of the potential consequences of that exposure** (KOIVISTO, 2016). While the demands for transparency can be seen as a rejection of the usual performances/representations/mediations (CHRISTENSEN and CHENEY, 2015). Moreover people's social life and organizations brands, depends on the capacity to create and uphold an appropriate 'persona' or 'performative social self' (how we perceive ourselves in relation to others). It requires enabling a coherent flexibly performative identity, according to the reactions of the audience, while the non-public-eye operations remain concealed — without transparency (KOIVISTO, 2016).

This performative connotation, to induce, consciously or unconsciously, leads to question the implications of transparency.

For example, Albu and Flyverbom (2019) alerts that the communication process — in making information available and accessible — can also **undermine trust**, as it involves active processes of sensing, framing, translation, mediation, and mutation of the information and its contextual meanings. As a consequence, it can result on a **culture of suspicion, low morale and cynicism** (FLUCK, 2016; MABILLARD and ZUMOFEN, 2017). Also, when organizations fail to deliver transparency, it may lead to a range of activities aimed at **accessing secret information** or **revealing hidden practices**, ranging from

campaigning by NGOs to unauthorized information leaks (FLUCK, 2016). Retaining information can be a source of power in many organizations.

Christensen and Cheney (2015) point out that information clarity about some areas or aspects of the organization, could potentially expose opaqueness in other areas that had previously been concealed behind normal.

When transparency functions as a moral norm by organizations, it constrains within a set of obligations or moral terms that lead to predictable behaviors. Therefore, organizations are expected to demonstrate the purity of their intentions regarding their decisions and actions.

“Truth is not a matter of exposure of the secret, but a revelation that does justice to it.” [KOIVISTO, 2016 apud BENJAMIN, 1998].

Janning et al. (2020) highlights that being transparent is not necessarily the same as being honest and virtuous, while Christensen and Cheney (2015) argues that although accountability is often “translated” and operationalized as transparency, what leads from one to the other is not always clear.

3.1.9 Inclusive and accessible transparency

With the popularization of digital information and communication technologies at different times of daily life, promoting more inclusive and accessible transparency can be a concern for individuals and society's social equity.

The Inclusive Design approach deals with making things as accessible and usable for as many people as possible in a wide variety of situations (BSI, 2005). It requires that design constantly look for ways to accommodate users' diversity in capabilities, needs, and aspirations (e.g.: age, disabilities, gender, ethnicity, etc.). McKercher (2020) argues for including people's differentials in co-design and for seeing and addressing power differences in meaningful ways.

Accessibility is a central quality attribute of more inclusive design that makes an experience open for all (PAPE et al., 2002; HOLMES, 2018). Accessible design is defined by a series of standards (e.g. ISO) and is aimed at people with some type of functional limitation or disability by designing solutions that are readily usable by most users without requiring any modification. Or, alternatively, making it adaptable to specific users (PERSSON et al), 2014). In that context, for example, the inclusion of people with visual impairments allows them to be better integrated into society and, consequently, have more independence and adherence to their daily activities (ROSS, 2001; HASSAN and TANG, 2016).

Thus, when working on projects aimed at inclusive digital transparency, it is important to consider not only the end result but adopt an inclusive process and tools throughout the Design process. Design need to consider the user's functional capabilities versus the social and cultural expectations that will affect the adoption or rejection of interactions and informations. One alternative is to offer customization options to enable user greater control over the interfaces with transparency, offering equity towards people with disability (PAPE et al., 2002; HOLMES, 2018; IDRC, 2021).

More recently, the issue of inclusion and accessibility has been integrated under the umbrella of "Responsible Design". It consists of a movement without fully defined theories, having roots in Design for Sustainability, Inclusive Design, Participatory Design, Systems/Systemic Design, Design Futures and Decolonising Design (VERMAAS, 2019; BOEHNERT et al., 2022). Mainly due to the advance of AI systems, Forrester (2023) proposed Responsible Design principles as a way to organizations acknowledge that products and services should provide consistently positive outcomes and avoid harm or hurt customers, otherwise causing a damage also to the firm itself.

The Responsible Design Research Group (RDRG) at Loughborough University (BOEHNERT et al., 2022) has established six foundational principles to supporting teaching and practice:

- Responsible Designers are **Ethical**, both in the way they conduct and report research, and in the design interventions they propose;
- Responsible Designers are **Pluriversal**, rejecting the 'defuturing' nature of the technological status quo and accepting multiple plausible futures;
- Responsible Designers are **Planet-centric**, accepting and embracing the challenges of climate change, and factoring the needs of all stakeholders, both human and other;
- Responsible Designers are **Decolonial**, realising that a primarily Western conception and canon of 'good design' is limiting and harmful;
- Responsible Designers are **Transdisciplinary**, comfortable working with and being challenged by creatives outside of their own specialism;
- Responsible Designers are **Optimistic**, believing that designers can make the world a better place.

Responsible Design applied to transparency in a Service Design context could be approached at interaction level (e.g., avoiding dark patterns in the interfaces; positive nudging; encouraging interactions in a respectful and sustainable manner). At service-system and institutional levels it could be approached as a way to encourage

organizations and communication change (e.g., value-sensitivity to respect; honesty and trust; better conditions for interactions to happen)(EPPINGER et al., 2019; VERMAAS, 2019). Leadbeater and Winhall (2020) argues *“systems are often hard to change because power, relationships, and resources are locked together in a reinforcing pattern to serve the system’s current purpose”*. The power determines how resources flow, what takes priority, who matters and what is counted as a good outcome. The resource flows includes different forms (money, technology, knowledge, etc) and the relationships are the different forms to connect and works together.

3.1.9 Summary of the theoretical findings

This section reported a theoretical review about the concept of transparency and Table 3.6 presents the summary of key findings that supports the research strategy:

TABLE 3.6 – Transparency theoretical findings

Code	Theoretical Findings
T3.1_01	Transparency research is research <i>through</i> transparency: implying in an enabling concept, as a means to achieve a result.
T3.1_02	Transparency is not neutral: because it expose and create the object to be seen — we see the created transparency itself in the form of the practices labelled as ‘transparency’.
T3.1_03	Transparency concept evolved from an ideal or reactive opportunity to a complex proactive requirement: from a moral concept, to a political and legal activity, a function of public and private organizational management, to a techno-socio-cultural collaborative perspective.
T3.1_04	Transparency is mainly built on communication processes: through social interactions via nonverbal and verbal messages that produce meanings, noises.
T3.1_05	Transparency can be seen as catalyst for change: implying in an opportunity for promoting self-reflection, enabling more understandable spaces and actionability upon it for people.
T3.1_06	Transparency as an ethical principle implying in honesty, openness and inclusivity, for enabling people's understandings and actionability from communication.
T3.1_07	Transparency is a multidimensional concept: implying that efforts can be oriented to distinct objects: actors, norms and regulations, policies, processes, data and information, digital systems.
T3.1_08	Transparency main drivers for organizations are related to politics and legislation, suspicious, informational efficiency, technological innovation, users needs, marketing, creative investigation, innovation opportunities
T3.1_09	Transparency main benefits for users are related to confidence (protection, trust-building), understanding (awareness, learning) and actionability (decision-making, customization, co-creation).
T3.1_10	Transparency nature is complex and dynamic, especially because transparency requirements change over time and a transparency vision can vary depending on the evolution of lifestyles, politics, market, etc.

T3.1_11	Transparency may lead to uncertainties, paradoxes and negative consequences such as undermine trust, resulting in a culture of suspicion, low morale and cynicism. Lead to access leaks for secret information or hidden practices. Adapt performance according to a particular audience or norms.
T3.1_12	Different qualifying factors contribute to overall levels and respective benefits or conflicting outcomes for digital transparency: user (digital capabilities, motivations, cognition) and organizations (providing infrastructure, organizational motivations, digital systems characteristics, data/information quality and integrity).
T3.1_13	Transparency can be approached as a spectrum with different types of classification (attitude-oriented, goal-oriented, information type-oriented and perception-oriented).
T3.1_14	Transparency initiatives needs to consider barriers: for the users (to perceive transparency) and for the organizations (to implement transparency).
T3.1_15	Co-design principles are based on power sharing, prioritising relationships, using participatory means and capability building (MCKERCHER, 2020).
T3.1_16	Inclusive digital transparency implies in embrace diversity; accessibility, adoption and rejection; content; customization and alternatives (PAPE et al., 2002; HOLMES, 2018; IDRC, 2021).

Source: the author.

3.2 Understanding design for digital services

3.2.1 Service and digital service concepts

Services are ubiquitous or are everywhere, existing in the invisible background of our daily lives, helping us to do something, such as choosing a food and having it delivered, or booking an appointment and being successfully treated (PENIN, 2017; DOWNE, 2020). From Pennin (2017) example of typical service interactions, *“one part, the service provider, performs a certain activity that results in some benefit that includes a specific output and involves certain experiences. The other part, the service user, sees value in the output, the experience, or both combined and is willing to pay for it or exchange for something else of equivalent value”*.

Historically, according to Edvardsson et al. (2005), the service concept has been traditionally associated with a set of market offerings, focused on aspects such as service performance, activities, processes, and interactions. However, the service concept has been revisited, with a growing interest on service as a perspective on value creation with the user's own context of use of the service. This implies that service research has also been changed, from exploring the differences between goods and services (ZEITHAML et al., 1985), to how explore value creation with users (and other stakeholders) (EDVARDSSON et al. 2005; SANGIORGI and PRENDIVILLE, 2017). Additionally, Edvardsson et al. (2005), argues that physical products may be seen as platforms for services or as components in service offerings.

This change in service conceptual perspective, also followed changes in the dominant practices from a traditional economy based on manufactured products to an economy based on services. This movement also suggests a change in the logic of organizations and has been described as a move from a *goods-dominant logic* to a *service-dominant logic* (VARGO and LUSCH 2004, 2008, 2014, GRÖNROOS 2008). The service logic is an alternative to the conventional paradigm based in value in goods.

With the advent of digital technologies, the service environment has also been under profound changes (MAGLIO et al., 2019). As new technologies are developed and old ones are reconfigured or suppressed, new forms and modalities of services emerged based on new forms of interaction. This movement, both design-driven and technology-driven, transforms the way service innovations are conceptualized, designed, marketed and how organizations operate them (OSTROM et al., 2015; PENIN, 2017; MAGLIO et al., 2019).

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. It is building on the Third Revolution characterized by the use of information technology

for automating basic processes and speeding up the exchange of information. The digital economy has been characterized by a convergence of multiple technologies happening today (*mobile, location-based, virtual reality, blockchains, artificial intelligence (AI), wearable technologies, chatbots, neuroscience and business process automation, Internet of Things (IoT)*), that is blurring the lines between the physical, digital, and biological spheres (WEF, 2017; ZAKI, 2019).

The digital economy has a direct influence on the emergent movement described here as *digital-service-dominant logic*. Miao (2021) points that organizations in the digital economy are also organized based in a model of value chain, as a flow of data, information, also, as a communication technology element. It also includes supporting activities (infrastructure, technology development, and others) and primary activities (digital application, digital production (operation), digital connectivity, digital marketing, and digital service).

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 users and organizations (PENIN, 2017; HARTWIG; BILLERT, 2018). Digital services are characterized by a direct user 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 services can be seen as an opportunity to develop ongoing relationships with and among users, enabling a greater understanding of their context, behaviors and needs, favouring service customizations.

From this conceptual review, digital service evolution can be understood as a progressive and complementary movement, influencing different approaches from different knowledge fields and organizations interested in services. From a broad perspective, Service Science is the systematically study of services system entities and value co-creation mechanism. It is the interdisciplinary integration of many service research areas and service disciplines, such as service design, service management, service marketing, service economics, service quality (especially customer satisfaction), service strategy, service engineering, service computing, among others (SPOHRER and MAGLIO, 2010; MAGLIO et al., 2010).

Digital service characteristics

Digital services have particular characteristics that can differ from the conventional services such as *simultaneous production/consumption nature, perishability, intangibility,*

and *heterogeneous*, in contrast to goods (ZEITHAML et al., 1985; LOVELOCK and GUMMESSON, 2004).

For example, Salminen (2014) argues that *inseparability* does not apply to digital services, because typically digital services are designed and developed prior their use, including automation by algorithms. *Perishability* does not apply to digital services because they can be provided on-demand, or upon user request. *Service intangibility* may not apply to all classes of digital services, according to the dependence of a physical device. However, digital environmental cues do play a role in user perception which can be called “*digital tangibles*” or “*tangibilizers*” (EDVARDSSON et al., 2005; SALMINEN, 2014).

Digital services can be *heterogeneous*, due to the quality of a service's performance of the digital resources. Additionally, Salminen (2014) suggests that digital services can be *standardized* by both quality and content due to other characteristic that is *high-tech low touch*, implying a human distance and interactions through digital interfaces. The last characteristic is *scalability*, meaning digital services can have “unlimited seats” according to the actual market demand.

3.2.2 Key categories for digital services

According to Jaakkola et al. (2017), typologies play an important role in service research, making it possible to divide services into groups that share certain characteristics.

At an organizational level, Strohmeier (2020) argues that the intensity of an organisational digitalization is determined by whether it supports only operational purposes or additionally different types of strategic purposes. The same author, proposes a typology of digital organizations (Figure 3.5).

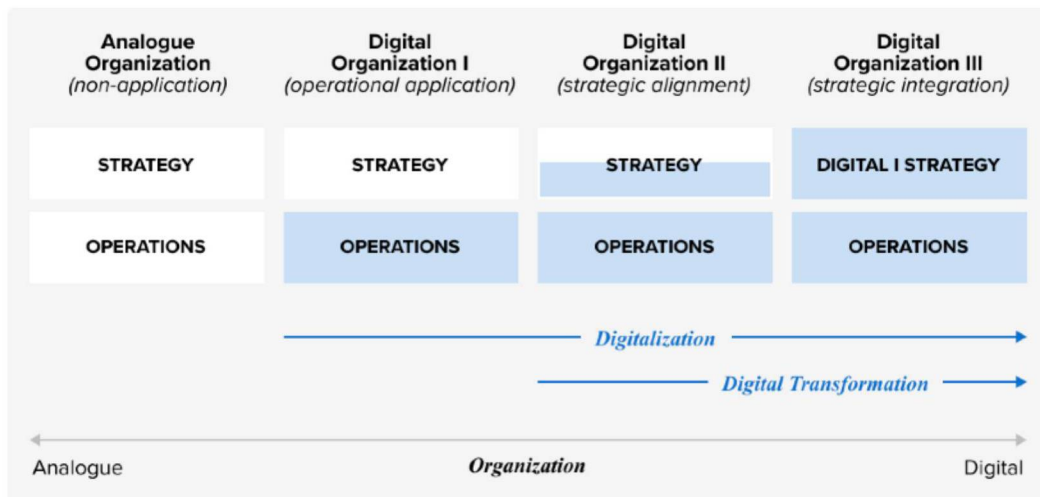


FIGURE 3.5 – Categories of digital organizations
 Source: the author, adapted from Strohmeier (2020)

Strategic alignment involves exploring functional digital potentials after the formulation of a business strategy. While in *strategic integration* involves exploring digital potentials to create new business opportunities and identify related strategies. This thesis concerns “*strategic alignment and integration*” of digital technologies from Strohmeier (2020) typology.

According to Rha and Lee (2022), digitalization is one of the main drivers of servitization — digital servitization is defined as “*the transformation in processes, capabilities, and offerings within industrial firms and their associated ecosystems to progressively create, deliver, and capture increased service value arising from a broad range of enabling digital technologies*” (SJÖDIN et al. 2020). Digital servitization has a front-end perspective dealing with interactions with customers, while the back-end perspective deals with operational efficiency and resource allocation (RHA and LEE, 2022).

At service level, Glushko (2010) identified seven contexts for digital services when the service-system is “*information-intensive*” — those in which the information and interactions are responsible for the greatest proportion of value created by the service (e.g. software applications and banking, insurance, consulting).

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 (GLUSHKO, 2010). In complement to “*experience-intensive*” that usually requires information interactions to specify and co-produce the service (e.g. *healthcare, dining or transportation services*).

According to the digital service concept adopted in this thesis — characterized by a direct user interaction with the service through digital touchpoints — it is best aligned with the “self-service” and “tech-enhanced” contexts from Figure 3.6.

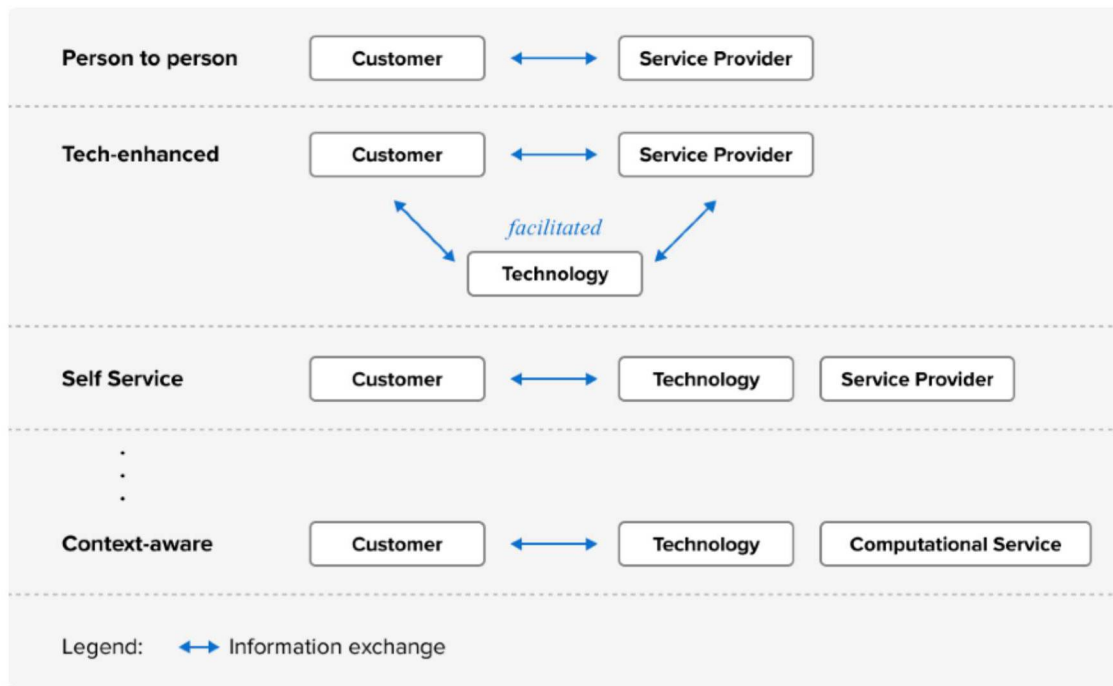


FIGURE 3.6 – Categories of information-intensive services
Source: Glushko (2010)

Glushko (2010) argues that a fundamental change in service design is, rather than introducing technology to assist a human service worker, is to use technology to transform person-to-person service into a self-service. This implies in giving to the customer, access to information that was previously visible only to the service worker. A common design pattern in this context is the service supporting the creation and aggregation of preferences or other content from the users of a service (contributing to a “community content”, “collective intelligence” or “crowdsourcing”), once it enhances the quality of future service encounters (GLUSHKO, 2010).

Then, at function level, the different types of informational exchange in digital services includes data collection, integration, analysis, based on the knowledge hierarchy (ROWLEY, 2007; BUMBLAUSKAS et al., 2017; LIU et al., 2022)(Figure 3.7):

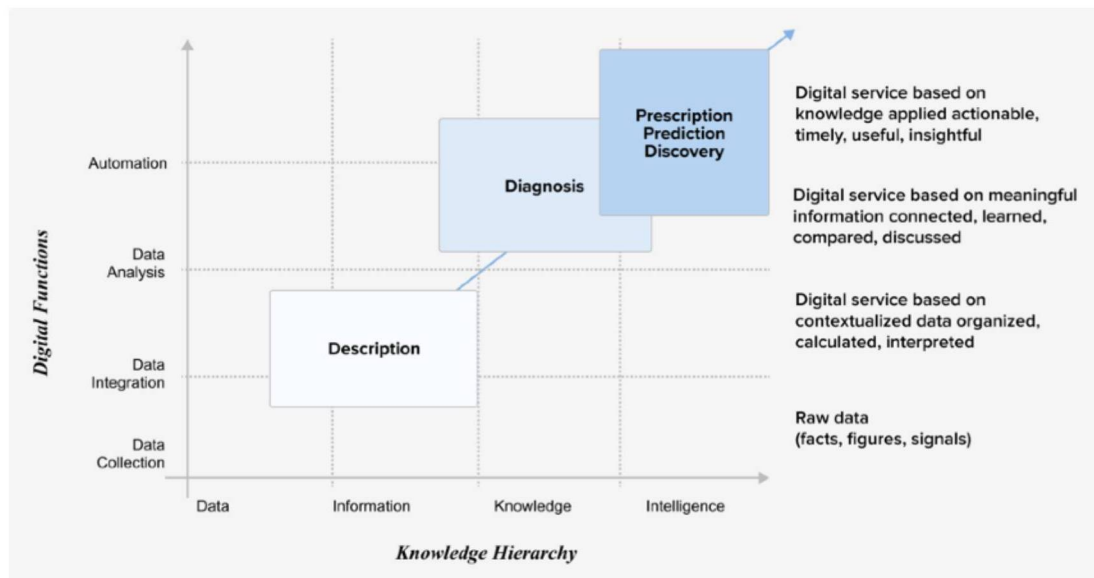


FIGURE 3.7 – Categories of digital functions
Source: the author, adapted from Liu et al. (2022)

- **Data collection:** based on raw **data**, which consists of properties of some event, environment or object (eg. facts, figures), mostly collected from physical and digital sources. It mostly includes sensing, inputting, sharing, selecting data functions.
- **Data integration (WHAT):** based on **Information**, which consists of contextualized data (eg. descriptions). It usually includes describing, summarizing, comparing, calculating, and presenting data functions.
- **Data analysis (HOW):** as the process of deriving **knowledge** from integrated information. Knowledge consists of information with added understanding and meaning. Data analysis connects information to support learning and understanding. It mostly includes monitoring, tracking and tracing functions.
- **Data analysis (WHY):** as the process of deriving **intelligence** from acquired knowledge. Intelligence consists of the ability to apply the knowledge with action. Data analysis provides insights to support decision-making. It mostly includes prediction and prescription functions such as discovering, assessing, detecting, connecting, forecasting, optimizing and automating.

Digital transparency refers here to organizations relying on digital technologies to operationalize at different levels (MATHEUS et al., 2021). Typically, transparency has been approached at data and information levels, being an opportunity for digitally enabled transparency to explore knowledge and intelligence levels.

3.2.3 Service Design and Design for Service

Service Design discipline emerged as a contribution of Design field to service studies, towards the development of economies based in services. With the growth and relevance of the services sector, not only Design was affected, but several other disciplines, such as Marketing, Engineering, Computing, Behavioural Sciences, among others, resulting in the need to fill the gap in meeting the needs that only the execution of products did not met (MAGER, 2009; MERONI and SANGIORGI, 2011; MORELLI et al., 2021).

For Meroni and Sangiorgi (2011), Service Design articulates what Design can do for the service sector and how it connects with existing knowledge and practices. Additionally, Service Design is built on and also can contribute to existing design approaches such as Experience Design, Strategic Design and Interaction Design, among others. Designing for services instead of products means that what is being designed is a platform for action or a system that enables a multiplicity of interactions and value creation (MERONI and SANGIORGI, 2011).

Additionally, the term *design for service* is also used in literature referring to service research theorization in design, based on the perspective of service as value creation, suggesting *“the fundamental inability of design to completely plan and regulate services, while instead considering its capacity to potentially create the right conditions for certain forms of interactions and relationships to happen”* (MERONI and SANGIORGI 2011, p. 10). In this context, for Kimbell (2011) *“designing for service”* rather than service design, makes clear that the purpose of the designers is to create and develop proposals for new kinds of value relation, and not directed toward specific outcomes.

3.2.4 Design principles for services

The approach for services in design evolved from viewing services in relation to their intrinsic differences in products to viewing services as processes of value co-creation (MORELLI et al., 2021). The discipline has been defined and approached from different contributions and emphasis of study. For example, theory and practice derives from studies which emphasis on the methodological perspective, including service design process, methods and tools (MORITZ, 2005; STICKDORN and SCHNEIDER, 2010), while other studies focus on the design perspective for service projects in different contexts (JUNGINGER and SANGIORGI, 2009; SANGIORGI and PRENDIVILLE, 2017).

To guide design work when it comes do digital services, from the literature review the basic principles are (STICKDORN and SCHNEIDER, 2010; PENIN, 2017):

- **Service design is people-centered:** users are people before they are users of a service. People who belong to communities, families, cities, and cultures and need to be considered in all the complexity determined by these relationships. Also, Penin (2017) highlights that services or digital services are delivered by people, implying that service workers needs to be accounted for;
- **Service design depends on participation and co-design:** Participatory design practices are central to service design, to understand people as partners, being involved throughout the design process;
- **Service design is communicated through service narratives:** service narratives can help not only understand things, but also imagining preferred futures and designing interventions to get there;
- **Service design includes the material side of services:** material evidence and touchpoints (non-digital and digital) in services is central to its process to help with service evidencing, anticipate the aesthetic, function and meanings of things and what they can represent in people's lives in the future;
- **Service design is holistic:** which means considering something as a whole, combining it's different parts into systems. It stands for integration, interconnectedness, and harmony. A key challenge in designing services is therefore how to integrate the system, process, and touchpoints in a consistent and holistic way.
- **Digital:** although fundamental principles from Service Design field do not encompass digital aspects, for this type of project it is usually reinforced the relevance of Design with Data, Data-Driven or Data Design practices, before, during and after services are delivered, letting data drive decision-making and iterating the deliveries (TERRETT and BRACKEN, 2016).

According to Cross (2008), since modern industrial societies the design activities became distant from the public, in control of the industry due to innovation and production processes, brands, patents and copyright, etc, leaving the public in a position of consumers. While design and openness implies in a philosophy to enable a democratization and accessibility of the design process and innovation (BJÖRGVINSSON et al. (2010); CABEZA and MOURA, 2014; BAKIRLIOĞLU and KOHTALA, 2019).

Due to the people-centered and co-design principles, it is also important to consider the levels of user engagement in a design process, from the lowest level characterized as “*design for*” — where users are consulted, to a highest level characterized as “*design with*” — where user are core part of the design team (Figure 3.8).

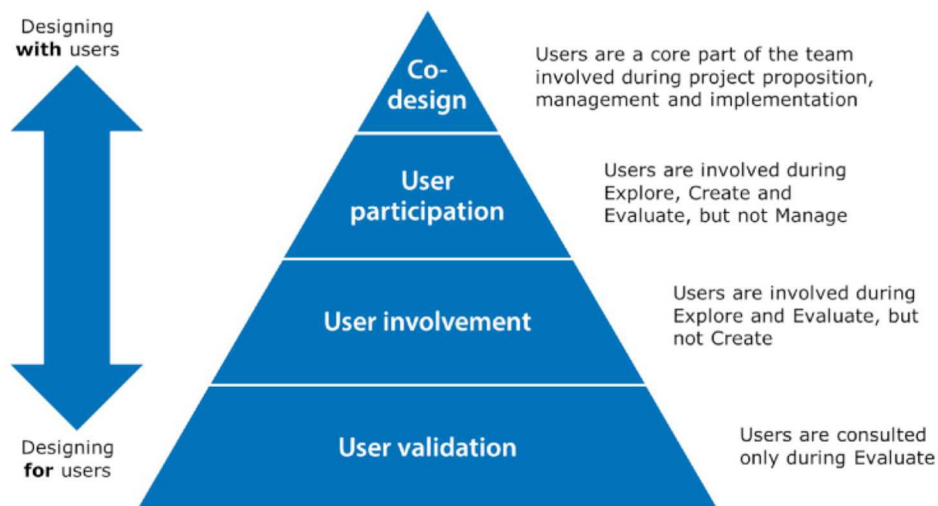


FIGURE 3.8 – Levels of user involvement in design
Source: Inclusive Design Toolkit (2022)

Bakırlioğlu and Kohtala (2019) differentiate open-design in two groups: open-to-participate and openly-shared processes. Open-to-participate refers to collaborative and ongoing process, typically based on participatory or co-design methods, self-selecting participants in any context, prior to the sharing of any outcomes. While openly-shared refers to documenting and sharing it upon completion or reaching maturity.

From this context, co-design is a *design with* people participatory approach, implying that service designers and service actors work together. It is based on the principles of power sharing, prioritising relationships, using participatory means and capability building (MCKERCHER, 2020). Mckercher (2020) argues that co-design isn't about involving everyone, instead, a small circle who are closest to an opportunity or issue, who know about it, and who are likely to be the most affected by a change. In line to that, Bakırlioğlu and Kohtala (2019), argues that open-design is more successful when approached in a modularized way and with tasks that participants find appealing and do-able, avoiding complexity.

3.2.5 Service elements for design

Services are composed of a variety of elements such as places, systems of communication and interactions, human beings and organizations, joined together to form a journey that helps people as service users to achieve their goals (MERONI; SANGIORGI, 2011; DOWNE, 2020).

There are a set of intertwined conceptual elements which needs to be considered when designing for digital services, and some of them can vary according to time, since

services are context dependent (FOGLIENI and HOLMLID, 2015): a) **before** the service development; b) **during** the service delivery; c) **after** the service delivery. The elements that form the basis for digital service design projects are described in Table 3.7 (WETTER-EDMAN et al., 2014; FOGLIENI and HOLMLID, 2015; JOLY et al., 2019).

TABLE 3.7 - Conceptual elements for digital service design

Elements	Description	Goal	Factor
value	Before as value proposition: a set of benefits and solutions that a service intends to <u>offer/exchange</u> as value. Also known as service concept. After as value created: a <u>judgment</u> of the resulted improvements, changes or influences to the actors and the service system.	WHY	Digitally enabled
experience	During: the actor's <u>perceptions and feelings emerged</u> from the service interactions.		
interactions	Before: the set up of the <u>intended actions</u> of the actors. During: the <u>actions performed</u> by the actors.	WHAT	Digital and non-digital
interface	The material, informational and sensorial <u>artifacts, environments</u> , embodied human interactions, and all service <u>evidences</u> and clues that intermediate service encounters and support the experience. Also known as servicescape, and includes channels and touchpoints concepts.	HOW	
encounter	Before: the set up of the <u>intended situational context</u> where and when the service interactions take place for the different actors. During: the situational context where and when the service interactions are <u>performed</u> by the different actors. Also known as the service delivery context.	WHERE and WHEN	
system	The set of interrelated <u>structures</u> , or <u>socio-technical-ecological systems</u> (resources, processes, actors, technologies, norms, etc), as the <u>platform</u> that support and enable service value co-creation among actors.	WHERE and HOW	
stakeholders	The network of individuals and organizations from the service system. Includes different roles such as users, beneficiaries, workers, or collaborators.	WHO	

Source: the author,
adapted from Wetter-Edman et al. (2014); Foglieni and Holmlid (2015); Joly et al. (2019)

A model representing the interconnections among the elements is illustrated in Figure 3.9.

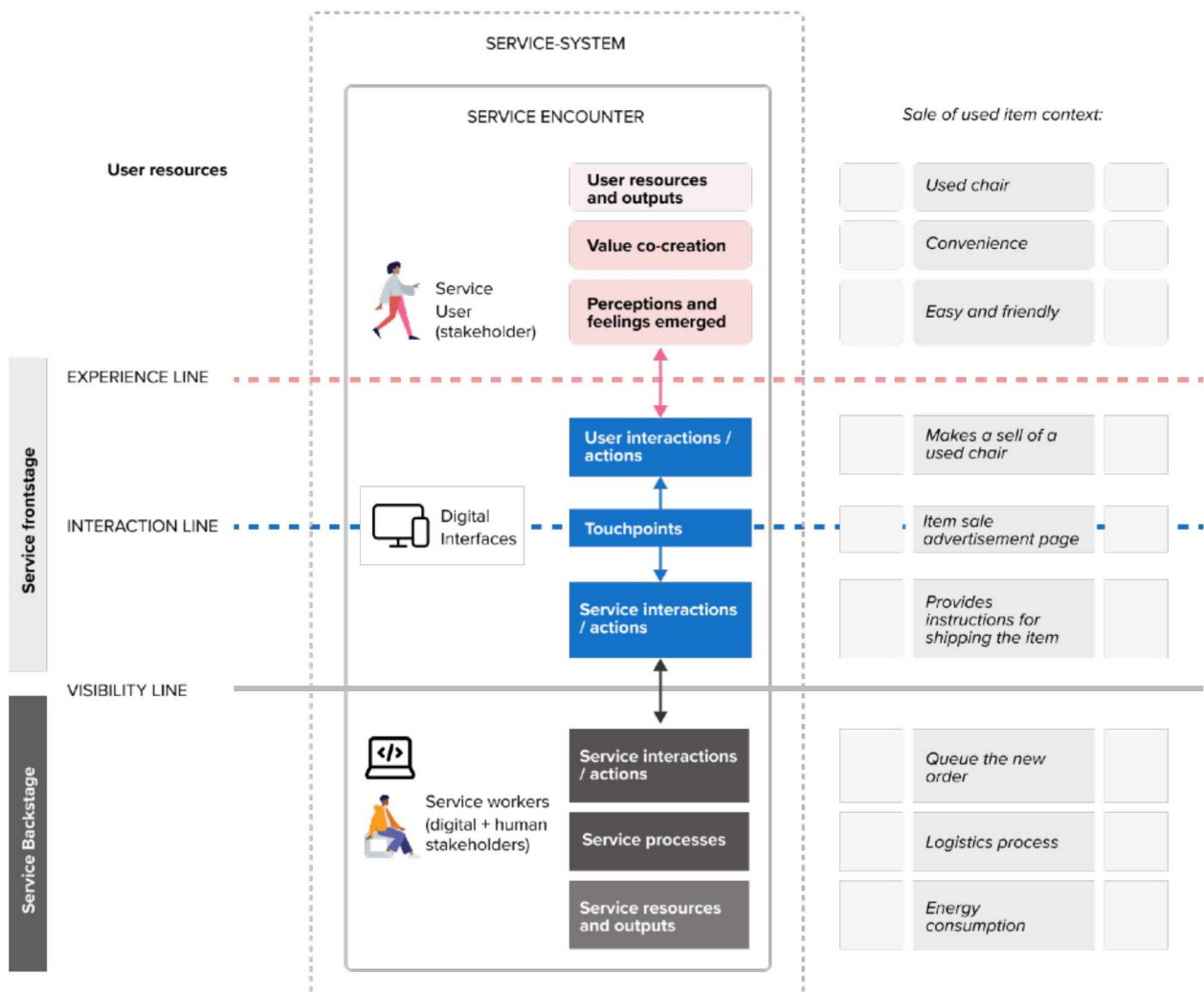


FIGURE 3.9 – Model of the key elements of a digital service

Source: the author

Image from Humaaans and The Noun Project by Dewanata Visuals

The first element is the **service value proposition** as a specific package of benefits and solutions that a service intends to offer. Designers develop proposals for new kinds of value, which are then co-created during the service delivery because they are context specific. To better understand *value* concept in services, there are two main perspectives (VARGO and LUSCH, 2008):

- value-in-exchange** representing the *goods-logic* and refers to the transactional value, suggesting that value is created by selling products or services;
- value-in-use** representing the *service-logic* and refers to the value co-created with customers in use, rather than produced and distributed by the organization.

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 or user. Although value is not always co-created, it is context specific.

To better understand the nature of value, Holbrook (1999) proposed a classification of value types, as shown in Table 3.8, organized according to self-oriented — primarily concerned with oneself, and other-oriented — taking into account the feelings and needs of others. *Extrinsic* value occurs through a means to accomplishing something and *intrinsic* occurs an end in itself. Also, value is *active* when entails things done by the user as part the experience, and value is *reactive* when it results from apprehending, appreciating, admiring, or otherwise responding to something as part the experience.

TABLE 3.8 - Typology of consumers values and sources

		Extrinsic	Intrinsic
Self-oriented	Active	Efficiency (Convenience)	Play (Fun)
	Reactive	Excellence (Quality)	Aesthetics (Beauty)
Others-oriented	Active	Status (Success, Impression Management)	Ethics (Virtue, Justice, Morality)
	Reactive	Esteem (Reputation, Materialism, Possessions)	Spirituality (Faith, Ecstasy, Sacredness)

Source: Holbrook (1999)

Holbrook (1999) defines **value as user interactive relativistic preference experience**, referring to the evaluation of some object of interest (e.g. digital service). By relativistic, means (a) comparative (involving preferences among objects); (b) personal (varying across people); and (c) situational (specific to the context). By preferential, Holbrook (1999) argues that value embodies a *preference* judgment. At last, by experience means that value resides and are derived in experiences.

For Wetter-Edman et al. (2014), individual user **experiences** emerge from service interactions at a specific point in time, shaping the way people perceive situations and make decisions. 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 the user perceptions emerged from a service interaction, sometimes referred to as “*look and feel*”. Experiences are the source for value perception and creation, and usually are represented by service narratives such as

user journeys and delivery processes as activities, workflows, procedures, or rituals timely performed by the service actors.

Interactions and experience are mainly related to the service users/beneficiaries, but they can also include a more broad range of service actors such as workers (WETTER-EDMAN et al., 2014). Typically, people engage with service providers and professionals as a relationship, and along the course of action they might find themselves co-producing the service to solve a problem or address a need for example (POLAINE et al., 2013). For that, the interactions can refer to very well-known sequences of routinary actions, or it may need a structured plan that requires certain capabilities (MORELLI et al., 2020).

Digital services comprise digital and social interactions among people, technology, and processes, which can also be seen as variations of actions, activities, relationships, behaviours or attitudes. Sharp, Preece and Rogers (2019) identified the common ways people interacts with digital systems, which are not meant to be mutually exclusive (Table 3.9).

TABLE 3.9 - Types of user digital interaction

Type of interaction	Description
Instructing	Where users issue instructions to a system. <i>This can be done in a number of ways, including typing in commands, selecting options from menus, speaking aloud commands, gesturing, pressing buttons, etc.</i>
Conversing	Where users have a dialog with a system. <i>Users can speak via an interface or type in questions to which the system replies via text or speech output.</i>
Manipulating	Where users interact with objects in a virtual and physical spaces by manipulating them. <i>For instance, opening, holding, closing, and placing.</i>
Exploring	Where users move through a virtual and physical space. <i>Virtual environments include 3D worlds and augmented and virtual reality systems. Physical spaces that use sensor-based technologies include smart rooms and ambient environments.</i>
Responding	Where the system initiates the interaction and the user chooses whether to respond. <i>For example, proactive mobile location-based technology that can alert people to points of interest, restaurant recommendation when they are walking nearby.</i>

Source: Sharp, Preece and Rogers (2019)

Considering that transparency interactions in digital services are mostly characterized by informational interactions, understanding the concept of informational behaviour is also relevant. Informational behaviour is the term used to describe the ways in which people interact with information, in particular, the ways in which people seek, search and use information (WILSON, 2000):

- **Information Seeking Behaviour** is the intentional search for information as a consequence of the need to satisfy some objective.
- **Information Search Behaviour** is the "micro level" of behaviour employed by the researcher in interaction with digital information systems, including how to judge the relevance of retrieved data or information.
- **Information Use Behaviour** is the physical and mental acts involved in incorporating information found in a person's existing knowledge base, including its applied use.

Experiences, service interactions are represented by service narratives such as user journeys and delivery processes as activities, workflows, procedures, or rituals timely performed by the service actors. Especially in digital services, it can include interaction design and information architecture methods for the service interfaces of the information systems (MORITZ, 2005; POLAINE et al., 2013).

Then, the **service interfaces** are the material, informational and sensorial artifacts, environments, embodied human interactions, and all service evidence and clues that intermediate service interactions, encounters and support the experience.

A service may consist of traditional physical channels, such as talking to a representative face-to-face or via phone or browse a physical store, as well as digital channels such as websites, mobile and tablet apps, texting, social media, live chat and email. Digital **touchpoints** represent the services interfaces that enables the digital interactions among actors and information systems. They are also essential to make more efficient, meaningful and more desirable experiences, being crucial to determine the perceived value of the service (POLAINE et al., 2013). To illustrate that, examples of digital touchpoints includes: browse movie times on laptop, download files, scan products, subscribe for a streaming service, among others.

Besides the types of interactions, Sharp, Preece and Rogers (2019) argues for considering the specific context-based activities in which users engage with the service, such as learning, working, socializing, playing, browsing, writing, problem-solving, decision-making, and searching, among others.

The **service encounters** are the situational contexts where and when the service interactions are performed by the different actors through the touchpoints, also known as "*moments of truth*" (SANGIORGI and PRENDIVILLE, 2017). It 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 value is perceived and assessed in a context, as a situated activity or use situations. Contexts are influenced by

external factors such social, aesthetics, cultural, environmental, economic, political. Also individual factors such as emotions, routines, motivations.

Three types of service digital encounters highlighted in literature (WOORHEES et al., 2017) (Figure 3.10):

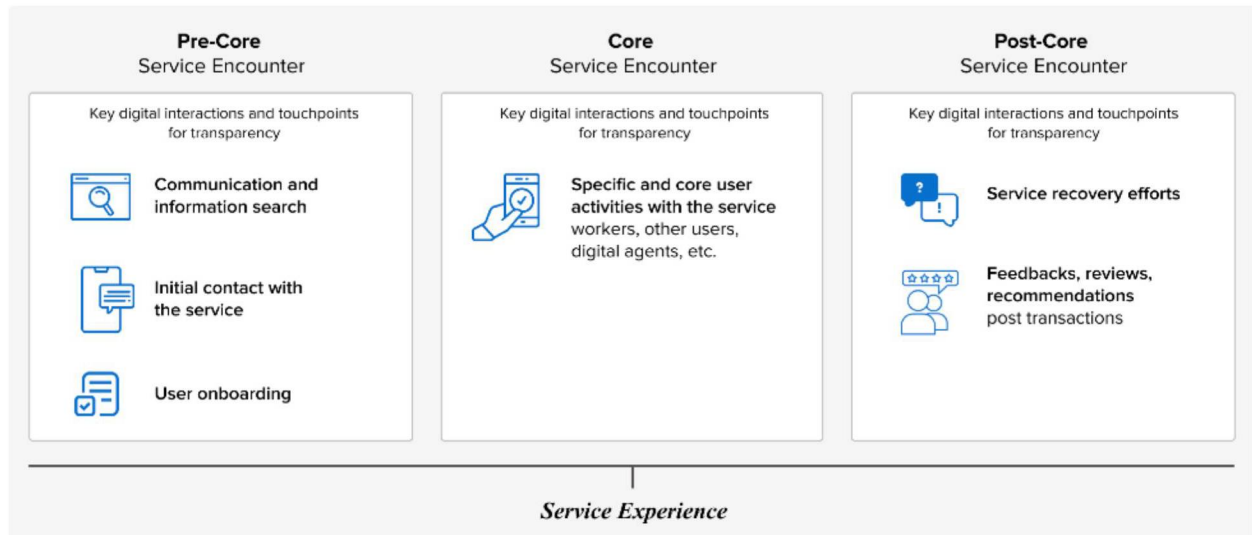


FIGURE 3.10 – Types of service encounter

Source: the author, adapted from Woorhees et al. (2017)

Icons from The NounProject by mim studio, iconixar, papergarden, Juicy Fish, myiconfinder, zafdesign

- **Pre-Core service encounter:** the time interval preceding the core service encounter that focuses on leading people to engage with the firm in the core-service encounter. Takes place when people either begin reviewing information about a firm's offering or make initial contact with the firm, and can be use strategies to influence decision-making;
- **Core service encounter:** the time interval during which the primary service offering is provided to the user. The primary service fulfils a foundational user need, which is the focal motivation that leads users to engage with the service provider.
- **Post-core service encounter:** the time interval following the core service encounter during which users assess and act on their experience in the two previous periods. Through this period, the firm's goal is to retain users and to improve future service experiences.

Adding to that, from a human-computer-interaction perspective, the frequency of use of the service can be an important variable to help characterize the service

encounters, such as (CARRILLO et al., 2017): a) first-time use; b) regular-use; c) occasional-use.

The other element is the **service system**, which represents the organizational setting or configuration that makes the service provision/delivery/offering possible, including resources, processes, actors, technologies, norms, forms of knowledge, among others, that can enable customers to co-create experiences and value (MAGLIO et al., 2009; PATRÍCIO et al.; 2011; WETTER-EDMAN et al., 2014; MORELLI et al., 2021). According to Patrício et al. (2011), the service system is designed based on a preliminary understanding of the service value proposition and interactions. This helps in revealing how to arrange the different touchpoints across the customer journey, and the factors that enable or inhibit the desired service experience.

“People are physical resources with legal rights, organizations (such as businesses) are conceptual resources with legal rights, shared information is a conceptual resource treated as property, and technology is a physical resource that is treated as property. Every service system has a unique identity, and is an instance of a type or class of service systems” [SPOHRER et al., 2008].

Lusch and Nambisan (2015) argues that a service system must provide an “*architecture of participation*” that brings clarity to the way value co-creation occurs (by a diverse sets of actors) as well as the way the “*rights*” (or value) are shared among the actors. **Participation** can be considered a source for value creation, as a characteristic of the system-configuration and interactions to facilitate resource integration — the incorporation of user’s resources within an organization’s resources. According to Wetter-Edman et al. (2014), participation is also a means to democratize processes and can be approached as a continuum that moves from consultation to coproduction.

Thus, the **service stakeholders or actors** are a central part of the service systems. Actors concept includes all individuals, as customers-users or 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. Lusch and Varg (2014) argues that adopting terms such as “*producer*” or “*consumer*” for service actors can indicate the economic type of exchange in the relation, given a false notion of one-way nature of value-creation. Instead, if service actors are co-creators of value, it implies that both performs “*production*” and “*consumption*” functions. Thus, all service actors can be seen as resource-integrating, service-exchanging, value co-creating based on an *actor-to-actor network logic* (LUSCH and VARG, 2014; LUSCH and NAMBISAN 2015).

From this review of the key service elements, transparency could be characterized as a *carrier or an instrument for value creation*. When enabled by digital technologies, transparent experiences could influence user’s expectations, preferences and

perceptions about the nature of value that can be derived (LUSCH and NAMBISAN, 2015).

Two key aspects are important for a more collaborative transparency in services: a) transparent rules of exchange — to facilitate the coordination of actor contributions and their interactions, implying in the adoption of more open processes and standards; b) enhance the transparency of value creation, clarifying “*who contributed what*” and enabling an equitable sharing of the value that is co-created (LUSCH and NAMBISAN 2015).

3.2.6 Levels for approaching design for services

Service Design can be seen as the design of the *service experience* (front-stage), focusing more on the user interactions, and as the *design of the service provision* (back-stage) focusing more on the business model, service system, processes, and resources (STICKDORN and SCHNEIDER, 2010; MERONI and SANGIORGI, 2011; MORELLI et al., 2021).

However, due to the broad variety of services and organizational contexts, approaching transparency for sustainability within digital service design can lead to different challenges, working areas and approached in diverse ways, such as: at different intervention levels (from an operational to a more strategic level); with different methods and tools; with different aims (from improve existing services or to foster transformations); with parts and segments of services; redesigning interactions and experiences; for wider service reconfigurations (suggesting new business models and value networks); for services as means for generating conditions for more sustainable futures (MERONI and SANGIORGI, 2011; MORELLI et al., 2021).

Scholars have been exploring how to approach different challenges and levels of impact, positioning design for services as means for societal transformation (PATRÍCIO et al., 2011; MERONI and SANGIORGI, 2011; SANGIORGI and PRENDIVILLE, 2017; MORELLI et al., 2021). Figure 3.11 presents an overview of the main scopes of digital service design for approaching transparency for sustainability.

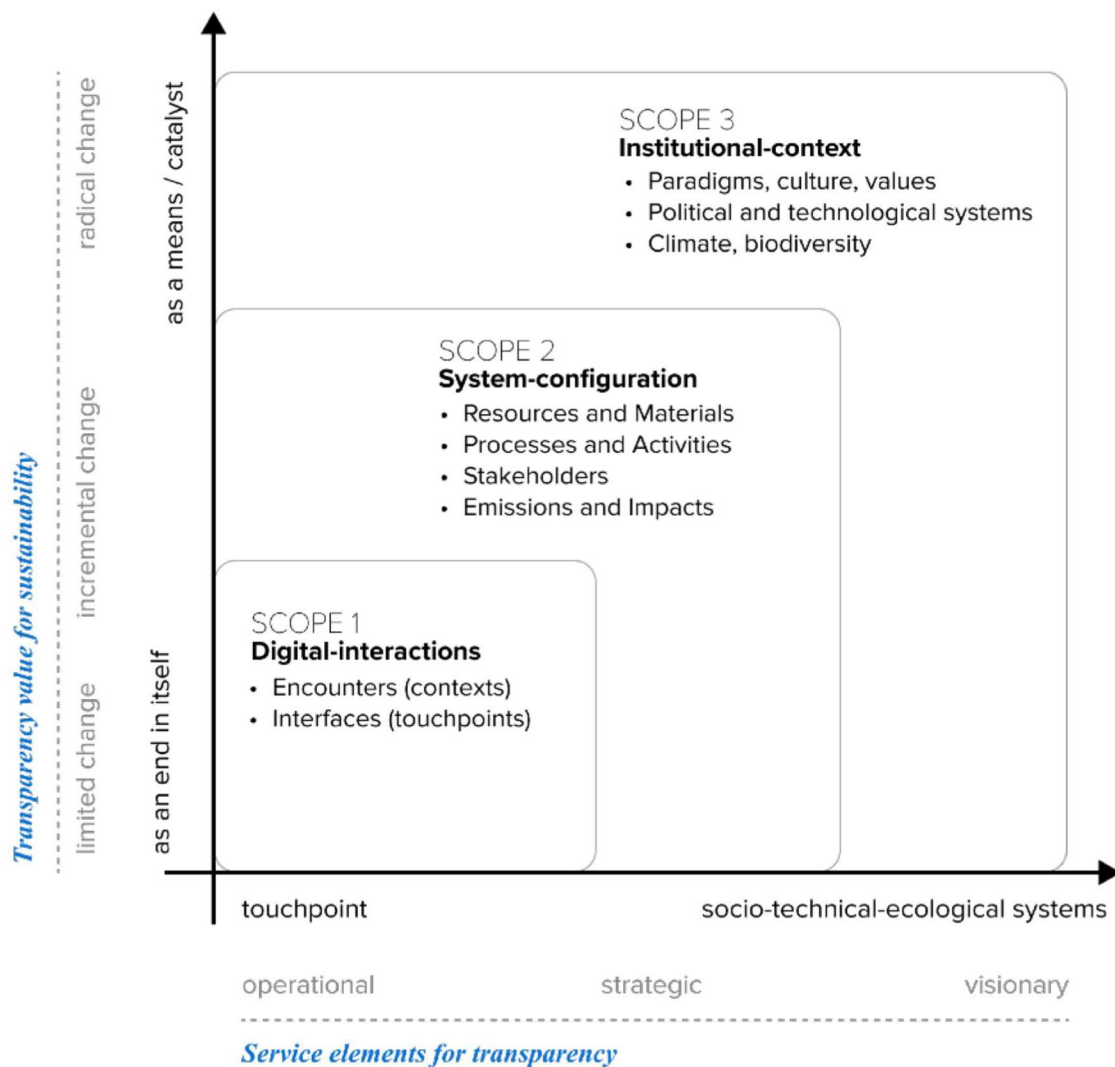


FIGURE 3.11 – Scopes of digital Service Design and elements for sustainability transparency

Source: the author, adapted from

McCarthy and Fluck (2017), Albu and Flyverbom (2019),
Ceschin and Gazioulosoy (2020), Morelli et al. (2021).

The first scope “Digital-interactions” is very close to the real time and context of users interacting with the service. According to Morelli et al. (2021), on this scope, value is perceived and determined by the user digitally accessing and/or 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 providing a number of digital interaction opportunities (that could facilitate value-creation in a specific time and context). Hence, designing at this scope requires the integration of capabilities into the service design to organize such interactions, in terms of physical, technological, logical or organizational micro-structures (MORELLI et al., 2021).

However, when service improvements or interventions remain focused on digital interactions, the potential for effective impact towards sustainability may be limited (SANGIORGI, 2011). At this scope, transparency interventions primarily focus on how to make digital encounters and touchpoints (content and functions) relevant, comprehensive, reliable, and usable for the users (SCHNACKENBERG and TOMLINSON, 2016; MCCARTHY and FLUCK, 2017; BUELL et al., 2017). This scope also represents an emphasis on literature. For Meroni and Sangiorgi (2011), when service design focus on interactions, relations and experiences, it can apply theory and practice from experience design, interaction design, participatory design, ethnography, social and cognitive psychology. At this scope, design approaches are mainly characterized by (MORELLI et al., 2021): controlling experiential aspects, engaging stakeholders, modelling possible solutions, and addressing the context.

The second scope is proposed as a transition from dealing with transparency as an end in it-self 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 stakeholders, processes, resources, and impacts associated with the service (MCCARTHY and FLUCK, 2017; SANGIORGI and PRENDIVILLE, 2017; MORELLI et al., 2021). For Sangiorgi and Prendiville (2017) the *socio-material configuration* focuses on the backstage co-articulation of the service execution, connecting participants experiences to material and digital touchpoints, social, economic, cultural, environmental aspects, organizational routines and narratives. For Morelli et al. (2021), service design approached at this scope is a facilitator representing logical architectures, interactions, time sequences and experiential elements of the service system.

Although digital transparency experience can be part of the design, at this scope the focus is on the value proposition and the arrangement of the service elements, rather than the digital interface. According to Meroni and Sangiorgi (2011), design approaches at this scope are characterized by:

- Reducing service interaction breakdowns, improving service usability, generating clearer processes, seamless experiences and effective communications;
- Promoting new service system configurations by exploring new service ideas that better answer people's needs and by looking at new potential or improved collaborations and interactions within and among stakeholders;
- Fostering organizational change, bringing people's needs and experiences to the centre of service provision and service development.

The third scope “institutional-context” implies a broader scale of impact for designers, dealing with elements such as social paradigms, culture and values, political and technological systems, and climate and biodiversity. This is considered a quite new scope for the Service Design discipline, and reflects an evolution, becoming more transformational, as a means for supporting the emergence of a more collaborative, sustainable, and creative society and economy (SANGIORGI, 2011; MORELLI et al., 2021).

Approaching transparency for sustainability at “institutional-context” scope requires certain organizational maturity to be able to address changes at socio-technical-ecological systems in which the service organization is part of (SANGIORGI, 2011; CESCHIN and GAZIOULOSY, 2020). It encompasses innovation and changes at all logical levels, from individual choices to the design of complex service platforms or public institutions. Although designers have no control of this systems, they can play a role in triggering change and possibly steer it in preferred directions (e.g.: by scaling-up local initiatives, working from a lower scale — a community or a small institution — to larger contexts, such as a city administration or national policies) (MORELLI et al., 2021).

By questioning organizations norms and values, or even deeper transformations, service designers need to engage the organizations to understand the value of the change, frame current situation and future vision, in a co-created agenda for change. This may require long-term collaboration and also, stronger commitment from the stakeholders (SANGIORGI, 2011).

For Meroni and Sangiorgi (2011), when service design focus on exploring new collaborative service models, it deals with services that enable people to participate and collaborate within their communities to achieve their goals and transform their lifestyles. When service design focus on imagining future directions for service systems, it deals with alternative and scenario generation for showing tangible ways to implement sustainable futures of regions, places and service systems.

When designers act as facilitators of transformation processes, the approaches are characterized by (MERONI and SANGIORGI, 2011):

- Engaging people to experiment with new service models and more collaborative solutions;
- Applying experimental approaches to generate the space for change to happen (e.g pilot projects and service prototypes);
- Fostering new behavioural patterns that challenge existing unsustainable lifestyles;
- Generating, sharing and visualising visions for the future (e.g: scenario building and storytelling);

- Working with and within communities to create the conditions for long-term transformation processes.

According to Meroni and Sangiorgi (2011), in these types of challenges, design methods and tools move from being user-centered to community-centered, acting for change on a regional scale.

In summary, the scopes of service design for transparency are built upon each other, implying that the same service could address more than one group of elements at the same time, contributing to different transparency outcomes towards sustainability.

Transparency for sustainability can be approached as a specific design goal or it can be embedded into other design goals. Enhancing customer experience, value co-creation, and improving service quality are cited as the main goals when approaching service design projects (JOLY et al., 2019). Hence, transparency for sustainability could be approached as service quality criteria when articulating the offerings, improving the service, and fostering organizational change.

It is also important to highlight that working with or within organizations implies in dealing with “*design legacies*” and service designers need to inquire into these pre-existing purposes or vision (*why it exists*), approaches or driving-values (e.g: *process-oriented, human-centred, participatory*) and practices (e.g.: *methods, team organization, tools*) when addressing service interventions for incremental improvements or transformations for more radical innovations (JUNGINGER, 2015). To shift design approaches in organizations, Junginger (2015) argues for the need to articulate, visualize and communicate the strengths and weaknesses of the alternative approaches.

3.2.7 Processes and models for Service Design diagnosis

Typically, a design process for services is a project in itself, developed, adapted and derived mainly from the Diamond model for the Design Process (PENIN, 2017; DESIGN COUNCIL, 2019). The Diamond model alternates divergent and convergent stages. The Discover stage focus on questioning the challenge or problem, leading mainly to research activities to support the understanding people, contexts and relationships. Then, the Define stage aims to make sense of the findings and opportunities, identifying criteria and insight themes, resulting in a design brief. Then, in second diamond, the Develop stage concentrates on exploring the concepts, prototyping and testing. At the Deliver stage the selected solution that works is prepared for further development and implementation.

It is common that the activities in a service design process are approached in an iterative way, rather than linear, to support the continuous development and improvement of the propositions (STICKDORN et al., 2011). Due to that, Moritz (2005) proposed a model to approach the Service Design process based on the key tasks that can happen in a project, rather than stages, organized in six categories: SD Understanding; SD Thinking; SD Generating; SD Filtering; SD Explaining; SD Realising. In that model, the early stages of the process are characterized by activities aimed to support understanding (about users, contexts, the service provider), providing insights, and giving strategic direction.

In terms of scope, projects can be oriented to the design of a new service (also know as *service innovation* and *new service development*) — which includes the introduction of a new service concept, offering, and delivery system; or — the redesign of existing services (the locus of the present thesis) — implying in incremental changes to a current offering and system (FOGLIENI et al., 2018).

According Foglieni et al. (2018), in contrast to the development of new services, the redesign of services requires changing the Discover stage of the Double Diamond process. The activity of research for understanding context and needs is combined with evaluation activity of the way services are delivered. Figure 3.12 illustrates the early stages for the redesign of existing services, where insights are gathered and potential changes are analyzed.

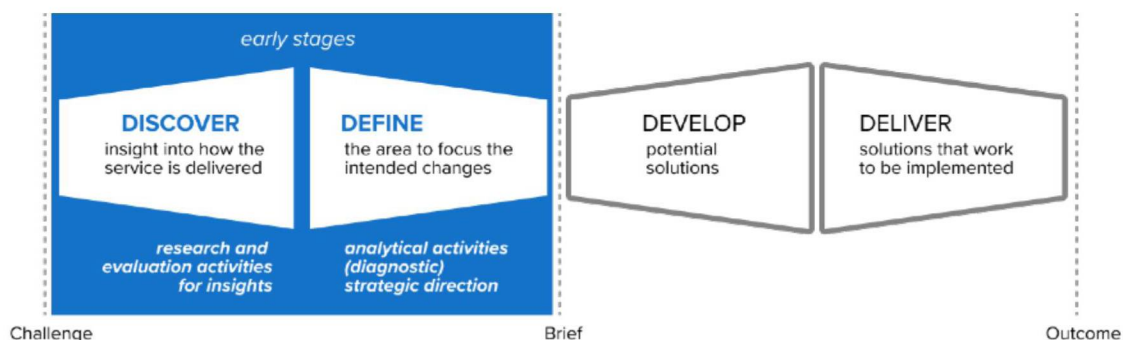


FIGURE 3.12 – The overall design process for the redesign of existing services

Source: the author, based on Foglieni et al. (2018) and Design Council (2019)

The term evaluation or assessment refers to the process of judging or calculating the quality, importance or value of something. While a diagnosis is a judgement about a particular issue, made after evaluating it. Thus, a service diagnosis is about analyzing how well an existing service is achieving its intended aims (such as transparency for sustainability), for supporting decision-making or triggering a change. In contrast, a service audit process, measures practices against pre-determined standards and usually

involves cycles of improvement and ongoing monitoring (TWYCROSS and SHORTEN, 2014; CED, 2021).

According to Maffei et al. (2013), service evaluation has a diagnostic role instrumenting value creation and a key factor to optimize service outcomes and impacts. Maffei et al. (2013a) argues for shifting the service evaluation focus from functional characteristics, technical components, flow of processes and relationships, to the potential impact (social, economic, organizational, educational) that services can have on individuals, communities and organizations.

Considering that transparency for sustainability can be approached as a service quality criteria, its diagnosis can be conducted as a practice in service redesign. It would help to understand if a service satisfies certain transparency criteria under design, delivery or impact, to learn what are the opportunities for improvement.

In order to design the evaluation/diagnosis process, Foglieni et al. (2018) propose to consider four elements: objectives, object, perspective and time. In the case of digital services, Liu et al. (2016) argues that the intrinsic iterative characteristic should be considered, influencing the evaluation stage, time and duration.

Maffei et al. (2013b) recommends to firstly define a logic model, comprising the set of indicators to help answering the evaluation objectives as questions such as *“what key outcomes have we achieved?, how well do we meet the needs of our users?, how do people use the service?, how good is our delivery of services?, what is our capacity for improvement?”*, *“what can be learned from and how the intervention was delivered?”*.

Then, the object of evaluation sets the delimitation of the study in terms of enabling conditions, performances, impacts, among others, influencing the definition of the indicators and type of data collection and analysis. For example, a service process evaluation, may include the collection of qualitative and quantitative data from different stakeholders considering the different elements of the service system, while a service impact evaluation, may demonstrate the added value of the service provided, related to a specific context (MAFFEI et al., 2013b). Additionally the perspective of evaluation includes who will be addressed. For example, from an organizational perspective the objects under evaluation could be the processes and resources, while under the user perspective could be the value in use.

Then, the time of evaluation concerns when to evaluate. From the service-logic perspective of value co-creation, Foglieni and Holmlid (2015) argues that a service evaluation can be conducted in three moments:

- imagined before (*ex-ante*): during the service development, for optimization evaluation of the enabling conditions, helping to inform the intervention design;

- perceived during (*in-itinere*): during the service delivery or monitoring, for a performance and efficacy oriented evaluation, helping to inform the implementation of the design intervention;
- impacted after (*ex-post*): after the service delivery, for an adoption or impact oriented evaluation, helping to inform the outcomes from the design implementation;

A diagnostic approach can help to improve the service experience from the users perspective, but also, from the organizational perspective to improve the service provision, which can often lead to organisational change (e.g.: new business opportunities, the review of processes, etc.) (SALGADO et al., 2022).

3.2.8 Summary of the theoretical findings

This section reported a theoretical review about design for digital services. Table 3.10 presents a summary of key findings that supports the research strategy:

TABLE 3.10 – Design for digital service theoretical findings

Code	Theoretical Findings
T3.2_01	Service is a value creation — with the user's own context of use (EDVARDSSON et al., 2005).
T3.2_02	Digital services are characterized by a direct user interaction with the service through digital touchpoints (PENIN, 2017; HARTWIG; BILLERT, 2018).
T3.2_03	Digital information-intensive services are digital services which informational interactions are responsible for the greatest proportion of value created by the service. In this thesis, digital self-services type is adopted (GLUSHKO, 2010).
T3.2_04	Besides data and information, digital services value can also be based on knowledge and intelligence (ROWLEY, 2007; BUMBLAUSKAS et al., 2017)
T3.2_05	Digital organizations strategically align or integrate digital technologies potentials with the organizational/business strategy (Strohmeier, 2020).
T3.2_06	Service Design is about designing a platform that enables a multiplicity of interactions and value creation (MERONI and SANGIORGI, 2011).
T3.2_07	Digital Service Design core principles are: people-centered; depends on participation and co-design; communicated through service narratives; includes the material side of services; holistic.
T3.2_08	Digital Service Design core elements — service values, system, actors, context, interactions, touchpoints, experience — considering the service time dimension (before, during, after)
T3.2_09	Value is user interactive relativistic preference experience, referring to the evaluation of some object of interest (HOLBROOK, 1999).

T3.2_10	Digital service transparency as value creation could influence user's expectations, preferences and perceptions about the nature of value that can be derived (LUSCH and NAMBISAN, 2015).
T3.2_11	Service Design can be approached at service digital-interaction, system-configuration and institutional context (SANGIORGI, 2011; MORELLI et al., 2021).
T3.2_12	Service designers need to inquire into " <i>design legacies</i> " such as purposes or vision, approaches or driving-values and practices (JUNGINGER, 2015).
T3.2_13	Service diagnosis is about analysing how well an existing service is achieving its intended aims, for supporting decision-making, triggering a change, optimizing service outcomes or impacts (MAFFEI et al., 2013).
T3.2_14	Service evaluation strategy have to consider the service actors, lifecycle phases and objects to address the evaluation, besides the evaluation purpose, criteria and role of the decision-makers (MAFFEI et al., 2013; FOGLIENI and HOLMLID, 2015).
T3.2_15	Service value evaluation can be conducted during the service development, during the service delivery, or after the service delivery (FOGLIENI and HOLMLID, 2015).
T3.2_16	Digital service key characteristics are: intangibility versus digital tangibilizers in the environment and physical devices; heterogeneous versus standardized in quality and performance; scalability versus limited workload or market demand (SALMINEN, 2014).
T3.2_17	Transparency for sustainability can be approached as a specific design goal or it can be embedded into other design goals — as service quality criteria when articulating the offerings, improving the service, and fostering organizational change.
T3.2_18	A digital service delivery can be seen as a performance across time, contexts, channels, organizations and actors.
T3.2_19	Transparency for sustainability can be approached as a service quality criteria. Its diagnosis can be conducted as a practice in service redesign to understand if a service satisfies certain transparency criteria, to learn what are the opportunities for improvement.

Source: the author.

3.3 Framing transparency within services for a circular economy

3.3.1 Sustainability and transparency as moving targets

Sustainable development is a widely shared concept that can be traced back to Brundtland Report (WCED, 1987) “*Our Future*”. A report produced by the United Nations World Commission on Environment and Development, in which sustainable development is defined as “*the development that meets the needs of the present without compromising the ability of future generations to meet their own needs*”. The Sustainable Development Goals (UN, 2021) forms a global agenda of action towards sustainability challenges. However, this definition is being criticized for its anthropocentric and development emphasis, which according to Gaziulusoy (2010) implies on sustaining the status quo of human society and societal functions.

Bagheri and Hjorth (2007) argues that “*sustainability cannot be considered as a defined end state of systems, but is an evolving ideal of development efforts with no end known in advance*.” From this conceptualization, Bagheri and Hjorth (2007) also suggests that sustainable development is an evolutionary process rather than a target goal, fostering adaptive capabilities while simultaneously creating opportunities that lead to betterment of economic, social and environmental conditions.

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 (GAZIULUSOY, 2010).

Using a direct corollary, transparency for sustainability is not a problem to be solved but it is more system status that can be continuously changed and improved overtime. For both transparency and sustainability concepts being considered a “moving target” (OLIVER, 2004; BAGHERI and HJORTH, 2007), it implies in approaching them in a more continuous, iterative and systemic way (Table 3.11).

TABLE 3.11 – Conceptual comparison between sustainability and transparency

	Transparency	Sustainability
<i>Concept</i>	A property of an ethical communication system	A property of a social, environmental and economic system
<i>Aim</i>	An ideal of ethical communication efforts	An ideal of social, environmental and economic development efforts

Source: the author.

Hence, transparency for sustainability challenges can be difficult to understand and to be formulated, involving conflicting interest and point of view of a diversity of stakeholders. Due to the variety of ethical, social, environmental and economic complexities, there is no immediate solution (RITTEL and WEBBER, 1973).

3.3.2 Sustainability concept and principles

Sustainability and sustainable development concepts can be described according to three dimensions: social, environmental and economic, as shown in Figure 3.13.

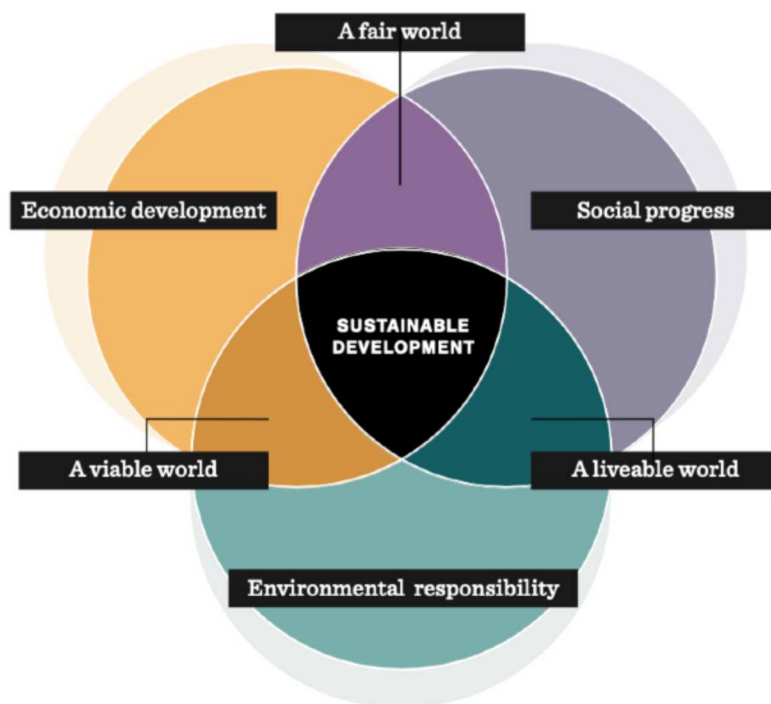


FIGURE 3.13 – Sustainable development dimensions

Source: Design Factory (2021)

The **environmental** dimension is the most explored by sustainability-oriented research and practice. It mainly deals with environmental impact reduction to not exceed the limits of the biosphere-geosphere resilience, without causing a phenomenon of irreversible degradation such as global warming, depletion of the ozone layer, acidification and eutrophication, etc.

Key design principles in this dimension includes: the selection of resources with low environmental impact; minimizing the use of resources; optimization of the lifespan of

products and services; extension of the useful lifespan (SANTOS et al., 2018; CESCHIN and GAZIULUSOY, 2020).

The **social** dimension of sustainability promotes a more democratic, fair and inclusive society, satisfying basic human needs, maintaining and optimizing current and future well-being, valuing culture and improving quality of life by reducing social inequality (SANTOS et al., 2019).

Social cohesion and social equity are both fundamental concepts to support social sustainable development, since divided, unequal, and unjust societies are unlikely to be sustainable. Both concepts collectively remind to be aware to any kind of discrimination, inequality, marginality or exclusion (SANTOS et al., 2019; JENSON, 2010). Social cohesion deals with developing well-being, sense of belonging, and participation, while promoting diversity in a social group or community (FONSECA et al., 2019). Social equity, deals with barriers (e.g: social, cultural, economic and political) that result in exclusion or inequality, while promoting access to opportunities and rights (SANTOS et al., 2019).

Design principles in the social dimension typically includes: improving work and employment conditions; favouring the inclusion of all; improve social cohesion; valuing local resources and skills; promoting education in sustainability; instrumentalizing responsible consumption (SANTOS et al., 2019). Design can address challenges related to public policies, corporate social responsibility, base of the pyramid initiatives, social business, product+service systems, distributed economy, social innovation, social inclusion and accessibility, creative communities and new lifestyles (SANTOS et al., 2019; CESCHIN and GAZIULUSOY, 2020).

The **economic** dimension of sustainability deals with changes in attitude regarding the decentralization of the economy, fair trade, respect for the individuals and communities, promoting economic development based on cooperation and distributed/ small scale systems, instead of the unrestrained growth of the economy, which does not consider the resilience of environmental resources. Enables the creation, delivery, and capture of value that benefits all those involved, such as the company, customers, suppliers, the environment, and society. Typically, the economic dimension of sustainability is less approached in relation to social and environmental.

Design principles in economic dimension includes: strengthening and enhancing local resources; respecting and valuing the local culture; promoting the local economy; promoting network organizations; valuing the reintegration of waste; promoting education for the sustainable economy (SANTOS et al., 2019). Design challenges includes topics such as business-economic-political models, consumption culture and organizational culture (SANTOS et al., 2019).

In this thesis, framing transparency for sustainability in services means standing for these social, environmental and economic principles, to expose and create the objects to be seen and interacted with. Bringing light to invisible flows of information and relationships in the input, processing and output boundaries of the service system, to support value creation at for individual matter, social relationships, and or for taking care of the environment.

Models to frame sustainability problems

There is a broad variety of sustainability models that articulate the principles presented on the previous section, when dealing with real world problems. Bastianoni et al. (2016)'s model, for instance, sees economic systems as *"inputs of energy and materials, processed through human labor and a structured organization, and eventually transformed into useful outputs (i.e., goods and services)"*.

In line to that, Giannetti et al. (2019) model (5SEnSU - Five Sector Sustainability) it embraces social, environmental and economic dimensions, while recognizes the double functions as a providers and receivers of the natural environment and society, in managing energy, materials, and information flows (Figure 3.14).

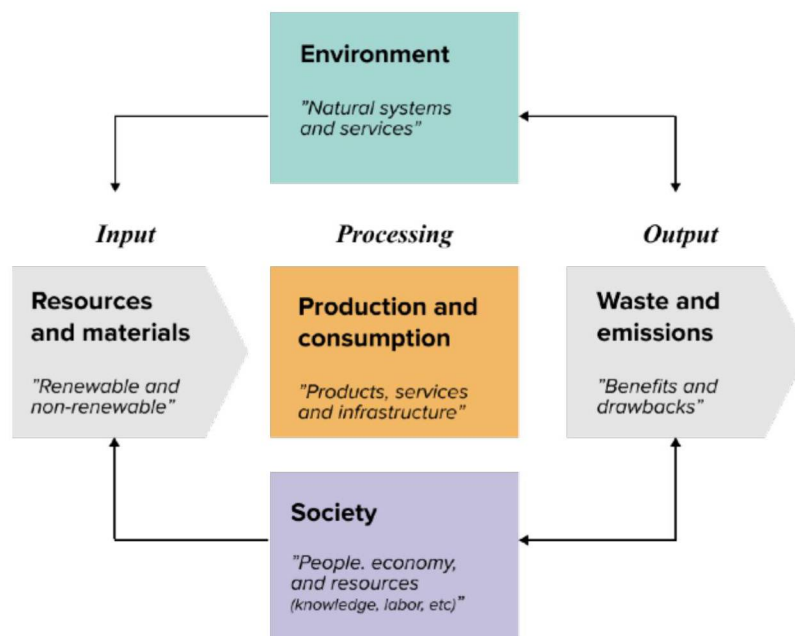


FIGURE 3.14 – Five sector sustainability model

Source: Giannetti et al. (2019)

The model considers that the environment has a source function in providing, for instance, raw materials to support the production unit functions. While also being the receiver of the wastes and emissions generated by the production unit activities. The

same applies to the society that holds the functions of supplier and consumer. Society supplies socio-economic resources to the production unit such as labor, knowledge and know-how, and it receives money for this. The production unit supplies products and services that will be consumed by the society that pays for them.

According to Giannetti et al. (2019), there are some balances and limits to be considered: no resource should be used more than its generation rate; no contaminant should be produced at higher rates than their natural recycling process, neutralization and absorption by the natural environment; non-renewable resource should be used faster than the necessary time to replace it with a renewable resource; the production of products and services must be limited by the sustainable exploitation of natural resources and by responsible consumption of the society; people as a social being, must have a balanced relationship with economic system.

The service is part of a system and influences the sustainability of this system. The service can have a dominant role in how it operates and processes inputs and outputs in a given system. Thus, transparency should refer to the sustainability of that service-system, considering the service inputs, processes e outputs regarding environmental, social, and economic aspects.

3.3.3 Circular Economy concept and principles

Since sustainability challenges have been discussed, new concepts and models have evolved such as industrial ecology, cradle-to-cradle, regenerative ecology, biomimicry, among others, influencing more recently the contemporary understanding of circular economy (CE) (GEISSDOERFER et al., 2017; JØRGENSEN and REMMEN, 2018).

Circular economy is usually described as an alternative system model to the predominant linear production and consumption model (with flows from raw materials, manufacturing, distribution, consumption and disposal of products at the end of their life cycle) (PAES et al., 2019). It considers waste as resource and the regenerative role of the systems.

The most common definition is from the Ellen MacArthur Foundation which defines circular economy as *“a system where materials never become waste and nature is regenerated”* (EMAF, 2023). Geissdoerfer et al. (2017) defines circular economy as *“a regenerative system in which resource input and waste, emission, and energy leakage are minimised”*. Suarez-Eiroa et al. (2019) defines circular economy as *“a regenerative production-consumption system that aims to maintain extraction rates of resources and generation rates of wastes and emissions under suitable values for planetary boundaries”*.

Although sometimes wrongly used as synonyms, the concept of circular economy is more recent than the concept of sustainability. Circular economy could be seen as one of the many approaches to implement sustainability. Geissdoerfer et al. (2017) argues that both concepts emphasize notions such of intra and intergenerational commitments; multi or interdisciplinary approaches; cooperation between stakeholders; and value creation opportunities. But circular economy goals are more focused on better using resources and reducing waste/emissions in production-consumption systems, aiming to contribute with sustainability.

The circular economy address mostly environmental-economic unsustainability challenges such as climate change, biodiversity loss and pollution. Although the potentialities of the concept, the pursuit for a circular economy will not necessarily promote sustainable development since, fostering certain aspects such as recycling can lead to rebound effects (GEISSDOERFER et al., 2017; VELENTURF and PURNELL, 2021).

The Ellen MacArthur Foundation (2023) considers CE based on three principles, driven by design: a) eliminate waste and pollution; circulate products and materials (at their highest value); c) regenerate nature.

The application of the circular economy is commonly guided by circular goals and strategies, but there are different perspectives in the literature. Bocken et al. (2016) adopts the resource-cycles perspective, categorizing circular economy generic strategies as follows:

- Slowing resource flows: through the design of long-life products, and product-life-extension, and the utilization period of products is extended and/or intensified, resulting in a slowdown of the flow of resources.
- Closing resource flows: through recycling, the loop between post-use and production is closed, resulting in a circular flow of resources.
- Narrowing resource flows: increasing resource efficiency by using fewer resources per product.

It is interesting to notice that Bocken et al. (2016)'s proposal does not include "eliminating resource flows", which could be achieved by changing lifestyles and innovation in business processes.

Another perspective is based on the hierarchy of waste, representing the various stages of a product's life cycle, linking each stage to the corresponding environmental impact level (ZHANG et al., 2022) (Table 3.12).

TABLE 3.12 – Circular economy goals and strategies

Goals	Strategies		
Lower environmental impact			
PRE-USAGE Smarter product manufacture and use	PREVENTION AND MINIMIZATION	Refuse	Prevent the use of products and materials
		Rethink	Rethink how function and ownership can be fulfilled
		Reduce	Increase efficiency in manufacturing or using products by minimizing resources and materials
USAGE Extend lifespan of products and parts	CONSERVE AND REUSE	Reuse	Use a discarded product that is still in good condition and fulfils its original function
		Repair	Maintain and repair a defective product so that it can be used for its original function
		Refurbish	Restore an old product and update it so it can be used for its original function
		Remanufacture	Use parts of a discarded product in a new product with the same function
		Repurpose	Use a discarded product or its parts into a new product with a different function
POST-USAGE Useful applications of waste materials	VALORIZATION AND TREATMENT	Recycle	Process discarded materials and turn them back into raw materials
		Recover	Incinerate non-recyclable waste materials to convert them into usable heat, electricity or fuel
Greater environmental impact			

Source: the author, adapted from Potting et al. (2017) and Zhang et al. (2022).

The circular economy concept aims to use waste flows as a source of secondary resources keeping them in the system through processes like maintenance, reuse, refurbishment, remanufacture, recycling. The application of the circular strategies implies considering regenerative aspect of the system in which the inflows and outflows of resources are prevented, minimized, and optimized (GEISSDOERFER et al., 2017; PAES et al., 2019). For that, Suarez-Eiroa et al. (2019) argues for “*closing the system, reducing its size and maintaining the resource's value as long as possible within the system, mainly leaning on design and education, and with capacity to be implemented at any scale*”.

Thus, transparency for circularity is more about supporting the communication and interactions with the different flows of resource. It also implies in approaching them in a more continuous, iterative and systemic way (Table 3.13).

TABLE 3.13 – Conceptual synergies between transparency and circularity

	Transparency	Circularity	Synergies
<i>Concept</i>	A property of an ethical communication system	A model for the use of waste as resource and the design of regenerative systems	- Deals with complex and wicked problems; - Requires a continuous and systemic approach;
<i>Aim</i>	An ideal of ethical communication efforts	An ideal model to eliminate waste and pollution; circulate products and materials, and regenerate nature	- Requires the communication of different aspects of the system; - Intended to contribute with value creation; - Depends on the contextual conditions;

Source: the author.

In this thesis, framing transparency for circularity in services means standing for broader goals and principles of sustainability, creating and presenting touchpoints to be seen and interacted with. By bringing light to invisible flows of information and resources through the promotion of interactions among the various system actors, it intends to contribute to value creation, improve social relationships, and, at the same time, contribute to a better care of the environment.

3.3.4 Design for Circular Economy

When comparing design for circular economy with other strategies on Design for Sustainability, Sumter et al. (2020) concludes that it puts more emphasis on multiple use cycles, changing the relationship between customers and companies. Sumter et al. (2020) describes seven circular economy competencies for design:

Normative competency:

- Circular Impact Assessment: estimating the environmental impact of circular offerings on a system level over multiple use cycles to support decision-making during the design process;

Anticipatory competencies:

- Design for Recovery: incorporating recovery strategies during the design process while taking into account multiple use cycles (i.e., strategies, such as repair, refurbishing and remanufacturing, meant to recover functionality and value in between use cycles and at the end of product life);
- Design for Multiple Use Cycles: foreseeing the consequences of prolonged use and multiple use cycles;

Strategic competencies:

- Circular Business Models: concurrently developing the circular product, service, and business model;
- Circular User Engagement: engaging users in the use and the (end-of-use) return of products;

Interpersonal competencies:

- Circular Economy Collaboration: identifying, mapping, facilitating, and managing the collaboration between external stakeholders in operationalizing a circular business model. Designing for a circular economy requires the shared creation of value;
- Circular Economy Communication: telling coherent stories about the circular offerings. In order to collaborate designers needed to get a circular buy in and create a shared understanding with both internal and external partners.

Sumter et al. (2020) highlights systems thinking as a relevant competency in identifying where waste is being created and understanding the various relationships across the network of stakeholders.

These competences are in line with Moreno et al. (2016) recommendations to consider when designing for a circular economy:

- Design for “systems change” when considering any circular design strategy;
- Design by identifying the new circular business model that your product/service is being designed for;
- Design by thinking of revolutionising the world: circular design goes beyond doing less bad;
- Design for multiple cycles (short and/or long) and not only with end-of-life in mind;
- Design by thinking in living and adaptive systems;
- Design with different participants in the value chain, including the final user, and always keep him/her/it in mind;
- Design by considering value in a broader view, not as a price tag on a shop shelf, but as an asset;
- Design with failure in mind: it is better to test and prototype as many times as possible;
- Design knowing where each material and part comes from and where each material and part goes to;

- Design with “hands on” experiences that foster a call for action.

These competences can be applied in design strategies, as presented in the conceptual framework developed by Moreno et al. (2016) (Figure 3.15)

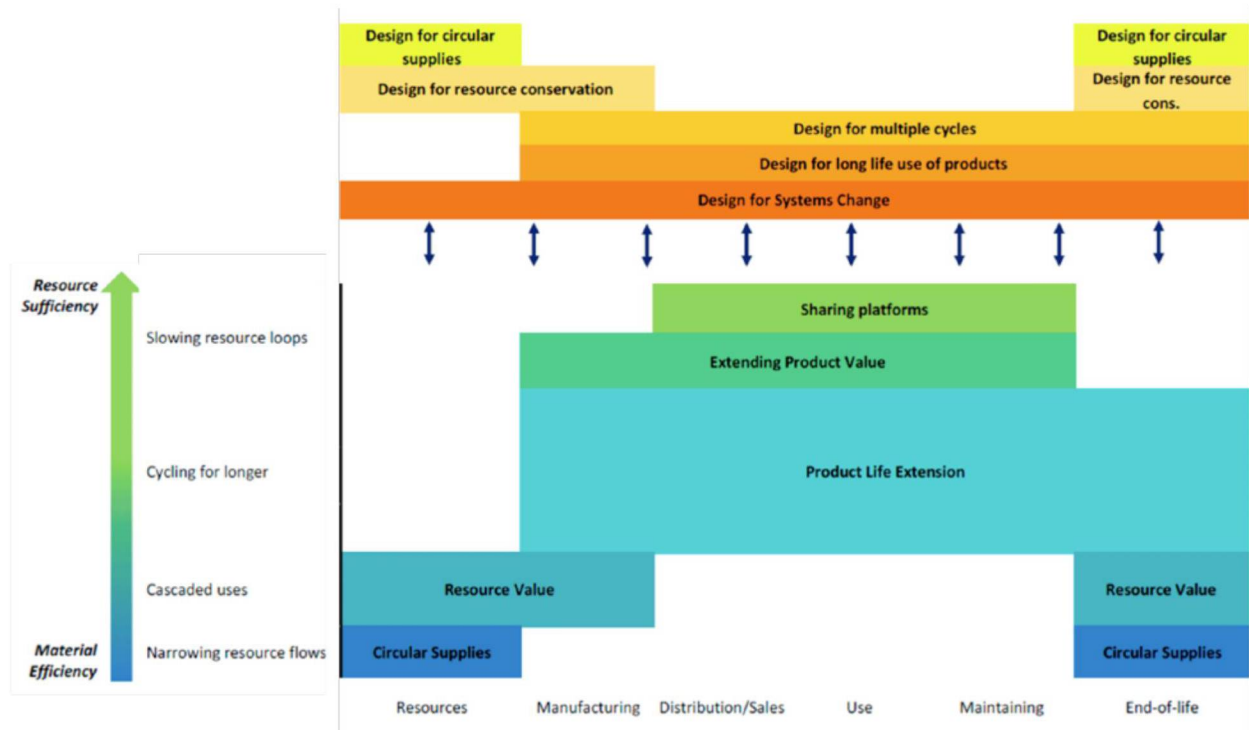


FIGURE 3.15 – Circular Design strategies towards business models

Source: the author, adapted from Moreno et al. (2016)

The general circular design strategies are organized according to the circular business models and their position in the value chain, to help designers to understand which is the business model they are designing for, and the different types of product cycles:

- **Design for circular supplies:** focuses mainly on the biological cycles and refers to thinking of “waste equals food” in which resources are captured and returned to their natural cycle without harming the environment;
- **Design for resource conservation:** focuses on both the technical and biological cycles and uses a preventative approach in which products are designed with the minimum of resources in mind;
- **Design for multiple cycles:** focuses on both the technical and biological cycle and refers to design aimed at enabling the longer circulation of materials and

resources in multiple cycles. For that, services can be integrated within this strategy;

- **Design for long life use of products:** focuses on the technical cycle and refers to extending the utilisation of a product during its use through extending its life and offering services for reuse, repair, maintenance and upgrade. Furthermore, changing the ownership of products through services could enhance longer utilisation of products and, therefore, move to a sharing system.
- **Design for systems change:** covers the whole spectrum of value creation for both biological and technical cycles and refers to design thinking in complex systems as a whole and between its parts to target problems and find innovative solutions.

At last, based on Haines-Gadd and Charnley (2019) propositions, the categories of value in service for circularity could include:

- a) Resource value from product, materials, energy, processes, space, waste streams;
- b) Consumer value from benefits provided to the customer;
- c) Relationship value of networks and partnerships, community, loyalty;
- d) Data/knowledge value generated from the product or service.

Aarikka-Stenroos et al. (2021) includes the “functional value” of services to circularity, with improved resource-efficient processes and practices, new options, easy replacement and better understanding of own processes and learning to improve; “economic value” from direct savings and earnings; “emotional value” positive (belonging to sustainable practices, satisfaction or excitement) and negative (fear of low quality, inconvenience); “symbolic value” from positioning among sustainable actors, involvement and engagement with similar actors, enabling sustainability.

3.3.5 Waste management and digital services for the circular economy

Under the circularity concept perhaps the most service intensive area deals with waste management, with a wide spectrum of sources ranging from household to agriculture.

The National Solid Waste Policy (Law No. 12.305 of 2010) defines Household Waste (HW) as waste originating from domestic activities in urban residences, as any material, substance, object or good discarded resulting from human activities in society.

Municipal Solid Waste (MSW) is those originating from domestic activities in urban residences (household waste) and originating from sweeping, cleaning of public places and roads and other urban cleaning services (urban cleaning waste).

Household solid waste is one of the several flows that cities manage and is a strong candidate for circularity. In urban areas, it is primarily a service for public health and the protection of the environment. Its implementation in Brazil occurs mainly through the concession of sanitation services through public entities and, also, through private and third-sector contributions (SANTOS et al., 2022).

Due to the complex range of actors and systems to be involved in waste management for the circular economy, the particularities of its application can be segmented, for example, in city, business, and individual contexts. Implementing the circular goals in each of these demands specific strategies, implying changes both at the system level and in private instances that might impact products and services with direct contact with citizens throughout the city.

Services have a potential strategic role on waste management since it can be positioned as a “*connector*” between end-users, manufacturers, retails, public services, etc. Such position can be used as an enabler, to promote changes on the habits and behaviours in the system, including the role of end-users in achieving a more sustainable system, changing the ways they obtain, use, reuse and discard products (KAZA et al., 2018; HEYES et al., 2018).

However, in Brazil the focus of waste management has been on offering waste services for the end of life of products, such as reverse logistics and recycling services. This is one of the consequences of the National Solid Waste Policy (Law 12.305/2010) that sets targets for companies based on the weight of waste, estimated from what the among of products they have placed on the market. This target takes into account the waste collected and correctly allocated.

Reverse logistics is one of the strategies to implement the circular economy and a central theme on the Brazilian National Solid Waste Policy. It can be defined as an “*instrument of economic and social development characterized by a set of actions, procedures and means designed to enable the collection and return of solid waste to the business sector, for reuse in its cycle or in other production cycles, or other environmentally appropriate final destination*”. Thus, waste whose disposal depends on a specific reverse logistics system, needs to be managed in a collaborative effort in order to be effective.

The circularity of the waste flows can be extended beyond solely economic activities to other social and environmental areas influencing a more sustainable waste management (SUAREZ-EIROA et al., 2019; SCHÖGGL et al., 2020). It requires a more

broad perspective to include different aspects of city management, enhancing the utilization of city assets beyond the economic ones, such as (U4SSC, 2020):

- Municipal physical environment: enables or disables the flows in the city;
- Social environment: social-cultural participation, inclusion and engagement;
- Natural environment: green spaces, natural systems and resources;
- Living environment: households, conditions in which people live and work;
- Digital environment: information and communication technologies (ICTs) that improves quality of life and efficiency of urban operation;

The changing structure of households (e.g.: decreasing in size, apartment or house, condominium, public and private space, etc), brings new challenges for the provision of services, implying in the importance of enabling adaptive behaviours to deal with the changing conditions of the living environment, including the integration of circular economy strategies and solutions (SKOUBY et al., 2014; HU, 2021). Interestingly, most of the waste management activities are carried out outside the household by a network of actors and systems, from which the citizens are usually too detached. This presents different transparency challenges for services in supporting communication and interactions in the different flows of waste and resources.

Services for more sustainable waste management are also influenced by digital technologies, which in turn create new affordances for transparency. Indeed, new types of data and information can be used by service providers and made available to citizens as end-users (SANTOS, et al., 2022). These digitalization of the waste management can be associated with two concepts “*Digital/Smart City*” and “*Sustainable Smart City*”, evolving from a technology to a citizen’s involvement perspective (ATMAKURI et al., 2021).

In a “*Digital/Smart City*” the focus is on information and communication technologies (ICTs), as a tool that contributes to increase the effectiveness, productivity or usability of products and services. In this perspective, daily activities can be facilitated by digital service encounters, helping citizens to perform actions, with different information and activity needs, such as (SKOUBY et al., 2014): the optimization of collection, the collection point location (minimizing the distance to collection points, pick-up frequency (weekly, every 2 weeks or per order) and volumes of containers (based on housing type, and the characteristics of households in the area), waste donation and sharing channels, etc.

However, cities addressing services for more sustainable waste management should evolve into “*Sustainable Smart City*” (ATMAKURI et al., 2021). This concept also

uses ICTs, but not as the central focus, from a broader perspective, as a means to improve the quality of life and promote citizen inclusion and participation in urban systems, while ensuring that the needs of present and future generations are met with respect to economic, social, environmental and cultural aspects.

3.3.5 The service design and circular economy on the field of Design for Sustainability

Design research plays a central role in addressing the societal challenges towards sustainability. It covers different levels of innovation, and it is also mainly characterized by making interdisciplinary collaboration between design and other areas of expertise (CESCHIN and GAZIULUSOY, 2020). Design for Sustainability (DfS) has been significantly developed by research with approaches, methods and tools in the last 30 years and is still evolving. In line with the global agenda managed by the United Nations, it tackles social, environmental and economic issues that have to be managed locally and globally by all nations (BHAMRA and HERNANDEZ, 2021).

Based on the framework proposed by Ceschin and Gazioulosoy (2020) (Figure 3.16), DfS main approaches are encapsulate in eleven categories, according to distinct innovation levels, implying that design can contribute in different scales of intervention for sustainability challenges.

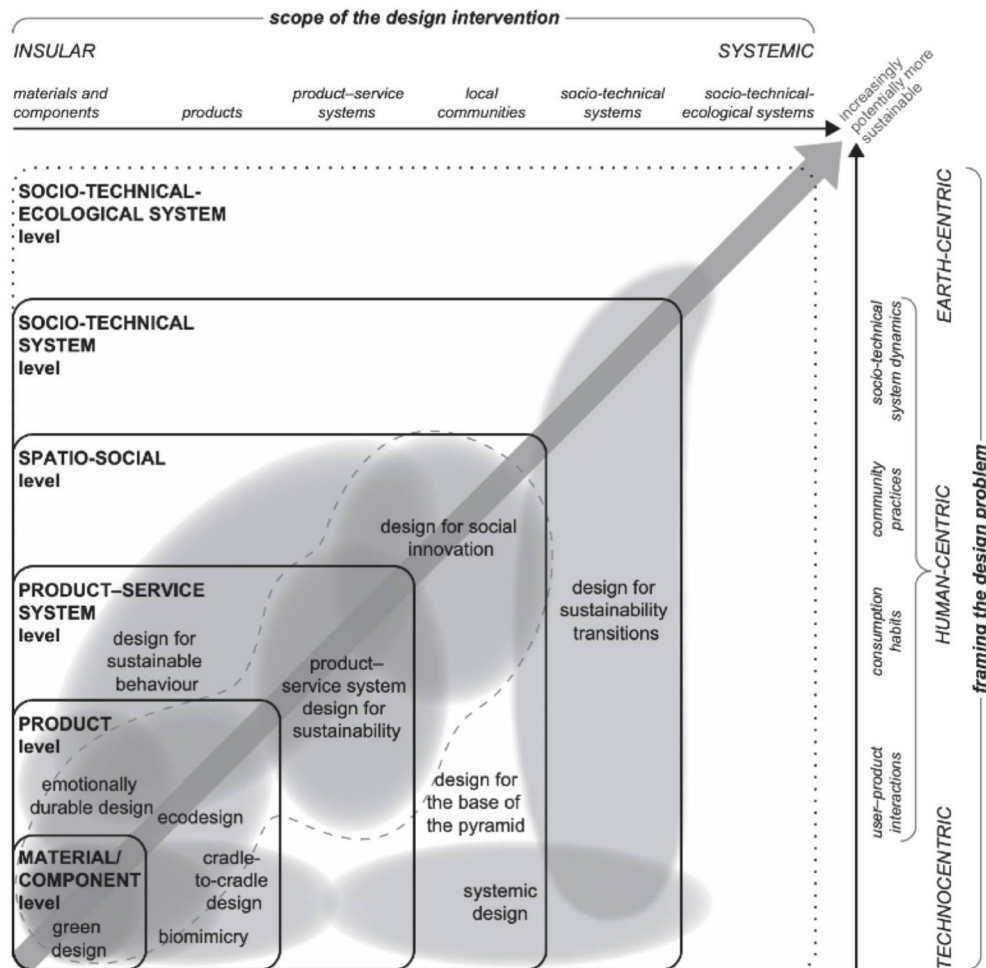


FIGURE 3.16 – Design for Sustainability framework

Source: Ceschin and Gazioulosoy (2020)

The material/component level aims at developing new or replacing materials. Product level aims at improving existing or developing new products by considering the whole life cycle.

The product-service system level the focus goes beyond individual products towards integrated combinations of products, services, stakeholder value chains and business models.

At spatio-social level the focus is on human settlements and conditions of communities from neighbourhoods to cities. While at socio-technical system level the focus is on promoting radical changes in how societal needs (such as nutrition and mobility) are fulfilled and thus supporting transitions to new socio-technical systems.

At last, the socio-technical-ecological systems level offers an earth-centric and non-anthropocentric focus for ongoing transitions or post-transition contexts, considering not only existing humans, but also non-humans and future generations.

Design for services in waste management and circular contexts, can be integrated from Product-Service System level to Socio-technical-ecological level. If adopting a non-anthropocentric perspective Design for Services could even contribute at the socio-technical-ecological level. Although this thesis theme is located at Product-Service System level, the research is more restrict, focusing on its service dimension. Notice that Design for Sustainable Behaviour along with Design for Circular Economy, Inclusive and Responsible Design were included in this review due to the direct influences to the research theme and in promoting active transparency.

3.3.6 Influencing behaviour change towards sustainability through transparency

Design for Sustainable Behaviour relates to people's behaviour towards sustainability. Ceschin and Gazioulosoy (2020) clarifies that *design for sustainable behaviour* (DfSB) is when *design for behavioural change* is applied to support the adoption of sustainable innovations and behaviours.

DfSB literature contains limited contributions oriented to digital services, being strongly characterized by its application in the design of physical products (LILLEY, 2009; BHAMRA et al., 2011; CESCHIN and GAZIOULOSOY, 2020). But DfSB can address a broad scope of intervention (systems of products and services, the built environment and even policies) as demonstrated on the PhD thesis of Kihara (2023).

The DfSB approaches have been built upon various behavioural change theories and models from behavioural sciences, to understand and explain human behaviour (NIEDDERER et al., 2014; LOCKTON, 2016). Behavioural models can be classified into three main groups according Niedderer et al. (2016):

- a) models with focus on individuals-cognition to make choices and act independently;
- b) models which see behaviour as a consequence of the **contextual elements** of the social structure in which individuals live;
- c) models which combine the individual and the context.

Due to the broad variety of behavioural change models, attempts to unify those models reflected in integrated versions, such as the Comprehensive Action Determination Model (CADM) of Klöckner & Blöbaum (2010). According to the model, individual behaviour is directly influenced by intentional, situational and habitual sources,

and indirectly influenced by normative sources. All sources of behaviour do not exist independently of each other and work together in decision making process (Figure 3.17).

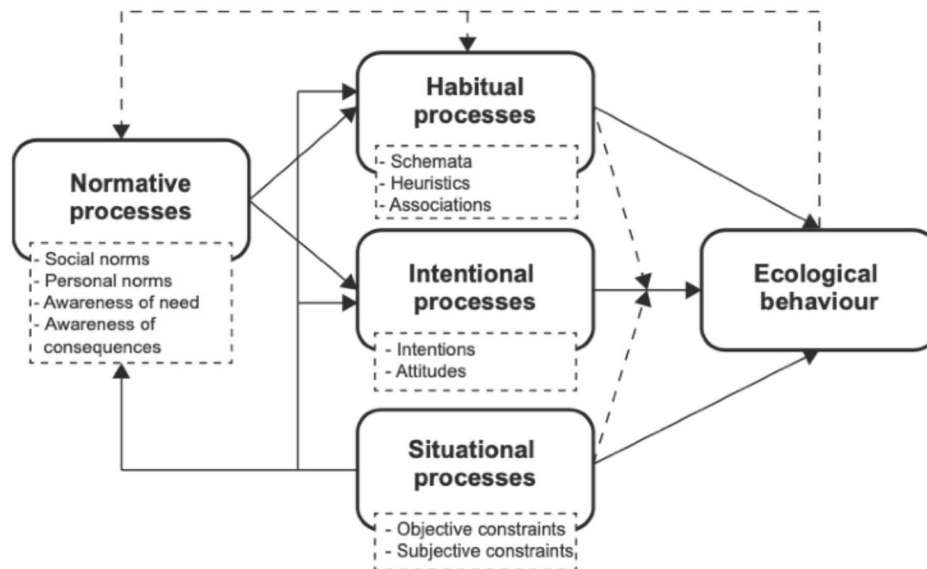


FIGURE 3.17 – The comprehensive action determination model (CADM)

Source: Klöckner and Blöbaum (2010)

Personal norms and beliefs although not permanently activated, are a relatively stable psychological construct related to one's own value system and affected by contextual norms and values regarding moral, social, cultural, political, environmental, economical, and other society systems. Habits are individuals conscious or unconscious automated processes, generated by successfully performing stable behavioral patterns in stable situations. Unlike an intention to act that is generated in the decision-making situation, influenced by individual's attitudes and perception of control. Then, situational conditions or facilitators that constrain or enable behavior.

A critical perspective on the behavior determinants results on the assumption that transparency could influence all sources of behavior. However, following Klöckner and Blöbaum (2010) CADM theoretical model and Niedderer et al. (2016) classification of Design for Behavioural Change approaches, this thesis focuses the studies on contextual approaches — **transparency conditions and facilitators for environmental and social behaviour of digital service user's** — rather than individual/cognitive level with habitual, intentional or normative processes.

For **behaviour context-oriented**, Niedderer et al. (2016) argues that design approaches typically use **prescription or prevention strategies** by redesigning the environment or artifact to enable or decrease desirable or undesirable behaviour

respectively. This logic aligns with Morelli et al. (2021) perspective of *service as an infrastructure*, where the design activity is in creating the conditions for users to create value. In this case, value creation is related to triggering and supporting sustainable behaviors through transparency.

Prochaska and Velicer (1997) Transtheoretical Model offers a more process-oriented approach. It is based on a temporal logic of behavioral stages, integrating different theories from psychotherapy and behavior change. According to this model, change occurs over time as a process involving a progression through six stages. The stages represent the temporal construct as shown in Figure 3.18: pre-contemplation, contemplation, preparation, action, and maintenance.

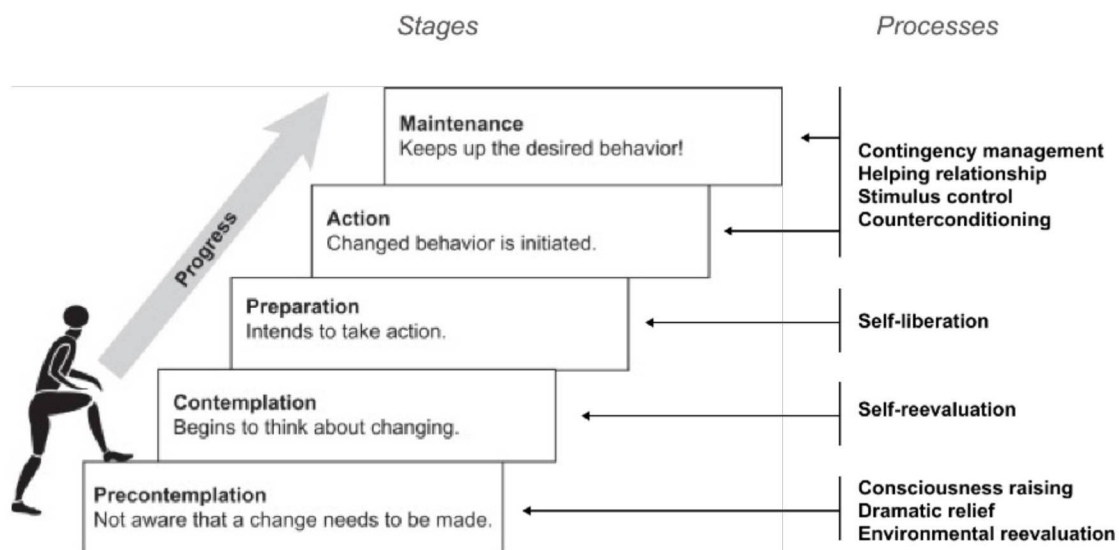


FIGURE 3.18 – The Transtheoretical Model
Source: Prochaska and Velicer (1997)

- In the *pre-contemplation* stage, people are not intended to take action, either for being uninformed or under informed about the consequences of their behaviour. Prochaska and Velicer (1997) argues that people on this stage are often characterized as resistant, unmotivated or as not ready for change.
- On *contemplation* stage people intends to take action, as they understand the benefits of change and the harm of maintaining their current behavior. However, Prochaska and Velicer (1997) argues that people on this stage may be stuck due to *chronic contemplation* or *behavioural procrastination*.
- In the *preparation* stage, people are beginning to outline plans and objectives to implement the action in the immediate future. Prochaska and Velicer (1997) argues that these are the best people for action-oriented programs.

- *Action* stage refers to people which have initiated specific behaviour change, that can be observable and equated with actions taken.
- At last, in the *maintenance* stage in which people are working to consolidate the new behavior, seeking to convert it into a habit. Prochaska and Velicer (1997) argues that in this stage people do not apply change processes as frequently. *Relapse* is one form of regression, returning to an earlier stage.

Additionally, the Transtheoretical Model encompasses the processes of change, providing a guide to move from stage to stage, which were used as a base for determining potential transparency value categories for sustainable behaviour:

- *Consciousness Raising* process concerns with increasing awareness for a particular behaviour, including feedback, education, confrontation, interpretation strategies. *Dramatic Relief* process concerns with moving people emotionally such as role playing and personal testimonies. *Environmental Reevaluation* process concerns with awareness of the impact of problem behaviour on the others, including empathic and social assessment.
- Then, *self-reevaluation* process concerns with the self-image with and without a particular behaviour for value clarification, including role models and imagery for move people. *Self-liberation* process involves the commitment and recommitment to act, by self-testimonies, multiple choices, resolutions as well as user empowerment.
- When change is initiated or in maintenance, *counterconditioning* process concerns with supporting the learning of the new behaviours, as well as *stimulus control* process to remove cues for problem habits and add prompts for desired behaviour alternatives. *Helping relationships* process combine caring, trust, openness, and acceptance as support for the behaviour change. At last, *contingency management* process can include the use of rewards or reinforcements.

Besides the behavior perspective, transparency for sustainability in services can be framed from a social practice perspective. For Spurling et al. (2013), behaviors are just the tip of the iceberg, as expressions of more general social phenomenon's or practices. Social practices are represented by three types of elements (SHOVE et al., 2012): material, competence and meaning (Figure 3.19)

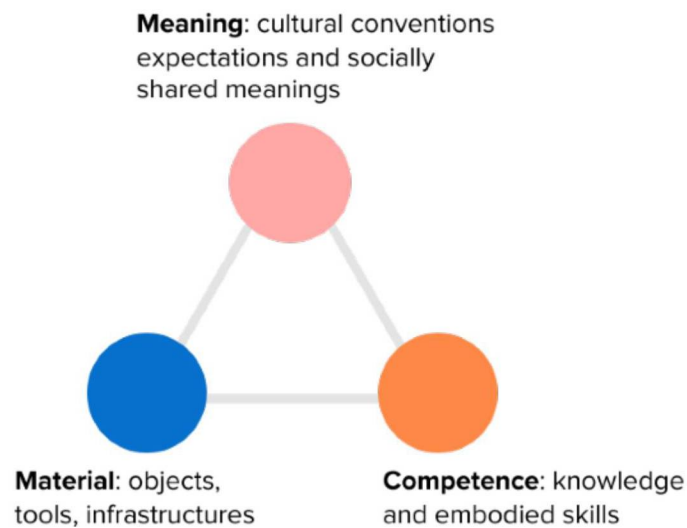


FIGURE 3.19 – Social practices elements
Source: Shove et al. (2012)

Materials include the things, technologies, tangible physical entities, and the stuff of which objects are made. Competences include skill, know-how and technique. Meanings include the symbolic meanings, ideas and aspirations (SHOVE et al., 2012).

According to Spurling et al. (2013), social practices are on constant change. A design approach based on practices would propose changes to the arrangement of these elements in a given context in order to achieve a goal, such as reducing product dependency or promoting knowledge-building.

3.3.7 Summary of the theoretical findings

This section reported a theoretical review about transparency for sustainability and circular economy in design for services. Table 3.14 presents the summary of key findings that supports the research strategy:

TABLE 3.14 – Transparency for sustainability and circularity theoretical findings

Code	Theoretical Finding
T2.3_01	Sustainability as a dynamic and systemic property — one that relates to the interactions between the environment, society, technology, culture and economy (CESCHIN and GAZIULUSOY, 2019).
T2.3_02	Design principles for environmental dimension of sustainability includes — the selection of resources with low environmental impact; minimizing the use of resources; optimization of the lifespan of products and services; extension of the useful lifespan (SANTOS et al., 2018).

T2.3_03	Design principles for social dimension of sustainability — improving work and employment conditions; favouring the inclusion of all; improve social cohesion; valuing local resources and skills; promoting education in sustainability; instrumentalizing responsible consumption (SANTOS et al., 2019).
T2.3_04	Design principles for economic dimension of sustainability — strengthening and enhancing local resources; respecting and valuing the local culture; promoting the local economy; promoting network organizations; valuing the reintegration of waste; promoting education for the sustainable economy (SANTOS et al., 2019).
T2.3_05	Transparency for sustainability — can be seen as a wicked problem, that changes overtime, requiring a continuous and iterative approach (RITTEL and WEBBER, 1973; OLIVER, 2004; BAGHERI and HJORTH, 2007).
T2.3_06	The service is part of a system and influences the sustainability of that system — how it operates and processes inputs and outputs. Transparency should consider the service-system inputs, processes e outputs regarding environmental, social, and economic aspects.
T2.3_07	Framing transparency for circularity within services — means standing for broader goals and principles of sustainability, bringing light to invisible flows of information and resources.
T2.3_08	Circular economy as a concept where the inflows and outflows of resources in system are prevented, minimized, and optimized — through strategies like reuse, repair, remanufacture, and recycling (GEISSDOERFER et al., 2017; PAES et al., 2019).
T2.3_09	Design for circular economy — puts more emphasis on multiple use cycles, changing the relationship between customers and companies (SUMTER et al., 2020)
T2.3_10	Service Design on Design for Sustainability — have greater emphasis on PSS level (integrated combinations of products, services, stakeholder value chains and business models); spatio-social level (human settlements and conditions from communities from to cities); socio-technical system level (supporting transitions to new socio-technical systems) (CESCHIN and GAZIOULOSOY, 2020).
T2.3_11	Design for sustainable behaviour — relates to people's behaviour towards sustainability, typically based on design for behavioural change to support the adoption of sustainable innovations and behaviours (CESCHIN and GAZIOULOSOY, 2020).
T2.3_12	Contextual behavioural design approaches for sustainability transparency — refers to conditions and facilitators for environmental and social behaviour of digital service user's (NIEDDERER et al., 2016).
T2.3_13	A progressive logic of behaviour change — consider the stages (pre-contemplation, contemplation, preparation, action, and maintenance) implying in distinct transparency values understanding and action oriented (PROCHASKA and VELICER, 1997).
T2.3_14	Design digitally enabled sustainable behaviour — can range from interaction to concepts of new service activities (SELVEFORS, STRÖMBERG and RENSTRÖM, 2016).
T2.3_15	Transparency for sustainability in services can be framed from a social practice perspective — as patterns represented by the practice material, competence and meaning (SHOVE et al., 2012; SPURLING et al., 2013).

Source: the author.

3.4 Existing artifacts for approaching transparency in diagnose activities

This section presents the existing artifacts which could potentially be used for approaching transparency for sustainability in diagnose activities. The artifacts were grouped by: artifacts to assess sustainability and transparency; artifacts to assess organizational maturity for transparency; artifacts directed towards data-driven transparency design; artifacts to integrate transparency in the design of AI systems.

3.4.1 Artifacts to assess sustainability and transparency

Sustainability corporate reporting is a communication practice to publish environmental, social and economic impacts. The report format and language is usually intended for corporate external stakeholders, and built based on specific standards.

The most relevant and globally adopted systems is from the **Global Reporting Initiative (2020)**. With the growing interest in sustainability development, sustainability reporting has rapidly capture the interest of companies around the world. The Global Reporting Initiative (GRI, 2020) is the world's leader and largest producer of standards/guidelines to sustainability reports. It was created under the guidance and support of the United Nations Environmental Programme (UNEP). It aims to provide the international community with a reporting framework to guide their sustainability efforts and initiatives. Figure 3.20 shows how the guidelines for the **standards** are organized.

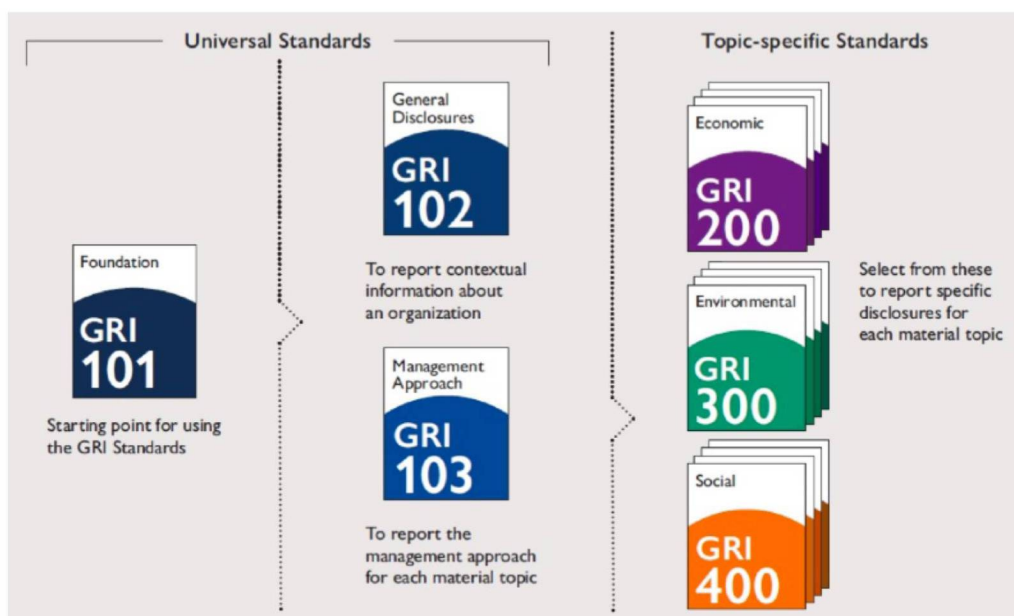


FIGURE 3.20 – Overview of the set of GRI Standards
Source: Global Reporting Initiative (2020)

The standards present within the GRI Framework are based on the notion that transparency and accountability about economic, environmental, and social impacts are of interest to a diverse group of stakeholders. Hence, it demands the adoption of a common language to support comparability and quality of information on these impacts (GRI, 2020). The GRI organization does not verify or audit the quality of the reports created by the organizations. However, it provides courses, certified training program, and auxiliary content and tools to support organizations in developing and improving their reporting.

Then, sustainability corporate certification is also a practice adopted by organizations to verify and demonstrate their environmental, social and economic commitments and impacts. There are a wide variety of certifications, from industry-specific to national and global. The certificate is usually represented by a visual stamp used in general communication assets, and the assessment is based on specific criteria and standards.

One of the most relevant and globally adopted systems is from the **B Corp Certification (2021)**. There is a growing movement around the world for organizations to become a “*B Corp*”, since it is perceived as opportunity to attract business with sustainability values-aligned. The certification is a designation that an organization is meeting high **standards** of verified performance, accountability, and transparency. The assessment focus on the evaluation on how the operations and business model impacts the workers, community, environment, and customers. The standards adopted for the assessment are grouped in governance, workers, community, the environment, and customers. Transparency is more directly evaluated as part of the governance area, concerned with a company's overall mission, engagement around its social/ environmental impact and ethics. Interestingly the assessment includes the company's stewardship of its customers through the quality of its products and services, ethical marketing, data privacy and security, and feedback channels.

The certification process to achieve and maintain this certification is rigorous and requires engaging teams and departments across the organization. Beyond the certification process itself, the B Corporation offers a series of programs and tools (Figure 3.21) to support organizations to become certified and leaders in the global movement for an inclusive, equitable, and regenerative economy.

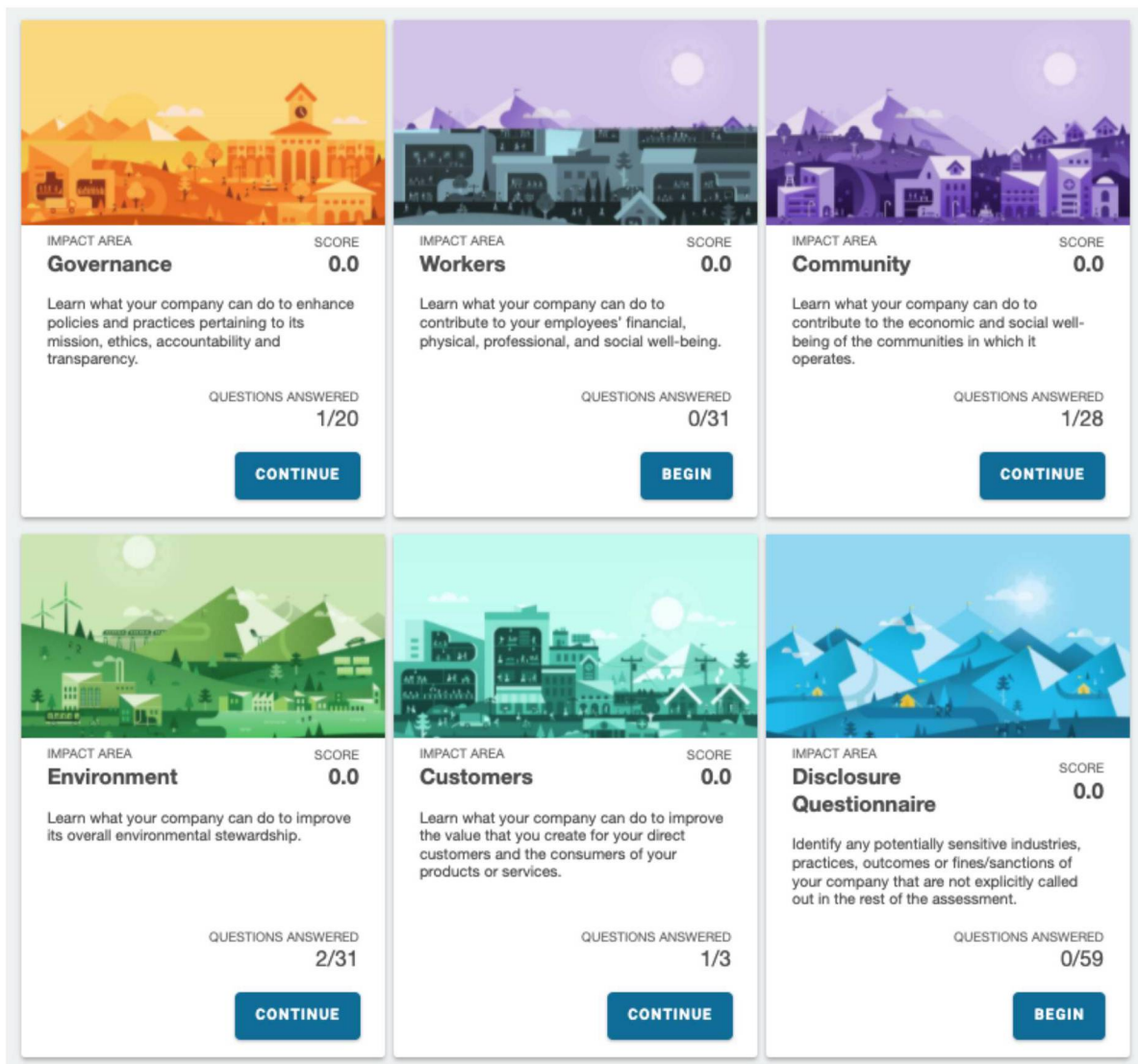


FIGURE 3.21 – Overview of the B Impact Assessment tool
Source: B Corporation (2020)

The B Impact Assessment tool is a digital platform that can help organizations to measure, manage, and improve positive impact performance for environment, communities, customers, suppliers, employees, and shareholders.

In the fashion sector, the Fashion Revolution created an annual edition of the **Fashion Transparency Index (2021)**. The Index is used to compare the level of transparency among the world's largest fashion brands and retailers; incentive major brands and retailers to disclose a greater level of credible, comparable, detailed information year-on-year by leveraging their competitive tendencies; it analyses trends in transparency across the global fashion industry; it offers a tool that people can use in their activism – whether at NGO or at consumer level.

According to the Fashion Revolution (2021), the method was designed in 2017 through a consultancy process and has been updated, with a variety of industry experts and stakeholders from academia, the trade union movement, civil society organizations, socially responsible investment, business consulting and journalism. The method is based on reviews and benchmarks among brands, using their public disclosure on human rights and environmental issues across five key areas. Data is collected and analyzed based on a scoring system. As Figure 3.22 shows, the **areas of the Transparency Index** are: 1) Policy and Commitments; 2) Governance; 3) Supply Chain Traceability; 4) Know, Show and Fix; 5) Spotlight Issues (*decent work, covering covid-19 response, living wages, purchasing practices, unionisation and collective bargaining, gender and racial equality, sustainable sourcing and materials, overconsumption and business model, waste and circularity, water and chemicals, climate change and biodiversity*).

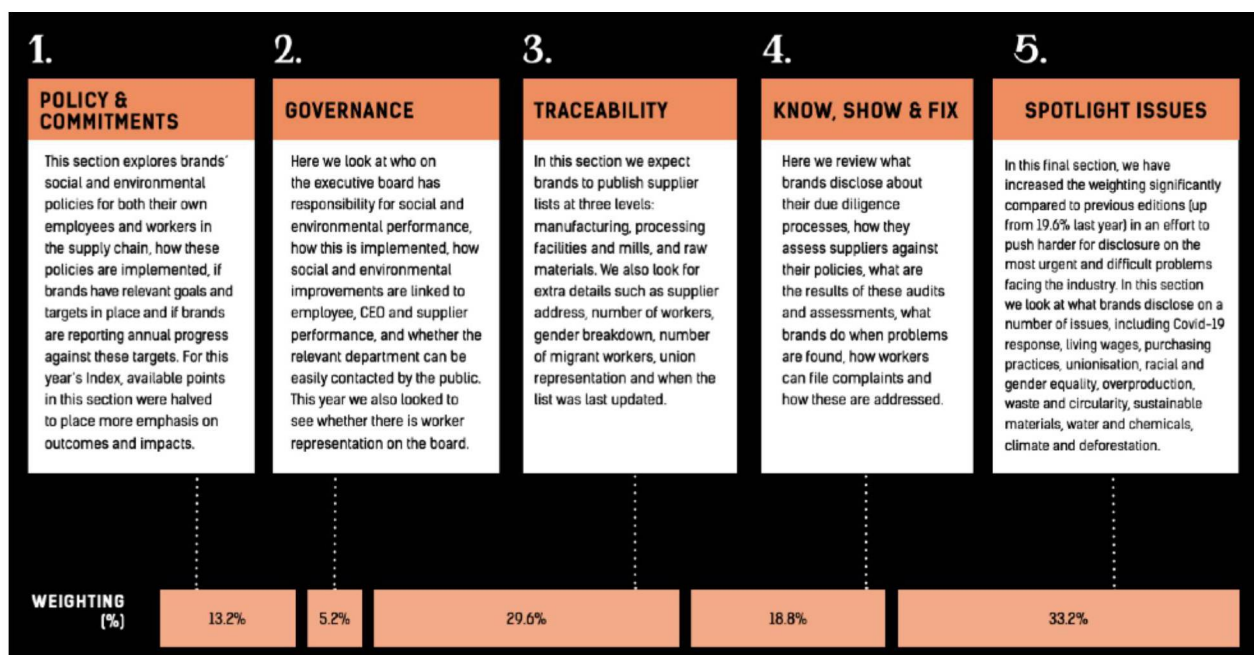


FIGURE 3.22 – Overview of the Transparency Index scores

Source: Fashion Revolution (2021)

Brands receive points for information that has been publicly disclosed on the website of the initiative. The initiative used self-published annual reports and third party assessments. There is a direct link between the company's website and the third-party disclosure. It is clear that the Fashion Revolution (2021) transparency initiative was conceived as a tool for promoting change. The Index focus on amount of information that

major brands and retailers share about their social and environmental efforts, holding them account for their impacts.

3.4.2 Artifacts to assess organizational maturity/capability for transparency

This category is characterized essentially by model artifacts that could support transparency at organizational level.

The **Transparency Maturity Meta Model** proposed by Cappeli et al. (2013) aims to establish a transparency maturity evaluation for organizations (Figure 3.23).

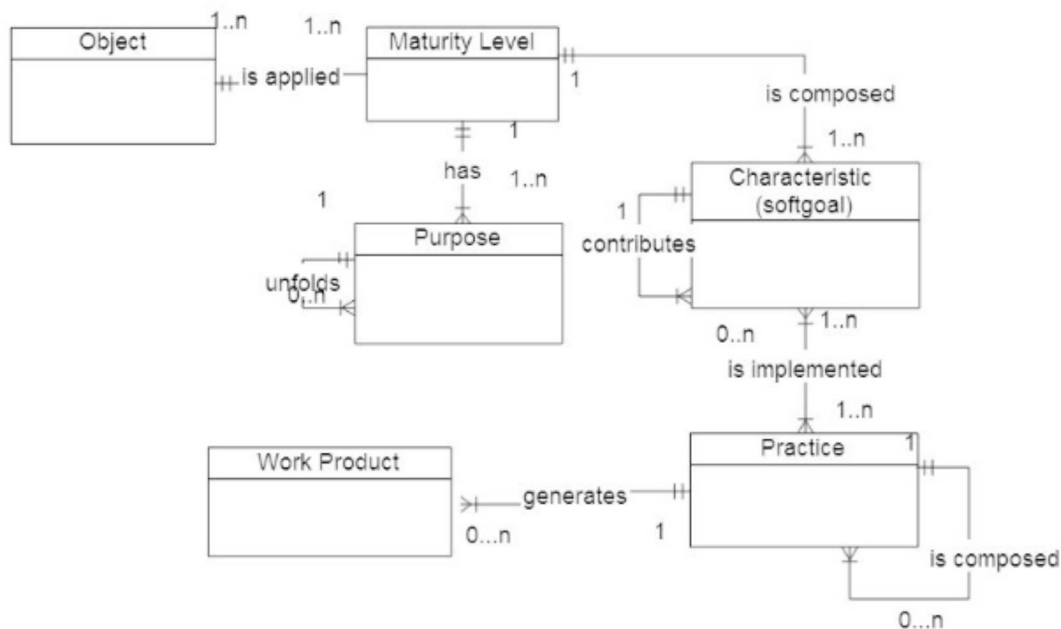


FIGURE 3.23 – Transparency Maturity Meta Model
Source: Cappeli et al. (2013)

According to the model: “a number of (n) maturity levels are applied to a number of (n) objects, An object can be parts, sectors, processes, systems of an organization. One maturity level is composed of a number of (n) characteristics (soft goals). A maturity level has a number of (n) of purposes. A purpose may be unfolded in a number of (n) (sub) purposes. A characteristic may be target of a number of (n) characteristics. A characteristic may be implemented by a number of (n) practices, and a practice may be implementing a number of (n) characteristics. A practice may be composed by a number of (n) (sub) practices. A practice may generate a number of (n) work products.”

The maturity levels comprehend the organization and the market, demanding to “gathers characteristics that, when applied to the object (information that the organization wants to make transparent), makes it possible to know what level the

organization has achieved” : 1) Opaque, the organization provides information to the external environment in a non-systematic fashion; 2) Disclosed, the organization provides and allows information access to the external environment; 3) Comprehended, the organization provides and allows access to understandable information to the external environment; 4) Reliable, the organization allows the audibility of the information provided; 5) Participative, the organization allows the dialogue with the external environment about the information provided.

In the context of automotive startups, Gonçalves (2021) identified **transparency strategies to support open and digital innovation capabilities**, internally and externally, as described on Figure 3.24.

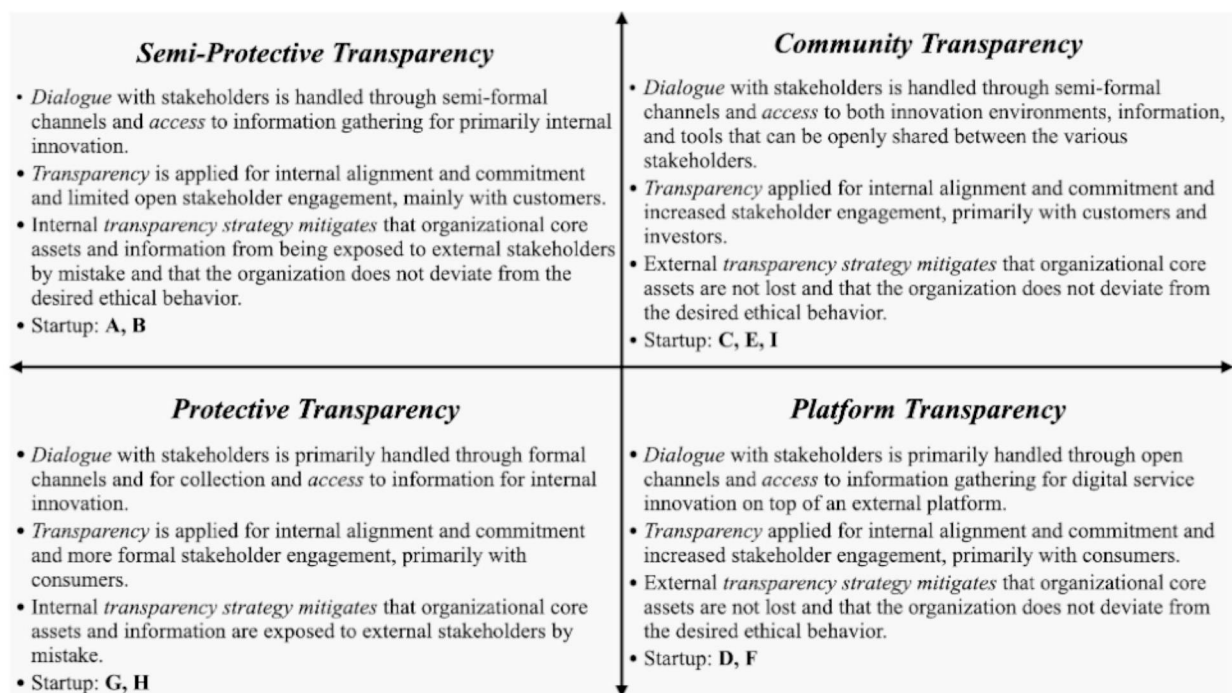


FIGURE 3.24 – Transparency strategies and corresponding digital capability

Source: Gonçalves (2021)

Thus, the approach focus on guiding organizations to better understand their transparency practices, to develop what may need to be addressed to create another desired digital innovation capability.

In the context of digital services on the food sector, Lomba (2020) proposed a conceptual framework to support service designers in diagnosing transparency in existing services, or in supporting the transparency improvement or new service development. According to Lomba (2020), the model assumes that transparency in digital services could follow a logic of progressive evolution. It is organized in three

dimensions (Normative, Formative and Participative), describing key heuristics that may influence the user's perception of transparency, as shown in Figure 3.25.

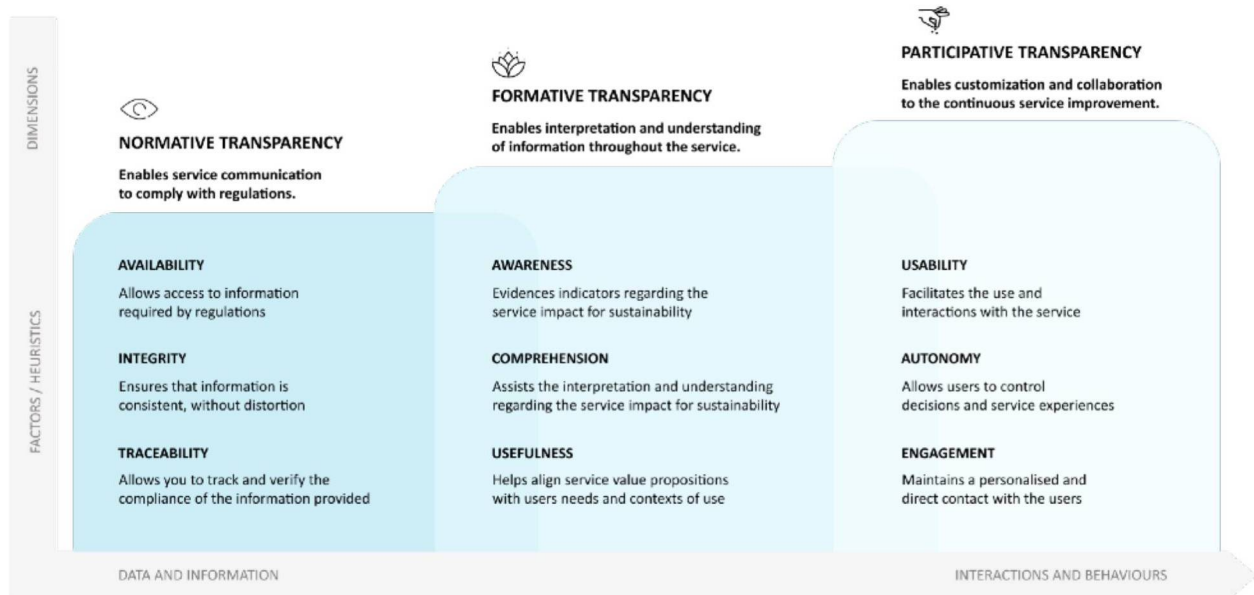


FIGURE 3.25 – Framework for diagnosing transparency in digital services

Source: Lomba (2020)

The *normative dimension of transparency* enables service communication to comply with sector regulations, by providing visibility of information. The *formative dimension of transparency* enables interpretation and understanding of information throughout the service, dealing with the meanings behind the provided information, contributing to raise awareness and educating users about the information provided, and how it relates to sustainability. And the *participative dimension of transparency* enables user's to customize or collaborate with service improvement and transparency, engaging actively in the service delivery.

3.4.3 Artifacts directed towards data-driven transparency design

Approaches in this category are characterized by the provision of concepts, principles, and process models addressing transparency through opening data within information and intelligent systems.

In the context of open government, the opening of public data is a global challenge since relevant datasets are usually fragmented, not organized, or even not digitalized. Janssen et al. (2017) proposed the concept/principle of **“transparency-by-design”**. This aims at ensuring that transparency requirements are considered in every

phase of the design process of information systems, separating sensitive data from non-sensitive data and accompanying metadata to support understanding and interpretation. The same authors proposed a **“transparency cycle”** as described on Figure 3.26, representing the flow of transparency creation.

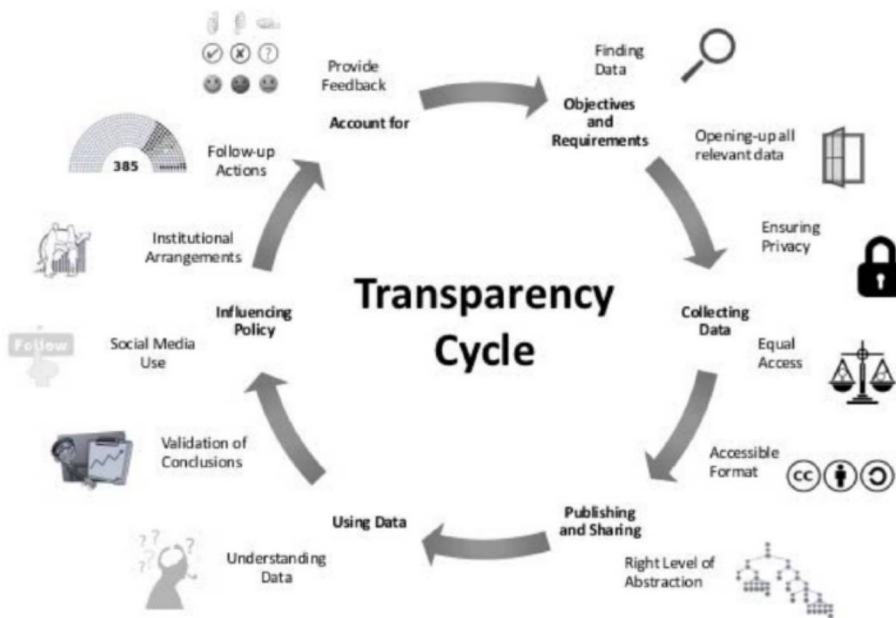


FIGURE 3.26 – Overview of the data-driven transparency cycle concept
Source: Janssen et al. (2017)

The flow for designing more transparent information systems starts by outlining the objectives of what should be accomplished with the intended transparency. Then, the necessary data for the intended transparency is processed. Next, the information is published and shared with the public (by making raw data available, developing apps, and other ways of making information easily accessible and understandable). At last, the information can be used by the public to influence the priorities of the government or to take other actions. Feedback can be used to reconsider transparency objectives and start the whole cycle again.

Adapted from this *“transparency-by-design cycle”* concept, Matheus et al. (2021) derived **design principles** aimed at helping overcome several barriers to digital transparency when designing digital solutions within government information systems (Figure 3.27).

Code	Name	Short Name
P1	Separating privacy-sensitive and -insensitive data at the source	Privacy
P2	The openness of processes and actors	Openness
P3	Feedback mechanisms for improving transparency	Feedback Mechanisms
P4	Various levels of abstraction for data access	Data Abstraction
P5	Avoid any jargon or terms that the public does not understand	Comprehension
P6	Checking and rating data quality	Data Quality Rating
P7	Visualization of different views	Visualization
P8	Data access in different protocols	Data Access
P9	Use of standardized formats	Standardized Formats
P10	Ensuring that data is unaltered and its history can be traced	Data Persistency
P11	Data and system interoperability	Interoperability
P12	Include metadata for data comprehension	Metadata
P13	Transparency-by-design (automatically opening data)	Transparency-by-Design
P14	Opening of raw data	Opening of Raw Data
P15	Assigning stewards responsible for digital transparency	Stewardship
P16	Supporting views with different level of details	Gradation of Detail

FIGURE 3.27 – Overview of design principles for digital transparency in government
Source: Matheus et al. (2021)

The authors argue that in order to create digital transparency, a “*transparency window*” should be designed to enable looking at different aspects and perspectives of the organization. Hence, the design principles are intended to help organizations make the right decisions and operationalize data-driven transparency. Also, approaching digital transparency is recognized as an organizational development rather than only a digital system development.

3.4.4 Artifacts to integrate transparency in the design of AI systems

Approaches in this category are characterized by process models and design patterns for integrating transparency into the design of intelligence systems.

The rise of artificial intelligence (AI) has led the creation of digital systems that make automated and self-learned decisions, bringing new implications for the design of transparency systems.

In that context, Felzmann et al. (2020) also adopted the term **Transparency by Design** (TbD) (inspired by the *Privacy by Design* (PbD)), to promote privacy by data protection. To provide practical guidance, Felzmann et al. (2020) proposed a **Model for Transparency by Design**, which organizes the transparency process in three phases as described on Figure 3.28.



FIGURE 3.28 – Overview of a model for transparency by design in AI systems
Source: Felzmann et al. (2020)

The model divides the transparency processes into three segments: 1) Design of AI systems to enhance transparency when developing new systems; 2) Information on Data Processing and Analysis once the system is in use; 3) Accountability to the organizational transparency aspects. The processes highlight where transparency need to be addressed during the design process by system designers.

For Eiband et al. (2018), guidance in the form of processes which can be adapted to the design settings, might be a better support for designers when dealing with challenges of real-world involving digital applications and when the needs of different stakeholders must be met. Due to that, Eiband et al. (2018) present a **Stage-based Participatory Design Process** for integrating transparency into intelligence systems. It aims at supporting users to understand the system's reasoning, without being

overwhelmed by information. This model also aims to support organizations on the process of meet the regulations on transparency without unveiling their intellectual property (Figure 3.29).

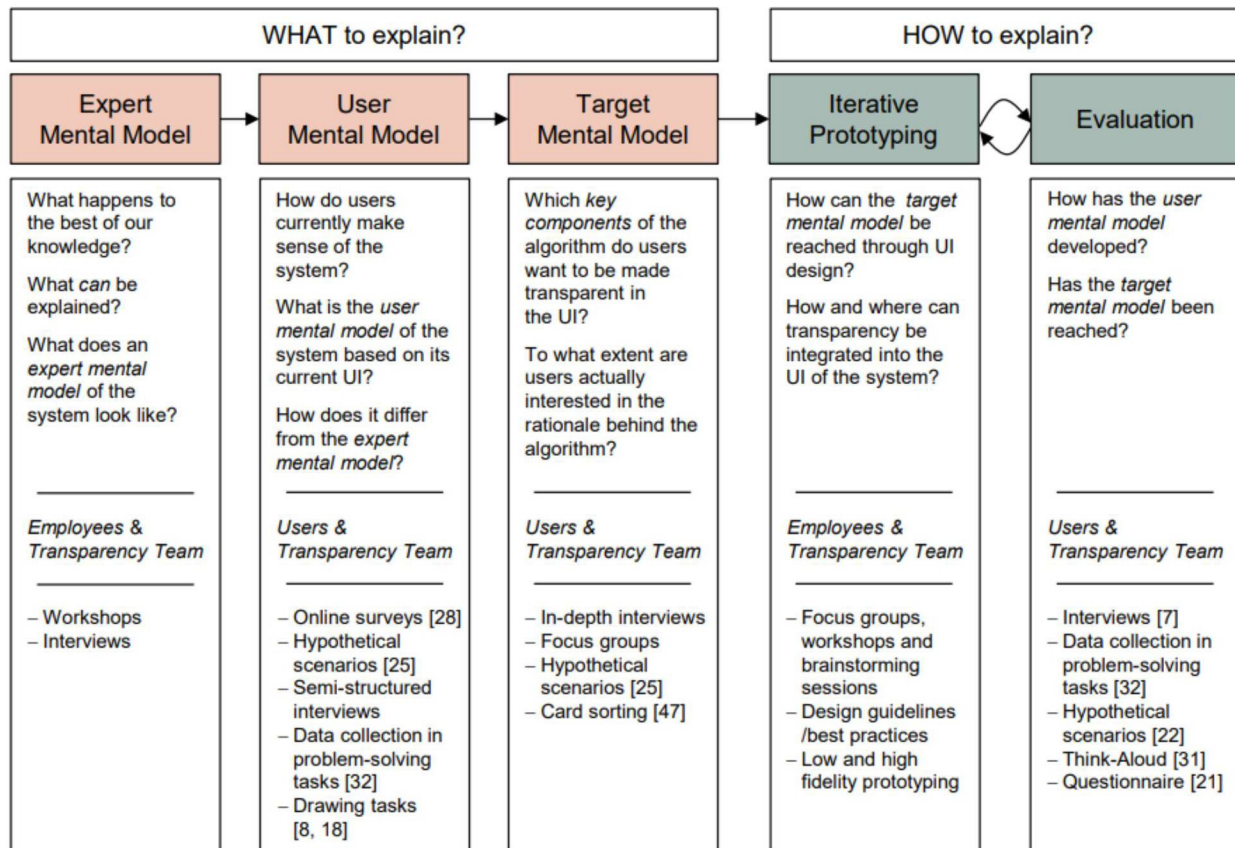


FIGURE 3.29 – Participatory design process for transparency in AI systems
Source: Eiband et al. (2018)

The process focuses on the improvement of users' mental models to make intelligent system and their design decisions more transparent (EIBAND et al., 2018). Mental Models are our internal conceptualizations of the objects, systems or processes that allow us to explain and predict their workings (NIELSEN, 2010). For that, the process proposed by Eiband et al. (2018) is based on *explanation interfaces* strategies, for supporting users in building mental models. It is divided into two parts: the first defines the content of an explanation to the user (*what to explain*), and the second defines the presentation format of the explanation (*how to explain*). Also, for each stage, exemplary methods are suggested, based in participatory design.

For Chromik et al. (2019), legal obligations of information explanation in intelligence systems might result in dark patterns rather than benefits for the users.

A *design pattern* is a proven and generalizing solution to a recurring design problem, structured in a way to be reused by other practitioners. A dark pattern refers to a solution that is commonly used although being considered ineffective or even trick users into doing things (CHROMIK et al., 2019).

Chromik et al. (2019) proposed a set of **dark patterns** of explainability, transparency, and user control for AI systems (Figure 3.30). It is based on the categorization of dark UX (User Experience) design patterns of Gray et al. (2018).

Dark Pattern by Gray et. al. [13]	Transfer to Explainability and Control	Example Phrasings of Explanation	Example Interfaces of Explanation Facilities
Nagging: "redirection of expected functionality that may persist over one or more interactions"	Interrupt users' desire for explanation and control	Restricted Dialogue	Hidden Interaction
Obstruction: "making a process more difficult than it needs to be, with the intent of dissuading certain action(s)"	Make users shun the effort to find and understand an explanation while interacting with explanation or control facilities	Information Overload, Nebulous Prioritization	Hidden Access, Nested Details, Hampered Selection
Sneaking: "attempting to hide, disguise, or delay the divulging of information that is relevant to the user"	Gain from user's interaction with explanation/control facilities through hidden functions	Explanation Marketing	Explanation Surveys
Interface Interference: "manipulation of the user interface that privileges certain actions over others."	Encourage explainability or control settings that are preferred by the system provider	Unfavorable Default	Competing Elements, Limited View
Forced Action "Requiring the user to perform a certain action to access [...] certain functionality"	Force users to perform an action before providing them with useful explanations or control options	Forced Data Exposure, Tit for Tat	Forced Dismissal

FIGURE 3.30 – Overview of the dark design patterns for transparency in AI systems

Source: Chromik et al. (2019)

One of the consequences of dark design patterns, is that users might be annoyed and irritated by explanations, and might lead to dismiss or disable explanations entirely. The end result is less efficiency and effectiveness of transparency attempts. Users might not recognize explanations when they are hidden, or when explanations are in a very technical language or are difficult to understand, users might simply skip them.

3.4.5 Summary of the theoretical findings

This section reported a literature review about the existing transparency artifacts, that could be used for solving the research problem. It was possible to identify artifacts that could potentially meet in part, the resolution of the research question:

- Artifacts to assess sustainability and transparency — characterized by more specific and situated implementation forms of knowledge. In general, they address issues related to corporate communication of sustainability and transparency at organizational level. Also, it was not possible to identify an existing artifact in this category addressing the topic of circular economy.
- Artifacts to assess organizational maturity for transparency — characterized by more conceptual and practical forms of knowledge. Artifacts linking transparency with sustainability, and addressing service organizations are limited. Until the time of this thesis, Lomba (2020) framework and respective heuristics was the existing artifact with greater similarity to the topics addressed in this research (transparency for sustainability and digital services).
- Artifacts directed towards data-driven transparency design — characterized by more conceptual and practical forms for knowledge to operationalize transparency. In general, the artifacts come from contexts of open-government and public administration and do not address sustainability issues. Although the focus is on the data aspect of transparency, the artifacts are more tangential to this thesis.
- Artifacts to integrate transparency in the design of AI systems — characterized by more specific and operational forms of new knowledge. In general the artifacts focuses on models for the process of design / development of AI systems and their user interfaces, and do not address sustainability or circular economy. Although the focus is on the AI systems, the artifacts are more tangential to this thesis.

Most of the existing artifacts identified are intended to support the design of a transparent informational state as the end-goal, rather than transparency as a means to sustainability goals, as the focus of this thesis. This implies that knowledge building in Transparency Design is being characterized by research in Information Design, and Human Computer Interaction fields addressing information accessibility, explainability, and understandability. Artifacts for approaching transparency for sustainability in diagnostic activities were limited to corporate sustainability reporting standards. Also, they do not focus on the design of digital services or even the context of the circular economy.

It had not been possible to identify in the literature an existing artifact that would sufficiently fill the gaps for the problem under study (the integration of transparency for sustainability on Service Design diagnose activities, in the context of digital services as enablers of circular economy). In terms of artifacts identified as potential in solving the problem, constructs are mentioned only in literature review as theoretical gathering and not as a sufficient solution for the problem. Also, there was an higher incidence of principles, guidelines, heuristics, patterns, standards, and models of processes.

Chapter 4 – Research Phase 1:

Problem Understanding and solution awareness

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4.1 Theoretical Framework version 1.0

The theoretical framework aims to describe the fundamental knowledge foundations to answer RQ1 and RQ3, supporting RQ2. The findings from the literature review helped to develop the components of framework. The findings from the exploratory studies (described at section 4.2 and 4.3) helped to refined and validate the theoretical framework, and support a better understanding of the research problem, providing insights into the requirements for developing the intended artifact.

The theoretical framework describes the key components and interconnections to be considered to support the integration of transparency for sustainability on digital Service Design, in the context of the circular economy. The components are formed by concepts (from the literature review) and design principles (proposed based on the literature review). It adopts a modular and interconnected structure, as illustrated by Figure 4.1.

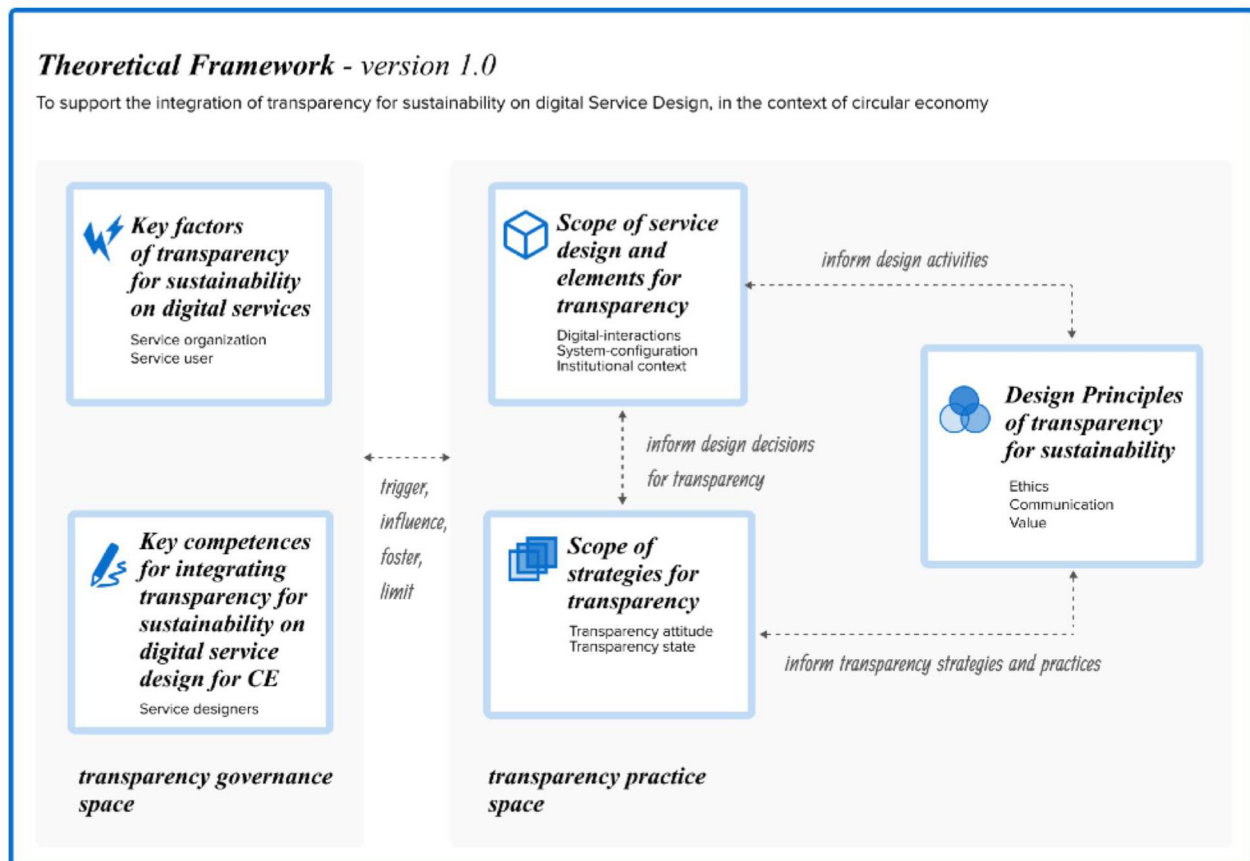


FIGURE 4.1 – Theoretical Framework version 1.0

Source: the author

Address transparency for sustainability on digital Service Design requires to consider the service motivations and conditions for transparency efforts. From a practice perspective, it also requires to consider the scope of sustainability and circularity; design principles to support the characterization of transparency practices; the spectrum of transparency states (or levels). For that purpose, the Theoretical Framework is instrumental to understand what transparency for sustainability on digital services means and the key analytical components for approaching the concept.

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 (or inhibit) value creation for sustainability or inhibit the parts. Figure 4.2 illustrates the concept integrated to a digital service structure.

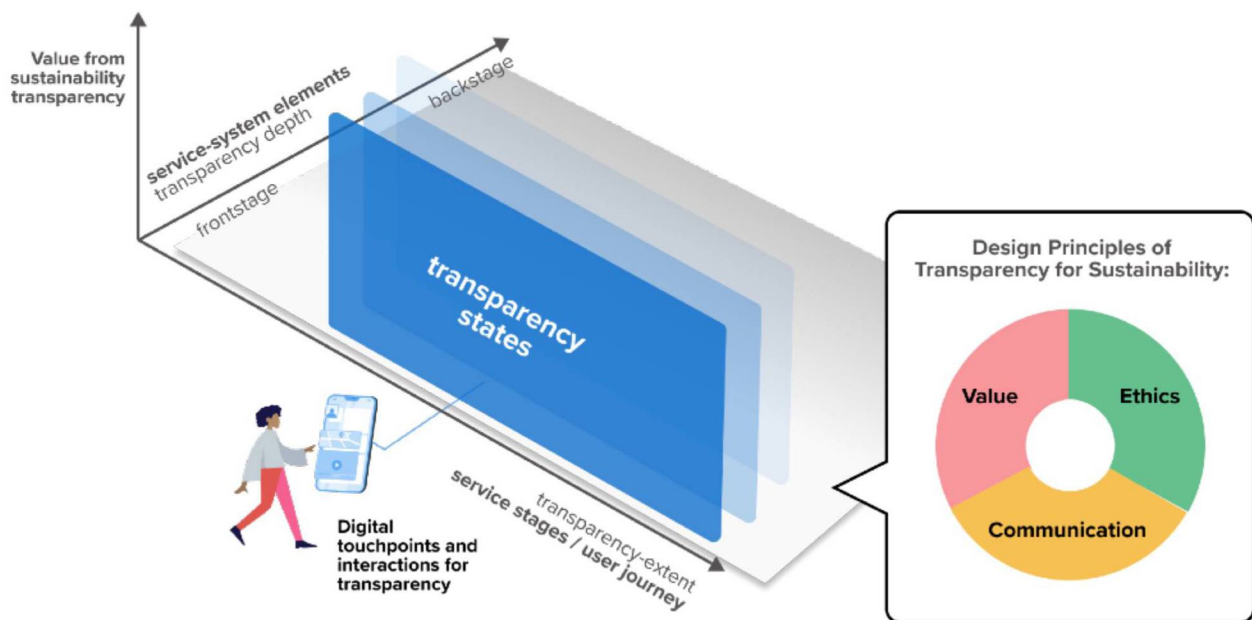


FIGURE 4.2 – Schematics of transparency for sustainability in digital services

Source: the author

Since a digital service can be seen as a performance across time, contexts, touchpoints, transparency can be understood as a situated state of that performance.

The **key factors of transparency** are the conditions or circumstances that drive (“trigger”) or limit (barrier) transparency for sustainability design initiatives on digital services. The literature review unveiled a set of factors, grouped according to service organization and user perspective (see Chapter 3 sections 3.1.4 and 3.1.5).

Due to the complexity of the different service systems, the proposed framework argues for the need to first gather research and existing evidence to have an understanding of WHO and WHAT is triggering the current transparency offering and WHAT are the conditions of the current service system for evolving the transparency offering. It is on the discover stage of the service design process that an assessment of the *key factors for transparency* would be more useful for Designers.

The **key competence for transparency** are the abilities required to be fostered by service designers to support the integration of transparency for sustainability on digital service design in the context of circular economy. The literature review unveiled a set of competence surrounding the main constructs of the research. The key competence at the intersection among those constructs were:

- **Observation and interpretation of current situations**, for considering the different key stakeholders perspective. Specially on diagnose activity (FOGLIENI et al., 2018);

- **Critical thinking for sustainability**, for reflecting on the service ethical responsibility and improvement opportunities of economic, social and environmental conditions through transparency (BAGHERI and HJORTH, 2007; VERMAAS, 2019; BOEHNERT et al., 2022);
- **Work across different service-scope**, for approaching design at systemic and digital scope (MORELLI et al., 2021);
- **Work across different transparency-scope**, for approaching transparency at governance and practice scopes (HOFSTEDE et al. 2004);
- **Work with mandatory requirements**, for acknowledging and addressing normative conditions of the service for transparency (MATHEUS and JANSSEN, 2020);
- **Work with digital infrastructure limitations**, for a acknowledging and addressing the digital conditions of the service for transparency (MATHEUS and JANSSEN, 2020);
- **Anticipatory attitude for circularity**, for considering transparency in face of multiple alternative scenarios of use and changes on the use of products and services (MORENO et al., 2016; SUMTER et al., 2020);
- **Interpersonal attitude for design**, for facilitating the collaboration and communicating of the emerging findings and insights (FOGLIENI et al., 2018; PAPE et al., 2002; MORELLI et al., 2021; MORENO et al., 2016; SUMTER et al., 2020).

The **scope of Service Design and key elements for transparency** characterize the different levels and objects for approaching transparency. The literature review unveiled the main perspectives, used as the basis to inform the integration of transparency for sustainability. (see Chapter 3 section 3.2.6).

This thesis approaches transparency mainly at the “service system-configuration” scope, supporting the articulation of the elements such as actor’s network, processes, resources, and impacts associated with social, environmental, and economic (MCCARTHY and FLUCK, 2017; SANGIORGI and PRENDIVILLE, 2017; MORELLI et al., 2021). The “service digital-interactions” scope is approached secondarily, to support the articulation of the digital encounters and touchpoints for transparency.

Then, to guide the design activities of the selected service elements, a **proposition of Design Principles of transparency for sustainability** was prescribed, based on the proposed definition of transparency (Chapter 3 section 3.1.1), translated into statements adapted from Rose et al. (2019) as show in Figure 4.3. Also, the results from

the empirical exploratory studies (described in the next sections 4.2 and 4.3) were helped to refine the categories and statements.



FIGURE 4.3 – A proposition of Design Principles of transparency for sustainability
Source: the author

The design principles were intended to guide the characterization of transparency practices (“mediations”). For Chandra et al. (2015) design principles are fundamental statements that prescribes WHAT and HOW to design in order to achieve a desired outcome. The design principles are intended to help to overcome the drivers and influencing factors.

First, transparency can be mediated according to its ethical characteristics. It is not a neutral mediation and deals with revelatory functions of the service elements “to be seen” (KOIVISTO, 2016). Transparency is an ethical principle in its core, rather than a fixed target state to be achieved or a communication quality standard to be implemented (ALLOA and THOMÄ, 2018). As such, transparency implies ethical responsibility with the level of sustainability throughout the service design process.

The principles of this ethical sustainability via transparency can be described as:

- Honestly communicating sustainability with the service users (ALLOA and THOMÄ, 2018), by digitally providing true, evidenced, and verifiable content, without deceiving people;
- Opening sustainability content for scrutiny, so that the service users can access and contribute with its performance (ALBU and FLYVERBOM, 2019), by making social, environmental, and economic aspects of the service digitally available;
- Including the diversity of users in the service (ALBU and FLYVERBOM, 2019), by digitally supporting the interaction with people with different capabilities;

Secondly, transparency can be mediated according to the communication context and needs. It can be built both through nonverbal as well as verbal messages, producing meanings and some shared understanding of what the message is about (FISKE, 2011). To deal with the suitability of the communication strategy, the principles can be described as:

- 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;
- Aesthetics, by making content and interactions identifiable, attractive and meaningful to users;

Transparency can be mediated according to its intrinsic characteristic in use on a given situation. Such characteristics can be catalyst for supporting people's confidence, enhancing their understanding about the relevance of their own actions and triggering new actions towards sustainability (ALBU and FLYVERBOM, 2019). To reach such potential it needs to be effective for the users, as a quality and differential criterion on its own, or as a means for value-creation towards sustainability.

A responsible value-proposition through transparency within digital service design, demands the following principles:

- Enabling customers to gain confidence from the transparency (FLUCK, 2016; MABILLARD and ZUMOFEN, 2017), digitally ensuring credibility, compliance and/or protection of rights on social, environmental, and economic aspects of the service;

- Enabling customers to gain a sustainability understanding about a particular subject (HOSSEINI et al., 2018; BUMBLAUSKAS et al., 2017), by digitally supporting knowledge-building on the social, environmental, and economic dimensions of the service.
- Triggering users to take actions towards sustainability (HOSSEINI et al., 2018; BUMBLAUSKAS et al., 2017), by digitally supporting customization of communication (individual) and promoting collaboration (others) in social, environmental, and economic aspects of the service.

The **scope of strategies for transparency** represents the categories used to classify the levels for design interventions according to: the service organization attitude towards transparency; the intended state (goal) of the service transparency practices (mediations) for value creation (linked with the value dimensions from the Design Principles). The literature review unveiled a set of categories, that can be used as a progressive spectrum of attitudes and goals to design for (see Chapter 3 section 3.1.7). A total of 4 general transparency intended-states were considered:

- An Opacity state represents a situation in which there is no need for transparency or that the service works based on secrecy or even against transparency. Typically, the service attitude is inactive, with no transparency practices or value created from it. Design strategies aim to support breaking secrecy;
- A Normative transparency state represents a situation in which service communication remains limited to regulatory/mandatory requirements. Typically, the service attitude is reactive, but, with the increased legal and political transparency requirements for organizations, it can also imply a more active attitude toward continued management. Design strategies aim to ensure the organization's credibility, users' rights and conflict resolution;
- A Formative transparency state represents a situation in which service communication fosters the user's knowledge of sustainability and circularity. Typically, the service attitude is active or proactive. Design strategies aim to support user awareness-raising, clarification, and informed and insightful decision-making;
- A Participative transparency state represents a situation in which service communication fosters the user's collaboration on transparency practices. Typically, it requires a more proactive attitude from the service. Design strategies aim to support user informed and insightful action-taking.

This key components of the theoretical framework supported the empirical exploratory studies described in the next sections, for better understanding of the research problem and criteria for the intended artifact.

4.2 Results from the Exploratory Study I

4.2.1 Results from the Assessment of Transparency on Digital Solutions [ESI_AP]

Sampling

This section describes the results from the assessment of transparency practices on existing digital solutions, conducted to **verify the adherence of the theoretical framework under development with the real-world phenomena**. The individual and cross-analysis enabled the identification of the main emphasis among the digital solutions, as well as gaps and contradictions on the comparison between theory and practice.

The field study involved a total of nine cases (three cases per category of solution), added progressively into the study until the increase in new observations does not lead to a significant increase in information (theoretical saturation) (GIL, 2002). Table 4.1 presents an overview of the overall profile of the cases studies, organized according to three types of digital solutions/platforms.

TABLE 4.1 - Overview of the profile of the digital solutions

Code	Local	Description
Manufacturer-solutions for sustainability transparency		
Case_01	United States	Patagonia - 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	Insecta Shoes - 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	Pure Waste - 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	Renoon - A platform of pre-built transparency components for manufacturer brands 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	Rastra - 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	EON Product Cloud - 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	Pawprint - 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	AMA - A social network to promote sustainable behaviors in the neighbourhood. 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 neighbourhood, encouraging new habits, contributing to a social environmental education, and generating relevant data for cities and municipalities.
Case_9	England	Giki Zero - 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 then find steps to reduce it, bringing people together through challenges and events to encourage collective action.

Source: the author

The first category represents “manufacturer-solutions” which typically provides information about the brand and its products. E-commerce website is the main digital channel, having a broad range of formats and areas such as institutional, store, 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 with digital transformation. The focus of the analysis was the embedded module for the end-users, and not the administrative module.

The category “service-solutions” represents Software as a Service (SaaS) in mobile or desktop apps, developed by companies providing services for sustainability (with focus in sustainable behaviors and SDG - Sustainable Development Goals) to address B2C and C2C markets. The selected cases represent a category of digital services driven mainly by startups tackling sustainability and climate change communication and engagement.

Results and cross-analysis

First, the types of digital touchpoints (contents and functions) that emerged from each case, were classified in categories, as the evidences of the potential types of transparency for sustainability practices adopted by the companies.

As shown in Table 4.2, the touchpoints were organized in 3 categories: communication about the institution or brand (4 touchpoints); communication about the product and chain (12 touchpoints); communication about the individual (4 touchpoints). Then, a comparative analysis were carried out to identify the replications among the cases. For that, the criteria adopted considered as *applicable* (+) when a touchpoint was present in a case; partially applicable (+/-) when only parts of the touchpoint was present in a case; not noticeable (-) when it was not possible to identify a similar touching in a case.

TABLE 4.2 - Overview of the key transparency practices from cases of the digital solutions

Categories and types of digital touchpoints for transparency		manufacturer			technology			service			Replicable
		1	2	3	4	5	6	7	8	9	
	Communication about the institution and brand										
T1	Download / read the organization's sustainability report	+	+	+	+	-	-	+	-	-	Yes
T2	Discover the organization's commitment to sustainability. (e.g: How we are supporting SDG; Our net zero commitment; Environmental and social responsibility programs)	+	+	+	+	-	-	+	+	+	Yes
T3	Download / read the organization's transparency policies (e.g: against slavery work; verification protocols; suppliers audits; certifications; internal accountability training)	+	-	-	+/-	-	-	-	-	-	No
T4	Discover how sustainability data is processed in the platform and the standards adopted	-	-	-	+	-	-	+	-	-	Partial
T5	Learn about sustainability	+	+	+	-	-	-	+	+	+	Yes
T6	Communication about the product and production-chain										
T7	Discover the environmental and social footprint of a type of product (e.g: where is made, CO2 emissions, water consumed, natural and renewable materials used)	+	+	+	+	+/-	+/-	-	-	-	Yes
T8	Filter products by the type of materials and production processes (e.g: organic cotton, hemp, fair trade)	+	-	-	+/-	-	-	-	-	-	No
T9	Calculate the environmental impacts saved when shopping certain types of products (e.g: litres of water, CO2 emissions)	-	-	+	-	-	-	-	-	-	No
T10	Learn about the production processes behind of a type of product (e.g: how recycled textiles works)	+	+	+	-	-	-	-	-	-	Yes
T11	Learn about sustainability attributes of a type of product, in a more didactic way (e.g: by making use of visual analogies such as Kms of driving emissions avoided, providing references, equals to annual water consumption of 19 people)	+	+	+	+	+/-	-	-	-	-	Yes
T12	Discover if a type of product's sustainability attributes was verified by third-parties	-	-	-	+	+/-	+/-	+	+/-	+	Partial
T13	Verify product's sustainability attributes, based on tracked / traced data (e.g: scan a QR code, consult a product journey from production to retail)	+/-	-	-	-	+	+	-	-	-	No
T14	Access the digital profile of a product (e.g: digital product passport / ID)	-	-	-	-	+/-	+	-	-	-	No

T15	Discover the circular functions available to manage a selected product life-cycle (e.g.: repair, recycle)	-	-	-	-	-	+	-	-	-	No
T16	Discover the conditions of used products for sale (e.g.: explains the signs of use)	+	-	-	-	-	+	-	-	-	No
T17	Discover how to adopt attitudes towards the circularity of products (e.g.: shop reused alternatives, care and repair guides, reverse logistic instructions)	+	+/-	+/-	-	-	+/-	-	-	-	No
T18	Share the experience with products designed for sustainability (e.g.: stories / reviews about trade in and second hand items)	+	+/-	-	-	-	-	-	-	-	No
T19	Communication about the individual										
T20	Calculate and compare individual environmental impacts (based on life-style data) with provided references (e.g.: your footprint in CO2 emissions and the UK average, ranking by region)	-	-	-	-	-	-	+	-	+	No
T21	Learn new sustainable tasks/actions (in gamification contexts) to progress and improve individual footprint (e.g.: eat locally, buy used clothes)	-	-	-	-	-	-	+	+/-	+	Partial
T22	Discover how to collaborate locally with activities for sustainability (e.g.: street sweeping, urban farms, activism campaigns)	+	-	-	-	-	-	+/-	+	+/-	No
T23	Share what is going on in my community for sustainability (e.g.: events, campaigns, activities)	+	-	-	-	-	-	-	+	+/-	No

ANALYSIS CRITERIA: + (applicable); +/- (partially applicable); - (not noticeable);

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).

The analysis of the cases showed that most of the touchpoints identified were related to the category “*Communication about the product and production-chain*” had the higher number of touchpoints (12), but only 3 were possible to identify replication among the cases. Although the category “*Communication about the institution or brand*” had 4 touchpoints, 3 were replicable among the cases. Also, most of the touchpoints were characterized by the display/description of information, with limited interactive functions. Next, Figures 4.4, 4.5 and 4.6 illustrates the main digital touchpoints from Table 4.2, according to each category and case.

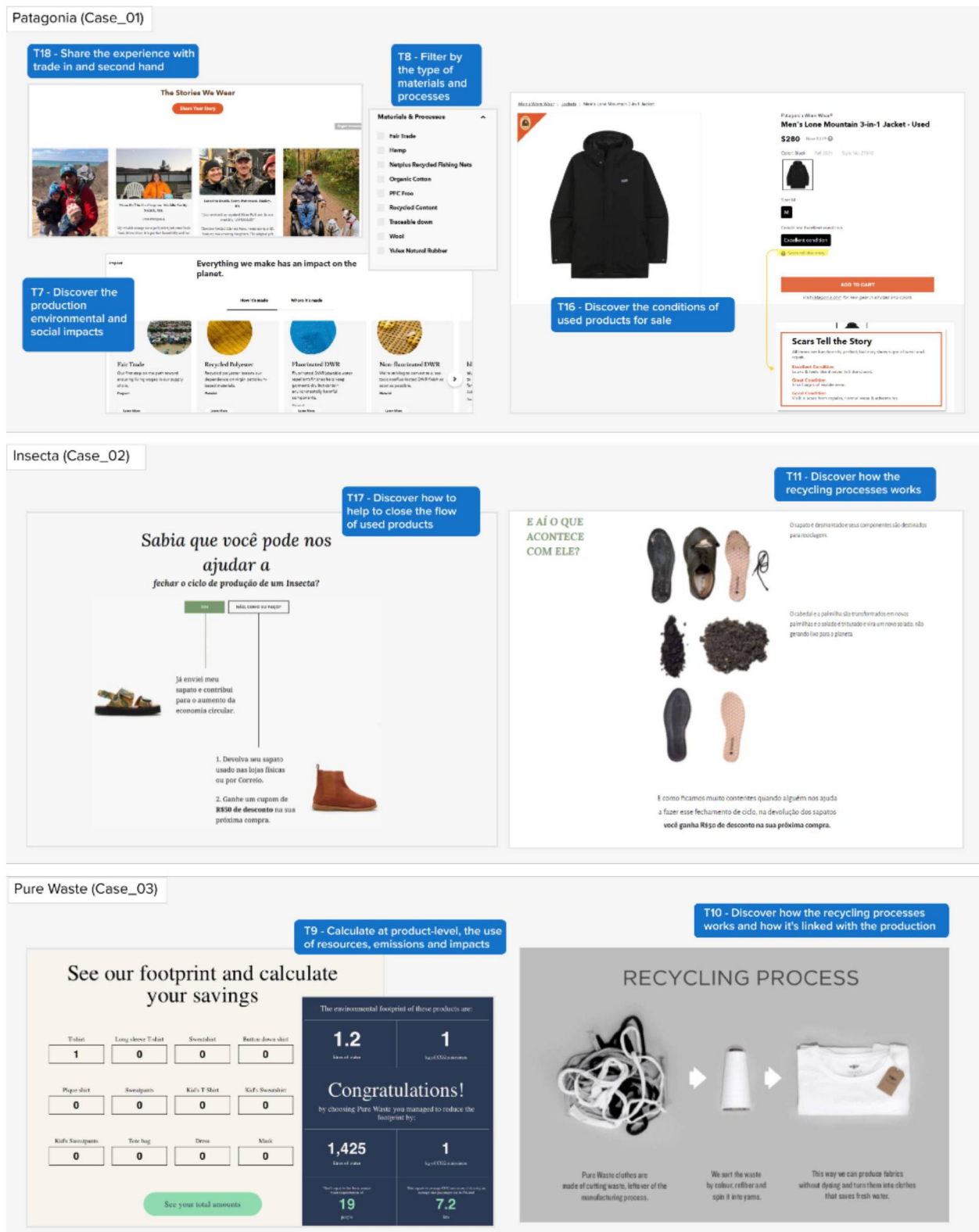


FIGURE 4.4 – Example of the sustainability transparency from manufacturer-cases
Source: the author

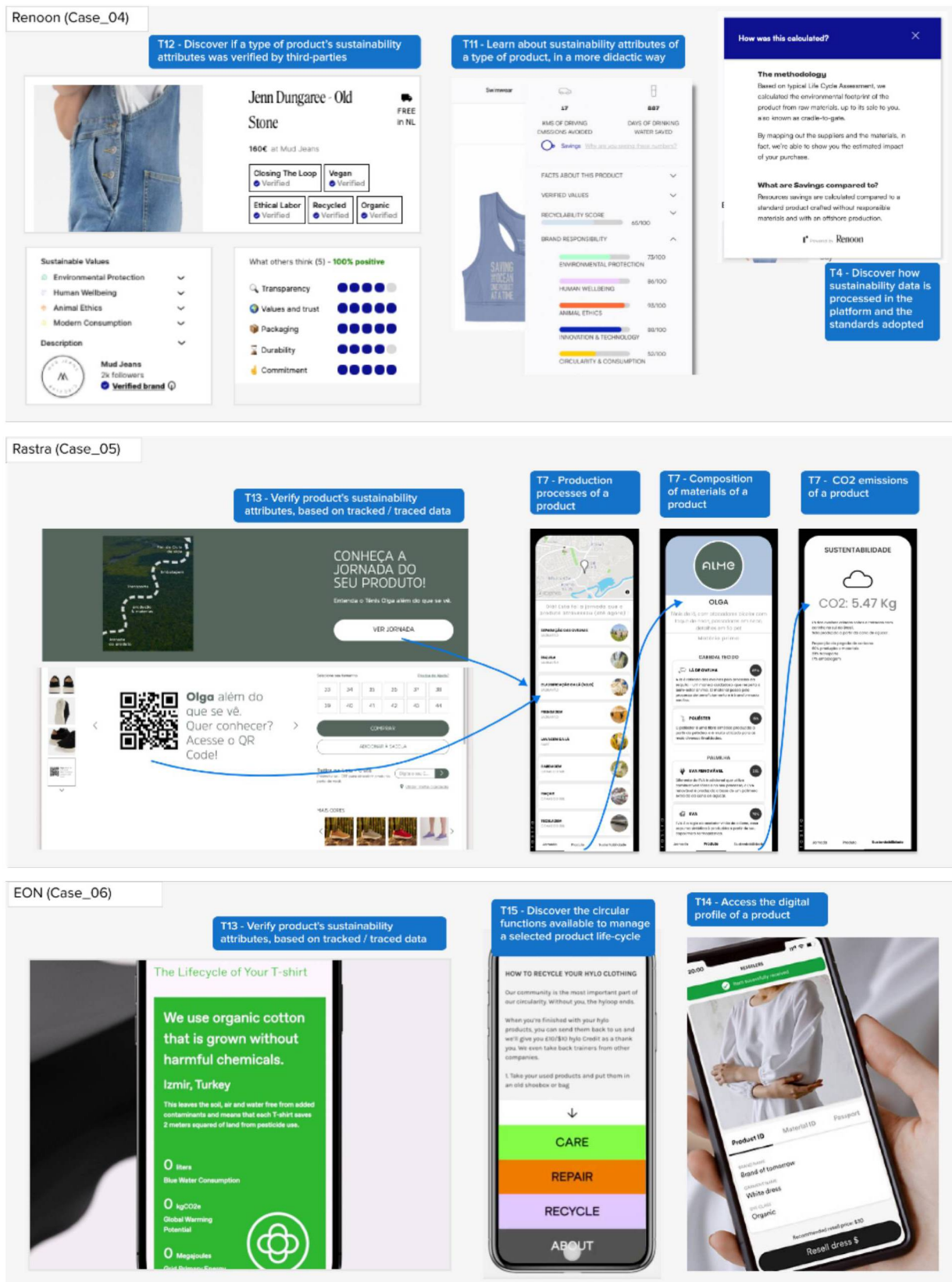


FIGURE 4.5 – Example of the sustainability transparency from technology-cases

Source: the author

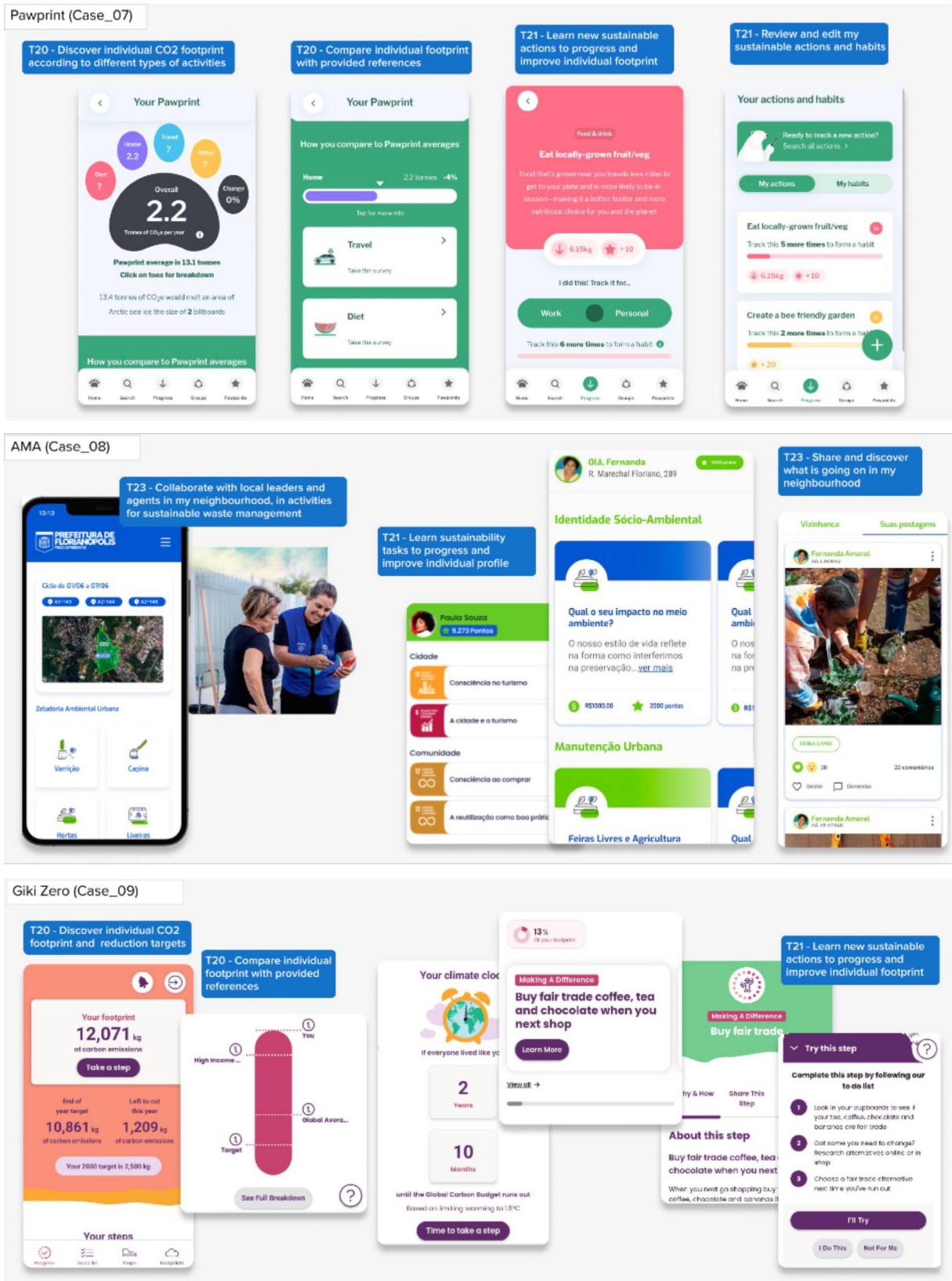


FIGURE 4.6 – Example of the sustainability transparency from digital service-cases

Source: the author

The touchpoints for transparency were confronted with the main types of service encounters (contexts) for circularity, and the main types of service elements at system-configuration scope (as adopted on the Theoretical Framework section 4.1). For that, the key elements from the touchpoints (types of content/information, functions, interactions) were used, aimed to support the understanding on WHAT system-elements the transparency practices were addressing. The findings from this cross-analysis aimed to check the internal adherence with the Theoretical Framework (Table 4.3).

TABLE 4.3 - Assessment of digital solutions: adherence to service design elements

Classes of Analysis		manufacturer			technology			service			Replicable
		1	2	3	4	5	6	7	8	9	
Service encounters for circularity versus “touchpoints for transparency”											
Purchase		+	+	+	+	+	+/-	+/-	-	+/-	Yes
	Touchpoints about the <i>institution/brand</i> ; and about the <i>product</i>										
Usage		+	-	-	-	-	+	+	+/-	+	Partial
	Touchpoints about the <i>product</i> ; and about the <i>individual</i>										
Post-usage		+	+	-	-	-	+	+/-	+	+/-	No
	Touchpoints about the <i>institution/brand</i> ; and about the <i>individual</i>										
Service elements at system-configuration scope versus “touchpoints for transparency”											
Processes and Activities		+	+	+	-	+	+/-	+	+	+	Yes
	Touchpoints about the <i>product</i> ; and about the <i>individual</i>										
Stakeholders		+/-	+/-	-	+/-	-	+/-	+	+	+/-	Partial
	Touchpoints about the <i>individual</i>										
Resources and Materials		+	+	+	+	+	+	+/-	+/-	+/-	Yes
	Touchpoints about the <i>institution/brand</i> ; and about the <i>product</i>										
Impacts and Emissions		+	+	+	+	+	-	+	+	+	Yes
	Touchpoints about the <i>product</i> ; and about the <i>individual</i>										

ANALYSIS CRITERIA: + (applicable); +/- (partially applicable); - (not noticeable);

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).

Source: the author

The study considered three types of service encounters (WOORHEES 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.

The analysis of the cases showed that at *purchase* encounters, there was an emphasis from *manufacturer* and *technology cases*, with touchpoints focusing the communication about the *institution/brand*, and the *product* (as a branding competitive differential and possible support for user acquisition). In that sense, transparency in *manufacturer cases* focuses on how innovative and less environmentally impactful were the resources used in their products. Although the *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 (eg.: “Browse Used Jackets and Vests”; “Don't buy a new jacket”). The *usage* and *post-usage* encounters were partly addressed among the cases.

Regarding the systemic scope of the touchpoints, the investigation showed that the cases from the *manufacturer* and *service* categories were the ones that addressed most of the elements — with emphasis on *Resources_Materials and Impacts_Emissions* — mostly focusing on the environmental dimension of sustainability. Content about footprint (at different levels such as industry-sector level; production-chain and product level; individuals-communities level) and content about sustainability governance were the ones mostly communicated, followed by sustainability educational content. The types of digital functions available to the users were mainly characterized by: search and filter products based on sustainability attributes (e.g: touchpoint T8 from Case01); data verification about sustainability (traceability) (e.g: touchpoint T13 from Case05); and to quantify sustainability impacts through calculators simulators (e.g: touchpoint T9 from Case03).

The cases from the *manufacturer* and *service* categories of solutions were the ones that mostly addressed the element *Processes_Activities* (regarding the different types of processes on the production and consumption system) through the touchpoints, with focus on the social and economic dimensions of sustainability. The *Processes_Activities* element was mainly characterized by touchpoints from the “communication about the product” and “communication about the individuals” categories. Hence, the types of content were related to production and distribution processes (such as materials production, transportation, etc), followed by circular content (such as care, repair and recycling activity guides), and individuals activities on sustainability tasks on gamification contexts. The types of digital functions available to users were mainly characterized by: connectivity of products (e.g: touchpoint T5 from Case06) and traceability.

The investigation showed that the element *Stakeholders* (regarding the different types of actors on the production and consumption system) was the one least addressed by the touchpoints among the cases. The element *Stakeholders* was partially addressed by the touchpoints from the category “*communication about the individuals*”, that is, the user. In *service* cases the element *Stakeholders* was typically implemented by the user's and communities reporting their own consumption performance (such as home or diet footprint, sustainability scoring, reviews and stories) (e.g: touchpoint T21 from Case07). In *manufacturer* cases it was mainly characterized by content about the production chain (such as by whom the products were made, manufacturing facilities and working conditions), and also by content about sustainability governance (such as commitments and initiatives in terms of labor conditions and social responsibility). The types of digital functions available to the users were mainly characterized by the quantification of sustainability performance through calculators simulators (e.g: touchpoint T20 from Case09).

On the second part of the analysis, the Design Principles of transparency for sustainability were used to guide the characterization of the touchpoints, aimed to support the understanding on HOW transparency practices were implemented and to check the internal adherence with the Theoretical Framework (section 4.1) (Table 4.4).

TABLE 4.4 - Assessment of digital solutions: adherence to transparency design principles

Classes of Analysis		manufacturer			technology			service			Replicable
		1	2	3	4	5	6	7	8	9	
Ethics dimension <i>versus</i> “touchpoints for transparency”											
	Touchpoints about the <i>institution/brand</i> ; about the <i>product</i> ; and about the <i>individual</i>										
P1	Honesty	+/-	+/-	+/-	+	+/-	+/-	+	+/-	+/-	Partial
P2	Openness	+	+	+	+	+	+	+	+	+	Yes
P3	Inclusive	+	+	+	+	+/-	-	+	+	+	Yes
Communication <i>versus</i> “touchpoints for transparency”											
	Touchpoints about the <i>product</i> ; and about the <i>individual</i>										
P4	Informational Quality	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	No
P5	Contextual	+	+/-	+/-	+	+	+	+	+	+	Yes
P6	Aesthetics	+	+	+	+	+	+	+	+	+	Yes
Value <i>versus</i> “touchpoints for transparency”											
P7	Confidence	+	+	-	+	-	+/-	+	-	+	No
	Touchpoints about the <i>institution/brand</i>										
P8	Understanding	+	+	+	+	+	+/-	+	+	+	Yes
	Touchpoints about the <i>product</i>										
P9	Agency	+	+/-	+/-	+/-	-	+/-	+	+	+	Partial
	Touchpoints about the <i>individual</i>										

ANALYSIS CRITERIA: + (applicable); +/- (partially applicable); - (not noticeable);

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).

Source: the author

The analysis of the cases showed that the cases from the *service* category were the ones that addressed most of the ethical design principles — with emphasis on *Openness* and *Inclusive* principles — which were also the mostly addressed principles in the ethical dimension.

The analysis showed different scopes of *Openness*, with touchpoints addressing the availability of information about the *institution/brand*, and the *product*, and the *individual*. In that sense, the findings from the analysis of the system-elements among the cases (Table 4.3), indicates the broad variety of the objects/content of *Openness*. Regarding the format, the implementation of the touchpoints were mainly characterized

by the “static” display or description of information. There were a few digital functions to support the access and navigation through the provided information, such as traceability functions (e.g: touchpoint T13 from Case05, Case06); the internal navigation links of the pages, showing alternative navigation flows to the user (e.g: touchpoint T17 from Case01); the visual representation of data/information (e.g. infographics of progress as touchpoint T21 from Case07; or images of stakeholders as touchpoint T23 from Case08).

Regarding the design principle for *inclusion*, the analysis showed that it was mostly addressed by cases that provided more clear and understandable explanations on the subjects being communication (e.g: touchpoints T11 and T17 from Case02). The types of digital functions available to the users were mainly characterized by search/filters, calculator/simulator and choice-making functions, both as a way to allow the users to adjust type of information according preferences (e.g: touchpoints T21 from Case09).

The cases of digital solutions have shown that the design principle for *honesty* was the least addressed by the touchpoints. The evidence-based characteristic was mainly characterized by the description of environmental impact indicators (providing the origins of data and calculation method) (e.g: touchpoints T12 from Case04) and certifications (at institutional and product level).

Regarding the design principles from the *communication* category, the analysis showed that they were mostly addressed by the cases from the *service* and *technology* category, with an emphasis on *Aesthetics* and *Context* principles.

The analysis of the cases showed that besides the textual format, the digital touchpoints adopted a more rich format comprising different types of visual medium, including pictures and videos (of places, stakeholders, materials, etc) and graphic symbols (illustrations, diagrams, icons). The *Aesthetics* design principle of transparency for sustainability concerns the “how” rather than “what” to communicate, contributing to the overall user experience, specially as a support to the other design principles, such as *Inclusive* and *Understanding* principles.

Regarding the design principle that deals with a *contextual* transparency communication, the analysis showed that the cases from the *service* and *technology* categories were the ones that mostly addressed it through touchpoints. Due to the dynamic nature of the platforms from the *service* and *technology* (typically mobile apps), *contextual* principle was mainly represented by the touchpoints in relation to the respective service-encounter, rather than a specific type of content or function. To illustrate that, the platform from Case06 supports the circularity of products during the usage and post-usage stages, by presenting custom information and functions to the user when scanning a product digital ID (e.g. circular business model available such as resale or rental; identification of materials to facilitate disassembly and recycling).

The design principle that deals with *Informational Quality* of the transparency communication was the least noticeable among the analysed cases. Since it is a principle focused on the quality of the data infrastructure, for a more effective analysis, it would be necessary to combine other sources of internal data from the companies. However, some touchpoints indicate care on the part of the organization regarding the quality of the information used. For instance, the cases in the *technology* category adopt digital functions for data verification and traceability as a way to support an assurance of the validity of the provided content.

Then, regarding the design principles addressing the value-proposition of transparency for sustainability, the analysis showed that the principle of *Confidence* was mostly addressed by the touchpoints about the *institution/brand*; the principle of *Understanding* was mostly addressed by the touchpoints about the *product*; the principle of *Agency* was mostly addressed by the touchpoints of *individual*. The cases from the *service* category were the ones that addressed most of the principles from the value dimension — with an emphasis on *Understanding* and *Agency*.

The analysis of the cases showed that the design principle for *Understanding* was mainly characterized by the provision of sustainability and circularity educational content (varying the presentation format and volume, from blogs to product hints or task descriptions). For instance, Case 1 provides to the users practical guides on how to take care of the products to last longer, and on how they can repair the products themselves when necessary. While Case 02 provides a more broader information to raise user awareness about the impact of the fashion sector for sustainability, and how does it connects with their business offerings and a more responsible consumption.

Then, the design principle for *Agency* was mainly characterized by the provision of digital functions to enable the users to customize their informational preferences and making-choices when alternatives are presented. Hence, besides information description function, the touchpoints addressing the *Agency* design principle were mainly characterized by using data analysis functions, to provide insights to the users (specially on the cases from the *service* category, based on quantified-self and gamification models). For instance, Case07 and Case09 suggest to users the actions that they could commit to improve their individual social and environmental footprint. Also, there were a few cases with touchpoints addressing the *Agency* design principle for collaboration with a community. Case01 and Case08 present and invite the users to join local community initiatives to minimize environmental impact and improve social benefits; and provides digital spaces for user generated content such as reviews, comments, and stories from their experiences.

Interestingly the analysis of the cases showed that the design principle for *Confidence* was the least addressed among the cases. In *manufacturer* cases, normative credentials and certifications associated with sustainability were the main type of content used to address the issue of credibility. But in *service* cases, although some of them also declared credentials, the main type of content addressed was the footprint calculation methodology, since those platforms offerings are more dependable on quantifiable evidences to reach credibility.

Reflection and implications for the Theoretical Framework

The analysis of the cases showed that the main value proposition linked to sustainability transparency among the observed touchpoints was related to supporting user with informed-decision making through knowledge building (information + learning), for a more responsible consumption and usage of products and services. Nevertheless, a possible value proposition that focused more on intelligence (knowledge + action) and linked to user-informed decision-making was observed. It was intended to encourage more sustainable behavior.

Unlike *service* cases, transparency was not identified as core value proposition of employed by *manufacturers* cases (e.g., textile, clothes, consumer goods, etc.). To meet this criterion in their services, they rely on technological solutions provided by third parties. Transparency demands on the practices of their supply chain was their main focus. In these cases, the empirical data shows that sustainability transparency was approached solely as a form of brand promotion and competitive differential.

The examination of the cases revealed that, the scope of sustainability transparency can vary from an institutional level to a product production or even individual consumption level.

With regard to the elements of the service system, sustainability transparency was mainly associated with the elements about *Resources_Materials* and *Impacts_Emissions*. With regard to the design principles, the observed empirical data reinforced the relevance of the *Aesthetics* principle in the communication dimension, but the *Informational Quality* principle lacked evidence among the cases.

The analysis also showed that sustainability transparency was mediated in an asymmetric way, focusing more on certain aspects than others, resulting in different states and limited forms of value provision. For instance, although the cases had a high degree of openness, the degree of honesty was not equivalent (especially when communicating processes and actors). This situation comprise the degree of ethical responsibility associated with transparency practices. Similarly, most of the cases

emphasized the “static” presentation of information, rather than the digital functions to support a more interactive user experience, resulting in limited forms of value provision.

Transparency is an opportunity to bring the user closer to the service and awaken a bond with the places, activities, and people. The more detached the user is from that reality or production-consumption system, the more it becomes necessary to explore the different design principles and service-system elements through digital functions. According to Bizzocchi and Woodbury (2003), the level of interactivity and the expression of a user 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, not necessarily following a pre-established order.

4.2.2 Results from the Thematic Workshops [ESI_TW]

Sampling

This section describes the results from the online “thematic-workshop” aimed to support a better understanding of the research problem, providing insights into the requirements for developing the intended artifact, based on the external validation of the potential users of the artifact.

A total of 57 participants joined the workshops, distributed in **3 sessions** of **1 hour** each, due to limited availability of the target audience. The first session was held on 3rd February 2021 with 12 participants, the second on 30th June 2021 with 35 participants and the third session was held on 7th July 2022 with 10 participants. The “thematic-workshops” were conducted along 18 months.

Most of the participants were self-identified as students and practitioners, having an initial contact with the theme proposed by the workshop — interested in didactic materials and how Design can contribute to sustainability. A second and minor part of the participants were self-identified as entrepreneurs active in the area of sustainability.

Reflections from the workshops

The qualitative data from all three workshops was cross-analysed and organized in three groups: a) the content provided; b) the ideas generated; c) the practical implications in organizations.

Regarding the content provided, the study showed that on average the theoretical content of the workshop was perceived by the participants as **relevant** and **partially**

helpful in the practical exercise. For being a **new and relative complex topic**, more **time** for **absorbing** and **practicing** was perceived as necessary by the participants.

Also, the participants preferred **real-case examples** to understand the concepts. A critical factor pointed by the participants was the presence of a **facilitator to guide** the participants in reflecting and using the materials. The diversity of **examples** selected from different contexts were important for facilitating an easy understanding of the subject. **Participative** transparency was the most **difficult** for the participants to make sense.

“The class taught was very clear and had a direct impact on the concepts applied to the project developed in the course. The selected examples in different contexts were a great support for understanding the theme.” (Workshop02, Participant “UX Design practitioner”)

“I think that the time to carry out the activity was very short, mainly because it was a large group, who did not know each other, and such a complex subject... until we “found” and started to discuss, almost half of the time had passed time.” (Workshop02, Participant “Product Manager”)

The study showed that the ideas generated by the participants ranged from specific **digital functions** to more robust **solutions**, including new **service offerings**. Also, the ideas included digital and non-digital experiences.

Some participants intended to **cluster the ideas** according to the types transparency goals (Normative, Formative and Participative) in the theoretical part of the workshop. Such approach revealed some **difficulties** in classifying the ideas, since most of them could **address more than one** goal for transparency. Most of the ideas were similar to the examples presented before or already implemented or available in the real world. The short time and format of the activity and first-contact with the topic, could explain this **creativity limitation**.

“Tag attached to the packaging with harvest data (with information about the producer and the place where it was produced)” (Workshop01, Participant “Service Design practitioner”)

“Purchase system where she (the user) can choose product information by phase (planting, harvesting, etc.)” (Workshop02, Participant “Design student”)

Regarding the practical implications in organizations, the study showed that transparency for sustainability was pointed as a topic of **growing relevance**, but in practice, **ignored** or **not yet addressed** according to the participants experience within organizations. The **lack of knowledge and competences** on the topic and the **organizational resistance** to changes were pointed as the main **barriers**.

Before the workshop, most of the participants associated the implementation of transparency on digital services with **forms of compliance**, such as the **Data Protection Law** (LGPD) related to personal data and privacy.

“Usually the demand is the LGPD regarding the use of customer data and information. On the part of users, there is a tendency to ask for greater transparency by service providers. It is a necessity on the part of users, they want to understand the service they are receiving and not just experience the result of it.” (Workshop03, Participant “UX Design practitioner”)

ESG (Environmental, Social, and Governance) was highlighted as a growing topic in organizations economic agenda. However, only a few participants had experience with sustainability-oriented initiatives. Despite not having enough information on that matter from the workshop sessions, one hypothesis is that the role of **design** is more **reactive** and **less strategic** when it comes to approaching sustainability in design.

“Customers' knowledge of sustainability, specific processes and techniques.... It's necessary a long educational step along the way.” (Workshop02, Participant “Service Design practitioner”)

According to the participants experience service design practice within organizations, the activities of user journey mapping and giving strategic direction (opportunities and improvements) were highlighted as the main type of activity carried out in organizations. User research was also pointed, however, some participants reported that accessing and involving users sometimes can be a difficulty due to the lack of organizational support or difficulties in engaging the user himself in the research.

Although the operational limitations to enable the participation of a larger number of people, the sessions were helpful for the researcher to explore different perspectives of the participants on the research topics, and better understand the implications for the intended artifact.

4.3 Results from the Exploratory Study II

4.3.1 Results from the Participant Observations [ESII_OBR]

This section describes the results from the participant observation in Brazil, aimed to explore the existing factors, conflicts and tensions, that could influence the integration of transparency for sustainability on digital services towards circular economy.

Observations in Research Project#1

The Research Project#1 “Policies and Solutions for Sustainable Cities Project” was a partnership of the Observatory for Innovation in Sustainable Cities and the Design & Sustainability Center of the Federal University of Paraná. The project aimed to develop publications intended to support decision makers within the municipal governments as input for the elaboration of local projects, having one of the topics with focus in sustainable waste management.

The observation sessions were held on **November and December of 2021** within the activities of the project. The main material of the activities was a taxonomy (Figure 4.7) developed in Project#1 regarding the state of the art in policies and solutions for sustainability on solid Waste Management, integrating the solutions available on the OICS platform (SANTOS et. al, 2022).



FIGURE 4.7 – Policies for a sustainable waste management from Project#1
Source: Santos et al. (2022)

For the purpose of seeking external validation, this taxonomy from Project#1 was evaluated in a workshop by **7 experts** in Waste Management field across Brazil, and in a second workshop by **municipal managers from 3 Brazilian cities** (Table 4.5).

TABLE 4.5 - Profile of the participants from Project#1

Participant role and area of expertise		Participant Institution / Local
1	Research Professor Waste and Cities	Universidade Federal Rural do Rio de Janeiro (UFRRJ)
2	Research Professor Waste Management	Universidade do Estado de Minas Gerais (UEMG)
3	Research Professor Waste and Civil Engineering	Universidade de Pernambuco (UPE)
4	Research Professor Waste and Circular Economy	Universidade do Extremo Sul Catarinense (UNESC)
5	Program Coordinator Public Policies and Environment	Projeto CITInova MCTI
6	Research Professor Waste Management	Universidade de São Paulo (USP)
7	Research Professor Waste and Environmental education	Universidade de Caxias do Sul (UCS)
8	Municipal Manager Environment	São Miguel do Gostoso/RN
9	Municipal Manager Environment	Magé/RJ
10	Municipal Manager Environment	Barcarena/PA

Source: the author

The workshop mixed both asynchronous and synchronous phases. In the asynchronous phase the participants carried out the evaluation of the proposed document, both through comments made directly in the report or through a form sent along with it. The experts were invited to assess the pertinence, relevance and level of dissemination of the propositions (Figure 4.8). The result of the asynchronous phase was subsequently used to establish the focus the synchronous phase — where the participants were invited to debate the convergences, gaps and divergences of the document versus their practical experience.

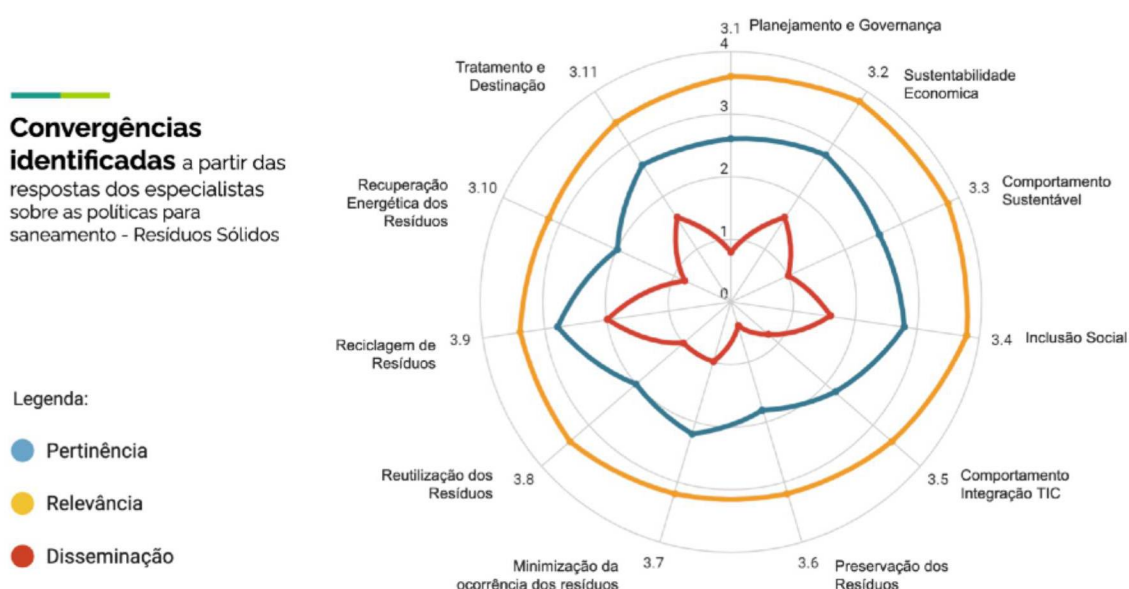


FIGURE 4.8 – Example of the observations from Project#1 experts evaluation
Source: the author adapted from Santos et al. (2022)

The participants ranked “Economic sustainability” and “social inclusion in waste management” policies with high relevance and high dissemination in Brazil, mainly due to the induction of practice by the National Waste Policy (Law No. 12.305 of 2010). These practices were identified in different spheres of public, private and third sectors, integrating informal workers and operators, through cooperative systems. However, experts argued that there is still a lack of administrative support to enable the effective participation of the recycling cooperatives in waste governance.

In line to that, policies for “Planning and governance”, was ranked with high relevance, but with low dissemination in Brazil, and experts argued there is still no strategy at state and municipal level for managing waste in a systematic way. There is a lack in integration and interaction between the different technical and administrative areas, and initiatives are departmentalized.

The policy for “integrating digital technologies” was ranked with high relevance, but with low dissemination in Brazil. Experts argued that digital technologies are fundamental to monitoring how waste management is being carried out, and data-driven decision-making. Although some municipalities are already using some technologies, the maturity is low and the generated data has not yet been properly used.

Then, regarding the focus on waste hierarchy and circular strategies, the policies for “waste prevention” and “sustainable behaviour” were ranked with high relevance, but with low dissemination in Brazil. Experts emphasized the importance of raising awareness to the topic since in the education of children and young people, and also at

the level of companies and public institutions. There is a lack of specify goals and targets to guide the actions in municipalities and key stakeholders, aimed at mitigating and reducing environmental impact. According to the experts, including the population in the initiatives are important, so that they understand their role and possibilities for change.

Observations in Research Project#2

The Research Project#2 “Zero Waste Co-Lab Project” was part of a research international collaboration between Federal University of Paraná (Curitiba/Brazil), Paulista University (São Paulo/Brazil), Aalborg University (Copenhagen/Denmark) and BOFA - Waste Management Company (Bornholm/Denmark). The project aimed to jointly develop research and innovation activities among Danish and Brazilian partners with thematic focus on resource streams and strategies for circular economy.

The second observation sessions were held on **April 2022**, carried out in technical visits and in person workshops in the city of Curitiba-PR and the city of Campos do Jordão-SP, with Brazilian and Danish participants from Project#2, among representatives from the city council and the waste ecosystem in both cities. The visits included cooperatives, city hall programs, projects and companies providing waste management services.

In the Municipality of Curitiba, the Municipal Secretariat for the Environment, through the Department of Public Cleaning, is the responsible for managing solid waste, through the execution of public cleaning services, carried out by contracted companies. The municipality offers the following services for household waste management (Figure 4.9):

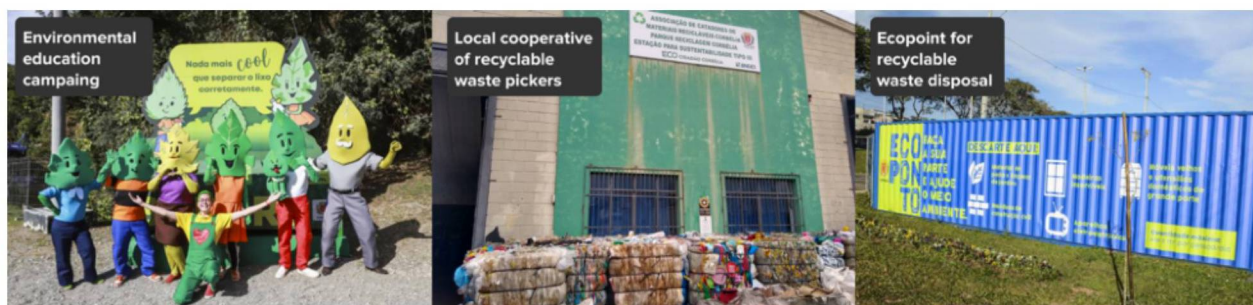


FIGURE 4.9 – Example of the observations in the city of Curitiba from Project#2

Source: the author and the municipality

- Collection of common / organic solid waste: destined for landfill;
- Collection of recyclable solid waste: carried out in partnership with accredited waste pickers associations. The municipality has two programs to promote recycling:
 - “Eco citizen” program - to strength the pickers organized in a system of associations, providing physical, administrative and managerial infrastructure for reception, classification and sale of collected material. According to the municipality, the program has 40 formal associations, and approximately a total of 1500 registered people working. The collection is carried out 3 times a week by box trucks (fractions: paper, cardboard, plastic, glass and metal);
 - “Green exchange” program - to promote the exchange of recyclable waste for seasonal food. Surplus production from small rural producers is offered for exchange at pre-defined service points. Every four kilograms of recyclable waste (paper, cardboard, glass, ferrous and non-ferrous scrap) is worth one kilogram of fruit and vegetables. Vegetable and animal oil can also be changed: every 4 liters of oil is worth 1 kg of food.
- Ecopoints: for receiving and correctly disposing of recyclable waste, electronic waste, construction waste from small renovations, vegetable waste (tree or grass pruning), unusable furniture, and community composting.

According to the municipality, Curitiba recycles 22.5% of solid waste, against 3% of the national average, and 26% of the material that arrives in the city landfills could be reused if properly managed (ABRELPE, 2020).

Waste communication through digital channels with citizens by the municipality of Curitiba is mainly based on the following channels:

- Municipal waste website (<https://coletalixo.curitiba.pr.gov.br/>): where people can check the frequency, time and days of collection, as well as the types of waste collected, tips for sorting and related programs and projects.
- Municipality social media (https://www.instagram.com/curitiba_pmc/): where people can follow campaigns, alerts, among different types of content about the city.
- Curitiba 156 app (<https://156.curitiba.pr.gov.br/>): where people can contact the municipality for service requests and complaints.

Recently the municipality re-launched an environmental education campaign from 1990, called "Família Folha / Family Leaf" (<https://familiafolhas.curitiba.pr.gov.br/>), mostly to reinforce the correct sorting of waste for recycling, but also as the main characters to communicate in a more didactic way the municipality initiatives for sustainability.

Campos do Jordão, the other municipality that participates on the “Zero Waste Co-Lab Project”, is a small touristic city located at Mantiqueira Mountains (under environmental protection) and part of the state of São Paulo. The city is located at an altitude of 1.628 meters, and is the highest Brazilian municipality.

In the Municipality of Campos do Jordão, the Municipal Secretariat for the Environment, is the responsible for managing solid waste, through the execution of public cleaning services, carried out by contract. The municipality offers the following services for household waste management (Figure 4.10):



FIGURE 4.10 – Example of the observation in Campos do Jordão from Project#2

Source: the author and the municipality

- Collection of common / organic solid waste: the collection is door-to-door and from containers and underground containers. The underground containers were implemented as a cleaning and educative strategy. The collected waste is destined for landfill, located in a distant district, due to the environmental protection of Campos do Jordão. To reduce and optimize the transportation, the municipality is developing a project of a transfer station in an urban park.
- Collection of recyclable solid waste: carried out in partnership with accredited waste pickers associations. The collection is door-to-door and from containers. The municipality has also campaigns to promote recycling such as e-waste drive-thru; e-waste collection at schools; used cooking oil; used sponge; bulky waste; environmental education;

According to Terra Campos, the company responsible for the public private partnership for the management of urban cleaning and waste collection in Campos do Jordão, 85,13% of the waste collected could be repurposed (53.4% is organic material that could be composted and 31.73% could be recyclable).

Waste communication through digital channels with citizens by the municipality of Campos do Jordão is limited, mainly based on the following channels Terra Campos social media (<https://www.facebook.com/TerraCamposAmbiental/>), where people can

follow campaigns, events and general educative information. The social media of the municipality (<https://www.instagram.com/prefeituradecamposdojordaio>) eventually shares waste related content.

Reflections from the Participant Observations within Research Projects

From the observations in both projects, it was possible to identify some categories of factors that can enable or inhibit transparency for sustainability on digital services enabling circular economy, more specifically in Brazilian waste management sector, as described next.

Governance transparency, influencing the participation of cooperatives and other key stakeholders — due to the low integration among the different actors (formal and informal) operating in the waste management system, governance transparency is limited, both for the operators working in the system as well as for the population as the end customer. This situation limits the capability to communicate the status of the waste system as well as its goals and targets towards sustainability. Despite the high relevance of local cooperatives in the waste management system in Brazil, their activities and impacts lack support and visibility. This is exacerbated by their precarious infrastructure and low level of technical knowledge. The study showed that the Brazilian waste management system is complex, involving different areas and stakeholders, with different needs and interests. This situation is affected by factors related to the (de) centralization of decision-making and power relationships on actors network (EGGERT and HELM, 2003; MCCARTHY and FLUCK, 2017; MATHEUS and JANSSEN, 2020).

Transparency on recycling performance, influencing the strategies towards waste prevention and sustainable behaviour — waste management service offerings are concentrated at post-usage or services for the end-of-life of products and goods within the value-chain (mainly due to regulations). Due to that, current strategies focus on closing resource flows through recycling, repair or reuse. Communication efforts focus on monitoring the amount of waste collected in relation to the waste sorted and recycled/reused. Despite efforts in sustainability education for the population, most waste management flows across the city, and associated services (e.g., computer repairs for supporting social enterprises), are effectively invisible for the population. This situation aligns with contextual approaches for promoting sustainable practices and behaviours. A transparency design approach would consider the arrangement of the service conditions and facilitators in a given context, that would trigger and support circular economy strategies towards waste prevention (SHOVE et al., 2012; NIEDDERER et al., 2016; MORELLI et al., 2021).

Analogue transparency, influencing the digital interfaces for interacting with people — in the digital space, communication about waste management in the cities is mostly dependent on social media platforms. In some cases, if the municipality can afford, proprietary channels such as a website or an app with limited functions. As a consequence, communication about waste in the cities requires the population to access multiple platforms, and sometimes information is duplicated and inconsistent. From the management side, digital data is not being used in municipal services as a tool for supporting policy making and strategic decision-making, specially due to the lack of technical knowledge and data integration of the digital information systems. Due to that, gathering basic data and information about the performance of the waste management system can be a challenge. This situation is in accordance with the one of the major barriers for transparency pointed by Schnackenberg and Tomlinson (2016), Matheus and Janssen (2020), related to the digital systems infrastructure.

The analysis of the key factors of transparency for sustainability in the observation contexts was in accordance with theory. The study contributed to a better understanding of these factors and their potential impact on transparency design initiatives. It is concluded that the analysis of the factors of transparency for sustainability on digital services could be integrated among the activities carried out at the early stages of the service design process. It would help to elicit and inform the transparency context, priorities, and limitations for design.

4.4 Criteria for the development of the intended artifact

The insights from the Literature Review and the Exploratory Studies I and II supported the researcher in understanding the problem space and delimiting the requirements for the intended. Figure 4.11 presents the timeline as a temporal reference for the studies conducted during this Phase 1 of the research.

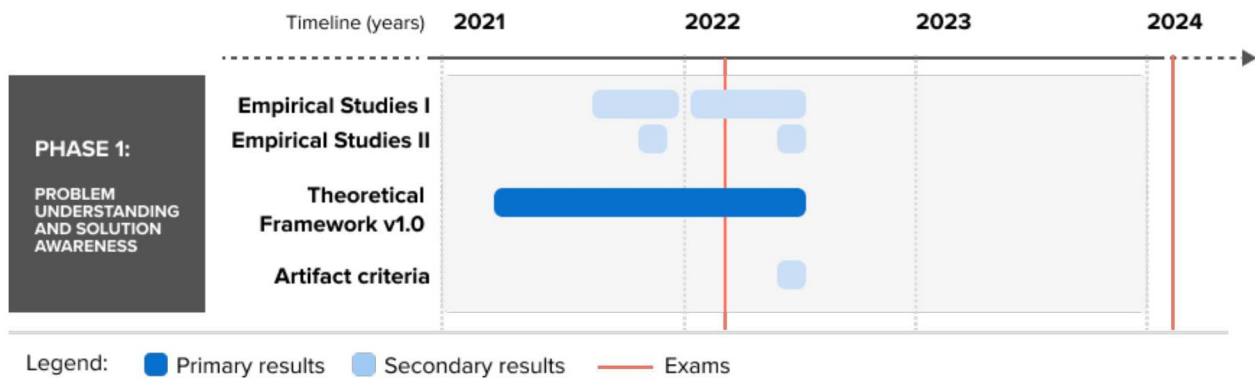


FIGURE 4.11 – Timeline of the research studies on Phase 1

Source: the author

Figure 4.12 shows the results from the cross-studies thematic analysis, and the key themes of insights that informed the criteria for the intended artifact. Based on the findings from the literature review and the insights from the exploratory studies, a total of **11 criteria** for the artifact developed were identified and classified in **3 categories** (Value, Format, Application). Construction and field test of the artifact in the Phase 2 has adopted these criteria throughout the research strategy (Table 4.6).

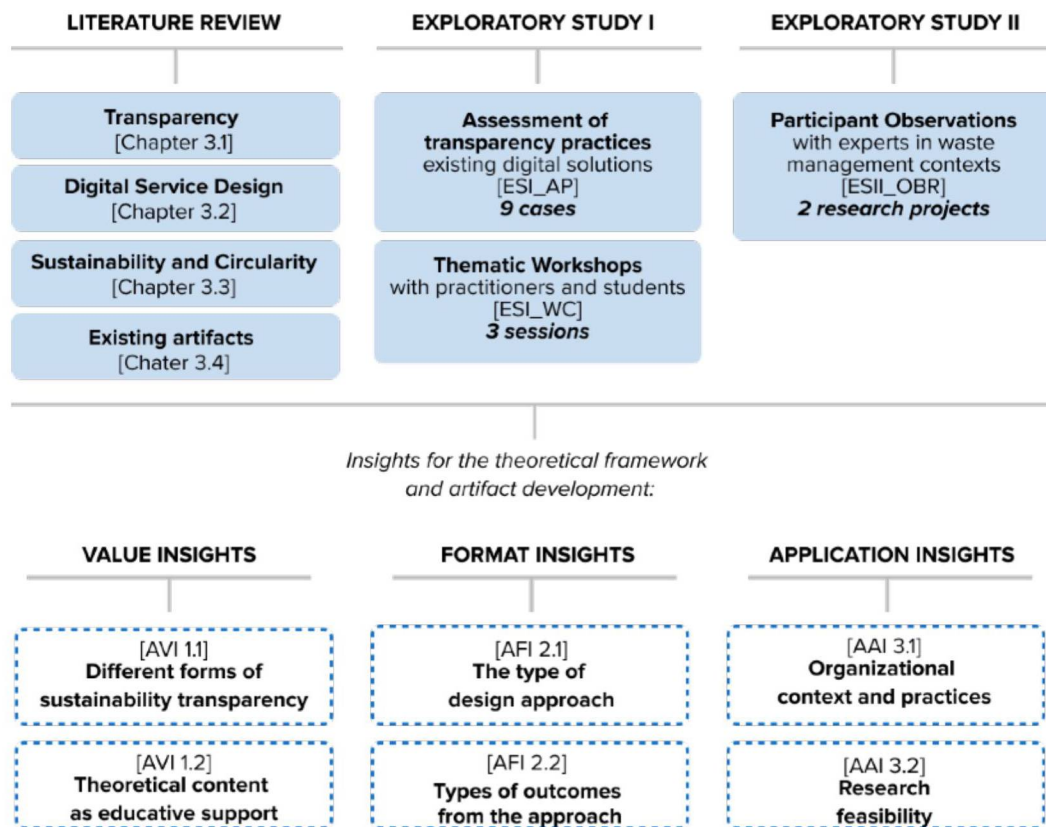


FIGURE 4.12 – Thematic insights for the artifact development criteria

Source: the author

Due to the emergence of the theme and lack of practical support for approaching transparency for sustainability in the Design field, the findings from the Research Phase 1 reinforced the need for an **artifact that support the integration of the concept in service design diagnosis and design education activities, addressing the theme as a form of practice**. Adding to that, the findings showed the need for accommodating different sustainability transparency priorities among the organizations. Brazilian waste management context reinforced the need for evidencing the social aspects that could be addressed with the transparency initiatives — to promote education for sustainability, sustainable behaviours and responsible waste management, and to promote transparent governance of all stakeholders, specially for social inclusion.

Regarding the artifact format, the findings from the Research Phase 1 reinforced the need for reducing the complexity of the theme, helping the audience anchoring and concepts and make sense of the practical activities as key outcomes. It was highlighted the need for having examples and addressing different levels of knowledge of the audience, and the need to favour the participation of beginners and experienced people in the topics.

TABLE 4.6 - Artifact development criteria

Code	Criteria	Class	Insight
AC 1.1	The approach should be based in active transparency — for promoting transparency as a means for value-creation towards sustainability.	Value	Forms of sustainability transparency
AC 1.2	The approach should embed the theoretical framework — for informing the critical components of its practice.		Educative support
AC 1.3	The approach should support the learning of sustainability transparency in digital services — for developing competences in the theme.		
AC 2.1	The approach should have a simple and easy format to learn and use — for providing guidance for application situations and reducing complexity in use by favouring already existing design methods and tools.	Format	Design approach format
AC 2.2	The approach should have a flexible format — to be more easily adapted and customized according to the intended context of use, issue to be addressed and learning.		
AC 2.3	The approach should practically support service design activities in understanding the current scenario — for identifying sustainability transparency problems and opportunities for change at the discover stage of a service design process.		Outcomes from the approach
AC 2.4	The approach should be able to integrate a continuous process — for evolving transparency for sustainability.		
AC 3.1	The approach should be developed based on the research resources — considering scope limitation, time and related costs.	Application	Research-feasibility
AC 3.2	The approach should be developed in validation cycles — for evolving and more easily accommodating changes, in line with the research method.		

AC 3.3	The approach should consider having a formal documentation and release of the final artifact — for enabling future studies and usages.	
AC 3.4	The approach should be based in short activities, rather than a few high demanding — favour stakeholders availability.	Organizational context

Source: the author

Besides the research feasibility requirements according to the selected method recommendations, local aspects needs to me considered during the planning, execution and analysis of the artifact during the evaluation cycles: a) to consider the lack of competencies in sustainability and the lack of integration of the digital information systems digital context; b) to consider the lack of sustainability knowledge, initiatives or legal instruments in the selected organizations and the consequences for design.

The findings presented on this chapter and the resulting requirements reported from Phase 1 supported the analysis and delimitation of the research problem.

Chapter 5 – Research Phase 2: Artifact development and evaluation

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5.1 Artifact proposition

Research Phase 2 deals with the development and evaluation of the artifact, which are stages of the Design Science Research method, described here through the cycles of Workshops based on Action Design Research as a field work strategy.

Based on the findings from research Phase 1, the artifact in this thesis was conceived and proposed with a diagnostic (see criteria AC 2.3 in Chapter 4 section 4.4) and an educative function (AC 1.3). The approach aimed to support a continuous (AC 2.4) form of practice at the early stages of the service design process, to help with the understanding the current sustainability transparency conditions and, at the same time, opportunities for innovation through design (AC 2.3; AC 1.3).

The initial proposal for the artifact composed a process Model, combined with Auxiliary tools that complement each other, derived from a creative exploration of a set of alternatives (AC 3.1; AC 3.2; AC 3.3; AC 3.4), as illustrated in Figure 5.1.

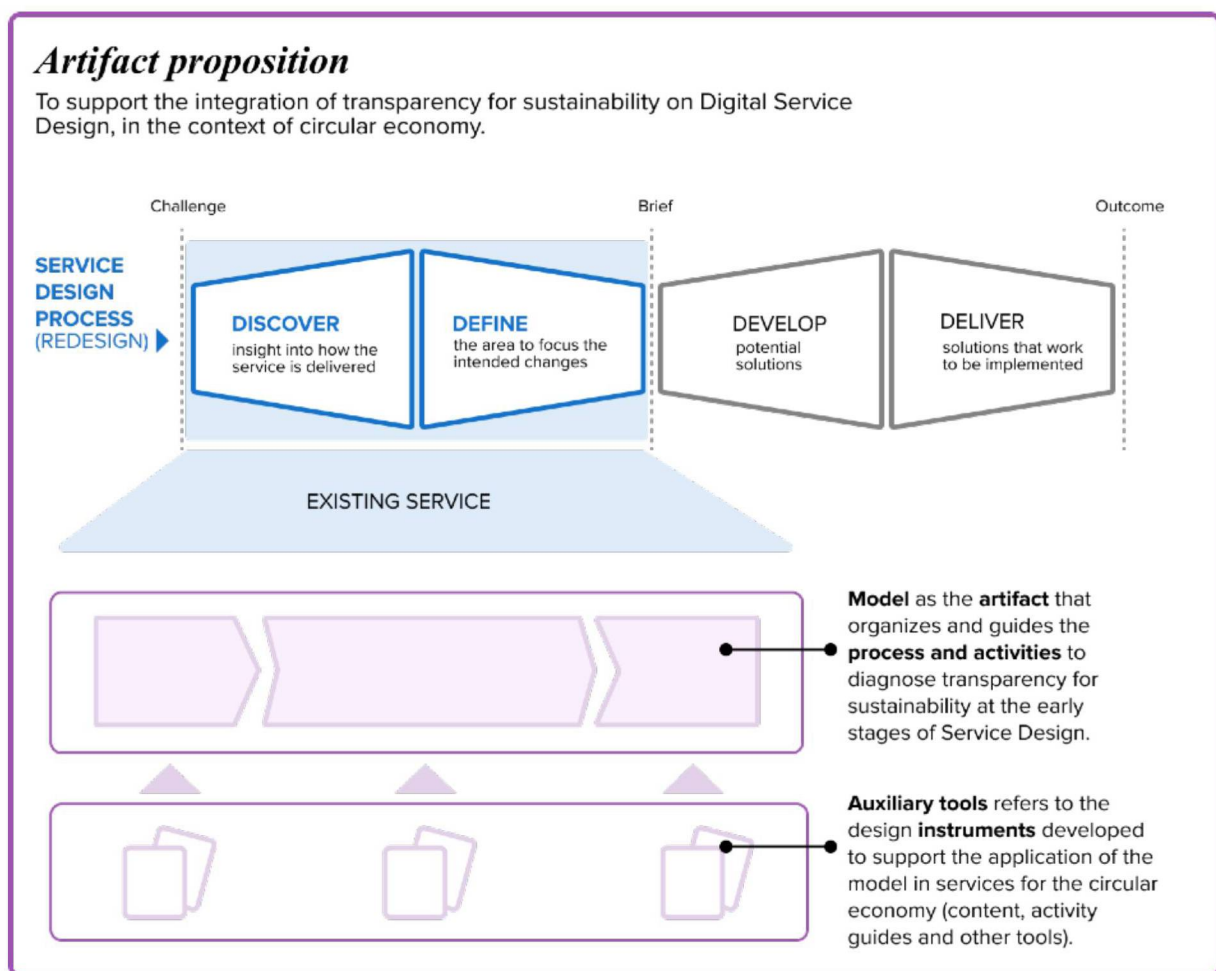


FIGURE 5.1 – Artifact proposition (Model) and Auxiliary tools

Source: the author

The Model artifact and Auxiliary tools were based on the Theoretical Framework as the core knowledge foundation to support the integration of transparency for sustainability on Digital Service Design, both on organizational as well as educational contexts (Figure 5.2).

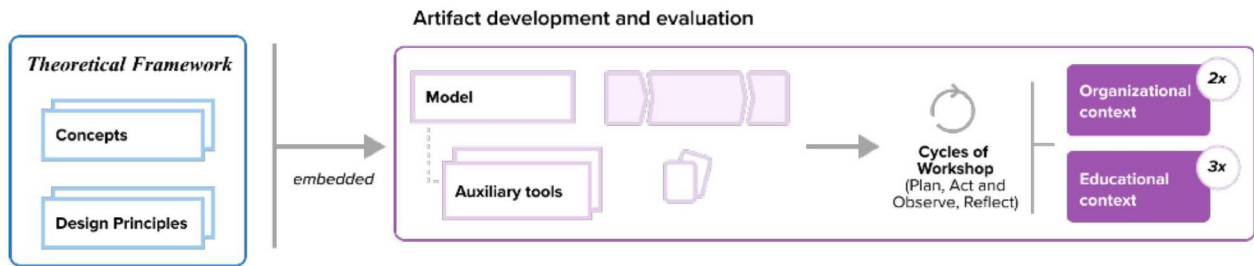


FIGURE 5.2 – Artifact and Auxiliary tools development and evaluation

Source: the author

The Model to support the diagnosis of transparency for sustainability on digital services (illustrated in Figure 5.3) was conceived to be integrated into the early stages of the design process, with focus on service redesign for improvement and optimization (AC 2.1; AC 2.2; AC 2.4). The Model was informed by the service evaluation guidelines proposed by Foglieni et al. (2018) to consider the key aspects of a service evaluation, combined with the general design process model from Design Council (2019), to be more easily adaptable to different application contexts.

The model was initially organized in three main stages: plan, diagnose and share. It proceeded as follows: first an organization considers to evaluate how an existing service satisfies transparency for sustainability criteria and, based on this diagnose, identify opportunities for improvement.

The first stage (“**PLAN**”) aims to support the setup of the diagnostic study. The main activity “**1.Prepare the preliminary settings for the diagnosis**”, aims to gather information to determine the target service for the study, key stakeholders to collaborate with and data availability. At the end of this first activity, the team is expected to be aligned on the service and transparency challenge to be addressed, in terms of goals and scope.

The second stage (“**DIAGNOSE**”), refers to specific data collection and analysis about the different service elements such as touchpoints, processes, resources and impacts. At the activity “**2.Describe the current service configuration**” the digital service is mapped and described to support the understanding of its current configuration. To achieve this, an initial interview with stakeholders can be conducted, a service walkthrough and other specific data collection according to the available sources (the System Map and Service Blueprint were the Service Design tools selected for visual representation).

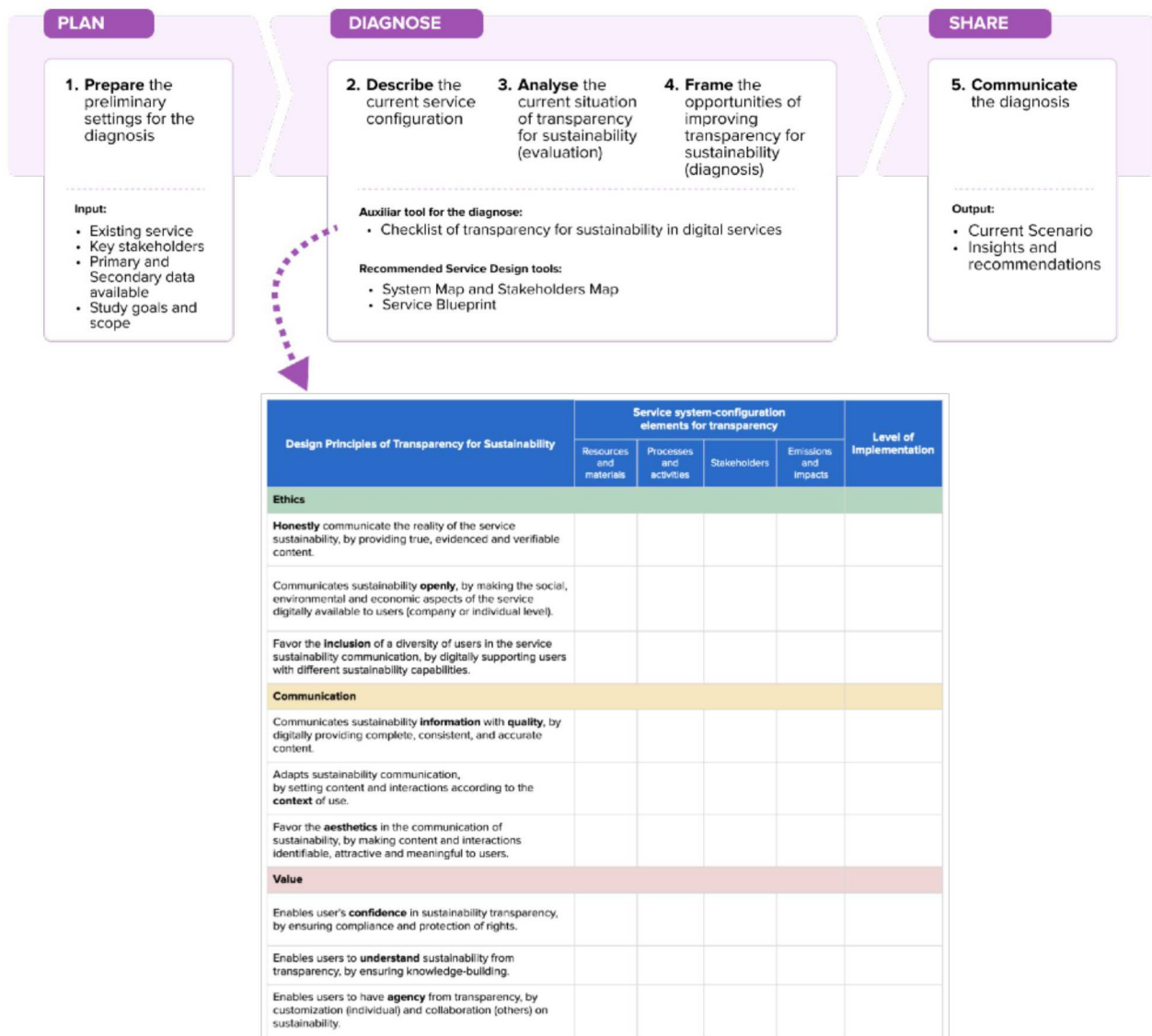


FIGURE 5.3 – Model and tool for integrating transparency for sustainability on the diagnosis of digital services (version 0.1)

Source: the author

Once sufficient information has been collected, it is conducted the activity “**3. Analyse the current situation of transparency for sustainability**”. For that, the transparency factors, service elements and design principles on the Theoretical Framework, informed the evaluation criteria, through the **auxiliary tool “Checklist”** developed to support analytical activities. A Likert 5-points scale was used to assess the level of implementation of the design principles on the service elements, ranging from 0 “not noticeable or implemented” to 4 “very strong”. The application of the checklist contribute to unveil insights on the emphasis and weakness in the current service, combined with other findings that support the diagnosis output.

Then, with the findings from the current situation it is possible to explore it is possible to explore and “**4.Frame the opportunities of improving transparency for sustainability**”, guided by the scope of transparency states desired on the Theoretical Framework.

The third stage (“**SHARE**”), aims to “**5.Communicate the diagnosis**” with stakeholders as they could learn from its outcomes and to devise further explorations or treat is as briefing for future actions. The output is formed by: a) description of the sustainability transparency current scenario; b) insights and recommendations to improve transparency.

The Model was developed to be conducted by a design research team in collaboration with the main stakeholders. The protocol was not intended to evaluate the performance of a digital service during its delivery, or its adoption or impact. It is an exploratory diagnose intended to evaluate the service configuration, informing the intervention opportunities for design, during the service development and optimization (*ex-ante*) (FOGLIENI et al., 2018).

5.2 Summary of the artifact development and evaluation

The first version of the artifact was submitted to a pilot study through an action design research based workshop, and its results informed the improvements for the next version of the artifact subsequently.

The cycles of artifact studies were conducted in a progressive manner between both organizational and educational application contexts. The cycles were clustered in: a) Organizational context - which refers the studies conducted with companies, aimed to support the integration of transparency for sustainability on design diagnosis activities, in the context of digital services as enablers of circular economy; b) Educational context - which refers the studies conducted with students and practitioners, aimed to support the integration of transparency for sustainability on design education activities.

Figure 5.4 presents an overview of all cycles of field work study conducted in Phase 2 of the research, in which the artifact was processed. It is important to highlight that the Theoretical Framework version 1.0 informed the artifact development refinement along these cycles. The final version of the Theoretical Framework based on the results from the field work is presented on the next Chapter 6, regarding the Phase 3 of the research.

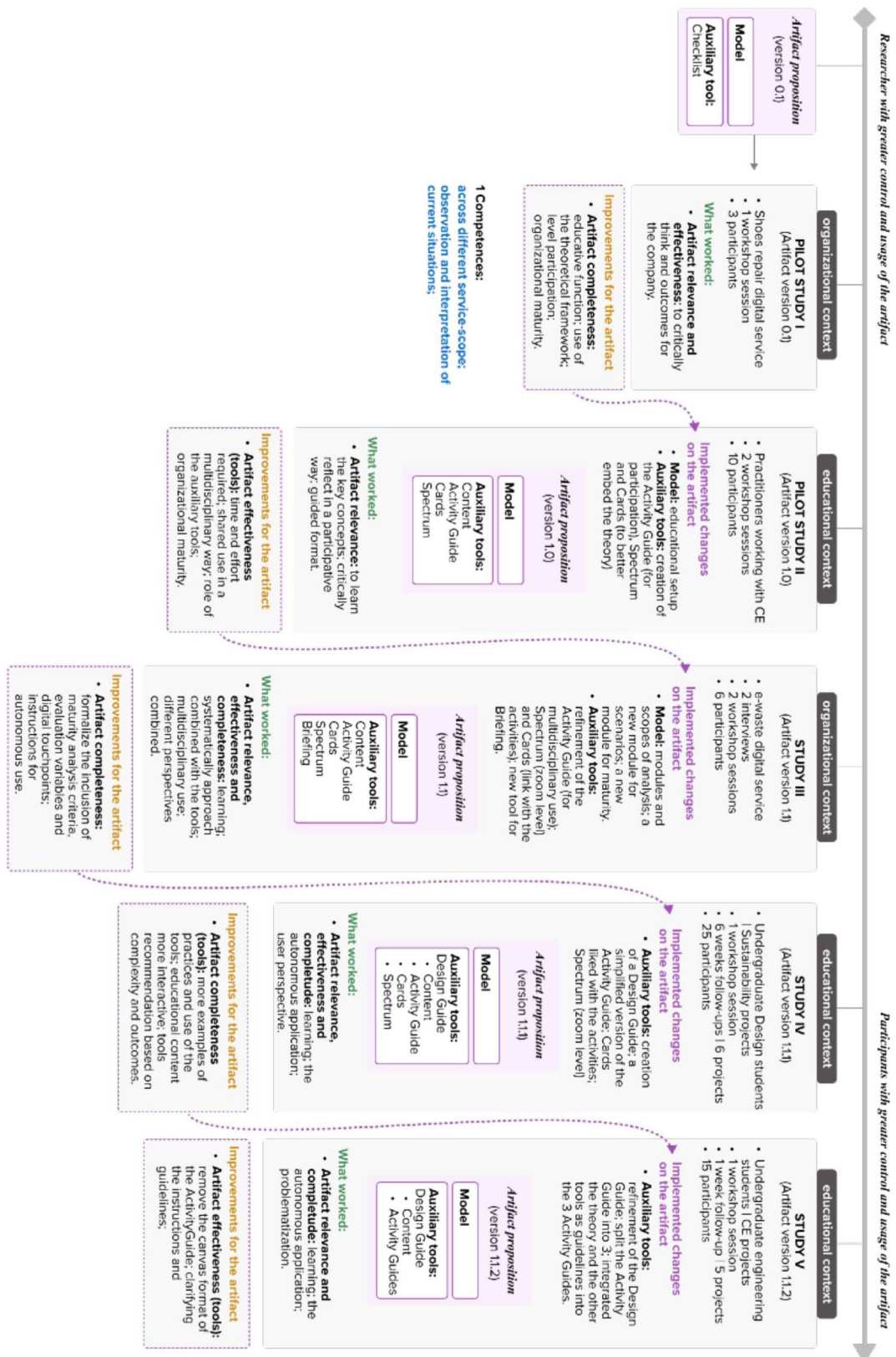


FIGURE 5.4 – Overview of the studies from Phase 2

Source: the author

Figure 5.5 presents the timeline as a temporal reference of the studies conducted in this Phase 2 of the research.

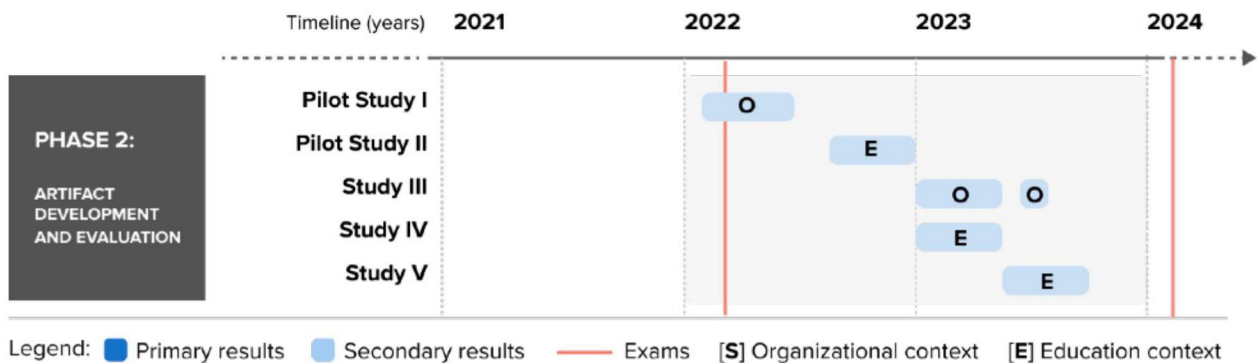


FIGURE 5.5 – Timeline of the research studies on Phase 2

Source: the author

The following sections in this chapter describes the results from each cycle of study in sequential order.

:: Organizational context

5.2 Pilot Study I: results from the study with a company in the shoe sector

5.2.1 Plan: study and artifact

Sampling

This pilot study aimed to better explore the artifact design, development and evaluation. It was conducted integrated with the field work activities of a scientific initiation research project of an undergraduate student (Eduardo Serraglio do Nascimento). For that purpose, a local and small company was selected to joint this study, from February to June of 2022.

The company, situated in Curitiba (Brazil) and with 8 years of experience, design and manufacture original and genderless handcrafted shoes. Its products employed materials extracted from waste produced from other industries, combining traditional handcraft techniques with design for handmade products. The company prioritize, whenever possible, the use of natural and recovered materials. At the same time of the research it had recovered more than 3 tons of materials that were originally destined to be discarded. The services offered by the company could be classified as product-

oriented, including services for selling, repair/maintenance, and customization of the shoes.

5.2.2 Act and Observe: artifact application

The application of the Model began by with the activity **Activity 1 - Prepare the preliminary settings for the diagnosis**. For that, a desktop research was conducted to gather public information in the official digital channels of the company. In a kick-off meeting, the company co-founders provided an overview of the business and the “*Care, maintenance and repair service*” was selected for the diagnosis. This service was considered by the company directors as its most important services besides the services associated with selling. It was also aligned the diagnosis goal as an exploratory study of the service transparency for sustainability to identify opportunities for improvement. The final customer of the company would not be directly involved in the process. The available digital data and interactions with the customer would be provided by the company and public secondary sources.

Activity 2 - Describe the current service configuration: in a discovery workshop session, the company co-founders provided an overview of the business and the “Care, maintenance and repair” service. In the same session, it was provided the customers profile, service offering, and market information, among others. For data collection it was used a Miro platform for a more participatory session with the company using the service design tools System Map and User Journey. The customer profile information was collected based on internal data the company already had. The main topics covered during this workshop with the company were:

//Describing the business

- Brand values
- Business vision
- Market and audience
- Circularity and sustainability

//Describing the customers and the service

- Customers profile
- Service value proposition, interactions, interface
- Service-system configuration

//Understanding transparency

- Drivers and needs
- Practices (meanings, materials, competence) and solutions
- Barriers and issues

After the session, the inventory of collected data was transferred to the Service Blueprint, helping to identify any missing data. In a second workshop a summary of the

discovery information representing the current situation was validated with the company. Figure 5.6 illustrates the service blueprint of the current situation, developed by the research team (in Portuguese).

The user journey with the service was organized in five stages: 1 - Shoes usage; 2 - Search for repair; 3 - Repair estimate; 4 - Repair execution; 5 - Delivery of repaired shoes). Highlighted in red were the potential transparency pain points identified.

The main type of customer of the repair service was represented by brand-loyal and recurring customers (due to the close relationship, they already know the brand and product). Because of that, the current value proposition of the repair service focuses on convenience and the technical quality of the repair.

A critical point in the user journey was the repair estimate stage, where the service provider assess the technical feasibility of the repair and the type of maintenance interventions that would be required. In some extreme cases, the repair could be assessed as unfeasible and the company would then offer the possibility of collect it and adequately manage its disposal destination. Thus, at this stage, there was a need to explain to the customer the technical assessment and budget regarding the feasibility and level of repair required, supporting the customer decision-making regarding repair services.

During the time of this study, the company mentioned the interest in developing a new page for the website, dedicated to better communicate to the customers the importance of taking care of their shoes. This would provide maintenance tips and instructions to get access to a repair service. At the time of the research most of this communication was either non-digital or through social media. During the service mapping, it was discovered that most of the digital interactions with the customers are through messaging apps (Instagram inbox, mail and WhatsApp), due to the relational characteristics of the brand.



FIGURE 5.6 – Pilot Study: example of the current situation Service Blueprint

Source: Nascimento (2022) and the author

Activity 3 - Analyse the current situation of transparency for sustainability: the collected data was used to reflect upon the service governance and practice of transparency for sustainability. In order to perform this process used the auxiliary tool “Checklist of transparency for sustainability in digital services”. The analysis was conducted by the research team and further presented and discussed with the company (Appendix 9).

The analysis revealed that transparency in this company was partially characterized by a formative state, mainly about the production processes, resources and materials (Figure 5.7). The company argued that sometimes they keep updates some general waste management indicators from their internal processes, resources and materials in the production stage, but not at the repair stage. Digital communication regarding care, maintenance and repair of the shoes was mostly dependent on individual direct messages with the customers, based on a simple protocol for reinforcing the service differential on the level of intervention on the shoes and the material choices in terms of cost and environmental impact.

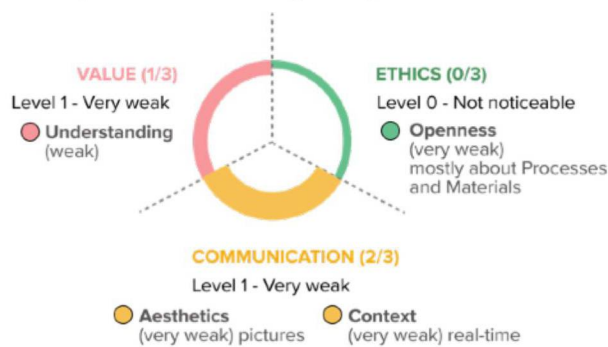
Activity 4 - Frame the opportunities of improving transparency for sustainability: according to the company director’s perception transparency for sustainability at repair/reuse stage was not a priority for their loyal customers. The loyal customer expects to continue using the loved and repaired product, having absolute trust on the manufacturer adequate ethics when taking care of their shoes.

*Transparency for sustainability diagnosis***Current situation****Overall Transparency state:**

☐ Opacity ☐ Normative ☒ **Formative** ☐ Participative
 (weak) at core-service encounter

Key factors influencing transparency:

- Users level of trust
- Company communication competences

Level of implementation of the Design Principles on the service elements:**Example of the main practices for transparency:**

Discover the materials and conditions to enable the repair (T16.b)



Message app

Discover who repair the shoes, how and why (T7)



Social media Message app

**Opportunities for improvement****Service encounters to improve transparency:**

Budget and repair execution

Key recommendations:

- To **improve** transparency in customer **decision-making touchpoints**
- To **improve** the **ethical transparency** of the sustainable practices that were **already being practiced** by the company
- To **open** information about the **impacts and emissions** of the service

FIGURE 5.7 – Pilot Study: Example of the diagnosis results

Source: Nascimento (2022) and the author

Due to the circular characteristic of the business, the main opportunity aligned with the company was to improve transparency in customer decision-making touchpoints. It was recommended to include ethical aspects in the communication to reinforce and bring to the surface the sustainable practices that were already being practiced behind the scenes by the company. For that, other types of content were suggested to be opened for the customers, including information for helping them to self-evaluate the shoes conditions and discover care, maintenance and repair alternatives. Also, to be more open and provide evidence on the known and unknown environmental/social/economic impacts of the repair service and products. One of the founders presented some key questions that should be answered to the customer: *“What is this guy [supplier] providing me? What is the origin of this? What is his process for treating raw materials? Is this certificate real?”* (Pilot Study I, Participant “Co-Founder 3”)

Activity 5 - Communicate the diagnosis: the results were presented to the company directors, including the service maps to better illustrate the transparency findings and respective innovation/improvement opportunities.

5.2.3 Reflect: clarification of the learnings

The evaluation of the first version of the artifact, aimed at assessing the relevance, effectiveness and completeness of the model and auxiliary tools (checklist and content) developed with the artifact. This assessment has used qualitative data collected from the company participants individuals perceptions and feedback questionnaire (Appendix 10), supported with the direct observation notes carried out by the research team.

Model: relevance, effectiveness and completeness

Participants of the pilot study consider the protocol activities totally relevant and effective for the diagnosis goal. The protocol showed completeness and confirm its suitability to be conducted by the researchers. The study showed that the participants from the company were interested in having a more active role in the process.

Checklist tool: relevance, effectiveness and completeness

The *Checklist* (assessment tool) was perceived as totally relevant by the participants. They participants agreed on the tool effectiveness to assess the proposed criteria, but sort of agreed on the tool completeness. Although participants have not used the tool itself, but presented to how it works and the results from its application, their reported perception showed that the tool needed to be improved in order to be used by practitioners or non-researchers.

Content tool: relevance, effectiveness and completeness

Although the content (derived from the Theoretical Framework) was perceived as totally relevant the company's participants had effectively reduced contact with the artifact. Their feedback showed that due to their lack of structured forms of knowledge on the theme, most of their practices were based on other business references and internal experiments: *“we have some brands with a similar purpose to ours, which we take a look from time to time to see what they are doing... with this material from you, it helps to organize the possibilities and where it makes the most sense for us”* (Pilot Study I, Participant “Co-Founder 2”).

Clearly the limited amount of time participants had to understand the theoretical content and its practical implications affected the results of the evaluation process.

Recommendations for improvements

The pilot study showed that the first version of the artifact and tools has a viable potential to achieve its goal in supporting the company understanding the current sustainability transparency situation and opportunities for improvement or innovation.

The analysis was based on the qualitative data from the artifact and tools evaluation, confronted with the artifact development criteria (value, format, application) (Chapter 4). The aspects which **worked** were:

- ✓ It has stimulated the participants to critically think about the service conditions and offerings through the diagnosis activities (AC 2.3);
- ✓ It has introduced a new format to frame and discuss transparency for sustainability (AC 2.1);
- ✓ It has provided practical insights and opportunities to the company to further explore and implement the concept (AC 1.1);

Also, the study showed that the next version of the artifact and tools requires further **improvements**, mostly regarding its **completeness** criteria:

- ✱ [CHANGE_P.1] The **educative function** (AC 1.3), by editing the protocol to include a prior activity for levelling basic knowledge as a training/course;
- ✱ [CHANGE_P.2] The **theoretical framework components** (AC 1.2), by reviewing the activities and tools needed to better embed the framework into the practical application;
- ✱ [CHANGE_P.3] The **level of participation** required by the proposed approach as a form of practice (AC 2.1; AC2.2; 2.4), by changing the role of participants from merely consultation to greater involvement and inputs along the activities and tools usage;
- ✱ [CHANGE_P.4] Explore the use of the drivers and influencing factors in understanding the **maturity in transparency for sustainability** of the service;

In summary, this study was helpful for the researcher to put in practice the propositions with a real company to gather empirical data to refine the artifact.

Limitations of the study

The potential biases and limitations which affected this study and needs to be considered in further developments includes:

- The sustainability transparency evaluation was exploratory, which means that it was not driven by a specific issue or problem reported by the company;

- The diagnostic approach focused on WHAT were the strengths and the pain points candidates for optimization, rather than providing support on HOW to design/implement the changes. Nevertheless, the outcome from the application could be used as input to development of an action plan;
- The context of the company and selected service: small business, and medium level of sustainability maturity, high customer loyalty, perception of low need for transparency and low level of digitalization.

The results from Pilot Study I helped to inform the planning of the Pilot Study II, described next.

:: Educational context

5.3 Pilot Study II: results from the study with practitioners

The Pilot Study II aimed to test the artifact within a design education context. The next sections describes the improvements implemented into the artifact and tools, the results and reflection from the empirical application.

5.3.1 Plan: study and artifact

Sampling

The selected audience for the workshops were professionals in companies effectively working with waste management or circular economy initiatives. **Two online sessions** of an educational workshop were offered to enable a greater participation of people. A total of **11 participants** attended the sessions, representing companies from sectors of: appliance manufacturer, corporate and technology consulting, fashion and textile, cosmetics, recycling and social business, design and sustainability education, marketing and communication.

Artifact refinement (version 1.0)

This revised version of the artifact incorporated the improvements identified in Pilot Study I. Based on the recommended improvements, the following changes were implemented (Figure 5.8):

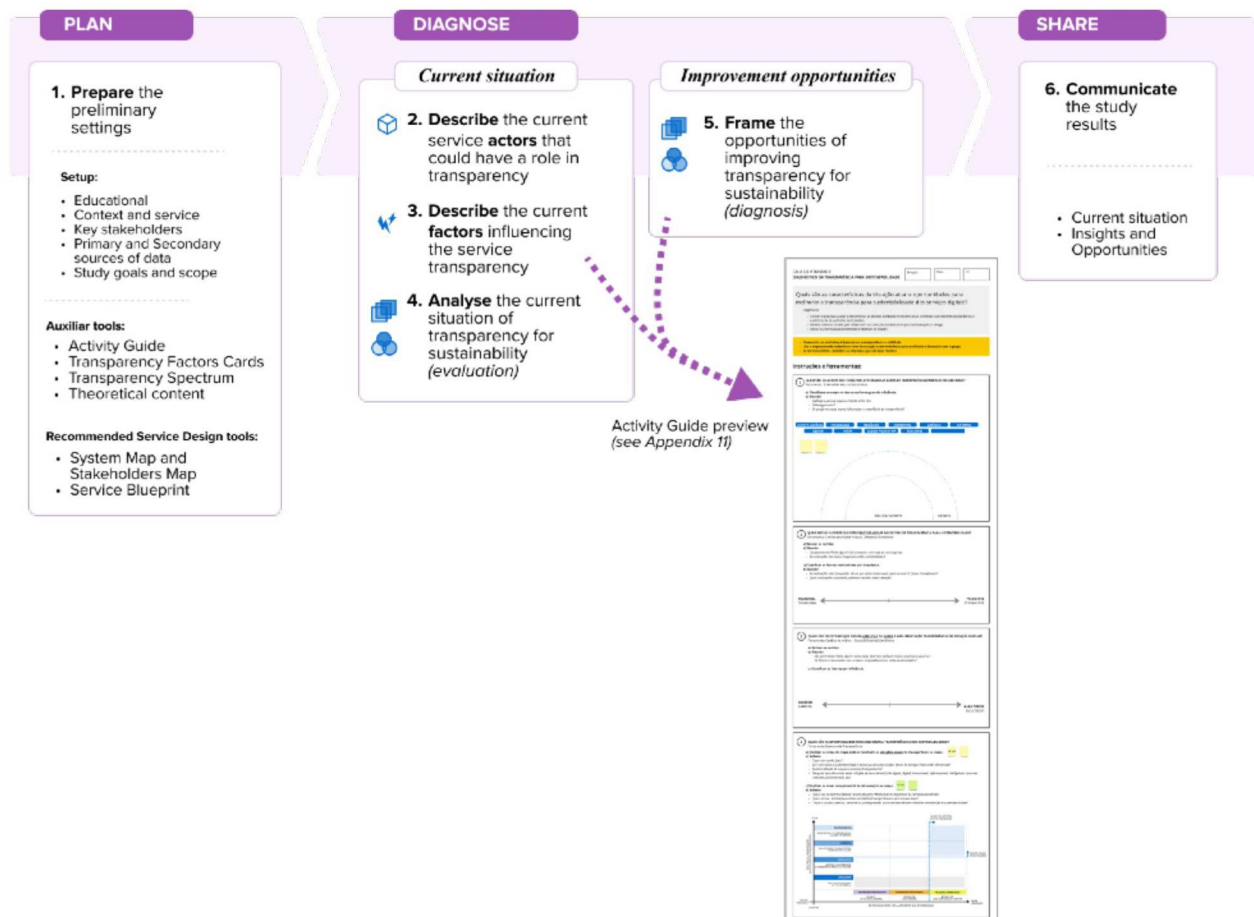


FIGURE 5.8 – Pilot Study II: Model and tool for integrating transparency for sustainability on the diagnosis of digital services (version 1.0)

Source: the author

MODEL and TOOL - COMPLETENESS and EFFECTIVENESS

- [IMPLEMENTED_1.1] The inclusion of an educational setup at the first activity, aimed to teach the participants of the workshop and levelling key concepts, was understood as a way to better support them in subsequent activities;
- [IMPLEMENTED_1.2] The creation of an auxiliary tool named “*Activity Guide*” as sheet/template based on the *Model* activities, as a way to enable the participants to have a more active role during the application. The researcher acts as a facilitator of the process, guiding the participants during the activities;
- [IMPLEMENTED_1.3_1.4] The “*Activity Guide tool*” embedded two other auxiliary tools, to support the participants to have a more active role during the workshop. In this way, the activities of the *Model* were more clearly associated with specific constructs of the Theoretical Framework (version 1.0)(Chapter 4), with respective tools to instrument its implementation. Notice that on this version of the artifact, the *Checklist tool* was not improved and included as an auxiliary tool for evaluation.

Both workshop sessions followed a similar protocol (Table 5.1), based on the *Model* version 1.0 (Figure 5.8).

TABLE 5.1 - Pilot Study II: protocol of activities and expected outcomes from the workshop

Duration	Activity	Expected outcomes
2 weeks	Pré-Workshop Disclosure of the invitation for voluntary participation in the workshop and registration form.	Participants registered in one of the workshop sessions and accepted the research ethical terms.
20 min	During-Workshop: Introduction 1. The participants check-in; 2. The facilitator briefs the group about the purpose and agenda.	Participants understand the purpose of the workshop and planned activities.
40 min	During-Workshop: Conceptual foundations and examples 3. The facilitator gives a short presentation clarifying the concepts and examples to illustrate them. 4. The facilitator open for questions before the practical exercise.	Participants reflect on the key concepts, make comments and questions.
40 min	During-Workshop - Practical exercise 5. The facilitator invites the participants to join a collaborative online board; 6. The facilitator explains the exercise and the Activity Guide. The participants were invited to reflect on the characteristics of their context of practice (as and individual exercise). The participants: a. describe and reflect on the key transparency actors; b. reflect and classify the transparency factors according to a scale; c. describe and locate the current situation of transparency on the spectrum; d. reflect and locate on the spectrum the identified opportunities; 5. The facilitator invites the participants to explain and share their perspectives with the group.	Participants critically reflect about the practices adopted in their current context of work, and reflect on the conditions for approaching transparency for sustainability.
20 min	After the Workshop: Closing and feedbacks 6. The facilitator closes the workshop and asked the participants for answer the evaluation survey.	Participants gives feedback on the workshop gains and pains.

Source: the author

The “Activity Guide” template implemented the *Model* in four group of activities, with the support of the respective auxiliary tools (Appendix 11). The tool “*Transparency Factors Cards*” was conceived to support the activities 2 and 3 of the *Model* in Figure 5.8). The format of cards was chosen as it is easier to adapt its content in online and presentational modes of workshop. Furthermore, it offers flexibility (AC 2.2) to expand the set of cards if needed or even to use only the most relevant for each application context. The cards content referred to the *transparency factors* from the Theoretical Framework.

The field of each card consist of: a category of factor; title; picture/illustration (optional); brief description and example.

A tool in the format of a matrix, entitled “*Transparency Spectrum*” allow a two-dimensional and progressive representation of the state of transparency in each case. It allows customization of the axis according to the study goals and intended level of detail. The spectrum supports the activities 4 and 5 of the *Model* Figure 5.8, by allowing the participants to locate the current situation and envision opportunity areas.

5.3.2 Act and Observe: artifact application

The application of the Model began with the **Activity 1 - Prepare the preliminary settings**: the workshop was planned to be conducted in an online/remote mode. The *Activity Guide* was built in the Miro platform (Appendix 11). Since the workshop sessions were planned to mix participants from different sectors and companies, the exercises were individual and its results have to be share with the group. Hence, the workshop relied on the participants previous experiences and knowledge (primary and secondary data were not collected). The workshop employed the strategy of a self diagnose as a form of critical reflection.

Both workshop sessions followed a similar format based on the protocol described previously on Table 5.1. At the begging of the workshop, the theoretical foundation was presented to the participants as part of the educational setup. According to the participants the content resonated with their working context, mainly in the technological side of data optimization and manipulation in digital products and services. It was a conclusion also in areas dealing with compliance and certification audits. The notion of transparency in South American market was perceived as recent and influenced by international practices.

Activity 2 - Describe the current service actors that could have a role in transparency: a pattern among the participants was consider that actors closer to the customer such as retailers, are among the actors that have the least influence on transparency. The actors pointed with higher influence were from business, legal, marketing/media areas. In more regulated sectors, such as appliance manufactures, the legal actors were considered the most influential role for transparency in the company.

Activity 3 - Describe the current factors influencing the service transparency: participants classified the maintenance of the brand image and marketing as the main motivation in organizations for approaching transparency for sustainability. Thus, such perception could be characterized as a more passive attitude and less centered in the

broad customers needs. Then, customer complaints presented a reduced impact on the promotion of some sustainability practice.

Regarding the current factors that enables or inhibits the implementation of transparency, the results were less uniform among the participants, due to their different professional backgrounds. A common reflection among the participants was that the company internal factors were the ones with greater potential to enable or inhibit transparency, while external user factors weren't perceived as influential. The most enabling factors in companies were: the competitive advantage of the company and the level of trust of customers in the brand. The inhibiting factors in companies were: fear of the company exposing/opening itself, the level of openness, secrecy of the internal processes and the complexity of the organization.

"Most of the factors inhibits ... in greenwashing, sometimes you have a product that they [fashion brands] go there and put the sustainable seal on it, but it isn't. We know that because of the size of the production, it is not possible to be an organic cotton. They also don't mention the origin [cotton]." (Pilot Study II, Workshop 2, Participant "Fashion Designer", Textile industry)

Activity 4 - Analyse the current situation of transparency for sustainability, Activity 5 - Frame the opportunities of improving transparency for sustainability, and Activity 6 - Communicate the study results: both activities were carried out together. The participants were asked to locate the areas in which where their companies transparency offerings were located using the *"Transparency Spectrum"* tool containing *transparency state* versus the life-cycle stage. According to the participants, most of the offerings of their companies are concentrated at the purchase stage as an informational support for buying the right product:

"Many people buy the wrong product, so it is a bad purchase because the person bought the wrong shampoo or wrong foundation and it goes to waste. I think transparency can help people not make the wrong purchase and not throw away the product without needing to". (Pilot Study II, Workshop 2, Participant "UX Designer", Cosmetics industry)

"We have invested in creating a size table and an illustrated step-by-step guide so people can find out exactly their size and make the right purchase online. This was a concern that we had to make it very transparent and not make mistakes, because otherwise the person makes the wrong purchase and then they see that it doesn't fit properly, they don't communicate to make the exchange because". (Pilot Study II, Workshop 1, Participant "Fashion Designer", Fashion industry)

Regarding the opportunities, participants from manufacture companies pointed the communication about the real cost of the products to justify the selling price. Awareness campaigns for new circular offerings required customer to change their reuse or recycle behaviour, both at the purchase stage and as a formative transparency state across life-cycle stages.

5.3.3 Reflect: clarification of the learnings

The evaluation of the artifact version 1.0, aimed at assessing the relevance, effectiveness and completeness of the *Model*, through its *content* and *tools* developed with the artifact. The evaluation also assessed the workshop contributions for the participants learning in terms of knowing the content, knowing why to act in the projects/challenges, and knowing how to do the activities. This assessment has used qualitative data collected from the participants perceptions and feedback questionnaire (Appendix 12), supported with the direct observation notes.

Content tool: relevance, effectiveness, completeness & learning impact (know what and why)

The workshop content referred characterized as an educational activity, aimed to support the participants in understanding the key fundamental concepts for the further exercise. Most participants agreed on the relevance, effectiveness and completeness of its content. The main feedbacks were directed to the need of **improving the time dedicated for the learning activity versus the practical activity**.

“The theoretical content is very well prepared, however, it could be synthesized to allow more time for the workshop, considering that the dynamics are a little more complex.” (Pilot Study II, Workshop 1, Participant “Digital Designer”, IT industry)

“We need more time for criticism and reflection.” (Pilot Study II, Workshop 1, Fashion Designer”, Fashion industry)

“The content is excellent and it was well conducted.” (Pilot Study II, Workshop 2, Product Manager”, Business Consultancy)

“It helped to associate the circular strategies with digital services, as these strategies are generally associated with physical products, making it easier to understand how they can be approached.” (Pilot Study II, Workshop 1, Industrial Designer”, Home Appliance Manufacturer)

The researcher observed that this teach/learning activity at the beginning of the workshop was important to help with the knowledge levelling up the participants and to stimulate the critical dialogue between them, since the class was formed by people with different backgrounds and the complexity of the theme itself. Although participants

indicated that they would like to have more time for practical activities, the teach/learning activity stimulated them to feel conformable in sharing their own perceptions and experiences on the theme in a critical manner.

The participants discussed on their **lack of belief in transparency for sustainability as a real practice in organizations**. Despite the participants agree on the relevance of the theme, in their organizational contexts transparency for sustainability was perceived more as a discourse than a practice, and that it was mainly characterized by opacity and “green washing”.

“Some of the third-party companies checking and reporting transparency of the brands does not appear to be responsible for the veracity of the data obtained, claiming that this is the brand responsibility. Thus, how can we trust these transparency? It seems like no one wants to be responsible.” (Pilot Study II, Workshop 2, Fashion Designer, Fashion industry)

“With the current policies and size of these companies, it is “cheaper” to pay the fines when there is an escape than to change the entire system, business as usual and lose market. This has been happening with LGPD (Brazilian General Personal Data Protection Law).” (Pilot Study II, Workshop 2, Product Manager, Business Consultancy)

In this sense, the **honesty** characteristic of the transparency **ethical responsibility** were the base for this discussion, pointed as the most fragile among the organizations.

Activity Guide tool: relevance, effectiveness, completeness & learning impact (know why and how)

Considering the educational as well as critical reflection intended by the workshop, the participants partially agreed on the relevance and completeness of the activity guide, and totally agreed on its effectiveness.

“... yes it helps, the route makes sense. Helps to give vision or bring vision. this type of exercise give us a dimension or awareness on possible paths or bring perspectives that we do not had in a mature way” (Pilot Study II, Workshop 1, Participant “Digital Designer”, IT industry)

“... research that can be very well applied in the business context, the reflections are the start” (Pilot Study II, Workshop 2, Product Manager, Business Consultancy)

“I thought it was very cool, very good, very complete material, we go through a thought session that narrows down” (Pilot Study II, Workshop 2, Fashion Designer, Fashion industry)

“if the objective is to make people reflect, it does” (Pilot Study II, Workshop 2, Fashion Designer, Fashion industry)

“I really liked the information provided, knowing that this can be transformed into a tool to create a type of guide and try to apply it in different sectors is very interesting” (Pilot Study II, Workshop 1, Participant “Digital Designer”, IT industry)

During the Activity 2 (mapping service actors that can have a role in transparency), the participants mentioned that the types of actors that come out as a proposal were sufficient. However, at the same time the participants expressed that it would be more impactful to **conduct this activity with other areas of the company**.

“I thought it was really cool and it could be interesting to bring the other stakeholders to the table, because there is a lot of information that I don't have or can't discuss now”. (Pilot Study II, Workshop 2, Participant “UX Designer”, Cosmetics industry)

“It was an opportunity to exchange ideas with other sectors/industries and get perceptions of our areas, which you can share.” (Pilot Study II, Workshop 1, Industrial Designer”, Home Appliance Manufacturer)

During Activity 3 (scanning the transparency drivers), in face of the notion of the participants of a corrupted system, especially in the context of big companies and industries, participants raised questions such as “*what are the interests or motivations of these actors?*”

“... we are dealing with human beings and these lines of who is doing right and wrong. I believe that when we have this theoretical foundation, research, analysis, thinking about the whole and all this research that you have already done and a filter of what can be implemented, it accelerates our thinking process and this work is very important.” (Pilot Study II, Workshop 1, “Project Manager”, Waste Management)

The researcher observed that the participants were more engaged in the guided discussion, rather than filling the templates of the activities.

“... more examples for each activity so that the people immediately understands what they need to do.” (Pilot Study II, Workshop 1, “Design Professor”, Design Education)

One of the possible reasons for that could be the limited availability of time for the workshop and the need to better stimulating the participants in how to use the tools and materials.

Transparency Factors Cards tool: relevance, effectiveness and completeness & learning impact (know how)

The participants agreed on the relevance of the tool and totally agreed on its effectiveness and sort of agreed on its completeness. However, no suggestions were made as to which cards would be required to obtain a more complete set.

The researcher observed during the activities that the cards needed more details and the instructions of the activities which used the cards could be more clearly stated and directed to avoid people get confused.

Transparency Spectrum tool: relevance, effectiveness and completeness & learning impact (know how)

The participants agreed on the relevance, effectiveness and completeness of the tool. The main feedbacks were to directed to **improve the time dedicated for the activity** (and to process new information and the operation of the tool itself) and the need for more practical examples.

“I considered it one of the most interesting activities in the workshop, but we didn't had enough time to do it and discuss it, which frustrated me. Maybe you should rethink the need for cards that require reading and understanding from the participant, to leave more time to the spectrum” (Pilot Study II, Workshop 1, Fashion Designer”, Fashion industry)

“I think it was super easy to do and the reflection in this graph was super cool.” (Pilot Study II, Workshop 2, Participant “UX Designer”, Cosmetics industry)

The researcher observed that in activities 4 and 5, participants had more difficulty executing them. One of the possible reasons for that could be the limited availability of time for the workshop, since both activities based on this tool occurred at the end of the workshop. In fact, in both workshop sessions the tool had to be conducted at once, influencing the overall perception of the activity and the tool.

Regardless of the time factor, the researcher also noticed that participants were having difficulties to identify transparency need and status in their current context. One assumption was that in some cases, the participants actually didn't know or remembered any example of situation associated with this concept on their organizational environment. Also, due to the scope and limitations of this workshops, the “*Spectrum tool*” was configured to a macro zoom level, with a more strategic orientation rather than a tactical or operational one. Hypothetically, if the tool has been applied at micro level and with more time, the participants could connect more easily the content with their work contexts.

Additionally, the *opacity state* (no communication) in the tool, was mentioned by the participants as helpful, because lot of companies actually are into this state of transparency. One participant highlighted that considers transparency as a binary state, with different maturity levels operating at the same time on the same organization, rather than a continuum of possibilities.

Recommendations for improvements

The study showed that this version of the artifact and tools (version 1.0) partially achieved the criteria established on Phase 1 (Chapter 4), with direct impact in its efficacy in supporting the participants understanding about sustainability transparency and critically reflect about opportunities for improvement and innovation in their contexts of practice.

The analysis was based on the qualitative data from the artifact and tools evaluation, confronted with the artifact development criteria (value, format, application) (Chapter 4) and the improvements implemented into the artifact for this study. The aspects which **worked** were:

- ✓ The educational activity has enabled the participants to learn the key concepts and supported the practical activity [IMPLEMENTED_1.1] (AC 1.3);
- ✓ The Activity Guide has guided the participants to have an active role in the workshop, and critically think about the conditions of transparency for sustainability in a more participative way [IMPLEMENTED_1.2] [IMPLEMENTED_1.3_1.4] (AC 1.3; AC 1.1);
- ✓ It has introduced a new format to describe and discuss transparency for sustainability, through a set of auxiliary tools [IMPLEMENTED_1.3_1.4] (AC 2.1);
- ✓ The overall activities of the Activity Guide has directed the transparency for sustainability critical reflection with more focus on the governance space [IMPLEMENTED_1.3_1.4](AC 1.1; AC 1.2).

Also, the study showed that the next version of the artifact requires further **improvements**, mostly regarding its **effectiveness**:

- ✳ [CHANGE_A1.1] The **time and effort required** (AC 3.4), by balancing the protocol and activities, to better support different learnings and participants.
- ✳ [CHANGE_A1.2] The **shared use in multidisciplinary teams**, by considering the joint use of the artifact in the same session by different stakeholders and perspectives.
- ✳ [CHANGE_A1.3] The “*Transparency Factors Cards*” tool, by rethinking its role in the activity and embedding more **details and context to their usage**.

- ✱ [CHANGE_A1.4] The “*Transparency Spectrum*” tool, by rethinking its role in the activity and exploring different **configurations of axis and zoom levels**.
- ✱ [CHANGE_A1.5] The **service transparency maturity**, by considering the different types of organizations, responsibility and attitude regarding transparency for sustainability.

In summary, this study was helpful for the researcher to put in practice the proposed artifact and tools under development with a diversity of participants experiences and contexts for sustainability transparency, gathering empirical data that helped with improvement directions.

The researcher observed the field study relevance and viability of adopting an educational approach with the artifact and tools, despite the complexity and need for deeper understanding of the participants on the theme. The logic of Theoretical Framework in deconstructing the key components to approach transparency for sustainability, was also reinforced as a differential of the proposed artifact. The Model through the Auxiliary tools enabled the structured reflection and analysis from the market perspective, bringing it into different contextual realities of practice.

The result of this reflection pointed that transparency for sustainability in corporate environments is a complex challenge and, despite its relevance, unfortunately it is not necessarily on the agenda of the organizations. Such situation raised the researcher's concern about whether transparency for sustainability should be a matter of priority or a requirement for organizations. The situation also reinforced the relevance of having a more rich set of tools to support those interested on embracing transparency, facilitating the task as much as possible.

From an individual learning perspective, the study shows that it was very fruitful for the participants. The researcher observed that the study fostered critical thinking for sustainability through transparency, as a key competence. The information gathered on the workshops showed that integrating transparency for sustainability in design will not necessarily change the culture of the organization where each participant is directly involved. However, it can be a very helpful facilitating tool for those who are at least ethically committed to transparency for sustainability.

Limitations of the study

The potential biases and limitations which affected this study needs to be considered in further developments, including:

- The sustainability transparency diagnosis was exploratory, which means that it was not driven by a specific issue or problem reported by the organizations represented by each participant;
- Due to the variety of organisations represented on the workshops it was not possible to assess the efficacy and potential impact of the artifact when applied for diagnostic purposes;
- Most of the participants who joined the workshop were from big companies or corporate environments and, therefore, the generalization of findings to the context of micro and small organizations is limited;
- Time constraints reduce the possibility of deepening the critical reflections of the participants during the workshop.

The results from Pilot Study I and II helped to inform the planning of the Study III within organizational context, described next.

:: Organizational context

5.4 Study III: investigation within an e-waste company

The Study III aimed to test the propositions of the artifact and tools in design diagnostic activities, with a company effectively working with digital services in the context of circular economy. The next sections describe the results obtained on this evaluation and the improvements implemented into the artifact and auxiliary tools, including the reflections obtained from the empirical application.

5.4.1 Plan: study and artifact

Sampling: about the e-waste company

The Study III was carried out in partnership with a reverse logistic startup from the city of Rio de Janeiro in Brazil, incubated by a national technology and innovation consultancy. It occurred from February to April of 2023, with a follow-up in July of 2023. The company was selected because it offered a digital service enabling circular economy in the context of waste management, with service offerings aimed at the B2C market, with a digital platform for the end-customer/consumer. At the time of the research in Brazil, most of the contacted companies with similar services had their business offerings and digital platforms with focus on the B2B market. Also, the company was selected because of its active role in promoting sustainability.

Since 2017 the selected company collects and correctly disposes e-waste (electronic waste). In 2022 with the digitalization of the operation, a digital platform was launched to enable the customer to directly schedule/request a collection service. The company operates with the domestic segment, managing electronics from the city households and, also, from companies.

The company is not a recycler itself, but acts as an intermediary that facilitates the implementation of the Law 12.305/2010 (National Solid Waste Policy) in the electronics sector for reverse logistics, by the collection, processing and sell of the sorted parts and materials to companies specialized in recycling, and to electronic manufactures.

The company works with any electronic equipment that uses or has used electrical energy/batteries to operate, in addition to their respective peripherals such as wires and cables. It includes equipment such as computers, TVs, chargers, remote controls, etc. The company does not work with: VHS tapes, cassettes and floppy disks, lamps, cartridges and printer toner.

Artifact refinement (version 1.1)

This revised version of the artifact and auxiliary tools incorporated the improvements identified in Pilot Study II. Based on the recommended improvements, the following changes were implemented (Figure 5.9):

- **MODEL and CONTENT TOOL - EFFECTIVENESS** [IMPLEMENTED_2.1] The organization of the activities in categories or modules. Also, grouping the activities would make the *Model* more flexible, and to better sizing it with participants time and interests (CHANGE_A1.1). With this change, at the “*Diagnose*” stage of the *Model*, the scopes / levels of data description and evaluation were also highlighted. The first activity of the *Model* was also used for planning the setup of the field work study. The educational setup was reinforced, to better support the participants in having greater control and usage of the artifact during the workshop.
- **MODEL - COMPLETENESS** [IMPLEMENTED_2.2] The inclusion of an activity to frame the service maturity in transparency for sustainability. For that, the theoretical findings were reviewed to support the formulation of a new component for the Theoretical Framework, considering the different types of organizations, responsibility and attitude regarding transparency for sustainability (CHANGE_P.4; CHANGE_A1.5);
- **AUXILIARY TOOLS - COMPLETENESS and EFFECTIVENESS** [IMPLEMENTED_2.3] The adjustment of the main tool “*Activity Guide*” to enable stakeholders from the same organization and with different perspectives/areas to participate together (CHANGE_A1.2). The secondary auxiliary tools were embedded into the “*Activity Guide*” to support specific activities:
 - [IMPLEMENTED_2.4] the auxiliary tool “*Transparency Factors Cards*” was better distributed along the *Activity Guide*, as a reference for consultation and for guidance on the analysis activities, not the activity itself (CHANGE_A1.3).

- [IMPLEMENTED_2.5] the auxiliary tool “*Transparency Spectrum*”, had its zoom level reviewed for this version. Since this version of the *Model* was planned to be conducted with a company, the *spectrum* was adjusted to be applicable from a user journey perspective (CHANGE_A1.4).
- [IMPLEMENTED_2.6] the creation of a new auxiliary tool name “*Transparency Briefing*” to support the description and formalization of the design scenarios intended to improve transparency, identified with the diagnosis.

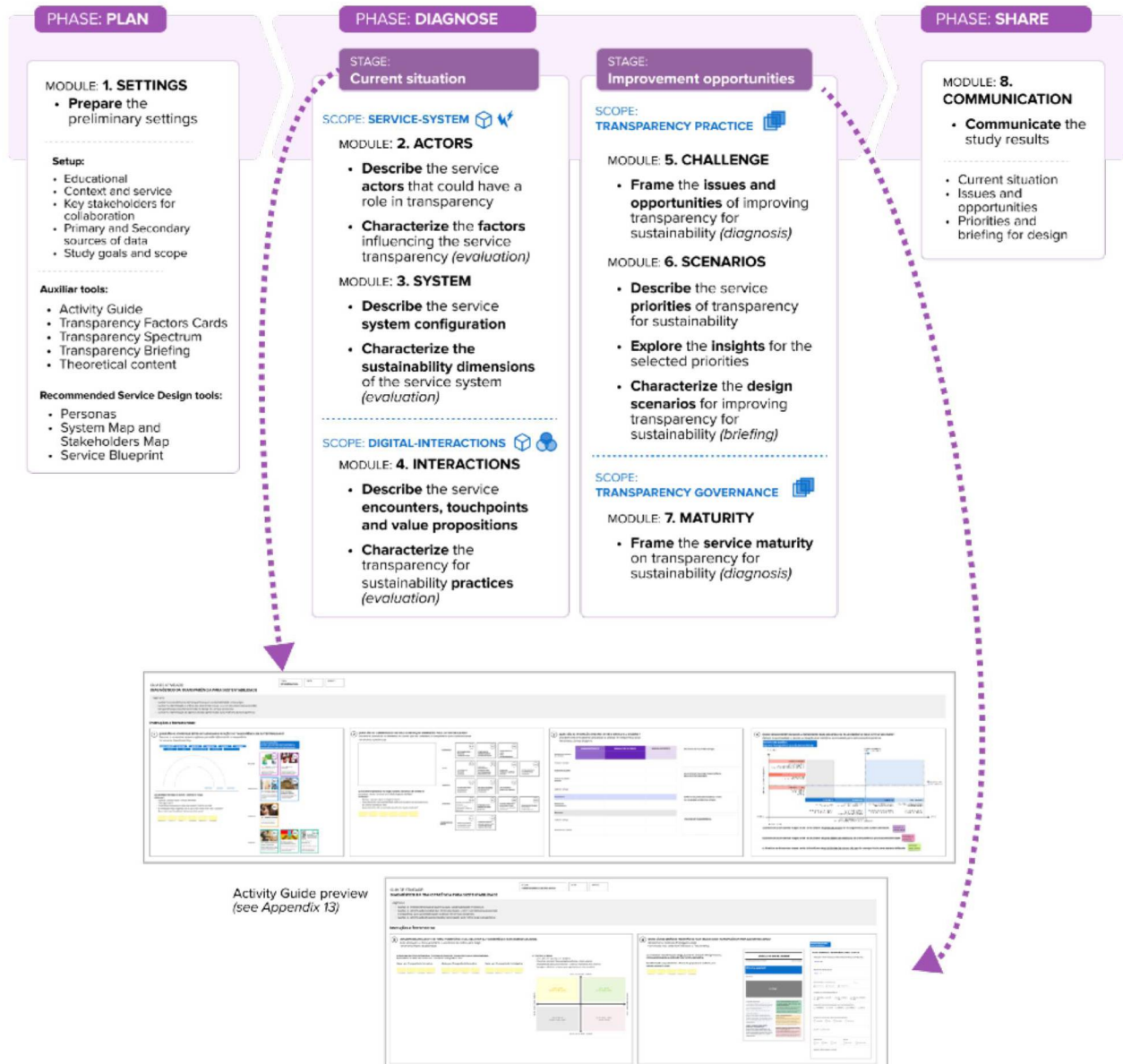


FIGURE 5.9 – Study III: Model and tool for integrating transparency for sustainability on the diagnosis of digital services (version 1.1)

Source: the author

The workshop was planned to be conducted in online/remote mode. The Activity Guide was built in the Miro platform, based on the *Model* version 1.1 (Figure 5.9). Since the workshop was planned to mix participants from different departments of the company, the exercises were individual and shared with the group, relying on the participants contextual professional experiences, knowledge and provided information.

TABLE 5.2 - Study III: protocol of activities and expected outcomes from the workshop

Duration	Activity	Outcomes
4 weeks	Pré-Workshop - Preliminar setup; - Disclosure of the invitation for voluntary participation in the workshop and registration form.	Setup of the study, materials and tools for the workshop.
		Participants registered in the workshop and accepted the research ethical terms.
30min	During-Workshop: Introduction 1. The participants check-in; 2. The facilitator briefs the group about the purpose and agenda.	Participants understand the purpose of the workshop and planned activities.
60 min	During-Workshop: Conceptual foundations and examples 3. The facilitator gives a presentation clarifying the concepts and examples to illustrate them. 4. The facilitator open for questions before the practical exercise.	Participants reflect on the key concepts, make comments and questions.
3h00min	During-Workshop - Practical exercise 5. The facilitator invites the participants to join a collaborative online board; 6. The facilitator explains the exercise and the Activity Guide. In the first session, the participants were invited to reflect on the characteristics of their current context of practice. In the second session, the participants were invited to reflect on opportunities for improvement of the service transparency. 7. Along the activities, the facilitator invites the participants to explain and share their perspectives with the group.	Participants critically reflect about the practices adopted in their current context of work, and identify the opportunities for improvement.
40 min	After the Workshop: Closing and feedbacks 8. The facilitator closes the workshop and asked the participants for answer the evaluation survey.	Participants gives feedback on the workshop gains and pains.

Source: the author

This updated version of the **Activity Guide** (Appendix 13) considers the Model implemented in five modules of activities, with a higher focus on the DIAGNOSE stage, and with the support of the respective auxiliary tools. The tool “*Transparency Factors Cards*” was relocated to support the activities from the modules 2, 3 and 4 of the Model in Figure 5.9). The tool “*Transparency Spectrum*” was relocated to supports the activities

from the module 5 of the *Model* (Figure 5.9), by allowing the participants to locate the current situation and envision opportunity areas.

The new auxiliary tool “*Transparency Briefing*” was conceived to support the activities from the module 6 of the *Model* (Figure 5.9). The form format was conceived with a focus on making it to be more easy to fill it with data from the activities and to allow multiple participants work on different briefing forms. It offered a higher level of flexibility (AC 2.2) to expand or broke the form if needed.

5.4.2 Act and Observe: artifact application

The application of the *Model* began by the **Module 1 - Settings**: the workshop was planned to be conducted in an online/remote mode. The *Activity Guide* was built in the Miro platform (Appendix 13). To optimize the time of the participants, the *Activity Guide* for the workshop was already “set/customized” with the data collected during the setup activities. This way, during the workshop the participants could move directly to reviews, editions and discussions regarding the current situation and improvement opportunities for transparency.

The data collected during the setup was used to support the researcher immersion on the company and to prepare the workshop. For that, the researcher conducted a desktop research to gather secondary and auxiliary information about the company, the digital channels and the waste management in the city. Then, a semi-structured interview was conducted with the founder of the company, to gather primary data, clarify questions and align the goals, scope and stakeholders for the study. The purpose of the workshop as set as both educational and exploratory diagnose to inform improvement opportunities for design, with focus on the household segment.

The selected audience for the workshops were the professionals from the company effectively working with the digital service. The workshop was planned to be conducted in **two online sessions** in two days to enable a greater participation of people. A total of **6 participants** attended the sessions, representing the areas of: business, sustainability, marketing, logistics, commercial, technology and design.

The researcher also conducted a desktop research on digital services that were similar to the service of the study partner company, to help the participants of the workshop with examples from the e-waste sector and also to support the activities related to idea generation.

Since the data sources for the study were limited to existing secondary data and primary data provided by the company, the study did not include user research activity. The information about the service customers and types of electronic equipment, were represented as extreme profiles, during the settings to support the analysis (Figure 5.10).



Perfis de usuários extremos do serviço
Fonte: Iyamu et al. (2020); Travassos et al. (2021); ABRELPE (2021); SindicoNet (2021); Mohamad et al. (2022); estudo de caso (2022)

Perfis de equipamentos críticos para o serviço
Fonte: IDEC (2013); SINIR (2019); GreenEletron (2021); estudo de caso (2022)

FIGURE 5.10 – Study III: example of the extreme personas of the e-waste service

Source: the author

The selected types of users fall into one of two categories: engaged household owners who already have attitudes toward sustainable management of electronic waste, or conventional household owners who do not. It was included the profile of the property manager of a residential condominium and the profile of the target electronic equipment processed by the service.

As described in Table 5.2, at the beginning the workshop, the researcher conducted the learning activities on the essentials for the day, as part of the educational setup. According to the participants the content resonated with their work context and needs, with focus on the customer in a more active way.

“... how we can make this reach the customer, bring them to be part of the process, feel, listen.” (Study III, Workshop Day1, Participant “Business”, e-waste)

The practical exercise of the workshop began by the **Module 2 - Actors**: the researcher as the facilitator explained the activity and the participants started to review and make changes on the initial version of the *Stakeholders Map*. Most of the changes were related to the secondary and tertiary layer of actors, and the activity fostered the collaboration among the participants from different departments to refine the map.

The facilitator needed to conduct the participants through the activity instructions and auxiliary tools (*Factors Cards*), especially in this first activity, reminding them to answer the questions to trigger the discussions and critical reflections. Based in the data from the workshop, Figure 5.11 presents the final documented version of the *Stakeholders Map*. This map is service design tool used to evidence: key actors from the e-waste service-system; their areas/contexts; the type of relation between/connecting them; the transparency factors influencing them.

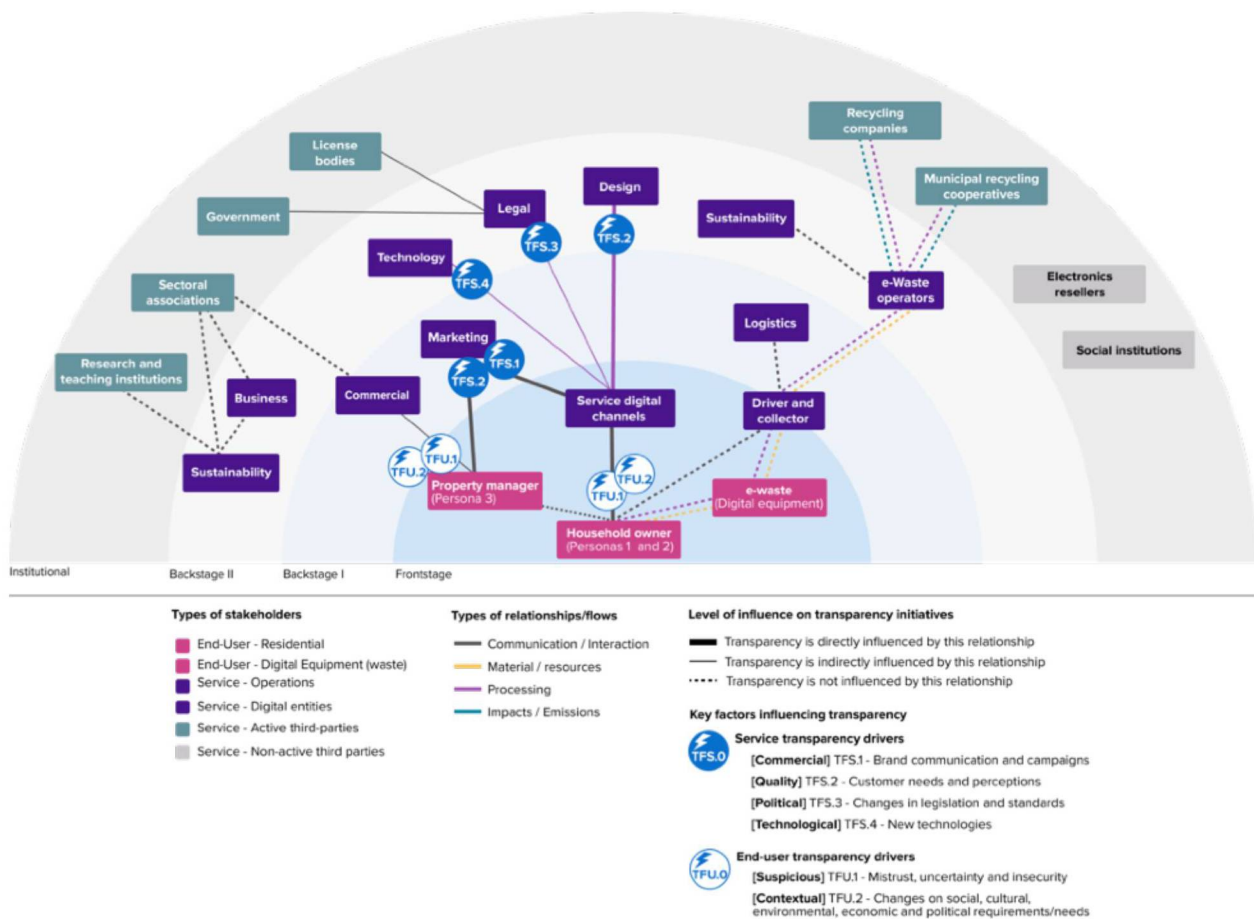


FIGURE 5.11 – Study III: service stakeholders map with data from the workshop

Source: the author

According with the participants analysis, for both the **end-user** (as the household owner that use the waste management services) and the representative on behalf of the user (e.g.: property manager of a condominium) the demands for transparency were mainly driven by notions of mistrust, uncertainty or insecurity on companies in which the offerings deals with environmental concerns, in that case, the proper handling of e-waste. It was also perceived as related to external contextual changes such as in legislation.

“Based on some preliminary research that we had with property managers and at events, a discomfort they have, for example, is that today they discard their waste on the junk truck in the North area of Rio de Janeiro [the common available option]. But after the collection, they don't know where it went, who was with it and what happened, or if it ended up in a river, for example. This also comes with a concern regarding the security of their data. They want to know that the HD (hard drive) of a discarded computer will not appear with the user data exposed.” (Study III, Workshop Day1, Participant “Business”, e-waste)

From the **organizational perspective**, according to the participants analysis, the transparency offerings of the research partner company were driven mainly by the user needs and perceptions, with the support of design and marketing departments (the ones closer to the users and who carry out research), followed by changes in legislation and standards affecting the organization.

“Thinking about our entire operation, I think that what most influences the transparency that we have and that we intend to have is the end customer. It is for them that we want to be as transparent as possible. Obviously the legal, governmental, licensing bodies, etc., require certain protocols, you have to comply with this environmental part, but you don't necessarily need to show this. What moves us to have a higher level of transparency is being able to transmit this security and credibility to our customers.” (Study III, Workshop Day1, Participant “Business”, e-waste)

Although the activity was planned to dive into the current situation, most of the changes and discussions among the participants were related to **projects under development and to be implemented** in the near future. Due to that, it was decided to include and mark these “future actions” in the map in gray colour to keep the big picture. These “future actions” include: local recycling cooperatives (specially for other fractions such as paper, plastic and glass); electronics resale and social organizations (e.g: reconditioned WEE - Waste of Electric and Electronic Equipment). Also, the participants pointed that in the future, they want digital technology to play a greater role in transparency. Currently it hasn't reached the desired stage (more automated communication to gain scale, without the need of human interaction to process the data).

“I think that in the future, technology will also be responsible for this transparency, because we want to bring transparency of the journey as a whole to the application. So we would have to communicate with the user every time the collection takes place. For example, when left the house, where the equipments are, etc. So the user would have visibility of the journey as a whole.” (Study III, Workshop Day1, Participant “Design”, e-waste)

According to the participants, at the time of this research, there was no legislation in place requiring full digital traceability (from the customer house to the processing system), although it was a topic under discussion among the sectorial organizations. The research partner company acts between the end-users and the entire ecosystem that can process the e-waste. Traceability, on their perspective, could be a determinant for residents and property manager to choose their service and be able to know that the parts and materials were properly allocated.

The next exercise was related to the **Module 3 - System**: where the participants were invited to expand their analysis to a systemic perspective in which the service was part. To begin, the facilitator presented the activity and the preliminary data mapped, provoking the participants to first review the current system configuration and then, characterize the transparency according the dimensions of sustainability versus each element of the system. The participants started to fill in the post-its and review the map, a sign that the group has already acquired familiarity with the structure of the activity. The presentation of the service-system representation was adapted from the five sector sustainability model of Giannetti et al. (2019).

Based in the data from the workshop, Figure 5.12 presents the final documented version of the adapted *System Map*, evidencing the key elements, and characterizing the transparency points and respective sustainability dimension. This representation allows the visualisation of the service-system elements that were not being communicated (opaque state), the elements that were communicated and the ones that the company wanted to communicate.

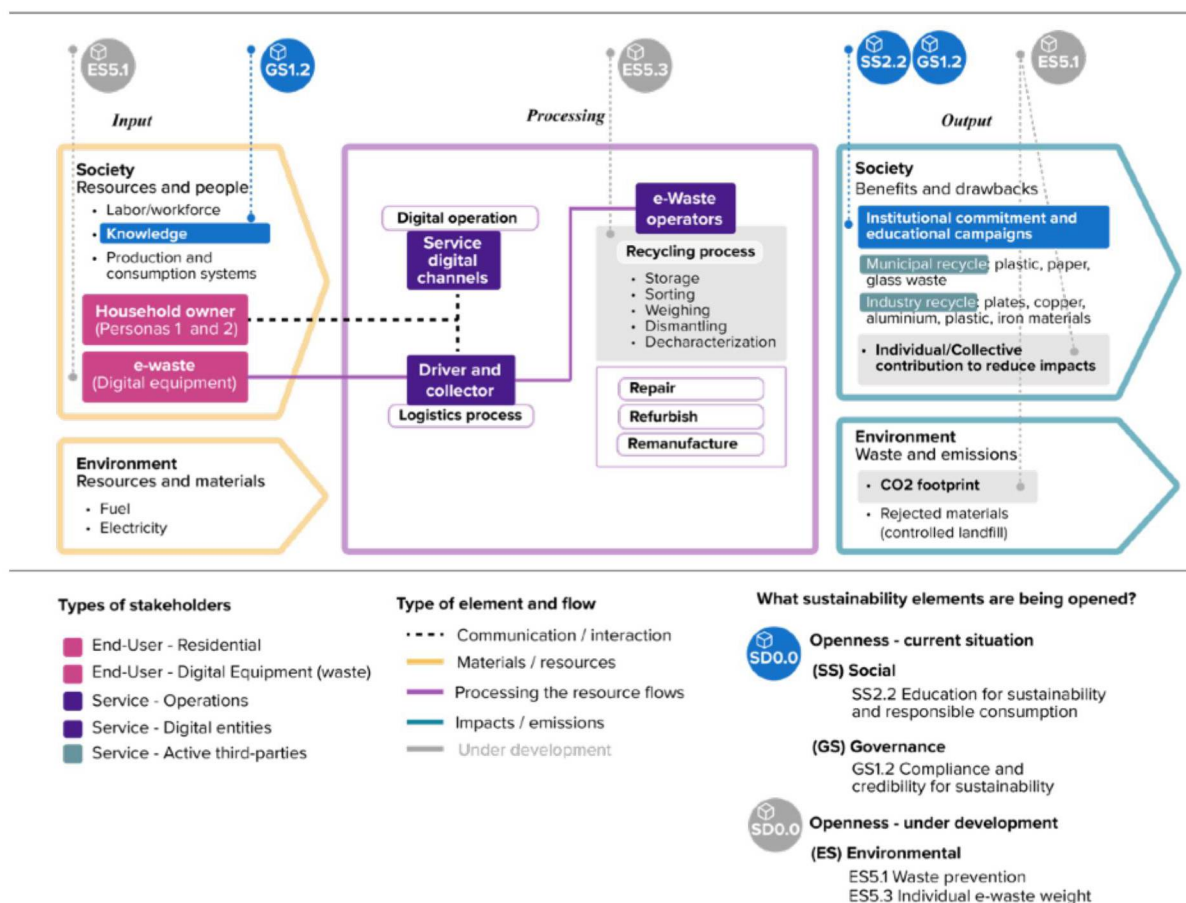


FIGURE 5.12 – Study III: adapted service system-map with data from the workshop
Source: the author

According to the participants, the preliminary map of the system was already very similar to reality and the participants helped to mark the elements that they were already planning to develop to improve transparency.

The *System Map* complements the *Stakeholders Map*, and according to the information reviewed by the participants, although the stakeholders and flows influencing transparency demands and offerings in current situation (Figure 5.11), the actual transparency provided was limited to a small part of the service-system, with focus on marketing processes of campaigns and events to promote the service and recycling education.

Similarly to the *Stakeholders Map*, the projects under development that could affect transparency were included in the map in gray colour to keep the big picture. Among the future value included on this map are: individually weighing the collections and being able to give this feedback to the customer per collection; performance report from a collection point in collaboration with a local partner (weight, CO₂eq saved); a calculator on the website with some key indicators such the total weight collected, number of collections, how much CO₂ we already avoided in the atmosphere, etc; among others.

“Today we don't have a structured reporting. We made a publication with the review of the year in our social media”. (Study III, Workshop Day1, Participant “Business”, e-waste)

“We will separate them individually into boxes and label them with the code that we receive from our app when the person collects them. So it's another step we're taking and then we'll insert other levels of transparency into this flow”. (Study III, Workshop Day1, Participant “Commercial”, e-waste)

“The big concern is how we establish these processes in a way that they are also sustainable. For example, the container that we will use for these individual collections, should we use plastic that comes from a non-sustainable chain”. (Study III, Workshop Day1, Participant “Commercial”, e-waste)

In addition to the points raised by the participants, other areas of the system were also candidates to improvement on transparency, such as the implementation of the collaboration with the local recycling cooperatives (rather than only the municipal, for recycling the other fractions of waste resulted from the service operation). According to the workshop participants, this could cause a greater social and environmental impact if this project was developed.

Regarding circularity, the main flow carried out by the company was called reverse manufacturing, which consists of dismantling, mischaracterization and recycling of obsolete, defective or end-of-life products. The process consists of obtaining

components and raw material through processes that result from the dismantling and recycling of products. Therefore, based on circular economy and sustainable waste management strategies, the company relies primarily on the recycling process, which consists of dismantling equipment and separating materials that can be recycled (plates, copper, aluminium, plastic, iron). Each piece goes to its specific recycling processes, returning to the production chain as raw material. The collected items are processed according to the most prevalent material and sold to interested or specialized companies. Organizations, whether private or cooperative, are the main buyers of this material.

According to the company manager, one of the barriers in the sector is the high level of informality in the chain. The rate of electronic waste in this process is low, and these are sent to the energy recovery process or disposal in a controlled landfill. In the past, the company has worked with processes to extend the useful life of electronic equipment, mainly with repair, reconditioning and remanufacturing. Currently, the company is resuming these processes, and in its planning is a partnership with social institutions to donate part of the recovered equipment and partnership with stores for resale and reinsertion of products into the market.

After the workshop participants reflected on the systemic perspective of the service for transparency, the next exercise was related to the **Module 4 - Interactions:** where they were invited to reflect at the interaction scope of the service, exploring with a closer focus to the user digital journey. The facilitator presented the activity and read together the preliminary user digital journey. The participants were called to first review the current user journey and identify current transparency practices at each service encounter. For that, it was used the *Service Blueprint Map*, adapted to include a transparency line situated between the service actions at the service frontstage, and the visibility line of the service actions in the backstage. Characterization of the transparency practices was based on the Design Principles of Transparency for Sustainability (from the Theoretical Framework version 1.0) and the user personas (Figure 5.10).

Based in the data from the workshop, Figure 5.13 presents the final documented version of the *Service Blueprint Map*, evidencing in blue the transparency components for the analysis, and in red, the transparency pain points for the users. This representation also allows the visualization of the service stages (as the encounters) that were not communicating (opaque state) with the user.

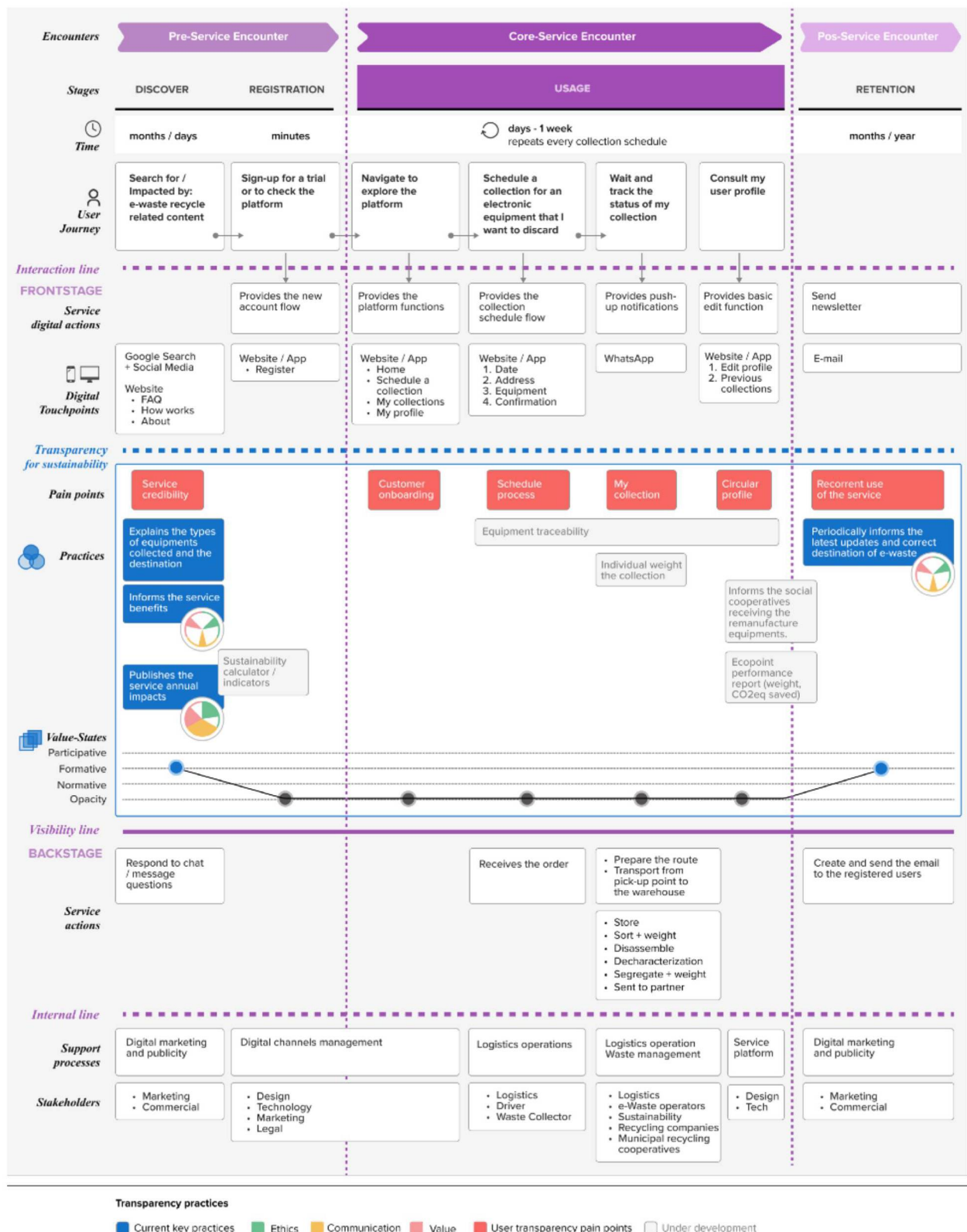


FIGURE 5.13 – Study III: service blueprint with data from the workshop

Source: the author

According to the participants, the preliminary version of the *Service Blueprint Map* was already very similar to reality and the participants helped to elicit the current transparency practices and characterize quite accurately based on the *Design Principles of Transparency for Sustainability*. Actually during the group discussions, they were using the terms such as “opaque”, “normative” to explain their points of view, in line with the theoretical support.

The *Service Blueprint Map* results reinforced the notion that the service efforts in communication were concentrated at the service discover stage, while the core service journey was lacking in communication to better assist the user throughout the service. Also, it was highlighted for the participants the lack of attention to the post-usage of the service, in order to retain customers and stimulate recycle and other circular flows for electronic equipment stored at home.

According to the information about the users, a key concern for them to join this type of service was associated with the company compliance with environmental standards. However, the communication on this issue was limited, lacking in the provision of evidences and verified content for the users (ethics - honesty and value - confidence). Discussing with the participants, this pain point was also related with the service usage and retention.

“In many cases, after the collection has been completed, they will ask us if we issue a report and if there is a cost. In other words, the user made the appointment, but you still have doubts about how the process will work.” (Study III, Workshop Day1, Participant “Commercial”, e-waste)

“Our flow starts with a registration, but it can be a single collection and the user may not talk to us again.” (Study III, Workshop Day1, Participant “Business”, e-waste)

The main discussion among participants was about the transparency of the service process itself. Improving that could lead to the improvements about the service sustainability too, as a general strategy. Since the current service journey didn't provide alternate pathways for the users to continue using the service, the main use case was characterized by a first-time and single use case. Through the activity, it was also highlighted by the participants the role of transparency also in improving the service interactions with the customer, by making the digital touchpoints at least open for the user. Unlike domestic waste such as organic and those originating from packaging such as plastic and paper, electronic waste has a smaller periodicity in user daily lives, implying in the need for strategies to continue the relationship with the end-users and, at the same time, emphasizing the lasting interactions with private/public organizations that have a more continue relationship with e-waste.

After the workshop participants reflected on the current situation of transparency for sustainability, from a service-system and service digital interaction perspective, they invited to the next stage *“Improvement opportunities”* from the *Diagnose* phase (Model Figure 5.9).

For that, the next exercise was related to the **Module 5 - Challenge** conducted in the second day of the workshop. The participants already had an understanding of the current transparency situation of the service. In order to explore the future opportunities for improvement, the participants were invited to establish a scope for the service transparency initiatives. To achieve that, it was used the auxiliary tool *“Transparency Spectrum Map”*.

“I wrote down a lot of things from yesterday, and it has had a huge impact on my work, including on things I have already delivered. And I think there is a need for things that we had already talked about.” (Study III, Workshop Day2, Participant “Design”, e-waste)

“The activities makes total sense, I looked at both the blueprint and the matrix and it helps us to find the blind spots, the gaps that we have there and how we see where to contribute to this transparency.” (Study III, Workshop Day2, Participant “Business”, e-waste)

Then, the participants were asked to locate on the *“Transparency Spectrum Map”* the current transparency practices from the past activities, the opportunities areas they identify, including their ideas that were emerging. Initial ideas emerged, based on the spectrum axis (service encounter/stages - WHEN *versus* the transparency states - WHY). Participants were then asked to reflect on why it was relevant and when, presenting their conclusions on the *“Transparency Spectrum Map”* (Figure 5.14). The ideas related to new service offerings and business models were saved but were not evolved in the workshop according to the study limitations in working with existing services.

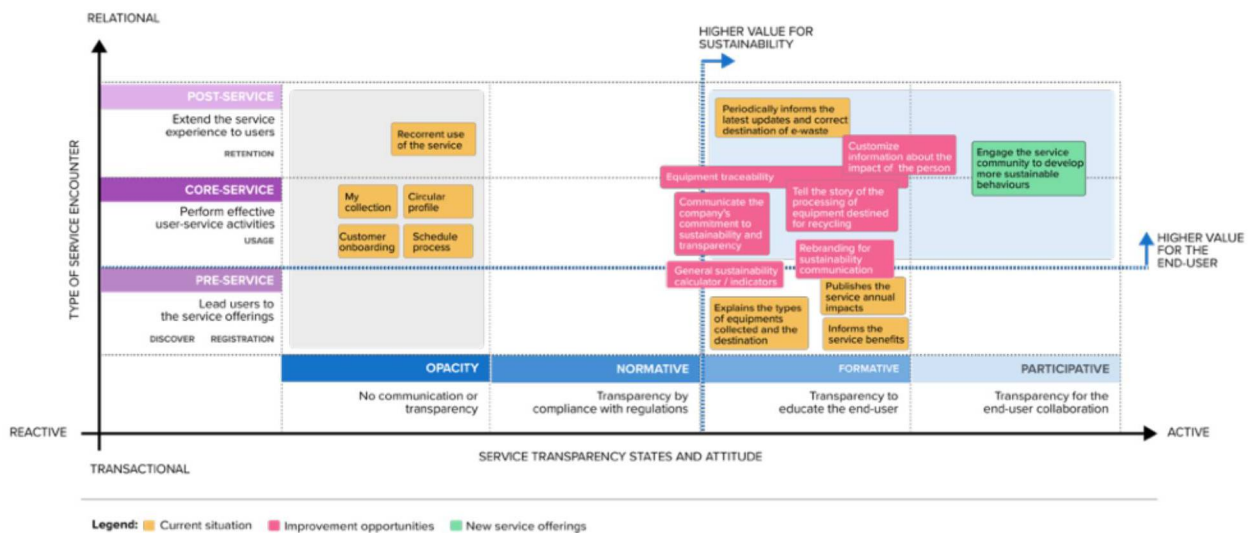


FIGURE 5.14 – Study III: Transparency Spectrum map with data from the workshop

Source: the author

As previously identified, most of the current practices were located on the intersection of pre-service encounter used on a formative transparency. In order to provide more value to the user and to promote circularity, the participants determined that, in addition to improving transparency at pre-service encounter, they also needed to expand it. This included addressing a more formative and participative service usage, as well as a more formative pos-service usage for retention.

Among the main themes of opportunities discussed it included: the rebranding of the service to better guide the sustainability communication as internal initiative; the individual feedback and storytelling of the collection and respective impacts, to a more personalised communication during the core service usage and the post-service stage; the engagement of the service community to promote more sustainable behaviours for circularity, initially without personalization.

This prioritization considered the factors that inhibits the service in providing transparency for sustainability: the level of competence of the company in digitalization of the service; the level of usability of the digital service; the level of quality of the available digital data.

According to the participants, besides the visual aspects of the rebranding idea, this could help them to clarify the service positioning and value proposition. Specially for property manager users and in B2B contexts, the participants highlighted from the activity that the main value of the service could be in being a partner that helps them to prove that they are managing their waste in a sustainable way. While in the current situation the value proposition was characterized by a convenient and utilitarian way for end-users to dispose of electronics (pick-up at home).

“We are focused on usefulness, but we are not providing transparency about the impacts that the user will have.” (Study III, Workshop Day2, Participant “Design”, e-waste)

“[circularity awareness] ... we are in a sector in which we often have to generate our own demand”. (Study III, Workshop Day2, Participant “Sustainability”, e-waste)

In this sense, the ethical dimension of transparency would play an important role in communicating the service's competence in this “expert/consultant” role.

Personalization of some types of information for the user was the theme perceived as the one with greatest value for the end-user, but also the one with greatest operational limitations for implementation. Due to that, although some ideas were raised to approach a more participative transparency, prioritization focused on enabling the users to customize the information needs, based on the normative and formative states.

Regarding the promotion of engagement for more sustainable behaviours, the participants argued that ideally the purpose of the service was to enable other circular strategies, specially to life extension and responsible consumption. In that sense, the participants wanted to explore how transparency could have a role in that challenge.

Once the workshop participants framed the key issues and opportunities of improving transparency for sustainability, at **Module 6 - Scenarios**, they were invited to creatively explore prioritized themes as future scenarios, to help formalize the design brief.

For that, this activity was based on the scenario-based design approach (ROSSON and CARROLL, 2012). A scenario is a description of an envisioned hypothetical use, event or situation. For example, describing how people would use a digital service to accomplish recycling tasks. Thus, scenarios can help designers to make sense of different problem spaces and reflect on what the possible implications might be for a service under study.

In the previous activity the participants framed the key themes of future opportunities to address the findings from the diagnosis of the current situation. Then, in this module, the participants were asked to explore insights for each theme, aimed to characterize the envisioned future scenarios.

To inspire the quick ideation session, the facilitator presented the examples of transparency for sustainability practices in digital solutions from different sectors. Then, the participants were invited to quickly generate ideas for each theme, using the *Design Principles of Transparency for Sustainability* (Theoretical Framework). A total of **15 ideas** were generated and then classified according to the potential value for the end-user *versus* the feasibility for the company competitors. The participants selected the ideas classified with “high value and high viability” and with “high value and medium

feasibility”. Then, the participants used the ideas to refine and described the scenarios based on the service design tool “*Post Cards from the Future*” and the auxiliary tool “*Transparency Briefing*”.

The scenarios described each concept with the following fields: a) overall description; b) how it works; c) the differential from current situation and competitors; d) transparency characterization in terms of ethical responsibility, communication format, and value proposition.

By the end of the workshop, the facilitator reflected on the outcomes and learnings from the workshop with the participants, including the service maturity in terms of transparency for sustainability (**Module 7 - Maturity**). Based on Vásquez et al. (2021) sustainability maturity model, the service maturity on transparency for sustainability could be classified in four levels: Level 1 - Companies with insufficient maturity; Level 2 - Companies with basic maturity; Level 3 - Companies with developing maturity; Level 4 - Companies with consolidated maturity. After the workshop, the facilitator perceived the research partner company as situated on Level 3, because the team already have knowledge and active initiatives directly aimed at improving transparency for sustainability. The main barrier for the company is the technological capability and resources to implement the projects.

Follow-up with the company

After a few months, the researcher contacted the company to understand how the findings from the workshop and the projects under development evolved. For that, the researcher visited the company office and conducted a semi-structured interview with the business founder.

Based on the outcomes from the workshop, the following items were incorporated to the team backlog: the *rebranding* of the service; the review of existing communication (by opening the certifications and specific official authorization for operation; by the inclusion of customers testimonials on social media, and by reinforcing the educational content).

Besides these punctual improvements, the service founder mentioned that they were also planning a project to encourage people to donate electronic equipment stored at home and unused. According to the company, they have received low-value equipment, very difficult to remanufacture or recycle due to the way these equipments were produced, types of materials used or their conditions when donated. Thus, the team was interested in improving educational communication to promote circular behaviour for equipment with higher value.

Also, since the workshop the company established a technical partnership with a e-waste traceability platform provider. As the participants argued during the workshop, this technology could instrument the service in quantifying the collections and track the equipment reverse logics processes.

Digital traceability has been increasingly used to implement transparency strategies on sustainability aspects in contexts characterized by production and consumption systems. Traceability can be understood as the ability to track the events of an incident from different sources, in order to obtain evidence through identification (RAHAYU et al., 2011; KARIE et al., 2016). Many times transparency and traceability are terms used as synonyms, but in reality they are complementary concepts. Traceability can be seen as a tool or strategy to help instrumentalize the implementation of transparency.

Traceability solutions are starting to be integrated into digital platforms such as e-commerce and mobile applications, so that users of consumer goods brands have the possibility of track the flow of the products they bought. This tracking includes information about the products, before, during and after their manufacturing (e.g.: processes, actors, resources, etc.). It used technologies that guarantee the integrity of the information provided. This type of solution is used as a way to build more trusting relationships with consumers, as it demonstrates sustainability attributes.

Despite being considered an emergent aspect, there are many barriers and especially digital factors that influence the conditions for application/approach of transparency (e.g.: digital infra, lack of knowledge, being guided by rules only, etc.) as well as the scope of transparency to be implemented. The possibility of applying transparency may be limited on the short term but new technological solutions have offered new functionalities and, thus, on the long term, the expectation is the technology induction of higher transparency. Yet, these new technologies might be overly expensive for small/medium businesses. As a consequence, despite the relevance of the concept, in practice it still present a limited scope of implementation and technological solutions available present reduced considered to real dilemmas and contexts of end-users.

5.4.5 Reflect: clarification of the learnings

The evaluation of the artifact version 1.1, aimed at demonstrating how relevant, effective and complete was the *Model*, through its *auxiliary tools*. The evaluation also assessed the workshop contributions for the participants learning in terms of knowing the content, knowing why to act in the projects/challenges, and knowing how to do the activities. This assessment has used qualitative data collected from the participants

perceptions and feedback questionnaire (Appendix 14), supported with the direct observation notes.

Content tool: relevance, effectiveness, completeness & learning (know what and why)

The workshop content referred to the educational setup, aimed to support the participants in understanding the key fundamental concepts on transparency. The participants perceived the educational content as totally relevant, effective and complete. The main feedback suggested that the content was really good, approached in a critical and in-depth way, supporting the practical activity:

“In some cases, I believe that the theoretical part could be summarized a little bit. I liked the examples with specific cases. Maybe present more cases.” (Study III, Workshop Day2, Participant “Sustainability”, e-waste)

“I found the cross between content and practice incredible.” (Study III, Workshop Day2, Participant “Business”, e-waste)

Activity Guide tool: relevance, effectiveness, completeness & learning (know why and how)

Considering the simultaneous educational and diagnostic purpose of the workshop, the participants perceived the *Activity Guide* as totally relevant, effective and complete. The main feedbacks were:

“Lots of provocations, great to be able to talk about it, very light and very good.” (Study III, Workshop Day1, Participant “Commercial”, e-waste)

“It was very interactive and provided very useful information.” (Study III, Workshop Day1, Participant “Logistics”, e-waste)

“I really liked it, it helped me to have a basis for future studies.” (Study III, Workshop Day2, Participant “Design”, e-waste)

“The activity guide is really cool, but it would take more time to fully understand.” (Study III, Workshop Day2, Participant “Commercial”, e-waste)

The researcher observed that the workshop flowed well. Despite the time limitations, it was enough to carry out the activities in greater depth. The organization of the *Activity Guide* in “current situation” and “improvement opportunities” helped, but since the current situation was mainly characterized by projects under development for the future, the facilitator needed to ensure and guide the participants to reflect on the initiatives that were actually implemented at that point of the workshop. Otherwise, the participants would focus the reflections more on the future, rather than the current situation.

Cards, Spectrum, Briefing tools: relevance, effectiveness and completeness & learning (know how)

The participants totally agreed on the relevance, effectiveness and completeness of the auxiliary tools (Cards, Spectrum, Briefing tools) used during the workshop. The main feedbacks suggested that part of the participants of the workshop was not familiar with traditional service design tools, such as the *Service Blueprint*.

"I really liked the tools, some I didn't know. It was very good, some ideas I already had, others were refined." (Study III, Workshop Day2, Participant "Design", e-waste)

"I liked the quadrants tool and user-based prioritization. I would spend more time on this tool. I would spend more time on the spectrum tool." (Study III, Workshop Day2, Participant "Business", e-waste)

"I found it very interactive and surgical." (Study III, Workshop Day2, Participant "Commercial", e-waste)

However the researcher observed during the activities that although the *Design Principles of Transparency for Sustainability* (Theoretical Framework) were integrated in the activities, a more practical way to use them would be appreciated.

Recommendations for improvements

The study showed that this version 1.1 of the artifact and tools achieved the criteria established on Phase 1 (Chapter 4), in supporting the participants understanding about transparency for sustainability, and the diagnosis of their current situation, while exploring opportunities for improvement.

The analysis was based on the qualitative data from the artifact and tools evaluation, confronted with the artifact development criteria (value, format, application) (Chapter 4) and the improvements implemented into the artifact for this study. The aspects which **worked** were:

- ✓ The educational setup has enabled the participants to learn the key concepts, and supported the practical activity [IMPLEMENTED_2.3] (AC 1.3);
- ✓ The *Activity Guide* modules and scopes has guided the participants to approach transparency for sustainability systematically, rather than in isolated actions [IMPLEMENTED_2.3] [IMPLEMENTED_2.1] (AC 2.3; AC 2.4);
- ✓ The diagnosis of the transparency for sustainability enabled the participants to understand, elicit and classify their practices according to its function in the service and strategy [IMPLEMENTED_2.3] [IMPLEMENTED_2.1] (AC 2.3; AC 2.4);

- ✓ It has introduced a new format to describe and discuss transparency for sustainability, through a set of *Auxiliary Tools*, that helped the participants to approach the concept through different perspectives of the service [IMPLEMENTED_2.4_2.5] (AC 2.2);
- ✓ The *Setup* module was fundamental to plan the study, immersion of the researcher in the context of the service and optimize time with participants [IMPLEMENTED_2.3] (AC 3.4);

Also, the study showed that a next version of the artifact could be **improved** mostly regarding its **completeness** criteria:

- ✱ [CHANGE_A2.1] The **Maturity** module, by formalizing the key criteria for classifying a service organization on each level;
- ✱ [CHANGE_A2.2] The **facilitator role**, by embedding on the artifact the key instructions, observations and tips for better supporting who will use the material without the researcher as a guide;
- ✱ [CHANGE_A2.3] The **protocol variables**: it dealt with “*the amount of transparency practices*”, when and how to consider them along the *Activity Guide*;
- ✱ [CHANGE_A2.4] The **evaluation criteria**, by formalizing the key criteria adopted in each module of the *Model*;
- ✱ [CHANGE_A2.5] The **digital touchpoints related with transparency for sustainability**, by formalizing the key types of content and functions as a reference.

In summary, this study was helpful for the researcher to put in practice the proposed artifact under development with a real company with attitudes towards greater transparency for sustainability.

Specially in the context of design diagnostic activities, the study helped to validate the *Theoretical Framework* components. The researcher observed that despite the organization's intent, attitudes and strategies, the effective implementation of transparency for sustainability through digital touchpoints was the key challenge for the company, due to operational, economic and technological factors. Despite the barriers, the path adopted by the company to continue the opportunities raised from the diagnosis was incremental.

From an individual learning perspective, the study showed that it was very fruitful for the participants. The researcher observed that the workshop fostered all the competences from the Theoretical Framework.

Spread the workshop over two days allowed the participants to digest the information and reflect on the implications for their department and work on progress. In this sense, the researcher observed that the multidisciplinary application of the *Model* through the *Activity Guide* can also be used to align a team's vision of transparency for sustainability, structuring future actions in a more integrated way.

Limitations of the study

The potential biases and limitations which affected this study needs to be considered in further developments:

- The sustainability transparency diagnosis was exploratory, with limited access to data and information, and not driven by a specific issue or problem reported by the company;
- The diagnostic approach focused on WHAT were the strengths and the pain points candidates for optimization, rather than focusing on HOW to design/ implement the required changes. The outcome from the application could be used as input to development of an action plan;
- The context of the company and selected service: small business, with limitations to implement digital solutions, a medium level of sustainability maturity, with customers mostly characterized by a first-time experience and a need for transparency related to compliance with environmental regulations.

The results from Study III helped to inform the planning of the Study IV within educational context, described next.

:: Educational context

5.5 Study IV: results from the study with design students

The Study IV aimed to provide to design students a simplified version of the *Model* for them to use in an unguided/self-application way, in the context of design education activities. The next sections describes the improvements implemented into the artifact and tools, the results and reflection from the empirical application.

5.5.1 Plan: study and artifact

Sampling

The selected audience were design students enrolled in a regular undergraduate course on Design for Sustainability during the first semester of 2023. The application consisted of **1 workshop / class** in person, **5 weeks of follow-up** with the students, including **2 weeks of presentations** of the final project in class. A total of **25 participants** attended the course, with a Graphic and Product Design background.

Artifact refinement (version 1.1.1)

This revised version of the artifact and tools incorporated part of the improvements identified in Study III, with focus on the *Auxiliary Tools* to support the simplified application of the *Model* with the students. The following changes were implemented for the educational application (Figure 5.15):

- **DESIGN GUIDE - COMPLETENESS and EFFECTIVENESS** [IMPLEMENTED_3.1] the creation of an “Design Guide” embedding the *Activity Guide* and the *Auxiliary Tools* and link to the theoretical content, to support the autonomous use of the artifact in a self-explanatory format. It provided the main guidelines to carry out a simplified diagnosis of transparency for sustainability (CHANGE_A2.2);
- **ACTIVITY GUIDE TOOL - COMPLETENESS and EFFECTIVENESS** [IMPLEMENTED_3.2] the creation of a new version of the *Activity Guide*, aimed to highlight the characterization of the user requirements on transparency for the sustainability (needs, perceptions, etc.). Since in this study the students were able to conduct an user research, it was an opportunity for the researcher to explore how to support that activity. This version of the *Activity Guide* template implemented the *Model* in three clusters of activities: the user perspective of the current situation, the service perspective of the current situation and the opportunities for improvement;
- **CARDS TOOL - COMPLETENESS and EFFECTIVENESS** [IMPLEMENTED_3.3] the auxiliary tool *Transparency Cards* included cards for the user perspective and the key digital functions. They were distributed along the *Activity Guide*, as a reference for consultation and guidance of analysis activities (CHANGE_A2.2; CHANGE_A2.5).
- **SPECTRUM TOOL - COMPLETENESS and EFFECTIVENESS** [IMPLEMENTED_3.4] the auxiliary tool *Transparency Spectrum*, had its zoom level adjusted to the practice level, with the aim of facilitating a more detailed use (CHANGE_A2.2).

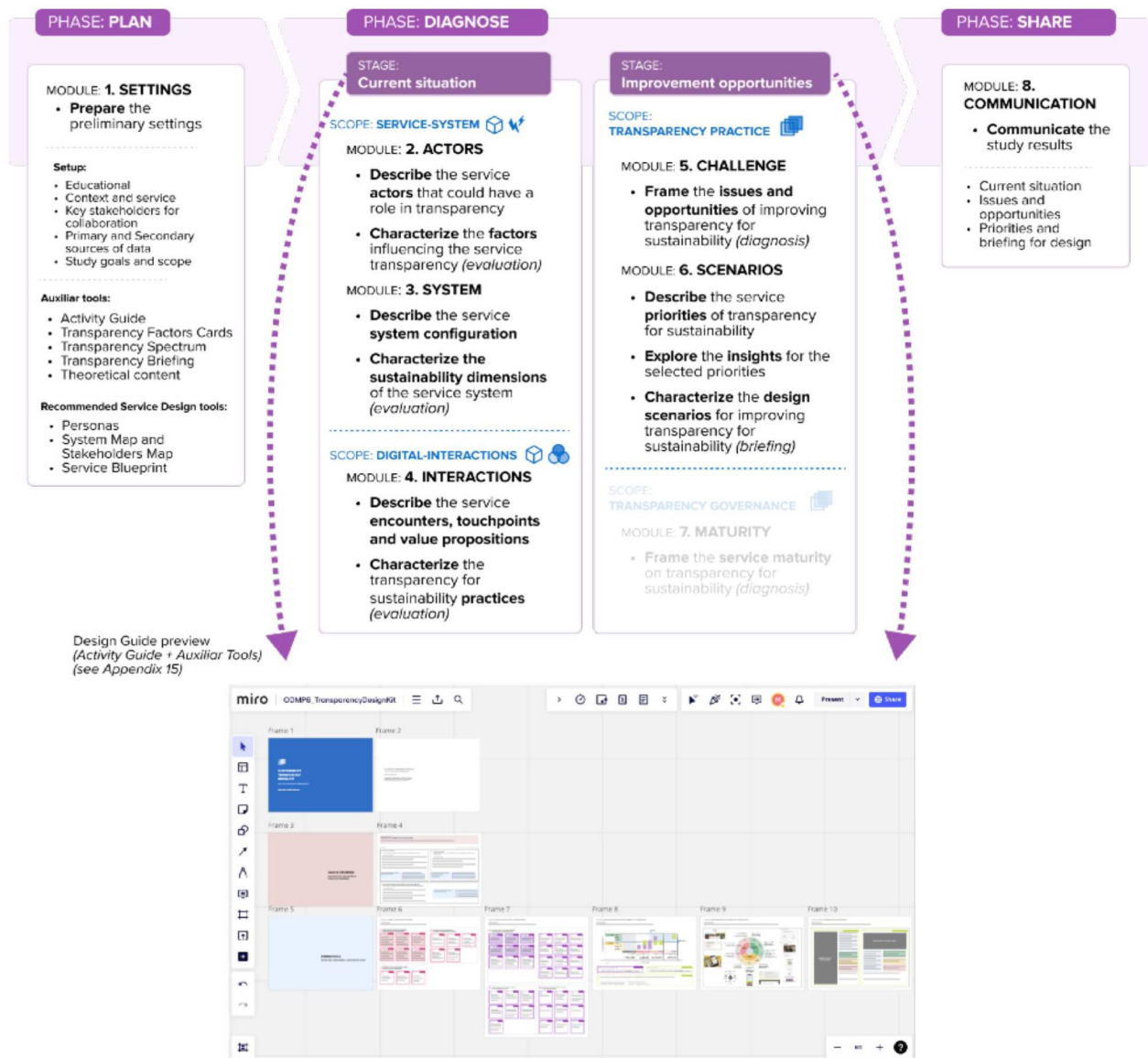


FIGURE 5.15 – Action IV: Model and tool for integrating transparency for sustainability on the diagnosis of digital services (version 1.1.1)

Source: the author

The application of the artifact and tools in Study IV followed a similar protocol (Table 5.1) from the Study III. The main difference was in this Study IV, the activities during the workshop were extended through the weeks, rather than days.

5.5.2 Act and Observe: artifact application

The researcher conducted a semi-structure interview with the professor of the course to align the project requirements and conditions for the application of the artifact

and tools. The course was part of a bachelor's degree in graphic design, and was based on Problem-Based Learning (PBL) method (a pedagogical approach for active learning, which encourage students to get in touch with the real context of the problem). That semester the theme of the challenge for the students was related to the concept of Creative Communities (groups of people whose actions bring positive changes to their everyday), where the students were asked to choose a local community to work with one of their services, and to propose design concepts for the community communication.

Although the communities selected by part of the groups had challenges related to the circular economy, the students didn't address them on their projects since it was the main transparency problem, according to their research. Hence, this Study IV didn't addressed the context of circular economy, having focus on the sustainability dimensions.

The classes were planned to be conducted in person, but the *Design Guide* was built in Miro platform to facilitate the accesses by the students.

First, the researcher conducted a class with the students to teach the theoretical foundations and examples. The researcher observed that part of the students were engaged with the content, by raising questions for clarification. Then, the researcher presented and explained the *Design Guide* (with the *Activity Guide* and its respective *Auxiliary Tools*) and the professor briefed the class with the course project challenge. The students were invited to use the *Design Guide* provided by the researcher to approach transparency for sustainability as one of the analytical and creative lens in their projects. The students were also asked to read and accepted the research ethical terms.

In the next weeks, the students used the material provided as reference to conduct the activities and produce partial deliverables. Every week each group of students met with the researcher and the professor for sharing their progress, clarifications and general supervision on the project.

In the first weeks, the students needed to conduct research with the selected community to characterize the current situation and identify a sustainability transparency problem to be addressed by the project. In the last weeks, they needed to explore alternatives for the problem, create and present the concept.

A total of 6 projects / groups of students were developed:

- Group01 - Education for young people to enter the job market, with social assistance;
- Group02 - Organic food fair that brings the university, small producers and local residents and visitors together;
- Group03 - Commerce of special coffee from small producer families;

- Group04 - Collective of artists and people who crochet, producing a traveling installation;
- Group05 - Jiu-jitsu training volunteer for kids and families in social vulnerability;
- Group06 - Collective of people who promote the inclusion of cultural activities, leisure and sport on the outskirts of the city;

Of the 6 groups, 3 effectively used the provided materials and embedded transparency in the project development and design propositions (Groups 01, 02, and 03). Appendix 16 presents an overview of the outcomes from these groups.

The problem selected by Group01 was the digital communication of the courses, because during their research they discovered that the users had difficulty finding more detailed, attractive and organized information. Despite the relevance, the **current communication did not reflect the organization differentials in terms of its social work within the community and related benefits, what could influence the young users decision-making**. The Group01 used the provided transparency *Design Guide* to help them to discover the current situation (user research, service mapping) and to frame the design opportunities. Based on the findings, the group understood that the **social dimension of sustainability and the service social benefits were the priorities for transparency**. Then, the students created design concepts for the organization website, but in this activity, the propositions didn't highlight the new types of information and functions, focusing on the general information architecture and pages navigation. The participants of the group mentioned that they tried to use all *Design Principles of Transparency for Sustainability* to diagnose the current situation, but they had more **difficulty with the principle of inclusion**.

The problem selected by Group02 was the **lack of knowledge and credibility of the fair among the visitors**. During their research, they perceived that despite the producers being certified, the potential new consumers visiting the fair were **suspicious about the origin and quality of the food**. One of the reasons for this is the communication at the fair site, which is informal and can go unnoticed. Then, based on the system study, the students **identified the critical actors and flows of information candidates for transparency**, that would be more relevant for the users, based on the feedbacks from the research. The Group02 used the provided transparency *DesignGuide* to discover the current situation (user research, service mapping), but mainly to frame the design opportunities from the user perspective. This was the only group that actually used the *Transparency Spectrum tool* to support the framing activity. Based on the findings, the group understood **the environmental dimension of sustainability as a priority for transparency, with focus on the information about the**

fair processes (origin and cultivation practices, hygiene and quality control). Then, the students proposed the inclusion of a digital touchpoint in the fair place, as a landing page accessed by a QR Code, that enable the customers to quickly check more details about the fair and its the processes in video, text, graphic formats. The students aimed to promote sustainable behaviour with the new public, addressing a normative and formative transparency. The participants of the group also mentioned that they tried to accommodate most of the *Design Principles of Transparency for Sustainability* in the solution concept, but the main one adopted was **Openness**.

The problem selected by Group03 was the **lack of transparency about the organization's sustainability aspects**. According to the students, social and environmental sustainability was a pillar for the organization, specially regarding the relationship with the small families of coffee producers, but the current communication did not value the work that was already being done. The study of the current situation revealed that the organization works with brand ambassadors (professionals in the gastronomy sector, partnering with the organization to help in the relationship and communication with the customers). However, they identified that **brand ambassadors did not have access to sufficient information to help them effectively communicate the social and environmental sustainability aspects of the brand**. The Group03 used the provided transparency *Design Guide* to discover the current situation (user research, service mapping), but mainly to frame the design opportunities from the user perspective. Thus, the students identified the opportunity to **increase transparency about the impacts and benefits of the organization's sustainability**. They identified the **ethical principles as the most relevant** for that: **honesty** to avoid green washing and enable trust-building with “practical information” (evidenced/quantified/qualified); **openness** as the most important, to start communicating something that already exists; and **inclusion** to enable the understanding of a broader audience. Then, the students proposed the creation of an educational material for training the community of ambassadors in sustainability transparency of the brand, to help them to keep the communication with the public, about their real impacts on the system, especially in the social dimension.

The other 3 groups had difficulties integrating transparency into the project, due to the characteristics of the chosen communities (students were unable to identify transparency as an issue in that context and they were the groups that least engaged with transparency supervision meetings). The Group 06, during the presentation explained how they envisioned transparency relevance and application in their project, despite the lack of time to accommodate it in the final proposition. The group argued for approaching transparency for trust-building and credibility.

5.5.3 Reflect: clarification of the learnings

The evaluation of the artifact version 1.1.1, aimed at demonstrating how relevant, effective and complete was the *Model*, through its *content* and *tools*, developed with the artifact. The evaluation also assessed the workshop contributions for the participants learning in terms of knowing the content, knowing why to act in the projects/challenges, and knowing how to do the activities. This assessment has used qualitative data collected from the participants perceptions and feedback questionnaire (Appendix 17), supported with the direct observation notes.

Content tool: relevance, effectiveness, completeness & learning (know what and why)

The participants perceived the educational content as totally relevant, effective and complete. The main feedbacks were regarding the format of the learning activity, to include some practical activity with the students to better fix the content under study.

“The content was very good and helped to better understand some processes” (Study IV, After-Workshop, Participant “Student A”, Design for Sustainability course)

“The theoretical presentation was excellent and added a lot of knowledge” (Study IV, After-Workshop, Participant “Student B”, Design for Sustainability course)

“More practical examples and interactive dynamics” (Study IV, After-Workshop, Participant “Student C”, Design for Sustainability course)

The researcher observed that this educational setup at the beginning of the workshop was important to introduce the theme for the students, and to stimulate them in approaching transparency in their projects. Although the students had access to the content later for consultation, the researcher observed that during the supervision meetings and project presentations, the majority of students made reference to the learning they had that day in the classroom.

Activity Guide tool: relevance, effectiveness, completeness & learning (know why and how)

Considering the educational and diagnostic purpose of the workshop for the students to use the provided *Activity Guide* in their projects, the participants agreed on its relevance, completeness, and effectiveness. The main feedbacks pointed to need of including more examples, maybe case studies, in order to facilitate understanding about the *Activity Guide*:

“I believe it is easy to use, I can't think of an improvement solution” (Study IV, After-Workshop, Participant “Student A”, Design for Sustainability course)

"I found the activity guide super complete, I don't know what could be added to it to improve it" (Study IV, After-Workshop, Participant "Student B", Design for Sustainability course)

"PDF version to facilitate portability (Miro may be a bit heavy for some devices). Maybe a version with light questionnaires, encouraging interaction." (Study IV, After-Workshop, Participant "Student C", Design for Sustainability course)

"I believe it fulfils its role" (Study IV, After-Workshop, Participant "Student D", Design for Sustainability course)

"The guide is quite complete" (Study IV, After-Workshop, Participant "Student E", Design for Sustainability course)

"The guide provides excellent and sufficient tools to understand each of the topics. To improve it, I would suggest adding practical cases of how the tools were useful for the process and their results, in which result and conclusion it was possible to reach with them." (Study IV, After-Workshop, Participant "Student F", Design for Sustainability course)

The researcher observed that the *Activity Guide* helped the students in following a sequenced activity, guiding the problematization and identification of initial transparency criteria for the projects.

Cards and Spectrum tools: relevance, effectiveness and completeness & learning (know how)

Although the participants agreed on the relevance, effectiveness, and completeness of the auxiliary *Cards* and *Spectrum tool*, the main feedbacks pointed to the need of including more examples on how to use the *Auxiliary Tools* and the traditional *Service Design tools* recommended, since some of the students had not worked with them previously:

"The cards were very useful for our project, I believe they didn't need to be changed, they were easy to understand." (Study IV, After-Workshop, Participant "Student A", Design for Sustainability course)

"The Spectrum Map + Transparency Principles worked well within the class dynamics." (Study IV, After-Workshop, Participant "Student B", Design for Sustainability course)

"Exemplifying how to apply some of them in a fictitious or already applied scenario." (Study IV, After-Workshop, Participant "Student C", Design for Sustainability course)

"Perhaps there could be a greater explanation about the system map and the user research as it ended up being a little confusing" (Study IV, After-Workshop, Participant "Student D", Design for Sustainability course)

"I believe the card tools were fulfilling their purpose" (Study IV, After-Workshop, Participant "Student F", Design for Sustainability course)

“I believe the tools are complete” (Study IV, After-Workshop, Participant “Student G”, Design for Sustainability course)

“The spectrum map and principles helped us make certain decisions about our project.” (Study IV, After-Workshop, Participant “Student H”, Design for Sustainability course)

“The spectrum map and principles were also easy to understand, no need for improvement.” (Study IV, After-Workshop, Participant “Student I”, Design for Sustainability course)

“[Spectrum map] We were a little confused at first, so could you suggest a more user-friendly layout?” (Study IV, After-Workshop, Participant “Student J”, Design for Sustainability course)

The researcher observed during the supervision and presentation, that as part of the students were carrying out some of the Service Design activities and tools for the first time, the orientation sessions helped them to build the basic understandings.

Among the three groups that effectively approached transparency in the project, the researcher observed that even though the final representation of the tools had points for improvement, the main goal was achieved regarding fostering key competence development: critical thinking for sustainability through transparency; observation and interpretation of current situations considering the perspective of different stakeholders; approach the application of transparency within a project at different service-scope.

Regarding the *Auxiliary tools*, the *Cards* were widely used, with less difficulty by the students. The *Cards* were developed in a guideline format and the set of cards linked to every activity of the *Activity Guide*, allowing the students to choose according to the project context.

The *Transparency Spectrum tool* was the tool that students reported greater difficulty in understanding and using, despite having received a positive feedback. In practice only one group effectively used it in their project. The *Design Principles of Transparency for Sustainability* were widely used and with less difficulty by the students. The wheel format combined with examples for each category allowed the students to use mainly for the evaluation activities, as a form to elicit the requirements for service design.

Recommendations for improvements

The study showed that this version 1.1.1 of the artifact and tools achieved the criteria established on Phase 1 (Chapter 4), in supporting the participants' understanding about transparency for sustainability, and the self-application in their projects.

The analysis was based on the qualitative data from the artifact and tools evaluation, confronted with the artifact development criteria (value, format, application) (Chapter 4) and the improvements implemented into the artifact and tools for this study. The aspects which **worked** were:

- ✓ The educational activity has enabled the participants to learn the key concepts, and supported the practical activity [IMPLEMENTED_3.1] (AC 1.3);
- ✓ The *Design Guide* organized in a unified way the artifact components for the students, similar to design kits they already used [IMPLEMENTED_3.1] (AC 2.1; AC2.2);
- ✓ The inclusion of the activity for the user perspective on transparency for sustainability in the *Activity Guide*, providing primary data during the project and criteria for selecting design alternatives [IMPLEMENTED_3.2] (AC 1.1);

Also, the study showed that a next version of the artifact and tools could be **improved** mostly regarding its **completeness** criteria:

- ✱ [CHANGE_A3.1] The **active learning**, to better retain the educational content;
- ✱ [CHANGE_A3.2] The **Design Guide instructions** on how to use it in the classroom;
- ✱ [CHANGE_A3.3] The **Auxiliary tools application** examples and recommendation for use based on complexity and expected outcomes;

In summary, this study was helpful for the researcher to put in practice the proposed artifact under development in a context with a diversity of design students projects in the same classroom.

The researcher observed that the students used the *Design Guide* in a less exploratory way and more in an issue-oriented way. They investigated the current issues in their projects, and used the *Design Guide* for the analysis, to frame priorities and ideas, helping them to create a transparency proposition which would provide greater value for the user. Therefore, there were aspects of the service and the user that have not been investigated or addressed.

In general the students could argue for the value of transparency for sustainability in their projects, even without knowing exactly how to articulate its practical application. Also the students focused more on the ethical and value principles of transparency. The researcher noticed that the groups explained their decisions and solutions in a combined way (e.g.: honesty + confidence) in the sense that ethical responsibility and the communication format activate value-propositions — which means that they had the correct understanding of the concept. In general the students propositions focused on

Openness and Honesty to enable users to gain a better confidence and understanding on the service.

Students also commented that being able to see at the end of the course how each group approached transparency for sustainability in their projects and applied the tools was interesting and inspiring, contributing to consolidate their competences on the theme.

The findings showed that Study IV fostered key transparency competence among the students regarding: observation and interpretation of current situations; critical thinking for sustainability; work across different service-scope; interpersonal attitude for design.

Limitations of the study

The potential biases and limitations which affected this study and needs to be considered in further developments includes:

- The circular economy context was not addressed in this study, the focus was the dimensions of sustainability;
- The students limited background in Service Design required an extra support during the supervision sessions and follow-up;
- The selection and access to the local creative community to develop the project;
- The inclusion of transparency in a semester course not dedicated to transparency. Due to the complexity of the theme, hypothetically a full course in transparency for sustainability would be better for students learning.

The results from Study IV helped to inform the planning of the Study V also within educational context, described next.

:: Educational context

5.6 Study V: results from the study with engineering students

The Study V aimed to provide to students a simplified version of the *Model* for them to use in an autonomous way, in the context of design education activities. The next sections describes the improvements implemented into the artifact and tools, the results and reflection from the empirical application.

5.6.1 Plan: study and artifact

Sampling

This study was conducted integrated with an international program named SDG Challenge (<https://www.sdgchallenge.com.br>), in partnership with University of Brasilia (UnB) Brazil, and Aalborg University (AAU) Denmark. It was a student-centred initiative for developing projects that can be strategic to the achievement of the 2030 Agenda's goals.

Since this thesis was also connected with Aalborg University (AAU) Copenhagen through the Zero Waste Co-Lab Project, it was possible to carry out this study in face-to-face format in the city of Copenhagen with Brazilian and Danish students, during **1 week** of August /2023. A total of **15 participants** attended the workshop. The selected audience were undergraduate students in a regular Production and Computer Engineering courses. Both engineering courses adopt “*design thinking*” at the early stages of the students project development.

Artifact refinement (version 1.1.2)

This revised version of the artifact and tools incorporated part of the improvements identified in Study IV, with focus on the *Design Guide* and *Activity Guide* to support the simplified application of the *Model* with the students. The following changes were implemented for the educational application (Figure 5.16):

- ✳ **ACTIVITY GUIDES TOOL AND GUIDELINES — KNOW HOW and EFFECTIVENESS** [IMPLEMENTED_4.1] the format was the main change, to embed the educational theoretical content and guidelines for the practical activities. For that, DesignGuide comprised a set of 3 *Activity Guides* organized in a modular way to be more easily adaptable to different application needs. The *Model* and the *Auxiliary Tool as Cards* (previously developed) were integrated into the *Activity Guide*. Hence, the *Activity Guide* was the unique *auxiliary tool* adopted for this Study V. The *Activity Guide* was broken into 3 categories: the transparency for sustainability practice (in blue); the service organizational transparency perspective (in purple); the service user perspective (in pink)[CHANGE_A3.2].

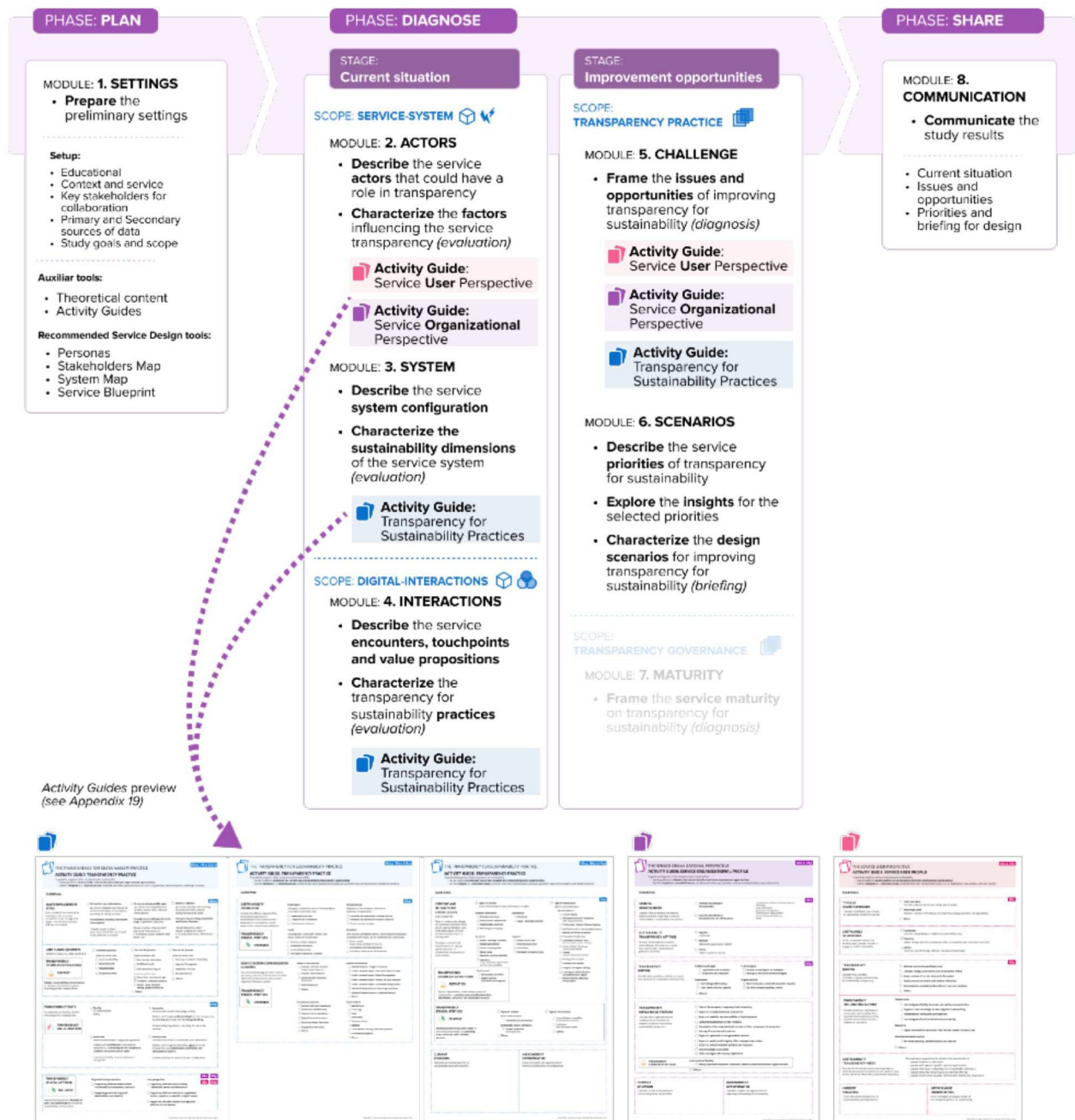


FIGURE 5.16 – Study V: Model, Guidelines and tool for integrating transparency for sustainability on the diagnosis of digital services (version 1.1.2)

Source: the author

The overview of the *Design Guide* is illustrated in Appendix 18 and the 3 *Activity Guides* are illustrated in Appendix 19. The purpose of the *Activity Guides* was to simplify learning and use, streamline the process of identifying and providing feedback on whether or not the guidelines were followed, and minimize the number of auxiliary tools by combining them into one. For each module of the *Model*, the 3 types of *Activity*

Guides offered guidelines based on the Theoretical Framework, to support the transparency for sustainability diagnose. These *Activity Guides* could be used in two different ways: either as a checklist of the guidelines or as a template or canvas in combination with other design tools for representation.

The application of the artifact and tool in Study V followed a similar protocol (Table 5.1) from the Study III. The main difference was that in this Study V, the activities during the workshop were extend through a week.

5.6.2 Act and Observe: artifact application

The researcher conducted a semi-structured interview with the SDG Program coordinators to align the requirements and conditions for the application of the artifact. The SDG Challenge workshop aimed to support the development of project briefings that could be further used by both universities as the scope of the semester courses, aligned with the Problem-Based Learning (PBL) educational method. Thus, this Study V aimed to guide the problematization and identification of initial transparency for sustainability criteria to compose the scope of the projects to be developed.

The SDG Challenge is a recurrent program addressing waste prevention, reduction, reuse, and recycling in the city of Brasilia, Brazil. The program has led to the development of various projects, particularly focused on solid waste management issues, including solutions such as apps for waste pickers, self-piloting waste collection machines for bodies of water, IoT sensors for waste containers, and other technology-based initiatives addressing the identified problems.

In this edition, the primary theme was Waste Management for the Circular Economy, but participants were encouraged to explore various other sustainability-related topics. The students were briefed on the main problems selected for the challenge, and in groups, they were asked to select one challenge to work with during the workshop to explore and develop a project proposition.

Throughout the week, students engaged in intense learning and design-thinking sessions to assist them in developing the projects as part of the partners program. The researcher conducted a class focused on transparency for sustainability with the students to teach the theoretical foundations and examples (Figure 5.17).



FIGURE 5.17 – Study V: overview of the workshop with the students carried out at Aalborg University
Source: the author

The researcher observed later that the students from the groups with projects more directly associated with transparency issues were more engaged with the content, raising questions for clarification. The students' questions during the class were mainly concerning: how to ensure the veracity of the information; how to know the best types of transparency indicators; when to communicate and with whom; how to make sure that a company is committed to sustainability and transparency.

Once the researcher made the *Design Guide* available to the students in advance, most of the students had already seen the material previously. On the second part of the class, the researcher presented and explained the *Design Guide* and the students were invited to use it to approach transparency for sustainability as one of the analytical and creative lens in their projects. The students were also asked to read and accepted the research ethical terms.

Although the workshop was planned to be conducted in person, the *Design Guide* was built in the Miro platform to facilitate the access by the students. Also, the researcher provided printed version of the *Activity Guides* to all students to use the material more freely in the classroom.

The students used the material provided as reference to conduct the activities and partial deliverables. Each group of students met with the researcher for a direct supervision, sharing their progress and obtaining clarifications.

In the first days, the students needed to conduct desktop research to characterize the current situation and identify a sustainability transparency issue to be addressed by the project. In the last days, they needed to explore alternatives for the problem, create and present a project proposition.

Of the **5 groups**, 3 were actually interested in approaching transparency in the project. Part of the groups engaged with transparency during the understanding of the problem, but during the elaboration of the propositions only **1 group** effectively integrated more clearly transparency in the project. One of the main reasons for that was the time limitation of the official program, and the other was that the other 2 projects had a different scope, being already under implementation stage, rather than discovery and definition stages.

The “Sustainable Hub” Group addressed the problem related to the lack of alternatives for the population to build awareness and engage in sustainable actions, with focus on recycling and reuse. According to the group research, in the city of Brasilia (Brazil), waste and sustainability information was decentralized in different digital platforms and was not sufficiently supporting the promotion of more sustainable and circular consumption patterns. The group used the provided *Activity Guides (mostly the transparency practices guide in blue)* to discover the current informational situation, and to frame the design opportunities.

Based on the findings, the group discovered that the city of Brasilia (Brazil) already had social and environmental initiatives (NGOs, projects, and events) that could benefit from greater participation of the population, but digital findability and visibility was a barrier. The group understood that transparency could play a role to open information and interaction alternatives between the citizens and the local initiatives and commerce enabling circular strategies such as reuse, repair, recycling; a funding and activism to enable people’s awareness and action (donation, volunteer, etc); circularity education contents and triggers for actions (e.g: correct disposal, options for reuse and recycling, near collection points, etc) (Figure 5.18).

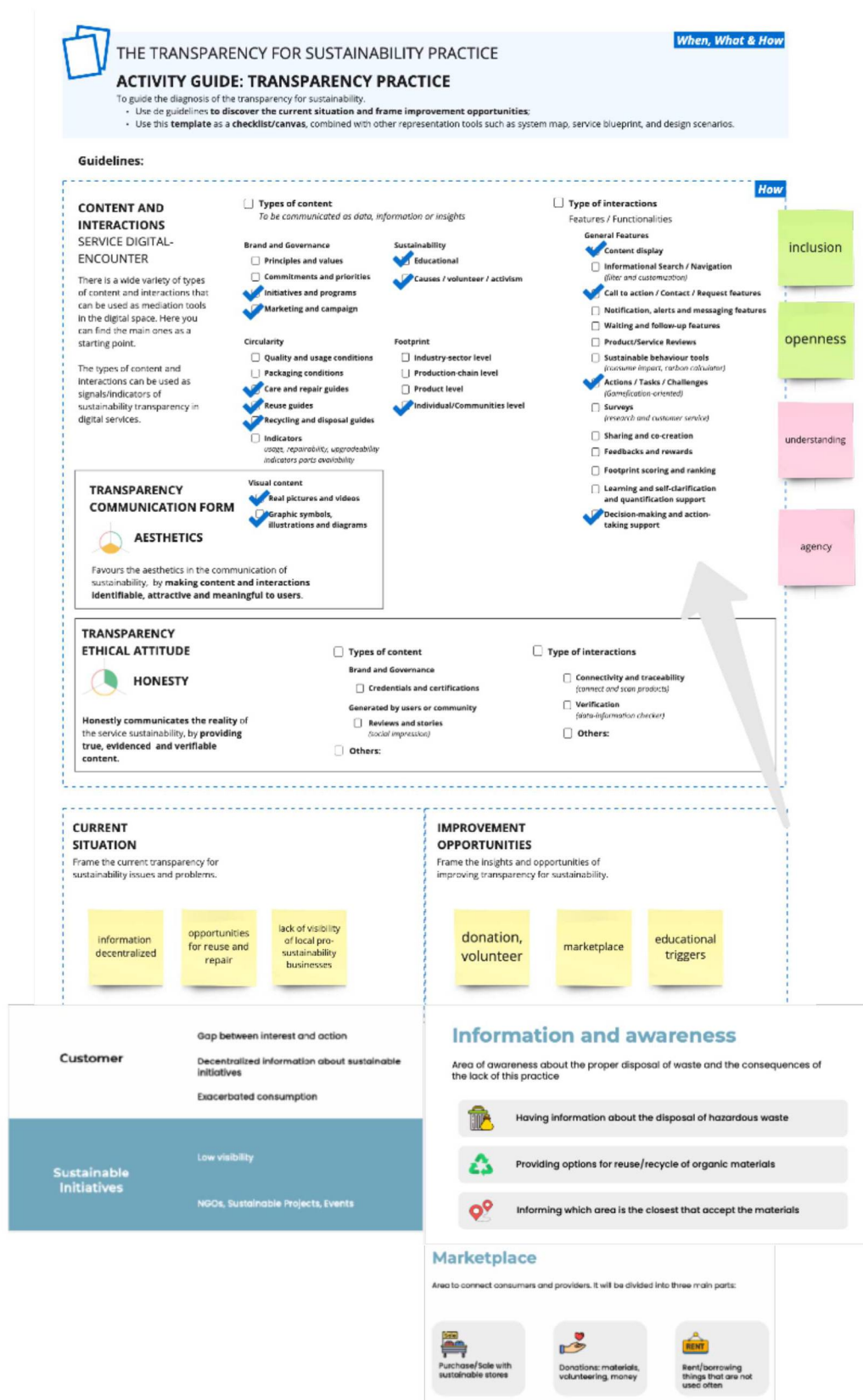


FIGURE 5.18 – Study V: example of an Activity Guide used by the students
Source: the author

The participants of the group mentioned that was easier for them to use the guidelines from the *Activity Guides* starting at the digital scope, with the types of information and interactions, and them linking with the transparency principles they want to activate. The students suggested for the next phase of their project (concept and development), the continued use of the provided *Design Guide* to support the transparency requirements of their proposal.

5.6.3 Reflect: clarification of the learnings

The evaluation of the artifacts and tool version 1.1.2, aimed at demonstrating how relevant, effective and complete was the *Model and Guidelines*, through its tools. The evaluation also assessed the workshop contributions for the participants learning in terms of knowing the content, knowing why to act in the projects/challenges, and knowing how to do the activities. This assessment has used qualitative data collected from the participants perceptions and feedback questionnaire (Appendix 20), supported with the direct observation notes.

Content tool: relevance, effectiveness, completeness & learning (know what and why)

The participants agreed on the relevance, effectiveness and completeness of the educational content. The participants had no recommendations for improving the content.

The researcher observed that since most of the participants had an engineering background, the content was also important to level critical aspects of the approach through design, reinforcing the importance of the user in the process.

Activity Guide tool: relevance, effectiveness, completeness & learning (know why and how)

Considering the educational and diagnostic purpose of the workshop for the students to use the provided *Activity Guides* in their projects, the participants agreed on its relevance, completeness, and effectiveness.

“The material is easy to understand and very complete, but I missed having a version of the checklist that I could apply later in the development of the project, to know if it is meeting what was proposed and how it is meeting.” (Study V, After-Workshop, Participant “Student B”, Production Engineering course)

The researcher observed that the *Activity Guides* helped participants to visualize the possibilities in a more tangible way to articulate transparency in their projects. The most attractive aspect for the students was having access to a complete and structured guide, including the educational and practical support. The format helped to simplify the

complexity of the theme from the class and to identify the transparency elements candidates for the projects.

Based on the experience of the groups that effectively used the *Activity Guides*, the researcher observed that the “*Transparency practice guide*” (in blue) regarding the system and the digital scope of the service was the most used. A possible reason for that was the fact that the groups didn’t have time to carry out primary data collection with stakeholders and potential users, focusing on the guide that deals with the digital scope.

The guidelines were also used by the participants as criteria to know whether transparency was relevant to their specific problem of their design projects. However, the groups didn't fully utilize the possibilities offered by the material, possibly due to limited time and being more oriented towards proposing a solution than exploring the problem.

This shows the importance of taking a more proactive approach to sustainability in projects by incorporating transparency early on the design process. By doing this, you can incite changes instead of waiting for the requirements for transparency to be identified.

Recommendations for improvements

The study showed that this version 1.1.2 of the artifact partially achieved the criteria established on Phase 1 (Chapter 4), in supporting the participants understanding about transparency for sustainability, and the self-application in their projects.

The analysis was based on the qualitative data from the artifacts and tool evaluation, confronted with the artifact development criteria (value, format, application) (Chapter 4) and the improvements implemented into the artifact and tool for this study. The aspects which **worked** were:

- ✓ The educational activity has enabled the participants to learn the key concepts, and supported the practical activity (AC 1.3);
- ✓ The *Design Guide* helped to raise awareness among students about transparency for sustainability and to apply in their projects (AC 1.3);
- ✓ The *Design Guide* organized in a unified way the artifact components for the students, similar to other design kits they already used [IMPLEMENTED_4.1] (AC 2.1; AC2.2);
- ✓ The *Activity Guide* printed and digital version [IMPLEMENTED_4.1] (AC 2.1; AC2.2);

Also, the study showed that a next version of the artifact could be **improved** mostly regarding it’s **effectiveness** criteria:

- ✱ [CHANGE_A4.1] The *Activity Guide* format to focus on instructions, guidelines and checklist, and not on the canvas format for representation. The *auxiliary tools Transparency Spectrum* or other existing Service Design tools could be used to support representation of information from the analysis;
- ✱ [CHANGE_A4.2] Clarify/improve the writing of guidelines to facilitate understanding;

In summary, this study was helpful for the researcher to put in practice the proposed artifact under development in a context with a diversity of design students projects in the same classroom and program.

Similar to Study IV, in this Study V the researcher observed that the students used the *Activity Guide* in a more issue-oriented way. They investigated the informational and digital interaction issues in their projects, and used the guidelines to confront with the transparency requirements of their projects. Therefore, there were aspects of the service and the user that have not been investigated or addressed. The researcher observed that Study V fostered the key transparency competence among the students regarding: observation and interpretation of current situations; critical thinking for sustainability through transparency; anticipatory attitude for circularity considering transparency of multiple scenarios of use; interpersonal attitude for design.

The *Design Guide* was well received in the engineering context, since the group already use design approaches in project disciplines.

Limitations of the study

The potential biases and limitations which affected this study and needs to be considered in further developments includes:

- It was not possible to test the full artifact and all its components, to delve deeper into the components of the *Activity Guides*;
- Limited time for the transparency workshop activities in the SDG Challenge program;
- Low knowledge level of the students in Design for Sustainability and Service Design;
- Engineering perspective on the design approach, with a greater focus on the solution rather than the problem.

Study V was the last cycle of artifact development and evaluation during the Phase 2 of the research. The results from Study V helped to inform the Phase 3 of the research aimed for the final reflections and learnings, as described in the next chapter.

Chapter 6 – Research Phase 3: Reflection and learnings

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6.1 Cross-analysis of the studies against the criteria

This section discuss the learnings from the cycles of studies conducted in Phase 2, during the artifacts development and evaluation. The studies were conducted both in educational and organizational contexts, including the perspective of the key potential stakeholders of the artifacts (students, professors, practitioners, service providers). The reflection considered the artifacts development criteria (value, format, application), the artifact evaluation criteria (relevance, effectiveness, completeness), and the learning criteria (know why, know what, know how).

The Theoretical Framework was the core knowledge foundation and logical model that informed and embedded the development of the artifacts (Model and Guidelines) and Auxiliary Tools. The Model and Guidelines prescriptions were implemented and evaluated mainly through the application of the Auxiliary Tools along the progressive cycles of fieldwork studies.

Considering the 11 initial criteria for the development of the artifact identified in the Phase 1 of the research (Chapter 4), 8 were fulfilled, 2 were partially fulfilled and 1 was not applicable. Based on this 11 artifact criteria: 3 were related to the value of the artifact (2 were fulfilled and 1 was partial fulfilled); 4 criteria were related to the format of the artifact (2 were fulfilled, 1 was partial fulfilled and 1 was not applicable); 4 criteria were related to the application of the artifact (all were fulfilled). Table 6.1 presents a summary of the results.

TABLE 6.1 - Summary of the artifact development criteria versus evaluation results

Artifact Development Criteria (Requirement)		How and sources of evidence
Value (benefits)		
AC 1.1	The artifact should be based in active transparency — for promoting transparency as a means for value-creation towards sustainability.	- Implemented by embedding the Theoretical Framework. ✓Fulfilled: Evidenced by the participants diagnose and strategies adopted applying the Model.
AC 1.2	The artifact should embed the theoretical framework — for informing the critical components of its practice.	- Implemented by the diagnostic components linked to the Model activities and Auxiliary tools. ✓Fulfilled: Evidenced by the participants using the Activity Guide that implements the Model.
AC 1.3	The artifact should support the learning of transparency for sustainability on digital services — for developing competences on the theme.	- Implemented by the learning activity/module in the Model and Auxiliary contents. *Partially fulfilled: Evidenced by the participants attending to the classes and applying their knowledge on the activities. The learning was less effective in terms of know-how.
Format (representation)		
AC 2.1	The artifact should have a simple and easy format to learn and use — for providing guidance for application situations and reducing complexity in use by favouring already existing design methods and tools.	- Implemented by the Activity Guide format of the Model. ✓Fulfilled: Evidenced by the different application contexts and usages by the participants, integrated with Service Design tools such as Stakeholders Map and Service Blueprint.
AC 2.2	The artifact should have a flexible format — to be more easily adapted and customized according to the intended context of use, issue to be addressed and learning.	- Implemented by the modular format of the Model and Activity Guide. ✓Fulfilled: Evidenced by the different application contexts and usages by the participants.
AC 2.3	The artifact should practically support service design activities in understanding the current situation — for identifying sustainability transparency issues and opportunities for improvements at the early stages of the design process.	- Implemented by the characterization and evaluation activities in the Model and Auxiliary tools. *Partially fulfilled: Evidenced by the participants use and outcomes from the activities. In the educational context, both the characterization of the current situation and the framing of improvement opportunities was less effective in terms of know-how.
AC 2.4	The artifact should be able to integrate a continuous process — for evolving transparency for sustainability.	- Implemented by the Model phases and modules, reflected to the Activity Guide. ⦿Not applicable: the effective continuous application of the Model was not evaluated.

Application (context)		
AC 3.1	The artifact should be developed based on the research resources — considering scope limitation, time and related costs.	- Implemented by the planning of the different cycles of workshops based on an action design research strategy. ✓ Fulfilled: Evidenced by the different application contexts and usages by the participants.
AC 3.2	The artifact should be developed in validation cycles — for evolving and more easily accommodating changes, in line with the research method.	- Implemented by the planning of the different cycles of workshops based on an action design research strategy. ✓ Fulfilled: Evidenced by the different application contexts and usages by the participants.
AC 3.3	The artifact should consider having a formal documentation and release of the final artifact — for enabling future studies and usages.	- Implemented by the final version of the artifact, including improvements identified through studies. ✓ Fulfilled: Evidenced by Chapter 7 with the final artifact.
AC 3.4	The artifact should be based in short activities, rather than a few high demanding — favour stakeholders availability.	- Implemented by the modular format of the Activity Guide. • Fulfilled: Evidenced by the different application contexts and usages by the participants.

Source: the author

The findings from the literature review unveiled that previous artifacts were limited to support the integration of transparency on digital service design as a means to promote sustainability and circularly. Therefore, the empirical studies helped to evolve the Theoretical Framework and the interconnections between its components, as wells the Model, Guidelines and Auxiliary tools for its practical application.

The Model artifact

The Model was the artifact proposed aimed to organize the process to integrate transparency for sustainability on digital service design diagnosis activities, with focus on redesign for improvement and optimization (AC 2.1; AC 2.2; AC 2.4). On Design Education context, the Model was carried out through courses and problem-based learning projects, with focus on supporting the students to build competence on the theme. On organizational context, the Model was carried out with companies real services, with focus on supporting the service team to build competence on the theme, but also to explore the outcomes from the diagnosis activity for the company.

The initial version of the Model was informed by the guidelines to be considered in a service evaluation proposed by Foglieni et al. (2018), combined with the general

design process model from Design Council (2019), to be more easily adaptable to different application contexts.

A total of 5 versions of the Model was incrementally developed, refined and evaluated along the Phase 2 of research with the support of Auxiliary Tools. The Auxiliary Tools were instrumental to support the application of the Model activities, comprising the *Activity Guide* as the primary tool, and other secondary tools (*Content*, *Checklist*, *Factors cards*, *Transparency Spectrum map*, *Briefing template*). The participants of the Workshops during the fieldwork studies experienced the Model indirectly through the use of the Auxiliary Tools, which were the focus of their evaluation. The researcher understands that from 7 artifact development criteria related with the Model (AC1.2; AC1.3; AC2.2; AC2.3; AC 2.4; AC3.4), 3 of them were fulfilled, 2 partially fulfilled and 1 not applicable with the field work studies.

Regarding **relevance**, the results of the studies showed that **the process for the diagnosis of transparency for sustainability was valued by the participants as a new approach from a design perspective, rather than usual technological, legal or corporate perspective**. The **Model's adaptable structure based on the Theoretical Framework** (which included phases, stages, modules, and different analysis scope) **offered a logical model** on how to organize data collection and analysis activities for integrating transparency for sustainability at digital service design diagnosis.

Regarding **effectiveness**, the process **provided guidance on how to evaluate a current situation and identify improvement opportunities of transparency for sustainability on digital services**. Also, the Model through the Activity Guides **supported learning, collaboration and critical-analysis**, both in the educational and organizational contexts.

In the Educational context it was observed a lower level of knowledge on the research themes and within service design activities. The students and practitioners tended to focus on the end-solution and the digital space, rather than exploring the problem space. In that sense, the Model **helped to establish a sequence of steps that encouraged them to explore the transparency problem space**. It's easy to get lost in digital features and forget about the purpose of transparency. Also, there is a higher risk of disconnection with the actual sustainability of the service-system when focusing merely on digital communication. In that Educational context, the results showed that the Model **helped to create awareness** among the students and practitioners, for them **to approach transparency for sustainability as a form of design practice, and where it has a role in a design project**.

Regarding **completeness**, in both contexts, the diagnostic approach revealed barriers in the service provision organizational infrastructure to include the user on the

strategies and actual implementation of transparency for sustainability. Services from different sectors will have different stakeholders influencing transparency, even varying from company to company due to organizational culture and contextual aspects. It was not the scope of this thesis collecting data from end-users of the services or analysing the service organizational culture. However, to alert about these issues, it was evidenced in the second prescribed artifact **Guidelines to consider the end-user and the organizational perspective on transparency diagnosis**. Despite the potential of the Model artifact to create awareness to transparency and sustainability, in the case of malicious organizations (such as supporters of practices of green washing, not interested in real sustainability), this problem goes beyond the scope of the proposed artifact.

The Guidelines artifact

The Auxiliary Tools evolved along the cycles of fieldwork study, based on empirical data, ranging from a larger number of tools in the initial studies to a smaller number of tools in the last studies. The progressive cycles of fieldwork studies revealed a need as well as an opportunity **to simplify the number of tools to help reduce complexity in application**. Due to that, the *Cards Briefing tool* was discontinued and its content was integrated into the *Activity Guide*. The *Spectrum tool* was also integrated into the *Activity Guide*. Hence, as the main Auxiliary Tool, **the Activity Guide evolved to provide a set of Guidelines to people intended to apply the Model** to integrate transparency for sustainability on design diagnosis activities, in the context of services enabling circular economy.

The **Guidelines** were the second type of artifact derived and prescribed from the progressive cycles of fieldwork studies, combined with the Theoretical Framework. The researcher understands the from 5 artifact development criteria related with the Guidelines (AC1.3; AC2.1; AC2.2; AC2.3; AC3.3), 3 of them were fulfilled, and 2 partially fulfilled with the field work studies.

Along the studies it was identified that the diagnosis activities should promote greater reflection rather than a mere assessment. The researcher observed that in both application contexts the provision of structured Guidelines to support the analysis of the current transparency situation and improvement opportunities was more effective to support the autonomous application, while keeping the critical reflection aspect of the Model.

Throughout the cycles of fieldwork study, the understanding of the artifact requirements and research problem evolved, from an artifact as an operational solution for running an assessment (a more positivist perspective), to a more strategic artifact aimed to point directions and provoking critical reflection. This way, the researcher

understood that a key requirement for the artifact was to provide to the participants of the workshops guidelines, for them to be able to self-articulate the key elements of transparency and digital service enabling circular economy, considering the implications of their own context. Figure 6.1 shows the studies that corroborated this understanding.

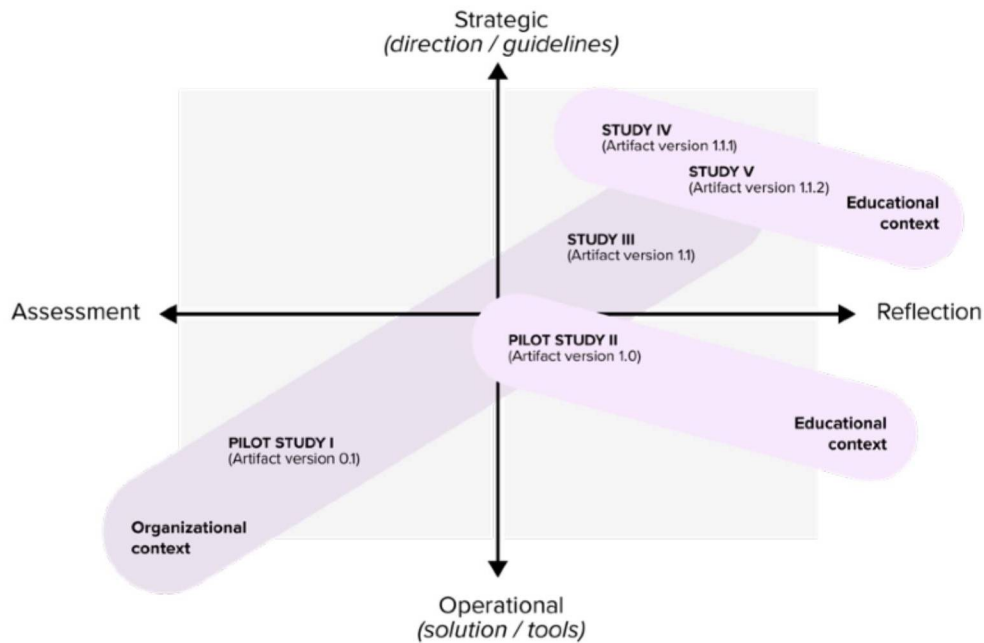


FIGURE 6.1 – Artifact development criteria evolution
Source: the author

This new artifact development criteria was fulfilled and evidenced by the participants feedback and their autonomous application of the artifact. It was specially noticed in the educational context, as the analytical outcome was integrated into the students projects, despite some understanding mistakes or lack of depth, due to the maturity of the students on the topic.

In terms of **relevance**, workshop participants appreciated how the Guidelines were **visually represented and described through the Auxiliary Tools as a connector of theory and practice**, much like other Design tools, with useful recommendations and examples, in both an organizational and educational contexts. However, most of the **feedbacks for improvement** concerned its **completeness** in terms of **having more recommendations and practical examples**, to help with the effectiveness of usage. The researcher understands that there are opportunities for **continue evolving the Guidelines specially in terms of format**.

Regarding **effectiveness**, the **educational function** of the Guidelines to support the integration of transparency for sustainability on digital service design was

highlighted. They were able to **support the participants on: understanding the content** (“know what”); **building the required attitudes** (“know why”) **to act on transparency for sustainability projects and challenges; experiencing the learnings on real transparency challenges.** However, the findings showed that the learning criteria “know how” was partially fulfilled, in line with the participants feedbacks for improvements regarding completeness (in terms of components and format), specially when using the *Transparency Spectrum tool*.

Also, the studies showed that the application of the Guidelines were able to **foster competences on transparency for sustainability** among the participants. Based on the competences described on the Theoretical Framework, the ones that were recurrently observed throughout the studies were: observation and interpretation of current situations; critical thinking for sustainability; work across different service-scope; anticipatory attitude for circularity; interpersonal attitude for design. Additionally, according to the participants, the Guidelines from the Activity Guides contributed to their: critical thinking in a participative and multidisciplinary way; learning of the key concepts; autonomous applications; adopting a systematic approach to transparency.

This reflection reinforces the relevance of the artifacts and auxiliary tools as instruments to support those interested in developing competence on transparency for sustainability.

Scope of strategies to increase transparency

Throughout the studies, the researcher observed the need **to reinforce the different levels to approach transparency for sustainability on digital services.** It was explained to the participants of the workshops with the Auxiliary educational content, but the researcher also identified the need to evidence that on the final version of the artifacts. Working with **transparency for sustainability on digital services requires a more multidimensional approach, rather than focusing exclusively on the digital scope.**

Hence, the understanding of the scope to approach transparency for sustainability on digital services evolved. The literature unveiled that different strategies contribute to overall types of transparency and outcomes (MOL 2015; SCHNACKENBERG and TOMLINSON, 2016; MABILLARD and ZUMOFEN, 2017). Based on that, this research adopted as *Scope of Strategies for Transparency* (Theoretical Framework version 1.0), the *type of organizational attitude* and the *states of the transparency practices*. The empirical studies combined with the theoretical studies (MOL 2015; SCHNACKENBERG and TOMLINSON, 2016; MABILLARD and ZUMOFEN, 2017), helped to refine this understanding.

Due to that, the researcher understands that **a service organization intended to increase transparency for sustainability based on the design of digital services for circular economy, should consider three scope of strategies at:**

- a) **Governance scope** to foster the required competencies for transparency, sustainability and circularity;
- b) **Practice scope** to enable the end-user value-creation for sustainability and circularity through transparency digital interactions;
- c) **Relational scope** to build relationships with the service key stakeholders on sustainability and circularity that have a role on transparency.

Both scopes are interconnected and **the Practice Scope for transparency was the focus of this thesis**. At *Practice Scope* transparency strategies could focus *openness* of different elements of the service-system (WHAT) along different service encounter for circularity (WHEN). While the service level of maturity at relational and governance scope could influence the priorities for transparency practices.

More specifically **at Practice Scope in the context of digital services enabling the circular economy**, transparency strategies could be organized into three sub-categories:

- **Institutional-oriented communication** typically concerning the service governance of sustainability and circularity;
- **Product-resource-oriented communication** of the resource flows handled by the service;
- **Individual-oriented communication** concerning the end-users and collaborators of the service.

Both course of action for transparency could address social, environmental, and economic dimensions.

Also, the studies reinforced the relevance of developing an **anticipatory attitude to enhance the effectiveness of the impact of transparency on circularity goals**. This implies in adopting a more active attitude to address ethical and behavioral issues towards sustainability, rather than focusing on meeting functional needs (such as convenience, compliance). The end-user journey for circular economy involves gaps in communication and service offerings. This means that at *practice scope*, **transparency strategies needs to foresee the multiple communication needs of the end-users**, but also **the principles and goals of circularity and sustainability which the service organization stands for**. However, it was not usual for the participants of the workshops to consider this level of detail and communication fragmentation. Hence, to facilitate this

process, it was evidenced in the artifact **guidelines for the key circularity encounters and sustainability dimensions for transparency**.

Utility of the artifacts

The process Model represents a multilevel and modular approach to integrate transparency for sustainability at the early stages of Service Design, providing Guidelines to support the key activities. Based on the fieldwork application outcomes within real situations, the Model and Guidelines (instrumented by the Activity Guides) can be used:

- With an **educational function to support the development of competences** to integrate transparency for sustainability on design projects, particularly in the context of digital services enabling circular economy. It promotes the reflection on the ethical and communication aspects of the service, and the value-propositions enabled by transparency practices to the service end-users;
- With an **diagnostic function to characterize and evaluate the level of maturity** of a service organization and **the current state of the practices on transparency for sustainability**;
- With an **analytical function to identify requirements on transparency for sustainability to inform service design activities and action plans**;
- With a **creative function to inform the key elements to consider when exploring insights and design scenarios** to improve transparency for sustainability in the context of digital services enabling circular economy.

Guidelines to integrate transparency at service *practice scope* were the focus of the studies, and can be used to: **analyse the sustainability dimensions and circularity elements of the service system that are critical for transparency; analyse the digital touchpoints enabling transparency along the critical service encounters for the end-users**. The Guidelines addressing transparency at service *governance scope* and *relational scope* were secondary among the studies, but recommended to enrich the analysis and transparency impact for sustainability.

Applicability of the artifacts

The Model and Guidelines to integrate transparency for sustainability on digital service diagnosis are presented in a structured way to be **used together** and provide **flexibility in its use**. For example, in low maturity contexts it was easier for the participants of the workshops to start thinking about transparency at service-digital scope (the touchpoints, types of interactions and information), and then move on to a more systemic including sustainability and circularity issues. Also, along the field work studies,

the researcher observed that the Activity Guide tool revealed **different usage intensities and possibilities** by the participants of the workshops. Some of them used it for consultation, for taking notes and as a checklist.

Although the Model and Guidelines were developed to enable their autonomous application by a broad audience, it is recommended that people with previous knowledge of the related themes act as **mediators and facilitators** during the application of the process to diagnose transparency for sustainability in the design of digital services for the circular economy. The fieldwork studies showed that having an external mediator was important to ensure that the team discussed in a collaborative way the conflicting situations, relationships, and practices influencing transparency efforts in the organization.

A service organization or educational service design project can apply the artifacts to analyze an existing digital service, implementing one of the circular economy strategies in the core business. The analysis can be **exploratory** (running most of the activities and guidelines to have a full picture of the transparency, typically for a long-term action plan) or **issue-oriented** (addressing a specific goal and scope of analysis, typically for a short-term action plan).

In terms of maturity on transparency for sustainability, the artifacts can be applied when there is **insufficient and basic maturity** to build awareness, identify possibilities, and begin to prioritize transparency as part of the service strategy. Within **developing and consolidated maturity**, the artifacts can be applied to expand the value propositions and continuously manage transparency strategies.

6.2 Recommendations for the final version of the artifact

Based on the results of the cycles of fieldwork study from Phase 2 of research and cross-analysis, the two final artifacts prescribed were grouped as part of a Design Guide (Figure 6.2).

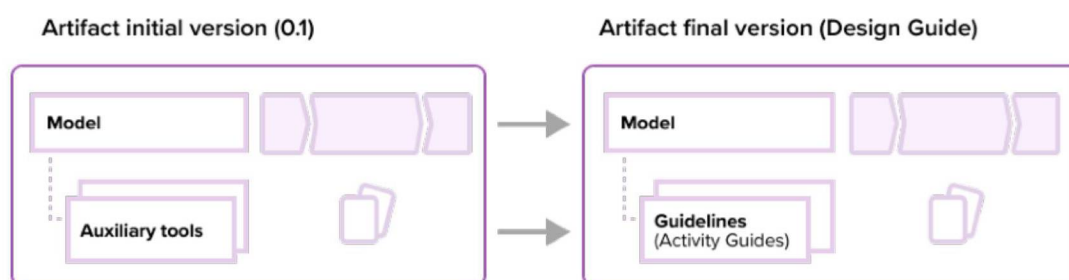


FIGURE 6.2 – Evolution of the types of artifacts
Source: the author

- a) **Model** of the process that organize and guide the integration of transparency for sustainability in service design diagnose activities at the early stages of digital service design;
- b) **Guidelines** to provide recommendations to support the practical application of the Model in the context of digital services enabling the circular economy. The **Activity Guides tool** was developed to help described the Guidelines and instrument its application, derived from the previous Auxiliary tools;

Figure 6.3 presents an overview of the schematics of the final version of the artifact and how each component are related.

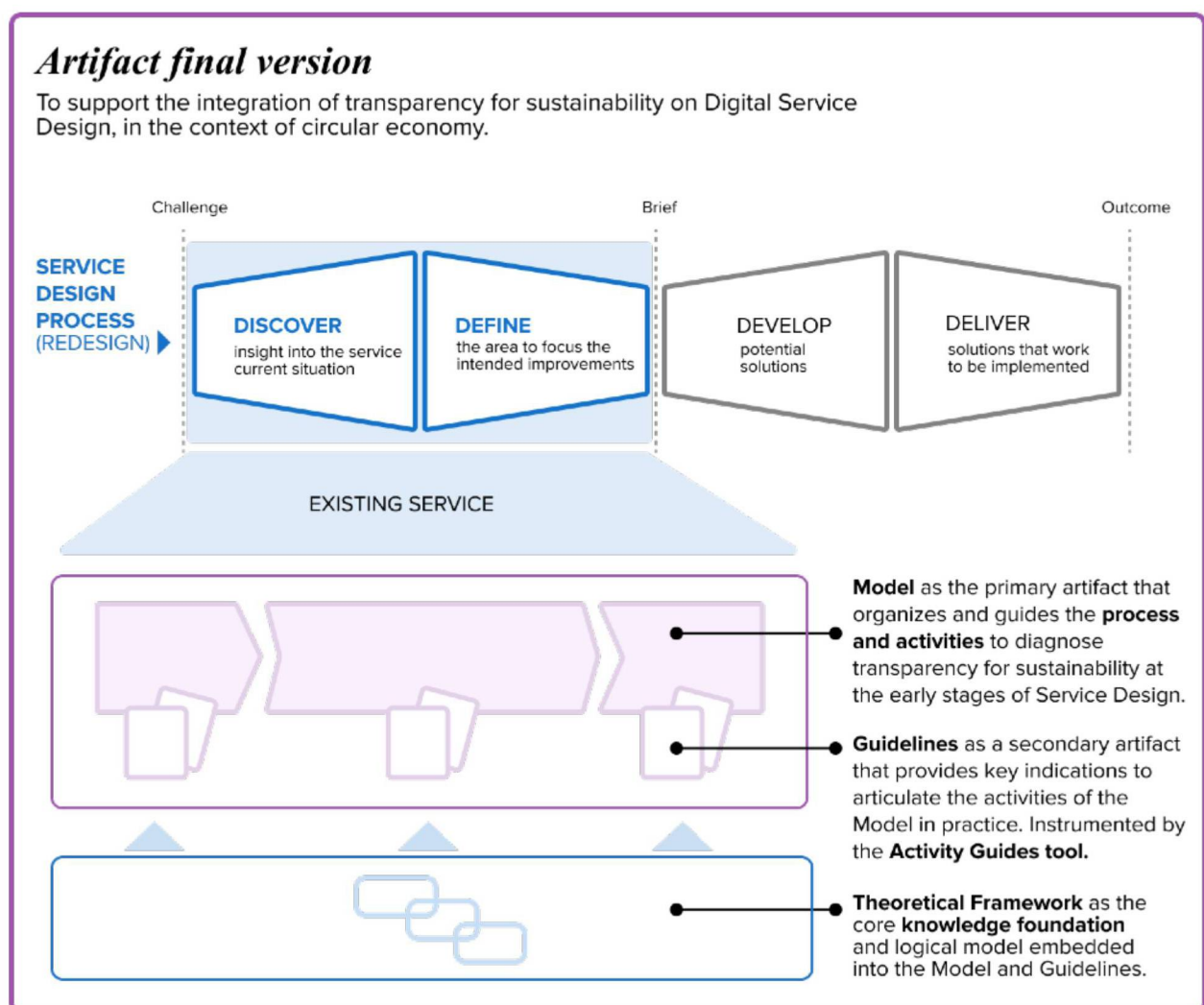


FIGURE 6.3 – Schematics of the final version of the artifacts

Source: the author

The **final improvements to the Theoretical Framework**, recommended by the researcher were:

- ✱ [CHANGE_FTF.1] Reinforce the components of the framework and their arrangement in relation to the scope of strategies (governance, practice, actors) to address transparency for sustainability on digital services;
- ✱ [CHANGE_FTF.2] Include the transparency maturity level as a new component at governance scope;
- ✱ [CHANGE_FTF.3] Evidence the early stages of design process addressed by the framework;

The final version of the Theoretical Framework was organized into two modes of visualization (see Chapter 7 Figure 7.1): a) scope of transparency strategies, based on the metaphor of “topographic maps”, to illustrate the different planes to approach transparency; b) the transparency components, based on the different components of each scope to be articulated to approach transparency;

The **final improvements to the Model** recommended by the researcher were:

- ✱ [CHANGE_FM.1] Review the description of each phase and activity module to make it clearer;
- ✱ [CHANGE_FM.2] Link the Guidelines to their respective scope and modules of activities, to clearly state the logic of the diagnosis;

The final version of the Model is illustrated at Chapter 7 Figure 7.2, including the improvements mentioned above.

The **final improvements to the Guidelines** recommended by the researcher were:

- ✱ [CHANGE_FAG.1] Include the guidelines to support the key modules of activities from the Model;
- ✱ [CHANGE_FAG.2] Review and refine the description of each guideline to improve their understanding and the hierarchy for an autonomous application, evidencing the recommendations and practical tips;
- ✱ [CHANGE_FAG.3] Integrate the *Spectrum tool* as a visual support for the guidelines regarding decision-making. The Spectrum tool was the most promising from the original set. During the studies it was understood that the Spectrum could be configured with different parameters, allowing different levels or angles of visualisations (zooms) to support the diagnostic analysis. Hence, the researcher understands the Spectrum as a versatile tool, that could be integrated into specific guidelines, and used to support diagnostic

analysis and prioritization activities in a visual way, rather than a usage it as an independent tool;

- ✱ [CHANGE_FAG.4] Integrate guidelines to help formulate a transparency practice. Regarding the *Design Principles of Transparency for Sustainability* (see Theoretical Framework), they were used during characterization of current practices and analysis of opportunities. During the studies it was provided to the participants of the workshops as part of the educational content.

The Guidelines were organized into four Activity Guides as shown at Chapter 7 Figure 7.3, to be more easily adaptable to different application contexts and needs. It also aimed to support the approach of each scope of transparency independently (although they are interconnected) and also the application of the two stages of the diagnosis phase.

The Chapter 7 presents the final version of the artifacts and tools, incorporating these latest recommendations.

6.3 Generalizations addressing the research problem

The class of problem addressed in this research was the integration of transparency for sustainability on Design education and Service Design diagnose activities.

Since the research contributions addresses a topic not yet approached in a structured way in Design, the Theoretical Framework and artifacts (Model and Guideline) could be used to help **formalize *Design for Transparency* research and practice**, in academic, educational and organizational contexts.

The artifacts could be applied in various types of digital services aiming **to improve value-propositions for sustainability**. This includes private companies, of small to medium-sized in different sectors, addressing transparency for sustainability and circular economy in service communication. Specially in organizational contexts, the artifacts could be integrated to change management and/or design management processes carried out from time to time to **monitor the evolution of transparency**, as well as in a more isolated way to support **specific improvement initiatives**.

In education context, the Theoretical Framework, the Model and the Guidelines could be applied in a **full course** dedicated to the theme, to enable the students to have quality time to learning the conceptual foundations and apply in **problem-based projects**. The artifacts could also be integrated as a topic in **existing courses of Service Design**,

Design for Sustainability and Circular Economy, to build competencies on transparency.

In both organizational and educational context, the Model and Guidelines could be applied to **projects addressing environmental, social and economic dimensions of sustainability**. The **multiple scope and components of the Model**, could be used to support the flexible approach of diagnosis activities. Besides the diagnosis support, the Guidelines could also be used combined with other service design methods and tools such as user research, concept generation, to **inform transparency design criteria**.

6.4 Communicating the research results

The publications written so far as a PhD Student that helped with the research theme are presented below:

Papers published in scientific journal

LOMBA, Marcella N.; SANTOS, Aguinaldo dos. Modelo teórico para diagnóstico da transparência em serviços: uma proposta para o setor de alimentos. **Estudos em Design**, v. 29, p. 65-81, 2021.

LOMBA, Marcella N.; SANTOS, Aguinaldo. Sustainability Transparency: Scope For Digital Services. **Mix Sustentável**, v.9, n.3, p.181–199. 2023.

Papers published in international conferences

LOMBA, Marcella N.; SANTOS, Aguinaldo dos. Embedding Transparency on Digital Services: a Case Study on the Food Sector. In **ServDes.2020 - Service Design and Innovation Conference**, 2021.

SCHERER, Karla; NICASTRO, Marcella Lomba; SANTOS, Aguinaldo dos. Product-Service System for Sustainability: Reflections from an Application on the Fashion Sector. In: **Simpósio de Design Sustentável**, 2021. Anais do VIII SDS 2021. Curitiba: Departamento de Design da UFPR, 2021.

Papers published in research seminars

LOMBA, Marcella N.; SANTOS, Aguinaldo dos.; MEDOLA, Fausto. Fatores críticos para transparência em contextos voltados para gestão sustentável de resíduos. In **2ºSPD - Seminário de Pesquisa em Design da UFPR**, 2023.

Papers published in book chapters

LOMBA, Marcella N.; SANTOS, Aguinaldo dos. Data Experience: A Protocol to Assess Transparency Towards Sustainability on Digital Services. In: Younghwan Pan; Renato Antonio Bertão. (Org.). **EXPERIENCE DESIGN Korea & Latin America Research Exchange**. 1ed.: Human and Design Press, 2021.

SANTOS, Aguinaldo dos; LOMBA, Marcella N.; PETRECCA, Alessandra. **Políticas e soluções para cidades sustentáveis: Resíduos**. Observatório de Inovações para Cidades Sustentáveis, 2022.

LOMBA, Marcella; DIAS, Gabriela S.; MEDOLA, Fausto. Óculos digital assistivo: situação e implicações para o Design. In: **Design inclusivo e persuasivo**. 1a ed: Ria Editorial, 2022.

Book chapters (to be published)

LOMBA, Marcella. Linking transparency to digital services enabling e-waste circularity. In: **Zero-Waste Collaboration: Brazilian and Danish perspectives**. 2024. *(in the preparation phase)*

Chapter 7 – The DesignGuide (final artifacts)

7.1 The Theoretical Framework to integrate transparency for sustainability on digital service design for circular economy

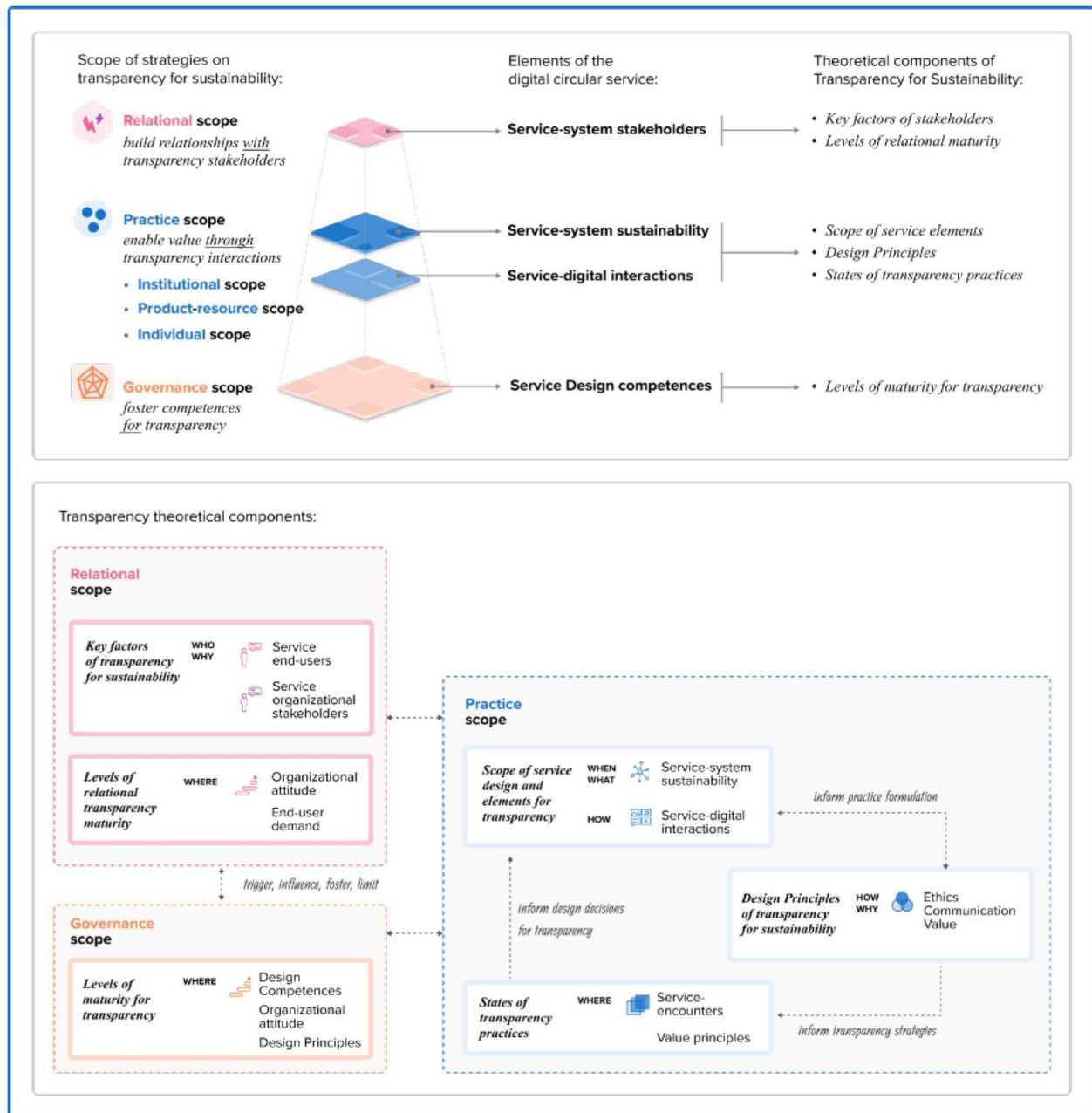


FIGURE 7.1 – The final version of the Theoretical Framework
Source: the author

7.2 The Model to integrate transparency for sustainability on design diagnostic of digital services for circular economy

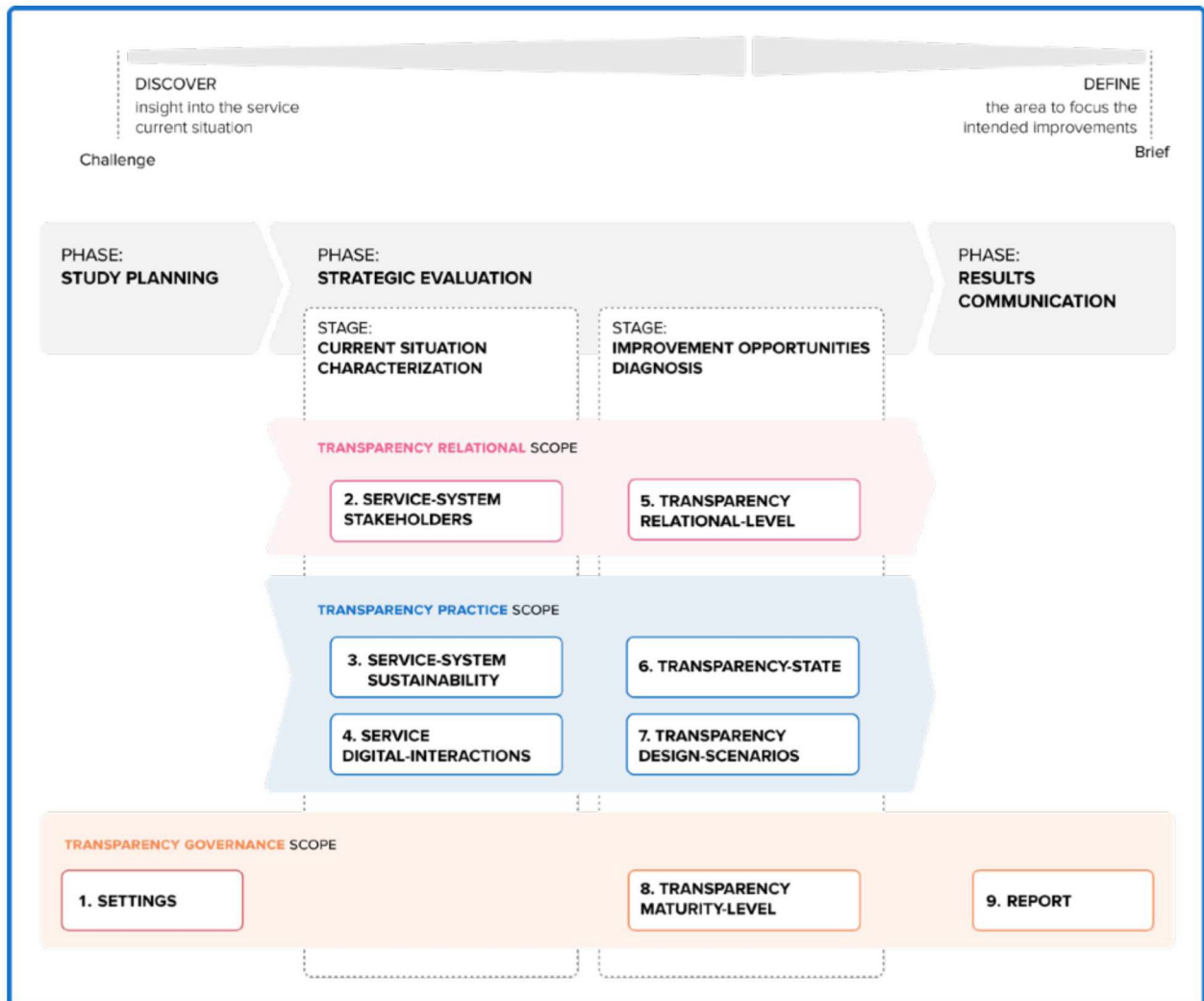


FIGURE 7.2a – The final version of the process Model
Source: the author

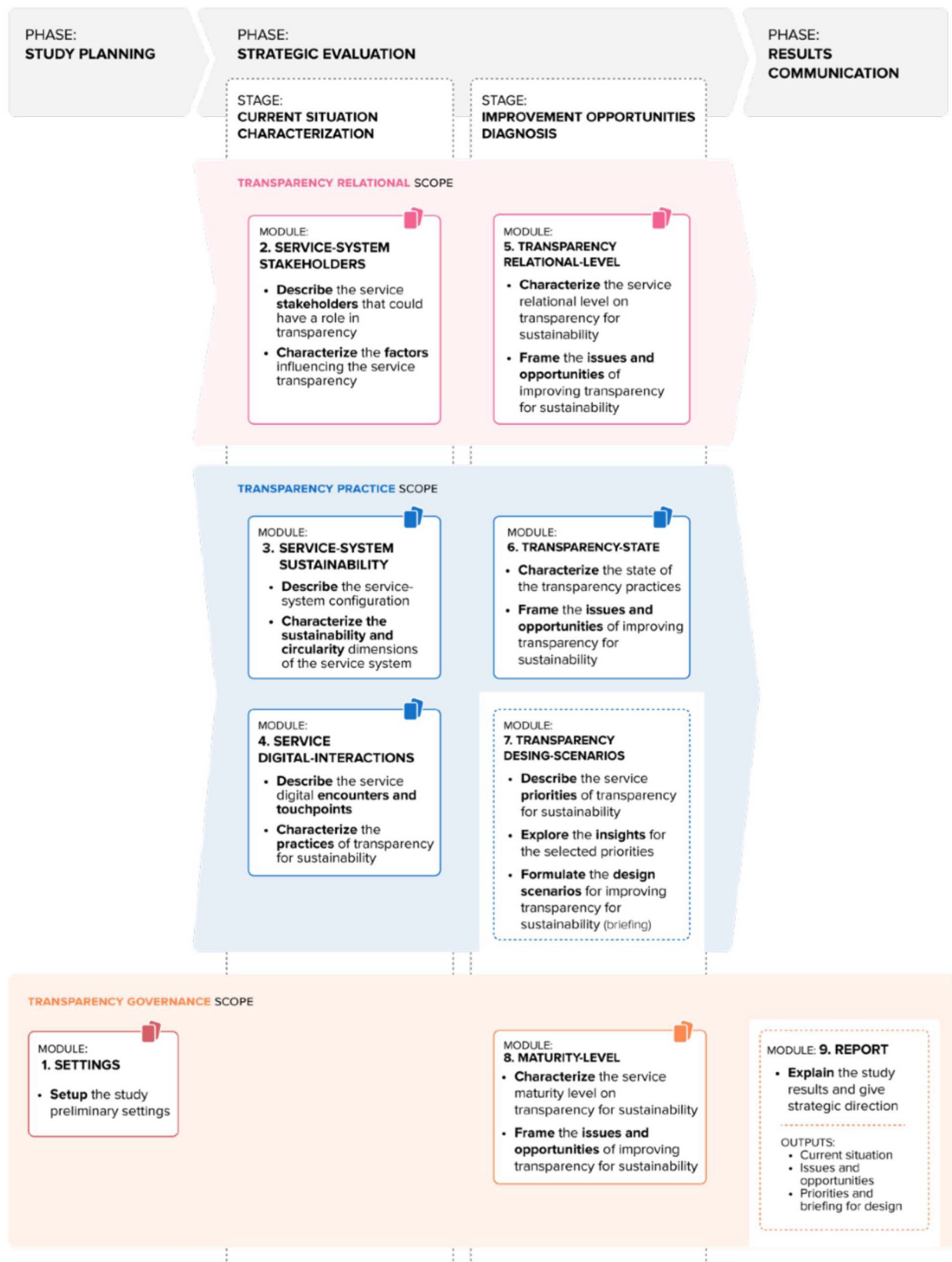


FIGURE 7.2b – The final version of the process detailed

Source: the author

7.3 The Guidelines to support the application of the Model through Activity Guides as an Auxiliary tool



FIGURE 7.3 – The final version of the types of Activity Guides
Source: the author

ACTIVITY GUIDE: SETTINGS

Goal: to provide **guidelines to support the preliminary settings** as input for running a transparency for sustainability diagnosis.

Guidelines: **Diagnosis Goal, Scope, Tools, Knowledge**

MODULE: 1. SETTINGS
PHASE: **PLAN**

GUIDELINES:

S.1

SETUP THE STUDY GOAL

- Description:** There is no one way to approach a transparency for sustainability diagnosis.
- Recommendation:** When planning a study, take into account what you are trying to do: an exploratory study or addressing a specific issue. Formulate the study goal as a question.
- Example:** "What is the transparency for sustainability situation of the service XYZ?"

What are you trying to do?

- ☐ Address a specific known issue
From a previous study or an input from research.
- ☐ Conduct an exploratory study
New initiative to discover problems and opportunities.

Practical tips:

**Select the guides and guidelines more relevant to your project.*

**Use the most of the guides and guidelines to a more complete study.*

S.2

SETUP THE STUDY SCOPE

- Description:** Depending on the goal and context, the boundaries of the diagnosis may vary.
- Recommendation:** When planning a study, take into account the main variables: available primary and secondary data sources, key stakeholders for collaboration, and general limitations.

Stakeholders

- ☐ Consider who are the critical stakeholders for collaborating with during the study.
- ☐ Consider the availability of stakeholders to participate on the activities.

Practical tips:

**Invite who should have a voice.*

**Plan the activities with flexibility.*

Data sources

- ☐ Consider which primary and secondary data sources are available for the study.
- ☐ Consider the possibility/need of integrating new research for updating or collecting new data.

Limitations

- ☐ Consider general restrictions of the study.

Practical tips:

**Use existing data from previous diagnostics or research.*

**Plan primary and secondary data collection.*

S.3

SETUP THE TOOLS FOR THE STUDY

- Description:** Along the study you can use the conventional Service Design tools and adapt them to highlight transparency, sustainability and circularity aspects to support the analysis.
- Recommendation:** When planning a study, take into account the use of Service Design tools for representation of maps, and narratives.

Key Service Design tools setup

- ☐ Stakeholders map, Actors Map, System map
- ☐ Personas
- ☐ User Journey map, Service Blueprint map
- ☐ Tomorrow narratives, User Scenarios

Transparency Activity Guides setup

- ☐ **Select the guides to be used according to the study goal and scope limitations.**

ACTIVITY GUIDE: REALTIONAL

ACTIVITY GUIDE: PRACTICE

ACTIVITY GUIDE: GOVERNANCE

S.4

SETUP THE KNOWLEDGE FOUNDATIONS FOR THE STUDY

- Description:** Due to the complexity of the theme, it requires an understanding of the key conceptual foundations to support a practical approach.
- Recommendation:** When planning a study, take into account the concepts of transparency for sustainability in digital services enabling circular economy.

Educational setup

- ☐ Consider the participants level of knowledge on the fundamentals concepts.

Practical tips:

**Align with the participants, an educational onboarding to level the concepts and understandings.*

**Check the Theoretical Chapter of the Design Guide.*

Transparency for Sustainability Design Guide (LOMBA, 2024)

FIGURE 7.4 – The final version of the Activity Guide: Settings
Source: the author



ACTIVITY GUIDE: RELATIONAL

Relational scope

Goal: to provide guidelines to support the characterization and diagnosis of the service stakeholders perspective on transparency for sustainability.
Guidelines: Characterization of Stakeholders, Key Influencing Factors, Transparency Requirements, and Diagnosis at Relational Level

MODULE: 2. STAKEHOLDERS | END-USERS 

GUIDELINES:

STAGE: CURRENT SITUATION

PAG. 1 - 5

Who and Why

R.1 INCLUDE TRANSPARENCY FOR SUSTAINABILITY FEATURES IN END-USER PROFILES

- Description:** Different groups of service end-users could have different transparency perceptions, needs and sustainability attitudes.
- Recommendation:** The tools such as Personas and User Journey can be used for visual representation.
- Insight:** When describing the end-user profiles, it can help with insights for the Practice scope: **the end-users informational and interaction needs.**

When Now

Consider aspects of circular-behaviour
Attitudes pro-circularity

- ☐ Pre-Usage
Consumption prevention and minimization.
- ☐ Usage
Extend the lifespan of product and parts
- ☐ Post-Usage
Useful applications of waste

Consider aspects of sustainable-behaviour
Attitudes pro-sustainability

- ☐ Not aware (Indifferent)
No changes in lifestyle, is indifferent to sustainability issues
- ☐ Begins to think (Reactive)
Adopts changes when it is mandatory or when there is a personal need or change in lifestyle
- ☐ Intends to act, Acting, Maintaining (Active)
Conscious, open to change behaviors, and/or requires change support

R.2 IDENTIFY THE FACTORS INFLUENCING END-USERS DEMANDS OF TRANSPARENCY FOR SUSTAINABILITY

- Description:** The factors that drives or motivates users to demand transparency for sustainability.
- Recommendation:** Connect the selected drivers with each end-user profile in the Persona tool.
- Insight:** When describing the end-users drivers, it can help with insights for Practice scope: **the sustainability and circularity elements for transparency.**

What

Individual

- ☐ UDI.1 Mistrust, uncertainty and insecurity
e.g.: users feel a discomfort with wrong waste destination practices
- ☐ UDI.2 Changes in lifestyle, care routine and consumption habits
e.g.: users changing diet habits for health reasons
- ☐ UDI.3 Changes in informational and knowledge needs
e.g.: users willing to gather more detailed information on certain brand offerings

Contextual

- ☐ UDE.1 Social, cultural, environmental, economic and political influences
e.g.: changes in legislation, climate change events or use of illegal natural resources, etc.
- ☐ UDE.2 Complaints, scandals and conflicts involving organizations
e.g.: media warnings about the increase in pesticides in food production of certain brands

S.3 IDENTIFY THE FACTORS INFLUENCING END-USERS EXPERIENCE WITH TRANSPARENCY FOR SUSTAINABILITY

- Description:** The factors that facilitates or prevents end-users user in benefiting from sustainability transparency, such as communication barriers, preferences, and limitations.
- Recommendation:** Connect the selected drivers with their respective user profiles in the persona.
- Insight:** When describing the influencing factors, it can help with insights for the Mediation plane: **the informational and interaction factors.**

How

Resources and digital devices

- ☐ UFR.1 The required tools and platforms in the digital space (technological factors)
e.g.: QR Code reader as a required functionality to use the service
- ☐ UFR.2 The required infrastructure in the urban, organizational and domestic space (operational factors)
e.g.: waste storage limitations, deficient municipal waste collection weekly
- ☐ UFR.3 The required functions for a more inclusive digital interaction (accessibility/usability factors)
e.g.: non-inclusive digital interfaces for people with visual impairment and disabilities

Symbolic meanings

- ☐ UFS.1 The understandings and beliefs that the users have (aesthetics and value factors)
e.g.: recyclability as an attribute to stimulate consumption

Competences

- ☐ UFC.1 The user's knowledge on the subjects of sustainability and circularity (educational factors)
e.g.: users who are familiar only with recycling and don't fully understand it
- ☐ UFC.2 The user's attitudes pro-sustainability (behavioral factors)
e.g.: the adoption of sustainability as a criteria for decision-making
- ☐ UFC.3 The user's level of digital maturity (technological factors)
e.g.: users who are not used to carrying out processual activities entirely digitally

Transparency for Sustainability Design Guide (LOMBA, 2024)

FIGURE 7.5 – The final version of the Activity Guide: Relational
Source: the author

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ACTIVITY GUIDE: RELATIONAL

Relational scope

Goal: to provide guidelines to support the characterization and diagnosis of the service stakeholders perspective on transparency for sustainability.
Guidelines: Characterization of Stakeholders, Key Influencing Factors, Transparency Requirements, and Diagnosis at Relational Level

MODULE: 2. STAKEHOLDERS | END-USERS



STAGE: CURRENT SITUATION

GUIDELINES:

PAG. 2 - 5

R.4

ELICIT THE END-USER'S REQUIREMENTS OF TRANSPARENCY FOR SUSTAINABILITY

Who and Why

• **Description:** The end-user's requirements which the service should satisfy or solve regarding transparency for sustainability and circularity.

Who should be included by transparency?

Evidence the user requirements of whom the service transparency should include, such as:

- ☐ People insecure, distrustful, or misinterpreting (conflict resolution)
- ☐ People with specific needs and disabilities (functional capabilities)
- ☐ People unaware or skeptics of service offerings for sustainability (unaware)
- ☐ People interested in adopting more sustainable behaviours (curious)
- ☐ People already adopting new products and service offerings (engaged)
- ☐ People in asymmetric power relations with brands and services (excluded)

What transparency needs should be addressed?

Qualify the user requirements based on categories, such as:

- ☐ Transparency competence needs
- ☐ Transparency meaning needs
- ☐ Transparency resource needs
- ☐ Transparency informational needs
- ☐ Transparency interaction needs



ACTIVITY GUIDE: RELATIONAL

Relational scope

Goal: to provide guidelines to support the characterization and diagnosis of the service stakeholders perspective on transparency for sustainability.
 Guidelines: Characterization of Stakeholders, Key Influencing Factors, Transparency Requirements, and Diagnosis at Relational Level

MODULE: 2. STAKEHOLDERS | ORGANIZATIONAL



STAGE: CURRENT SITUATION

GUIDELINES:

PAG. 3 - 5

Who and Why

R.5 IDENTIFY THE KEY SERVICE STAKEHOLDERS INFLUENCING TRANSPARENCY FOR SUSTAINABILITY

- **Description:** The core internal and external actors in the service-system that might have a role in transparency for sustainability and circularity.
- **Recommendation:** The tools such as Stakeholders map, Actors map, System map can be used for visual representation.
- **Insight:** When describing the stakeholders, it can help with insights for the Practice scope: **sustainability and circularity elements for transparency.**

What

Types of stakeholders

Consider the human and non-human key actors from the service-system, such as:

- | | |
|---|---|
| ☐ Design, technology, marketing, business, legal | ☐ End-users/customers |
| ☐ Manufacturers, logistics, retail | ☐ Digital platforms/digital entities |
| ☐ Government and sector organizations | ☐ Intermediaries and third-parties |
| ☐ Social-environmental affiliates | |

Level of influence

Consider how much the service stakeholders influence transparency offerings:

- | | | |
|---------------------------------|-----------------------------------|---------------------------------------|
| ☐ Direct | ☐ Indirect | ☐ No influence |
|---------------------------------|-----------------------------------|---------------------------------------|

R.6 IDENTIFY THE KEY DRIVERS OF THE SERVICE TRANSPARENCY FOR SUSTAINABILITY

- **Description:** The factors that motivates the service stakeholders to address transparency for sustainability and circularity.
- **Recommendation:** Connect the selected drivers with their respective stakeholders and relational flows in the maps.
- **Insight:** When describing the drivers, it can help with insights for the Practice scope: the **sustainability and circularity elements for transparency.**

What

Internal to the service organization

- ☐ SDI.1 Implementation of new technology (technological factors)
e.g.: digital passport to store product history and authentication via QR Code scan and blockchain.
- ☐ SDI.2 Communication of marketing and branding campaigns (commercial factors)
e.g.: socio-environmental and sustainability education campaigns
- ☐ SDI.3 Communication of environmental, social and economic results (quality factors)
e.g.: sustainability reporting
- ☐ SDI.4 Communication of sustainability quality compliance (quality factors)
e.g.: third-party certifications

External to the service organization context

- ☐ SDE.1 Changes in legislation and standards affecting the organization (political factors)
e.g.: National Solid Waste Policy that makes it mandatory for the company to carry out reverse logistics.
- ☐ SDE.2 Complaints, scandals and conflicts involving the organization (political factors)
e.g.: media warnings about the increase in pesticides in food production of certain brands
- ☐ SDE.3 User needs and perceptions (quality factors)
e.g.: people would like to be able to repair their equipment



ACTIVITY GUIDE: RELATIONAL

Relational scope

Goal: to provide guidelines to support the characterization and diagnosis of the service stakeholders perspective on transparency for sustainability.
Guidelines: Characterization of Stakeholders, Key Influencing Factors, Transparency Requirements, and Diagnosis at Relational Level

MODULE: 2. STAKEHOLDERS | ORGANIZATIONAL



STAGE: CURRENT SITUATION

GUIDELINES:

PAG. 4 - 5

Who and Why

R.7 IDENTIFY THE FACTORS INFLUENCING THE IMPLEMENTATION OF TRANSPARENCY FOR SUSTAINABILITY

- **Description:** The factors that facilitates or prevents the service in implementing transparency for sustainability and circularity.
- **Recommendation:** Connect the selected factors with their respective actors and flows in the actors map.
- **Insight:** When describing the influencing factors, It can help with insights for the Practice scope: **the informational and interaction features.**

How

Resources

- ☐ SFR.1 The required tools and platforms in the digital space
technological factors
- ☐ SFR.2 The required infrastructure in the urban, organizational and domestic space
operational factors
- ☐ SFR.3 The complexity and size of the service system configuration
organizational and systemic factors
- ☐ SFR.4 The nature of the transparency content (positive and negative)
responsibility and ethical factors

Symbolic meanings

- ☐ SFS.1 The beliefs that the service stakeholders have on transparency for sustainability and circularity
educational and responsibility factors
- ☐ SFS.2 The fear of the service stakeholders in exposing themselves
marketing and political factors
- ☐ SFS.3 The level of secrecy of the service contents and processes
legal and political factors
- ☐ SFS.4 The level of competitive advantage of the service
marketing and business factors
- ☐ SFS.5 The end-users level of trust in the service
customer relationship factors
- ☐ SFS.6 The service willingness to open for end-user generated content
political and user factors

Competences

- ☐ SFC.1 The service ability to digitalize the service system
digital transformation factors
- ☐ SFC.2 The service ability to include usability and accessibility practices in the digital platforms
accessibility and usability factors
- ☐ SFC.3 The service ability to provide complete, consistent, and accurate digital content
informational quality factors
- ☐ SFC.4 The service stakeholders knowledge of the service end-users sustainability profile
user sustainability factors
- ☐ SFC.5 The knowledge that service stakeholders have on transparency for sustainability and circularity
educational factors

R.8 ELICIT THE SERVICE ORGANIZATIONAL REQUIREMENTS OF TRANSPARENCY FOR SUSTAINABILITY

- **Description:** The requirements which the service organization should satisfy or solve regarding transparency for sustainability and circularity.
- **Recommendation:** consider what are the transparency for sustainability needs and commitments from the organization perspective.

Who should be included by transparency?

- ☐ Evidence the stakeholders who the service transparency should include.
- ☐ Consider to support different stakeholders needs on transparency for sustainability
- ☐ Consider unbalanced power-sharing for stakeholders participation

Practical tips:

*Reflect on the stakeholders distance from the end-user in the service-system and the power asymmetries.

*Reflect on competences, meanings, resources. informational, interaction requirements.

*Reflect on the stakeholders competence on the theme and potential barriers.

*Reflect on the stakeholders with low influence on actual practices.



ACTIVITY GUIDE: RELATIONAL

Relational scope

Goal: to provide guidelines to support the characterization and diagnosis of the service stakeholders perspective on transparency for sustainability.
Guidelines: Characterization of Stakeholders, Key Influencing Factors, Transparency Requirements, and Diagnosis at Relational Level

MODULE: 5. RELATIONAL-LEVEL



STAGE: IMPROVEMENT OPPORTUNITIES

GUIDELINES:

PAG. 5 - 5

R.9

ANALYZE THE SERVICE RELATIONAL LEVEL OF TRANSPARENCY FOR SUSTAINABILITY

Where

- Description:** The relational analysis concerns how the transparency attitudes of the service organizational stakeholders support or promote the attitudes toward sustainability and circularity of the service end-users. It is a qualitative analysis to support diagnosis reflection and decision-making.

Practical tips:

* Use the findings from the characterization of the key factors and requirements of stakeholders to support your analysis.

* The tools such as Service Blueprint, Tomorrow Narratives, User Scenarios can be used for visual representation and communication of the identified opportunities.

Relational Spectrum tool

The Spectrum map aims to support analysis and decision-making in a more visual way.

It is possible to locate in the map the areas which represents the current situation, to identify key areas/scenarios for improvement.

- ☐ Locate on the map the quadrants related to the current end-users attitudes versus the organizational attitude with transparency for sustainability.



- ☐ Identify the respective level of relational maturity of the service with transparency for sustainability:

☐ 1 - Insufficient level

No or low predisposition for transparency

Service with no intentional transparency attitudes and end-users with no interest on sustainability/circularity.

Recommendation:

To consider who are the key stakeholders to help change the attitude of the service organization on transparency for sustainability, aimed to promote the awareness of the service end-users.

☐ 2 - Basic level

End-users demand more than the service offers

Service approaches transparency usually as a response for compliance requirements, for legitimacy and credibility.

Recommendation:

To develop transparency for sustainability competence on the key stakeholders of the service, to better fulfil end-user requirements and address key influencing factors.

☐ 3 - Developing level

Service offers more than the end-users demands

Service approaches transparency usually to enable end-users understanding and support informed decision-making.

Recommendation:

To continue developing the service end-users competences and attitudes on sustainability, in direction to more proactive attitudes. Consider the different end-user profiles and potential barriers to overcome.

☐ 4 - Consolidated level

End-users and service with higher demands and offerings

Service approaches transparency in a systematised way, usually to enable end-users actionability for sustainability.

Recommendation:

To continue developing the service end-users and organization stakeholders attitudes, but ensuring the need for other complementary strategies.

- ☐ Reflect on the issues, opportunities and priorities for improvement.



ACTIVITY GUIDE: PRACTICE

Goal: to provide guidelines to support the characterization and diagnosis of the service practices of transparency for sustainability.
Guidelines: Characterization of the Service Encounters, Sustainability Elements, Digital Interactions, Transparency Practices and Diagnosis at Practice Level

Practice scope

MODULE: 3. SUSTAINABILITY 

GUIDELINES:

STAGE: CURRENT SITUATION

PAG. 1 - 6

P.1 LOCATE THE KEY SERVICE STAGES AND STRATEGIES ON CIRCULAR ECONOMY FOR TRANSPARENCY

- Description:** In the context of services enabling circular economy, the circular stage represents the products life-cycle stage, in which the service(s) offerings are situated.
- Recommendation:** Consider the service supports more than one circular strategy and vice-versa, depending on the business model.
- Recommendation:** Consider that each circular stage presents different transparency challenges for the service.
- Recommendation:** Consider the study scope and limitations.
- Insight:** It can help with insights related to the **context of transparency communication**.



Circular context

Transparency communication

When

Service Circular stages:

☐ **PURCHASE**
 Consider transparency in the context of **consumption prevention and minimization**.

Key Strategies:

☐ **Prevent and reduce**

Transparency on **consumption efficiency, sufficiency and impacts**
e.g: Should I buy this item?

☐ **USAGE**
 Consider transparency in the context of **extend the lifespan of products and parts**.

Key Strategies:

☐ **Reuse**

Transparency on the **use of a discarded products**, that is still in good condition and fulfills its original function.
e.g: Should I buy a new or used item?

☐ **Repair**

Transparency on the **maintenance and/or fix of defective products** so it can be used for its original function.
e.g: How should I maintain this item?

☐ **Remanufacture**

Transparency on the **alternative use of parts of a discarded product in a new product** with the same function.
e.g: What are my options to extend the life of the parts of this item?

☐ **POST-USAGE**
 Consider transparency in the context of **useful applications of waste as resource**.

Key Strategies:

☐ **Recycle**

Transparency on the **responsibility and processing of waste** to transform back into raw materials.
e.g: What and how should I recycle? What reverse logistic means?

P.2 LOCATE THE KEY SERVICE ENCOUNTERS OF TRANSPARENCY FOR SUSTAINABILITY

- Description:** A service comprise a set of phases, as the main moments or situations the end-users goes through when interacting with a service.
- Recommendation:** Consider which service encounter presents different challenges of transparency for sustainability challenges for the service. Also, consider the critical encounters for the service end-users experience.
- Recommendation:** The tools such as User Journey and Service Blueprint can be used for visual representation.
- Recommendation:** Consider the study scope and limitations.
- Insight:** It can help with insights related to the **context of transparency communication**.



Service context

Transparency communication

Key Service Encounters:

PRE-SERVICE ENCOUNTER Lead end-users to service offerings	CORE-SERVICE ENCOUNTER When end-users perform main service activities	POST-SERVICE ENCOUNTER Extend the service experience to end-users
☐ Consider transparency for sustainability in the context of awareness building and willingness to join the service . <i>e.g: Information search, initial contact with the service, transactions, service onboarding.</i>	☐ Consider transparency for sustainability in the context of effective interactions with core service processes . <i>e.g: scheduling, delivery, follow up, notifications, instructions, profile update.</i>	☐ Consider transparency for sustainability in the context of service evaluation and continued use . <i>e.g.: service recovery efforts, feedbacks, reviews, recommendations.</i>
Practical tips: <i>*Reflect on the critical moments for transparency to influence decision-making for sustainability and circularity.</i>	Practical tips: <i>*Reflect on the critical moments for transparency to fulfil end-users needs and to promote attitudes towards sustainability and circularity.</i>	Practical tips: <i>*Reflect on the critical moments for transparency to help retain end-users by sustainability and circularity reasons.</i>

Transparency for Sustainability Design Guide (J OMSA, 2024)

FIGURE 7.6 – The final version of the Activity Guide: Practice
 Source: the author



ACTIVITY GUIDE: PRACTICE

Practice scope

Goal: to provide guidelines to support the characterization and diagnosis of the service practices of transparency for sustainability.
Guidelines: Characterization of the Service Encounters, Sustainability Elements, Digital Interactions, Transparency Practices and Diagnosis at Practice Level

MODULE: 3. SUSTAINABILITY



STAGE: CURRENT SITUATION

GUIDELINES:

PAG. 2 - 6

What

P.3 IDENTIFY THE KEY SUSTAINABILITY DIMENSIONS OF THE SERVICE FOR TRANSPARENCY

- **Description:** The governance, environmental, social and economic dimensions of sustainability to be transparent.
- **Recommendation:** Consider that transparency practices can support more than one dimension.
- **Recommendation:** Consider the study scope and limitations.
- **Insight:** It can help with insights related to what sustainability dimensions are **honestly open**, from **transparency ethical principle**.



Sustainability openness
Transparency ethics



Sustainability honesty
Transparency ethics

Sustainability Dimensions ("informational objects")

Governance

Consider transparency of the management of sustainability, such as:

- ☐ Commitments (*vision and ethical responsibility*)
- ☐ Compliance and accreditation (*legal, regulatory*)
- ☐ Policies, programs, projects (*actions*)
- ☐ Accountability (*indicators and metrics*)

Social

Consider transparency of social progress and respect for human rights, such as:

- ☐ Diversity and inclusion
- ☐ Social justice, cohesion and equity
- ☐ Responsible consumption
- ☐ Sustainability education
- ☐ Work and employment conditions

Environmental

Consider transparency of environmental mitigation impact, such as:

- ☐ Natural resources (from prevention to regeneration strategies)
- ☐ Material resources (from prevention to optimization strategies)
- ☐ Circular economy (from prevention to recycle strategies)

Economic

Consider the transparency of the economy development model, such as:

- ☐ Business model (*circular, shared, distributed, fair trade, etc.*)
- ☐ Value offerings (*accessibility and reach*)
- ☐ Stakeholders network (*organization, cooperation*)
- ☐ Local economy and income generation (*offers*)
- ☐ Culture, resources and infrastructures (*respect and resilience*)

P.4 IDENTIFY THE KEY ELEMENTS OF THE SERVICE-SYSTEM FOR TRANSPARENCY

- **Description:** The service stakeholders, processes, resources and emissions to be transparent, associated with the sustainability dimensions.
- **Recommendation:** Consider that different transparency practices can support more than one element.
- **Recommendation:** The tools such as System map and Service Blueprint can be used for visual representation.
- **Recommendation:** Consider the study scope and limitations.
- **Insight:** It can help with insights related to what sustainability are **honestly open**, from **transparency ethical principle**.



Sustainability openness
Transparency ethics



Sustainability honesty
Transparency ethics

Key service-systemic elements ("informational objects")

Resources and materials

Consider transparency of the renewable and non-renewable resources and materials used as **input for the service-system**. Key categories:

Environmental

- ☐ Biodiversity
- ☐ Energy
- ☐ Existing materials or waste

Socio-Economic

- ☐ Technology
- ☐ Knowledge
- ☐ Capital
- ☐ Human
- ☐ Other products, services and systems

Stakeholders

Consider transparency of the **stakeholders** of the service-system, those closest and furthest from the end-users of the service. Also, consider the different types of end-users.
Check the Activity Guide :: Relational, Guideline R.5.

Processes and activities

Consider transparency of the processes and activities performed by the front and back stage of the **service-system processing**. Key categories:

- | | | | |
|---|---|---|---|
| ☐ Business and commercial | ☐ Customer service | ☐ Logistics | ☐ Usage cycles |
| ☐ Marketing | ☐ Technical assistance | ☐ Supply-chain | ☐ Other sustainability and circularity related processes |
| ☐ Digital-entities/systems (artificial intelligence) | ☐ Social organizations and communities | ☐ Waste management | |
| | | ☐ End-Users activities | |

Impacts and emissions

Consider transparency of the positive (benefits) and negative (drawbacks) as impacts and emissions produced as **output of the service-system processing**. Key categories:

- | | | | |
|--|---|--|--|
| Environmental | | Socio-Economic | |
| ☐ Pollution and toxicity | ☐ Waste | ☐ Health and safety | ☐ Local economy |
| ☐ Depletion (<i>ozone, water, resource, etc.</i>) | ☐ Climate change | ☐ Human rights | ☐ Cultural |
| ☐ Land use | ☐ Other impacts | ☐ Ethics | ☐ Value |
| ☐ Resource use | | ☐ Education | ☐ Other impacts |
| | | ☐ Work | |



ACTIVITY GUIDE: PRACTICE

Practice scope

Goal: to provide guidelines to support the characterization and diagnosis of the service practices of transparency for sustainability.
Guidelines: Characterization of the Service Encounters, Sustainability Elements, Digital Interactions, Transparency Practices and Diagnosis at Practice Level

MODULE: 4. DIGITAL



STAGE: CURRENT SITUATION

GUIDELINES:

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P.5 IDENTIFY THE KEY DIGITAL TOUCHPOINTS OF TRANSPARENCY FOR SUSTAINABILITY

How

- **Description:** In digital space, transparency results from the communication interactions performed by the service workers and end-users through digital interfaces (touchpoints). Touchpoints are interaction instances, that can be used as signals/indicators of the forms of transparency practices in the service.
- **Touchpoint examples:**
 - Discover repair alternatives for my phone on service webpage.
 - Detect the recyclability of unused electronics on QR code scan.
- **Recommendation:** Reflect on the sequence of tasks performed by the service end-users and workers and the digital interfaces.
- **Recommendation:** The tools such as System map, User Journey and Service Blueprint can be used for visual representation.
- **Insight:** It can help with insights related to the principles:

Touchpoint honesty
Transparency ethics

Touchpoint inclusive
Transparency ethics

Touchpoint aesthetics
Transparency communication

Touchpoint quality
Transparency communication

Scope of digital service communication

Consider transparency digital touchpoints according to the focus of the service communication for sustainability:

- | | | |
|--|--|---|
| ☐ Institutional-oriented
<i>Communicate the governance of sustainability and circularity.</i> | ☐ Product-Service oriented
<i>Communicate the product/resource flows handled by the service and the service itself.</i> | ☐ Individual-oriented
<i>Communicate the activities of end-users and collaborators with the service.</i> |
|--|--|---|

Type of digital interactions

Consider the actors tasks within the service to identify transparency digital touchpoints, such as:

- | | | |
|--|---|--|
| ☐ Recurrence (time) | | |
| ☐ First time | ☐ Occasional | ☐ Frequent |
| ☐ Task (action/function) | | |
| ☐ Exploring
<i>e.g.: to discover, access, navigate, learn</i> | ☐ Connectivity
<i>e.g.: to connect, sensor</i> | ☐ Gamification
<i>e.g.: to score, rank, reward, reinforce</i> |
| ☐ Conversational
<i>e.g.: to talk, dialog, share, respond, alert, notify</i> | ☐ Fact checking
<i>e.g.: to verify, trace,</i> | ☐ Configuration / Setup
<i>e.g.: to onboard, personalize</i> |
| ☐ Instructing
<i>e.g.: to select options, filter, search, calculate, compare</i> | ☐ Prediction insights
<i>e.g.: to detect, forecast</i> | ☐ Item preparation / manipulation
<i>e.g.: to separate, clean, storage</i> |
| ☐ Transactional
<i>e.g.: to shop, register</i> | ☐ Prescription Insights
<i>e.g.: to recommend, optimize, automate</i> | ☐ Transport / mobility
<i>e.g.: to receive, collect, deliver</i> |

Type of digital interfaces

Consider the digital medium and type of content of the interactions to identify transparency digital touchpoints, such as:

- | | | | | | |
|---|--|---|---|---|--|
| ☐ Medium | ☒ Informational Content | | | | |
| Consider the type of visual and physical interface, such as: | Consider the type of information (facts, indicators, concepts, insights) based on the sustainability dimensions and service-system elements for circularity, such as: | | | | |
| ☐ Landing page
☐ Call to action
☐ Menu
☐ E-mail
☐ Message
☐ Survey
☐ Review
☐ Notification
☐ Digital ID
☐ QR code scan
☐ Gamification challenge page
☐ Sensor, augmented and virtual reality
☐ Voice | <table border="0"> <tr> <td> ☐ Stakeholders content
 ☐ Extended Producer responsibility
 ☐ Value-chain
 <i>e.g: origin, who made, work conditions</i>
 ☐ Local partners and initiatives
 <i>e.g: repair local groups, waste pickers</i> </td> <td> ☐ Resources content
 ☐ Sufficiency
 ☐ Efficiency
 ☐ Composition
 <i>e.g: of what it's made</i> </td> </tr> <tr> <td> ☐ Processes/activities content
 ☐ Usage conditions / cycles
 ☐ Repairability
 ☐ Upgradeability
 ☐ Damage extension
 ☐ Availability of parts for repair
 ☐ Remaining useful life after repair
 ☐ How it works / how it's made / how to do
 <i>e.g: reuse, care, repair, recycle, disposal</i>
 ☐ Causes / volunteer / activism
 <i>e.g: clear the city, support small business</i> </td> <td> ☐ Impacts content
 ☐ Waste collected
 ☐ Waste recycled
 ☐ Waste generation reduction
 ☐ CO2 emission reduction
 ☐ Donated, repaired items </td> </tr> </table> | ☐ Stakeholders content
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<i>e.g: of what it's made</i> | | | | |
| ☐ Processes/activities content
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☐ Repairability
☐ Upgradeability
☐ Damage extension
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☐ Causes / volunteer / activism
<i>e.g: clear the city, support small business</i> | ☐ Impacts content
☐ Waste collected
☐ Waste recycled
☐ Waste generation reduction
☐ CO2 emission reduction
☐ Donated, repaired items | | | | |

Practical tips:

- *Consider the non-digital and digital actors and interactions. Even analogue interactions could have a role in digital transparency.
- *Consider user-generated content, such as reviews, stories, etc.
- *Besides the textual format, real pictures and videos, graphic illustrations can be used as visual representations of content.



ACTIVITY GUIDE: PRACTICE

Practice scope

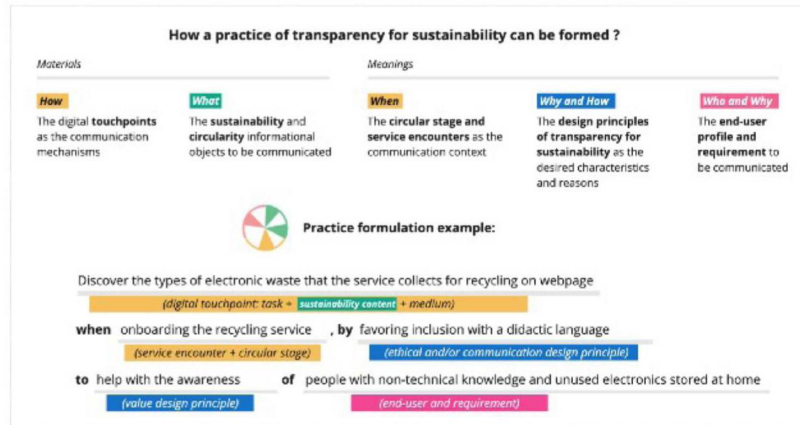
Goal: to provide guidelines to support the characterization and diagnosis of the service practices of transparency for sustainability.
Guidelines: Characterization of the Service Encounters, Sustainability Elements, Digital Interactions, Transparency Practices and Diagnosis at Practice Level

MODULE: 4. DIGITAL
 GUIDELINES:

STAGE: CURRENT SITUATION
 PAG. 4 - 6

P.7 FORMULATE THE PRACTICES OF TRANSPARENCY FOR SUSTAINABILITY

- **Description:** A transparency practice can be expressed by the elements presented along the Relational and Practice Activity Guides.
- **Recommendation:** Elicit the practices of transparency for sustainability adopted by the digital service. Analyse the principles and heuristics addressed by the practices.
- **Recommendation:** Use the formulation guide as applicable to the service configuration.
- **Recommendation:** The tools such as User Journey and Service Blueprint can be used for visual representation of the practices in context.



Design Principles of Transparency for Sustainability

Why and How

Ethical responsibility

- Principle:**
- Honestly** communicating the reality of service sustainability with end-users, by providing true, evidenced, and verifiable informational content.
 - Opening** sustainability informational content, by making the social, environmental, and economic dimensions of the service digitally available to end-users scrutiny.
 - Favors the inclusion** of a diversity of people on sustainability, by digitally supporting the interaction of people with different capabilities.

- Key heuristics/strategies:**
- ☐ Providing indication of compliance
 - ☐ Providing evidence-based content
 - ☐ Providing fact-verification digital functions
 - ☐ Providing content with positive and negative nature
 - ☐ Do not deceiving end-users with tricks for bad behaviours
 - ☐ Opening access to sustainability/circularity
 - ☐ Opening knowledge to sustainability/circularity
 - ☐ Opening contribute to sustainability/circularity
 - ☐ Ensuring a didactic and simple language
 - ☐ Ensuring content in textual and non-textual formats
 - ☐ Avoiding the need for multiple sources of content
 - ☐ Avoiding the need for memorization with cues or reminders
 - ☐ Ensuring the accessibility and usability of the digital interfaces
 - ☐ Ensuring service interactions with people with different sustainability attitudes and requirements

Communication strategy suitability

- Communicating sustainability with **informational quality**, by digitally providing complete, consistent, and accurate informational content.
- Communicating sustainability according to the **interaction context** of end-users with the service, by setting and adapting digital encounters and touchpoints.
- Communicating sustainability with **aesthetic quality**, by making digital interface identifiable, attractive and meaningful to users.

- ☐ Providing relevant and necessary informational content
- ☐ Avoiding informational content with errors and outdated
- ☐ Providing indicators (measurable criteria) of sustainability/circularity
- ☐ Adapting service encounters to sustainability/circularity
- ☐ Ensuring touchpoints are relevant to interaction recurrence
- ☐ Varying the digital function and interface of touchpoints
- ☐ Providing an effective and efficient graphic/informational interface to support end-users tasks
- ☐ Providing affordances or triggers to support value-creation
- ☐ Providing affordances or triggers to promote end-users sustainable behavior

Enabling value (beneficial outcomes)

- Principle:**
- Enables end-users to gain **confidence** on a particular sustainability subject from transparency.
 - Enables end-users to gain **understanding** on a particular sustainability subject from transparency.
 - Enables end-users to gain **agency** on a particular sustainability subject from transparency.
- Key heuristics/strategies:**
- ☐ Ensuring compliance
 - ☐ Ensuring protection of rights
 - ☐ Ensuring reduction of risks
 - ☐ Ensuring conflict resolution
 - ☐ Building awareness
 - ☐ Building competences
 - ☐ Providing clarification
 - ☐ Ensuring reduction of errors
 - ☐ Ensuring informed decision-making
 - ☐ Supporting communication customization
 - ☐ Supporting sustainable behavior change
 - ☐ Promoting collaboration in social environmental, and economic dimensions of the service



ACTIVITY GUIDE: PRACTICE

Practice scope

Goal: to provide guidelines to support the characterization and diagnosis of the service practices of transparency for sustainability.
Guidelines: Characterization of the Service Encounters, Sustainability Elements, Digital Interactions, Transparency Practices and Diagnosis at Practice Level

MODULE: 6. TRANSPARENCY-STATE

STAGE: IMPROVEMENT OPPORTUNITIES

GUIDELINES:

PAG. 5 - 6

P.8

ANALYZE THE SERVICE TRANSPARENCY FOR SUSTAINABILITY PRACTICES

Where

• **Description:** The analysis concerns how each transparency practice adopts the Design Principles of Transparency for Sustainability, in order to overcome the key factors influencing the end-users. It is a qualitative analysis to support diagnosis reflection and decision-making.

• **Practical tips:**

** Use the findings from the characterization of the service encounters, sustainability, digital interactions, to support your analysis, specially the transparency practices (P.7).*

** Use the findings from the Relational Activity Guide to support your analysis.*

Considering the service current set of transparency for sustainability practices, reflect on:

■ Ethical responsibility

- ☐ Does sustainability reality reflect the openness suggested by current practices, or are there some dimensions that could have been open but weren't?
- ☐ Does digital touchpoints from current practices provide mechanisms for end-users to validate the honesty of sustainability informational content?
- ☐ Does the digital interaction of current practices include the diversity of capabilities and needs of end-users of the service?

Recommendation:

If there are limitations, it might be necessary to improve transparency ethical responsibility for sustainability by redesigning current practices and creating new ones at the same time.

■ Communication strategy suitability

- ☐ Does the digital touchpoint of current practices guarantee informational quality?
- ☐ Does the digital touchpoint of current practices address the critical service encounters for end-users interacting with sustainability and circularity?
- ☐ Does the digital touchpoint of current practices guarantee aesthetic quality?

Recommendation:

If there are limitations, it might be necessary to improve the suitability of communication for transparency by redesigning current practices.

■ Enabling value

- ☐ Does the current practices promote any of benefits (value propositions) for the end-users of the service on sustainability and circularity?
- ☐ Does the value proposition derived from current practices encourage more sustainable behaviors or sufficiently meet the needs of the end-users of the service?

Recommendation:

If there are limitations, it might be necessary to improve the value from transparency on sustainability and circularity, by redesigning current practices and creating new ones at the same time.



ACTIVITY GUIDE: PRACTICE

Practice scope

Goal: to provide guidelines to support the characterization and diagnosis of the service practices of transparency for sustainability.
Guidelines: Characterization of the Service Encounters, Sustainability Elements, Digital Interactions, Transparency Practices and Diagnosis at Practice Level

MODULE: 6. TRANSPARENCY-STATE

STAGE: IMPROVEMENT OPPORTUNITIES

GUIDELINES:

PAG. 6 - 6

Where

P.9 ANALYZE THE VALUE-STATE OF THE SERVICE TRANSPARENCY FOR SUSTAINABILITY PRACTICES

- Description:** The analysis concerns when the transparency practices provides value to end-users at the service encounters, towards sustainability and circularity. It is a qualitative analysis to support diagnosis reflection and decision-making.

Practical tips:

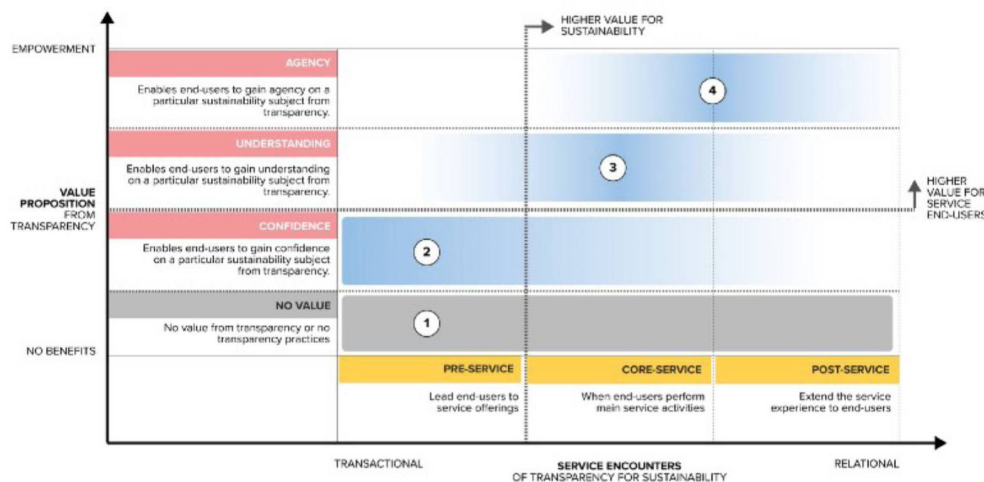
* Use the findings from the characterization of the service encounters, sustainability, digital interactions and transparency practices, to support your analysis.

*The tools such as Service Blueprint, Tomorrow Narratives, User Scenarios can be used for visual representation and communication of the identified opportunities.

Practice Spectrum tool

The Spectrum map aims to support analysis and decision-making in a more visual way. It is possible to locate in the map the areas which represents the current situation, to identify key areas/scenarios for improvement.

- ☐ Locate on the map the service current practices of transparency for sustainability:



- ☐ Identify the respective states which represents the service transparency for sustainability practices:

☐ 1 - Opacity state

No or low from transparency for end-users

Service with no intentional transparency practices or current practices doesn't enable value for the service end-users.

☐ 2 - Normative state

Transparency to comply with sustainability regulations

Services usually approach transparency as a response for regulatory/mandatory requirements, for end-users to gain confidence to join the service.

☐ 3 - Formative state

Transparency to educate end-users on sustainability

Services usually approach transparency to foster end-users knowledge of sustainability and circularity, specially to use the service.

☐ 4 - Participative state

Transparency for end-users action-taking on sustainability

Services usually approaches transparency to foster end-users actionability on sustainability and circularity, specially when using the service.

Recommendation:

To consider reviewing the organizational attitude and adopting ethical design principles in existing / new transparency practices to start breaking the service sustainability secrecy.

Recommendation:

To consider developing transparency for sustainability competences and practices to better fulfil end-user requirements and promote higher value for sustainability. Consider expanding communication from institutional to product-service and individual scope.

Recommendation:

To consider continue developing the end-users competences on sustainability and circularity from transparency, specially at usage stage. Consider expanding communication from product-service to individual scope.

Recommendation:

To consider continue developing the end-users agency on sustainability and circularity from transparency, specially at usage stage. But ensuring the need for complementary strategies. Also, consider expanding communication from individual to product-service scope.

- ☐ Reflect on the issues, opportunities and priorities for improvement.



ACTIVITY GUIDE: GOVERNANCE

Goal: to provide guidelines to support the characterization and diagnosis of Service Design competences to integrate transparency for sustainability on digital services in the context of the circular economy.
Guidelines: Characterization of Competences and Diagnosis at Governance Level

Governance scope

MODULE: 8. MATURITY-LEVEL 

GUIDELINES:

STAGE: IMPROVEMENT OPPORTUNITIES

PAG. 1 - 2

G.1

ANALYZE THE SERVICE DESIGN COMPETENCES ON TRANSPARENCY FOR SUSTAINABILITY

Where

• **Description:** The analysis concerns how the Service Designers applies the key competences to integrate transparency for sustainability on digital services in the context of the circular economy. It is a qualitative analysis to support diagnosis reflection and decision-making.

• **Practical tips:**
* Use the findings from Relational and Practice Activity Guides, to support your analysis.

Considering the key competences for transparency, reflect on service designers current knowledge (know what), attitudes (know why / want to do) and skills (know how) to apply them:

Analytical competences

- ☐ **Theoretical knowledge on Transparency for sustainability**, for approaching transparency on Design based on key principles and concepts that underlie the field.
- ☐ **Critical thinking for sustainability**, for reflecting on the service ethical responsibility and improvement opportunities of economic, social and environmental conditions through transparency.
- ☐ **Observation and interpretation of current situations**, for considering the different key stakeholders perspective, specially on diagnosis activities.
- ☐ **Anticipatory thinking for circularity**, for considering transparency in face of multiple alternative scenarios of use and changes on the use of products and services.

Scope competences

- ☐ **Work across different service-scope**, for approaching transparency design at systemic and digital scope.
- ☐ **Work with mandatory requirements**, for acknowledging and addressing normative conditions of the service for transparency.
- ☐ **Work with digital infrastructure limitations**, for a acknowledging and addressing the digital conditions of the service for transparency.

Interpersonal competences

- ☐ **Interpersonal attitude for design**, for facilitating the collaboration and communicating of the emerging findings and insights.

Transparency for Sustainability Design Guide (LOMBA, 2024)

FIGURE 7.7 – The final version of the Activity Guide: Governance
Source: the author



ACTIVITY GUIDE: GOVERNANCE

Governance scope

Goal: to provide guidelines to support the characterization and diagnosis of Service Design competences to integrate transparency for sustainability on digital services in the context of the circular economy.

Guidelines: Characterization of Competences and Diagnosis at Governance Level

MODULE: 8. MATURITY-LEVEL

STAGE: IMPROVEMENT OPPORTUNITIES

GUIDELINES:

PAG. 2 - 2

Where

G.2 ANALYZE THE MATURITY-LEVEL OF THE SERVICE FOR TRANSPARENCY FOR SUSTAINABILITY

- Description:** The analysis concerns how the service attitudes supports the practices on transparency for sustainability. It is a qualitative analysis to support diagnosis reflection and decision-making.

Practical tips:

* Use the findings from the Relational and Practice Activity Guides to support your analysis.

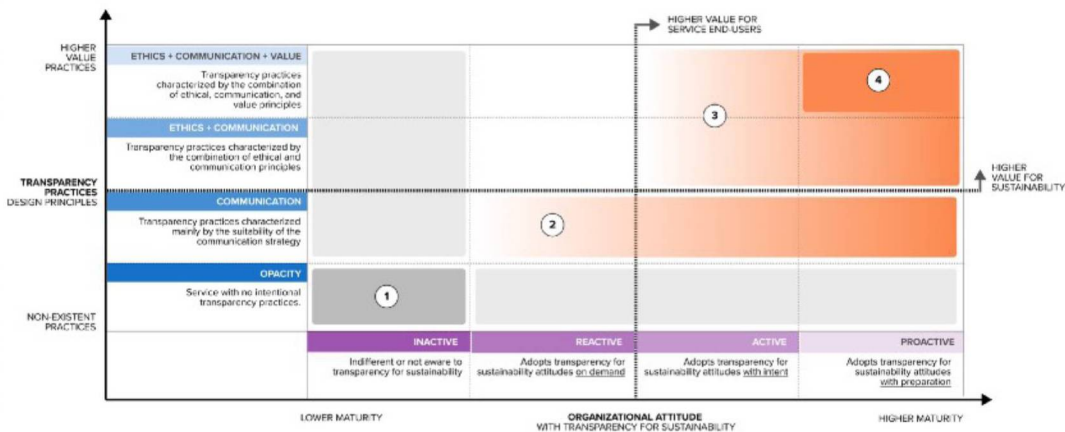
* The tools such as Design Scenarios can be used for visual representation and communication of the identified opportunities.

Maturity Spectrum tool

The Spectrum map aims to support analysis and decision-making in a more visual way.

It is possible to locate in the map the areas which represents the current situation, to identify key areas/scenarios for improvement.

- ☐ Locate on the map the quadrants related to the service current practices versus the attitude on transparency for sustainability.



- ☐ Identify the respective levels which represents the service maturity on transparency for sustainability:

☐ Level 1 - Insufficient

Services with insufficient maturity on transparency for sustainability
Organizations with no intentional practices and attitudes on transparency for sustainability.

Recommendation:

To consider developing key competences on transparency for sustainability, and who are the key stakeholders to help change the attitude of the service organization on transparency for sustainability.

☐ Level 2 - Basic maturity

Services with basic maturity on transparency for sustainability
Organizations where transparency for sustainability usually is not a priority on the agenda, although they may understand the relevance and have some communication practice.

Recommendation:

To consider developing competences and the service ethical responsibility for sustainability. Consider developing analytical competences and attention to avoid bad practices such as green/social/governance washing.

☐ Level 3 - Developing maturity

Services developing their maturity on transparency for sustainability
Organizations where transparency for sustainability is usually perceived as strategic in part of the service offerings, and the organization explores more actively ethical attitudes and value-propositions.

Recommendation:

To continue developing the competences and practices towards more proactive attitudes and higher value propositions from transparency for service end-users.

☐ Level 4 - Consolidated maturity

Services with consolidated maturity on transparency for sustainability
Organizations where transparency for sustainability is part of the core business, and the organization systematically approaches transparency with higher competence and responsibility.

Recommendation:

To consider managing transparency for sustainability in a more integrated and multidisciplinary way, to expand the governance.

- ☐ Reflect on the issues, opportunities and priorities for improvement.

Chapter 8 – Conclusions

Chapter Content

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8.1 Research questions, goals, and assumptions

Due to the lack of theoretical and methodological support for designers, this thesis explored the adaptation of the concept *transparency for sustainability* at the early stages of Design process through the development of *artifacts* to support this integration. Particularly, this integration addressed service design diagnose activities in educational and organizational contexts.

Within this context, this research addressed the question, “*How can transparency for sustainability be approached at the early stages of Design, in the context of digital services as enablers of circular economy?*” This question about the general research problem was broken down into specific questions: *What are the theoretical foundations of transparency for sustainability?; How to integrate transparency for sustainability on Service Design diagnostic activities?; What are the key strategies to consider when intending to increase transparency on digital services within the context of circular economy?*

To address this problem, the general goal of this research was to propose a Model and Guidelines as an artifact to support the integration of transparency for sustainability on Digital Service Design, in the context of circular economy. This general research goal was considered achieved through the fulfillment of the specific goals.

The first specific goal referred to the **proposition of a Theoretical Framework to describe the knowledge foundations of transparency for sustainability on the context of the Design field (RG1)**. This goal was considered fulfilled based on the results from the Phase 1, Phase 2 and Phase 3 of the research:

- In Phase 1 of the research (Chapters 3 and 4) the preliminary version of the framework was developed, by carrying out the following procedures: Literature Review, Assessment of transparency practices on digital solutions, Thematic-Workshops, Participant Observations and Theoretical Framework Development. In Phase 2, the Theoretical Framework was embedded into the artifacts of this thesis (Model and Guidelines) to support its development and

evaluation. Then, the Phase 3 of the research (Chapters 6 and 7) contributed to formalizing and integrating the final learnings and recommendations from the fieldwork studies into the final version of the Theoretical Framework (Chapter 5).

- Carrying out these procedures indicated that addressing transparency for sustainability in services is complex, and there are several aspects and elements that need to be considered by Design. However, the existing theoretical frameworks found in the literature review weren't sufficient to answer the questions. Either because they had an exclusive focus on the topic of transparency in Information Systems contexts (HOSSEINI et al., 2008; GRIMMELIKHUIJSEN and WELCH, 2012; CAPPELI et al., 2013), or because they had an emphasis on the classification of types or strategies of transparency (HOFSTEDE et al., 2004; SCHNACKENBERG and TOMLINSON, 2016; MABILLARD, and ZUMOFEN, 2017; LOMBA, 2020). Thus, the cross-analysis of the findings from the literature review enabled the researcher to systematize and integrate the key components of the research theme, resulting in the Theoretical Framework. It is highlighted that the final version of the framework comprised the components: (WHO and WHY) the actors responsible for or benefiting from transparency; (WHAT) the service-system sustainability objects to be "revealed"; (HOW and WHEN) the service digital mechanisms and moments for transparency; (HOW and WHY) the design principles of transparency for sustainability; (WHERE) the organizational maturity in transparency for sustainability.
- The assumption related to this specific goal stated that the current literature, combined with empirical knowledge, could provide initial insights into how to approach transparency for sustainability in the context of the Design field. In fact, the development of the Theoretical Framework was enabled by the review of the state of the art, which provided the key definitions, principles, elements, and factors to represent the initial version of the framework.

The second specific goal referred to the **proposition of an auxiliary tool to articulate the Model and Guidelines on Service Design diagnostic activities in organizational and educational contexts (RG2)**. This goal was considered fulfilled based on the results from the Phase 2 and Phase 3 of the research:

- In Phase 2 of the research (Chapter 5), the Model and Guidelines (as the prescribed artifacts) were conceptualized, developed, and tested through Activity Guides (as auxiliary tools). The fieldwork was characterized by

progressive cycles of Workshops based on Action Design Research strategy in organizational and educational contexts. Then, Phase 3 of the research (Chapters 6 and 7) contributed to formalizing and integrating the final learnings and recommendations from the fieldwork studies into the final version of the Theoretical Framework, Model and Guidelines (by the Activity Guide tool) (Chapter 5).

- Carrying out these studies helped the researcher identify the need to evolve the format of the artifacts and tools in order to improve their effectiveness and completeness, since they were recurrently perceived as relevant along the cycles (see Figure 5.4 at Chapter 5). Due to that, the concept of the auxiliary tools changed along the cycles, from an assessment instrument to a guide to point directions, provoke critical reflections and support competence development on the theme. Although Chapter 7 presents the final version of the artifacts (Model and Guidelines) and auxiliary tool (Activity Guides), the researcher acknowledges that they were not intended to be a definitive or final solution. Since the research problem was characterized as a *wicked problem* leading to an exploratory research, the propositions contribute to refine the understanding on the theme and the exploration of new methodological approaches. For that, the researcher recommended further studies (section 8.3) for continuous contributions.
- One of the assumptions related to this specific goal stated that it would be possible to integrate transparency for sustainability in the activities of diagnosis at the early stages of Service Design process. In fact, the characterization of the current situation and the evaluation of future improvement opportunities were the key types of activities addressed by the Model and Guidelines (by the Activity Guide tool). Also, the studies evidenced the need to enable the customization of the application, which was made possible by its flexible arrangement in modules to navigate the plurality of transparency realities in service organizations.
- The other assumption related to this specific goal stated that contextual and operational limitations would influence the practical applications of the artifact. In fact, there were limitations in each cycle of fieldwork study. Due to that, the external validity of the propositions was considered partially fulfilled. Chapter 6 presents the identified possibilities for generalizing the knowledge from the research. Also, the researcher recommended further studies to expand the application contexts, especially with organizations (section 8.3).

The third specific goal referred to the **identification of the key strategies to articulate the Theory, Model, and Guidelines in practice to enhance the effectiveness of the impact of transparency on sustainability goals (RG3)**. This goal was considered partially fulfilled based on the results from the Phase 2 and Phase 3 of the research:

- The Phase 2 of the research (Chapter 5) contributed to enable the practical application of the artifacts (Model and Guidelines) in organizational and educational contexts. Then, Phase 3 of the research (Chapters 6 and 7) contributed to formalizing and integrating the final learnings and recommendations from the fieldwork studies into the final version of the Theoretical Framework, Model, and Guidelines (by the Activity Guide tool) (Chapter 5).
- Carrying out these procedures indicated that approaching transparency for sustainability in services requires a multidimensional perspective to expand the levels of intervention. The existing literature wasn't sufficient to answer the questions, but supported this multidimensional perspective, event not addressing sustainability goals and services (HOFSTEDE et al., 2004; MOL, 2015; HOSSEINI et al., 2018). Thus, the analysis that support the development of the Theoretical Framework, combined with the cross-analysis from the fieldwork studies, enabled the researcher to propose the organization of the key theoretical components into three scope ("planes"): governance as the foundation with focus on the organization competences on transparency for sustainability; practice as the intermediary with focus on the configuration of the transparency practices; relational as the top with focus on the service-actors relationship with transparency.
- One assumption related to this specific goal stated that transparency for sustainability in services can contribute to create conditions to broaden the organization perceptions on how to improve the customer experience (and learning) with sustainability. The researcher understands that a structured design approach for transparency can encourage service organizations to have a more active attitude towards transparency and sustainability (MCCARTHY and FLUCK, 2017; ALBU and FLYVERBOM, 2019; CESCHIN and GAZIULUSOY, 2020). Due to the lack of artifacts specific for the Design field, a design approach could provide a methodological support in how to deal with the concept in both educational and organizational contexts. Also, the researcher understands that transparency for sustainability can be approached as a service quality attribute when articulating the customer offerings, improving the customer experience.

With these reflections, it is possible to identify that both the general and the specific goals were met. Specific and general research questions were also answered. It is understood that transparency for sustainability can be approached at the early stages of Design, as a research and analytical support among the procedures adopted in the configuration of service projects. This practice is based on theoretical and practical foundations such as those proposed in this thesis.

8.2 Research method

This research adopted the method of Design Science Research (DSR). The research strategy adopted a methodological arrangement, combining different procedures to support each phase. The method proved suitable for the problem and goals addressed in this research, providing greater depth on the topic and combining theoretical and practical learnings and prescriptions.

The cycles of fieldwork study allowed the researcher to get closer to different real-world contexts for the application and evaluation of the artifact under development. It was fundamental to support the researcher in understanding the problem and evolving the propositions.

Due to the characterization of the research problem and contextual limitations, the application of the artifact in incremental cycles considering organizational and educational contexts was fundamental to provide a broader perspective on the problem.

Initially, the field work strategy considered the application of the artifact only with companies, with a longer (duration) and deepening (intervention). However, most of the contacted companies were not able to attend this strategy due to limitations with internal availability of the participants. Even after reviewing the field work strategy through shorter and preset workshops, two other companies that were already engaged within the fieldwork study, decided to quit the research in the middle due to availability limitations. Despite the difficulties in achieving the effective participation of companies in more in-depth studies, this perspective would be essential in future studies, even if applied to a smaller number of cases and within specific contexts.

8.3 Recommendations for future work

The proposed artifact represents one possible approach in the thesis context, developed as a means of answering the research question. Other artifacts may adapt to the context and resources available to other researchers.

Based on the learnings and limitations of the development and evaluation of the artifacts, it is possible to make recommendations for future work on the research theme. The recommendations are related to the artifact context of use and improvement.

Regarding the context of use of the artifact, it was limited to educational contexts and small to medium-sized companies, with restrictions on the level of implementation of digital technologies and the scope of circular strategies. For this reason, the artifact may not be suitable for application in large companies and value chains due to the particularities of its systemic complexity. In highly technological contexts with low implementation limitations, the use of the artifact may require including other possibilities of digital interactions enabled by innovative technologies. Due to that, there are some opportunities for future studies to explore the application of such artifact with:

- a) Different types of organizations and how it affects transparency efforts: such as: private companies connected to a complex actors-network; public and third sector organizations; organizations where transparency maturity and practices are already consolidated; organizations with different culture (hierarchy, power, innovation, etc.); organizations exploring circular strategies for waste prevention and minimization.
- b) Highly digitalized and pervasive systems (including technologies such as Artificial Intelligence, Augmented Reality and IoT). In terms of communication, these emergent technologies have presented new interfaces for people to interact with digital services, influencing transparency aspects such as the quality, context, content, aesthetics, cognition. In terms of ethics, the rapid rise of such technologies has raised global ethical concerns (scholars, global institutions, government, license bodies, civil society, etc.). Although literature unveiled studies approaching transparency in the design of AI systems, there is a lack of studies addressing ethical aspects of transparency for sustainability on such pervasive digital systems;

Regarding the improvement of the artifact, it was limited to the learnings from the empirical fieldwork applications. Exploring the use of the artifact in other contexts, as mentioned before, would expand the potential insights for improving the artifact. However, based on the learnings from this research, there are some opportunities for future studies to explore the development of such artifact:

- a) The relational and governance planes/dimensions of the Theoretical Framework — since in the thesis they were considered but weren't the central focus of the studies. This implies expanding the studies to include structural or cultural changes at the organizational level as well as the end-user of transparency in the research (e.g., through ethnographic methods);
- b) The *solution space* of the design process (“the second diamond” stages of develop and deliver) — including the activities such as ideation and concept development with a focus on transparency for sustainability;
- c) The focus of the evaluation, to expand to after the service delivery — concerning the use and effective performance of transparency for sustainability. It could explore the synergies with the SERVQUAL model (PARASURAMAN et al., 1985), which focuses on service performance and perceived quality;
- d) The new service development — for supporting the analysis of the service and business model offerings driven by transparency for sustainability.
- e) The types of artifacts proposed — to explore other application contexts and possible uses, based on logic of *meta-design* (“design the design”), to extend the contributions and provide greater generalization and configuration of parameters.
- f) The proposed design principles — to fully apply and test the principles on different application contexts as previously recommended;

From these recommendations, it is expected to expand *transparency research* on Design for Sustainability field, broadening the scope of the design intervention, from insular digital interactions level to socio-technical-ecological systems level.

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Glossary

Activity Guide	— group of practical guidelines to conduct certain types of activities
Artifact	— a type of prescriptive and abstract contribution building knowledge that supports problem solving.
Barrier	— anything that prevents or inhibits
Concept	— an abstract idea about a particular subject
Contextual condition	— a particular state characterized by contextual aspects
Communication	— a process of social interaction via nonverbal and/or verbal exchange of messages that produce meanings and noises
Criteria	— conditions to be met to comply with principles
Design Principle	— statement on what, how, why to design for
Driver	— a trigger, motivation or problem
Guideline	— an indication of a course of action
Governance	— the way organizations are managed
Indicator	— measurable states of a criteria
Influencing factor	— circumstance that affects a process or an outcome
Interaction	— an intended action between actors
Mediation	— a process for assisting a conflicting interaction
Practice	— the active application of a concept, by the integration of materials/ infrastructures, meanings and competence
Principle	— statements of desire outcome and actions
Process model	— a representation of a process steps and activities
Protocol	— a set of procedures for the accomplishment of a task
Relationship	— the way actors are connected, by series of interactions between actors known to each other
Standard	— a level of attainment
Stakeholder Map	— a representation of all the stakeholder, roles and relationships
System Map	— a representation how the service elements are connected, and involved in a service delivery
Typology	— groups of concepts with similar features or qualities

Appendixes

Appendix 1: **Additional search strings from the literature review**

Search Strings (2011 - 2023)	Results:
transparen* and sustain*	241
transparen* and design	251
transparen* and service	138
transparen* and "circular economy"	27
transparen* and practice	229
"digital service" and design	9
digital and "circular economy"	243
"digital service" and sustain*	23
service and "circular economy"	486
transparen* and waste	201

Source: the author

Appendix 2: Term of free and informed consent



FEDERAL UNIVERSITY OF PARANÁ
Arts, Communication and Design Sector
Postgraduate Program in Design

TERM OF FREE AND INFORMED CONSENT

Project title: Design for Transparency: an approach to sustainability in digital services

Responsible Researcher: Prof. Aguinaldo dos Santos, PhD
Assistant Researcher: Marcella Lomba Nicastro, PhD Student

Research Location:
Federal University of Parana, Postgraduate Program in Design, Design and Sustainability Research Center

You are being invited to participate in research. This document, called "Term of Free and Informed Consent" aims to ensure your rights as a research participant. Please read carefully and calmly, taking the opportunity to clarify your doubts. If there are questions before or even after signing it, you can clarify them with the researcher. You are free to decide to participate and you can withdraw at any time without causing any harm to you.

The research entitled "Design for Transparency: an approach to sustainability in digital services" is part of a doctoral research project and aims to develop and evaluate a design protocol applied to digital services aimed at the circular economy, to promote transparency in waste management.

By participating in the study, you are being invited to use the protocol developed by the researchers in simulated situations that are similar to the real ones of your work context, aimed to test the effectiveness of the propositions. The research comprises the following steps:

1. You will receive by email a document containing key information and instructions for reading.
2. The researchers will contact you by email to schedule the workshop sessions of approximately 3 hours. For this research, about 3 workshop sessions are planned.
3. Participate in the workshops with the researchers and other participants. The sessions will be recorded in audio, photo and video for internal use as an instrument for validating the notes.

The expected benefit from this research is the understanding and proposition of a theoretical-practical protocol to support design practitioners, students and teachers in how to approach the concept of transparency for sustainability in the design of digital services.

Discomforts and Risks: it is possible that you experience some discomfort, mainly related to the understanding of propositions and questions. The study involves risks related only to the content of the questions - if at any moment it causes you discomfort, you can withdraw from participation or omit the answer. Confidential matters will not be dealt with.

Confidentiality and Privacy: You are assured that your identity will be kept confidential and that no information will be given to anyone who is not part of the research team. When publishing the results of this study, your name will not be mentioned and in the case of the images, your face will be covered up. The images and audio will be saved in digital format, remaining under the custody and responsibility of the

Researcher's rubric: _____ Participant's rubric: _____

Version: XX/XX/20XX

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FEDERAL UNIVERSITY OF PARANÁ
Arts, Communication and Design Sector
Postgraduate Program in Design

researcher for a period of 5 years after the end of the research and will be eliminated after this period (Resolution 466/2012; 510/2016).

Reimbursement and Indemnity: the realization of this research does not foresee any cost or financial incentive to the participant. If you incur expenses to participate in the research, you will be fully reimbursed for your expenses, and you will also be entitled to compensation for any damages resulting from the research.

Contact:

If you have any questions about the research, you can contact the researchers: Marcella Lomba Nicastro and Aguinaldo dos Santos, located at Rua General Carneiro, 460 Centro, Dom Pedro I, room 717, Curitiba, Paraná in Brazil. e-mail <marcellaln@gmail.com> <asantos@ufpr.br> or by phone +55(41) 3360-5095, from 9:30 am to 12:00 pm to clarify any doubts you may have and provide them with the information you want, before, during or after of the end of the study.

In case of complaints or complaints about your participation and about ethical issues of the study, you can contact the secretary of the Ethics Committee in Research in Human and Social Sciences of the Human Sciences Sector (CEP/CHS) of the Federal University of Paraná, Sector of Applied Social Sciences, room SA.SSW.09, at Av. Mayor Lothário Meissner, 632 - Campus Jardim Botânico, +55(41) 3360-4344, or by e-mail cep_chs@ufpr.br.

The Research Ethics Committee (CEP): The role of the CEP is to evaluate and monitor the ethical aspects of all research involving human beings. The National Research Ethics Commission (CONEP) aims to develop regulations on the protection of human beings involved in research. It plays a coordinating role in the network of Research Ethics Committees (CEPs) of the institutions, in addition to acting as a consulting body in the area of research ethics.

This research was submitted to the Ethics Committee in Research with Human Beings of UFPR under the number CAAE n° _____ and approved with the number _____ issued on _____.

Free and Informed Consent:

After reading this document with information about the research and having no doubts, I inform that I accept to participate and authorize image and voice recording for use in the research.

Name of the research participant: _____

_____ Date: ____/____/____.

(Signature of the research participant)

Researcher's rubric: _____ Participant's rubric: _____

Version: XX/XX/20XX

Page 2 of 2

Appendix 3: Term of confidentiality and secrecy



FEDERAL UNIVERSITY OF PARANÁ
Arts, Communication and Design Sector
Postgraduate Program in Design

TERM OF CONFIDENTIALITY AND SECRECY

I _____, member of the institution _____
assume the commitment to maintain secrecy and confidentiality in relation to any data and information that may be made available to me by any means of physical or digital support, which for all purposes must be treated as confidential information or data in the project "*Design for Transparency: an approach to sustainability in digital services* " from the researchers Aguinaldo dos Santos CPF: 611.979.989-34 and Marcella Lomba Nicastro CPF: 311.431.888-61.

By signing this Confidentiality and Confidentiality Term, I understand and agree to:

1. Not use the confidential information made available, to generate exclusive and/or unilateral benefit, present or future, or for the use of third parties;
2. Not record or copy confidential documentation to which I have access, except when expressly authorized;
3. Not appropriate for myself or for others any confidential material that may be made available;
4. Not to pass on knowledge of confidential information, being responsible for all people who may have access to the information, through it, and thus forcing itself to reimburse the occurrence of any damage and / or loss arising from a possible breach confidentiality of the information provided.

The validity of the obligation of confidentiality and secrecy, assumed by me through this term, will be valid as long as the information is not made public, or upon written authorization, granted to me.

For non-compliance with this Confidentiality and Confidentiality Agreement, the undersigned is aware of all legal sanctions that may arise.

[City and date]

[Signature of the Research Participant]

Appendix 4: **Term of service agreement**

TERM OF SERVICE AGREEMENT

Local and Date: _____

We at _____, declare to agree with the conduction of the research project "Design for Transparency: an approach to sustainability in digital services" under the responsibility of Aguinaldo dos Santos and Marcella Lomba Nicastro, at our installations, as soon as the project is approved by the Ethics Committee for Research in Human and Social Sciences of the Human Sciences Sector (CEP/CHS) of the Federal University of Paraná, until its end in 2023.

We are aware that the data will be obtained through workshop sessions with the company's leadership and technical teams, and interviews with end-users of the company's service, as well as that the proposed work must follow the current regulations of the National Health Council. (CNS).

Yours sincerely,

Name and full title of the person in charge in the organization

Signature of the person in charge in the organization

Appendix 5: Declaration of agreement to participate in research protocol

DECLARATION OF AGREEMENT TO PARTICIPATE IN RESEARCH PROTOCOL

Local and Date: _____

We at _____, declare to agree with the conduction of the research project "Design for Transparency: an approach to sustainability in digital services" under the responsibility of Aguinaldo dos Santos and Marcella Lomba Nicastro, at our installations, as soon as the project is approved by the Ethics Committee for Research in Human and Social Sciences of the Human Sciences Sector (CEP/CHS) of the Federal University of Paraná, until its end in 2023.

We are aware that the data will be obtained through workshop sessions with the company's leadership and technical teams, and interviews with end-users of the company's service, as well as that the proposed work must follow the current regulations of the National Health Council. (CNS).

Yours sincerely,

Name and full title of the person in charge in the organization

Signature of the person in charge in the organization

Appendix 6: Proof of “project approved” by the Ethics committee

DETALHAR PROJETO DE PESQUISA

DADOS DA VERSÃO DO PROJETO DE PESQUISA

Título da Pesquisa: Design para Transparência: uma abordagem para sustentabilidade em serviços digitais

Pesquisador Responsável: AGUINALDO DOS SANTOS

Área Temática:

Versão: 2

CAAE: 60925822.6.0000.0214

Submetido em: 01/09/2022

Instituição Proponente: Universidade Federal do Paraná - Ciências Humanas e Sociais

Situação da Versão do Projeto: Aprovado

Localização atual da Versão do Projeto: Pesquisador Responsável

Patrocinador Principal: Financiamento Próprio



Comprovante de Recepção:  PB_COMPROVANTE_RECEPCAO_1975375

DOCUMENTOS DO PROJETO DE PESQUISA

Versão Atual Aprovada (PO) - Versão 2

Pendência de Parecer (PO) - Versão 2

Curriculo dos Assistentes

Documentos do Projeto

Comprovante de Recepção - Submi

Folha de Rosto - Submissão 3

Informações Básicas do Projeto - Su

Outros - Submissão 3

Projeto Detalhado / Brochura Investi

TCLE / Termos de Assentimento / Ju

Apreciação 3 - Universidade Federal do

Pendência Documental (PO) - Versão 1

Curriculo dos Assistentes

Documentos do Projeto

Comprovante de Recepção - Submi

Folha de Rosto - Submissão 2

Informações Básicas do Projeto - Su

Outros - Submissão 2

Projeto Detalhado / Brochura Investi

TCLE / Termos de Assentimento / Ju

Apreciação 2 - Universidade Federal do

Projeto Original (PO) - Versão 1

Curriculo dos Assistentes

Documentos do Projeto

Declaração de concordância - Subm

Folha de Rosto - Submissão 1

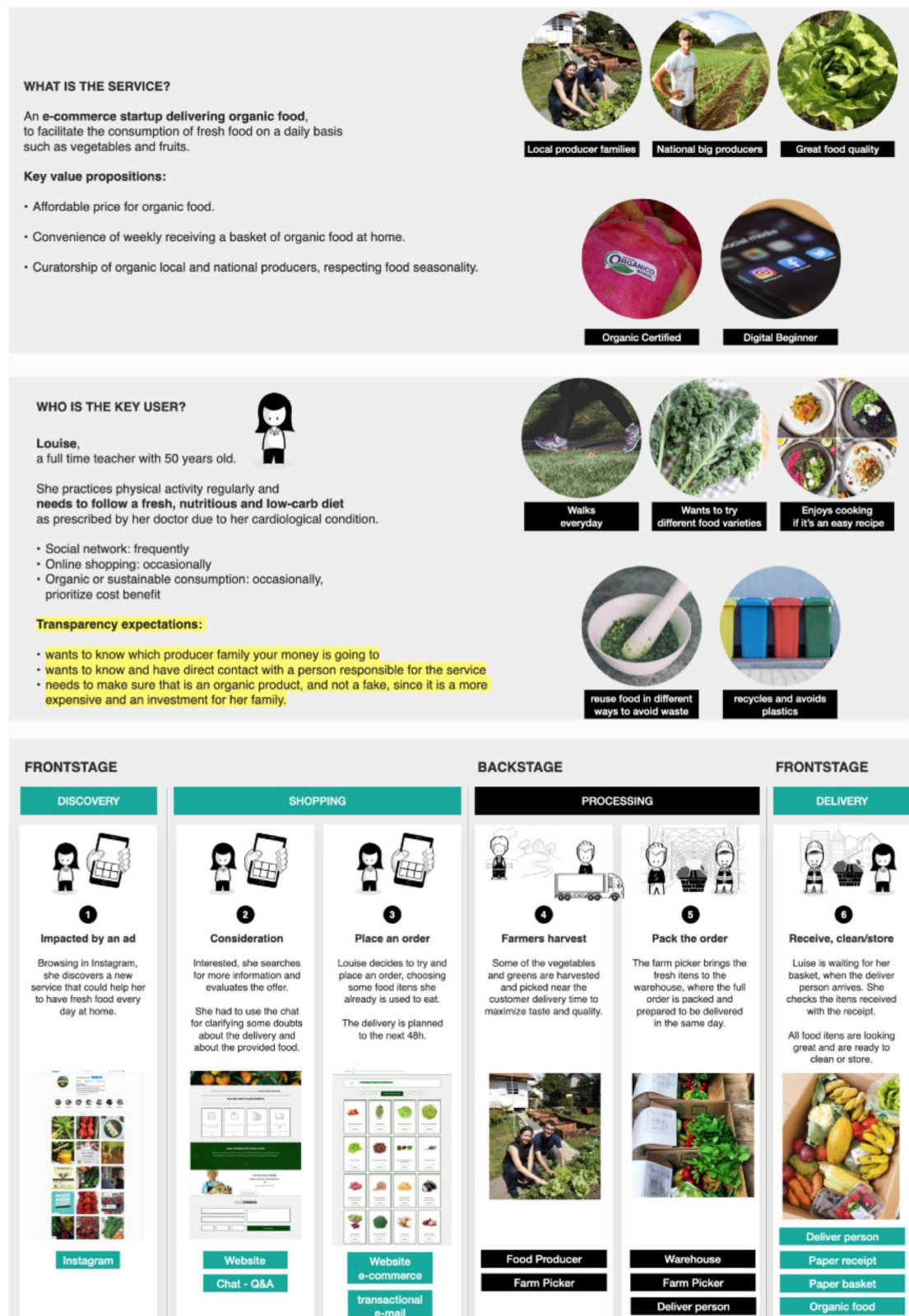
Tipo de Documento	Situação	Arquivo	Postagem	Ações
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LISTA DE APRECIÇÕES DO PROJETO

Apreciação *	Pesquisador Responsável *	Versão *	Submissão *	Modificação *	Situação *	Exclusiva do Centro Coord. *	Ações
PO	AGUINALDO DOS SANTOS	2	01/09/2022	28/09/2022	Aprovado	Não	   

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Appendix 7: Example of the briefing for the thematic-workshops



Appendix 8: Additional questionnaire from the “thematic-workshops”

PART 1 - WORK AND EXPERIENCE WITH SERVICE DESIGN
1.1) Select the options that best represent your current work context in companies with service design: ☐ Consultancy, Agency, or similar ☐ Medium to large company, Consultancy, Agency, or similar ☐ Consultancy, Agency, or similar ☐ Other: _____
1.2) Describe the characteristics of your current work context with service design (DS)? <i>e.g.: whether or not to internalize design work, size of the design team and how many work with DS, approximate maturity of the company with DS</i>
1.3) Could you provide the approximate amount of practical experience you have with Service Design?
1.4) Select the option that best represents your involvement with service design on a daily basis: ☐ I act directly, as it is my main function or position ☐ I work indirectly, using some methods and/or tools combined with other design practices
1.5) Could you briefly describe what types of projects, briefs or design challenges you have worked on most often?
PART 2 - DIGITAL SERVICES DESIGN
2.1) Based on your experience, would you say that: ☐ Most projects are aimed at some type of digital service ☐ Half of the projects are aimed at some type of digital service ☐ The minority of projects are aimed at some type of digital service ☐ I can't say
2.2) Could you describe which steps, methods and/or tools you use most in your daily life when working with digital services? Why?
2.3) Based on your experience, what would be the main barriers or difficulties in working with digital service design? Why?
2.4) Based on your experience, how do you see design for digital services evolving in the coming years?
PART 3 - DESIGN SERVICE FOR SUSTAINABILITY
3.1) Based on your experience, would you say that: ☐ Most service projects include some aspect of sustainability ☐ Half of service projects include some aspect of sustainability ☐ A minority of service projects include some sustainability aspect ☐ I can't say
3.2) If applicable: Could you briefly describe the most frequent requirements/demands for service design, as well as any sustainability aspects?
3.3) Based on your experience, what would be the main barriers or difficulties in working with sustainability in the design of digital services? Why?

3.4) Based on your experience, how do you see service design for sustainability evolving in the coming years?

PART 4 - DESIGN FOR TRANSPARENCY IN SERVICES

3.1) Based on your experience, would you say that:

- ☐ Most service projects include some transparency requirement
- ☐ Half of service projects include some transparency requirement
- ☐ A minority of service projects include some transparency requirement
- ☐ I can't say

4.2) If applicable: Could you briefly describe the most frequent requirements/demands related to transparency?

4.3) Based on your experience, what would be the main barriers or difficulties in working with transparency in the design of digital services? Why?

4.4) Based on your experience, how do you see the inclusion of transparency criteria in service design evolving in the coming years?

Additional feedback and comments:

Appendix 9: Pilot Study I - Sustainability Transparency Checklist

Design Principles of Transparency for Sustainability	Service system-configuration elements for transparency				Level of Implementation
	Resources and materials	Processes and activities	Stakeholders	Emissions and impacts	
Ethics					0
Honestly communicate the reality of the service sustainability, by providing true, evidenced and verifiable content.	0	0	0	0	0
Communicates sustainability openly , by making the social, environmental and economic aspects of the service digitally available to users (company or individual level).	2	2	0	1	1
Favor the inclusion of a diversity of users in the service sustainability communication, by digitally supporting users with different sustainability capabilities.	0	0	0	0	0
Communication					1
Communicates sustainability information with quality , by digitally providing complete, consistent, and accurate content.	0	0	0	0	0
Adapts sustainability communication, by setting content and interactions according to the context of use.	1	2	1	0	1
Favor the aesthetics in the communication of sustainability, by making content and interactions identifiable, attractive and meaningful to users.	2	2	0	0	1
Value					1
Enables user's confidence in sustainability transparency, by ensuring compliance and protection of rights.	0	0	0	0	0
Enables users to understand sustainability from transparency, by ensuring knowledge-building.	3	3	2	1	2
Enables users to have agency from transparency, by customization (individual) and collaboration (others) on sustainability.	0	1	0	0	0

IMPLEMENTATION CRITERIA: level of dissemination or implementation of the design principles on the service elements

0 (not noticeable or implemented); 1 (very weak); 2 (weak); 3(strong); 4(very strong)

blue (high emphasis); purple (medium emphasis); white (low or lack of).

Appendix 10: Pilot Study I - Participants evaluation

Criteria	Question	Participants response					
Content		1	2	3	4	5	Average response
Relevance	The content presented was relevant to my work context.	-	-	-	-	100%	5 (totally agree)
Effectiveness	The content presented helped to understand the sustainability transparency diagnosis of the service.	-	-	33%	33%	33%	3 (sort of agree)
Completeness	The content presented was sufficient to understand the sustainability transparency diagnosis of the service.	-	66%	33%	-	-	2 (disagree)
Model (activities)		1	2	3	4	5	Average response
Relevance	The activities were relevant to my work context.	-	-	-	-	100%	5 (totally agree)
Effectiveness	The activities helped to guide the reflection on the current sustainability transparency of the service and potential opportunities.	-	-	-	-	100%	5 (totally agree)
Completeness	The activities were enough to apply in my work context.	-	-	33%	33%	33%	3 (sort of agree)
Tool (assessment checklist)		1	2	3	4	5	Average response
Relevance	The tool is relevant to my work context.	-	-	-	-	100%	5 (totally agree)
Effectiveness	The tool helped to guide the reflection on how the service satisfies the sustainability transparency indicators.	-	-	-	66%	33%	4 (agree)
Completeness	The tool is enough to apply in my work context.	-	-	33%	33%	33%	3 (sort of agree)

ANALYSIS CRITERIA: 1 (totally disagree); 2 (disagree); 3 (sort of agree); 4 (agree); 5 (totally agree)

GUIA DE ATIVIDADE:

DIAGNÓSTICO DA TRANSPARÊNCIA PARA SUSTENTABILIDADE

Módulo

Data

ID

Quais são as características da situação atual e oportunidades para melhorar a transparência para sustentabilidade dos serviços digitais?

OBJETIVOS

- Utilizar o guia para ajudar a desconstruir as práticas adotadas no cenário atual, com base nas diferentes experiências e conteúdos de atuação dos participantes.
- Refletir sobre os fatores que influenciam as condições sistêmicas e oportunidades para o design.
- Apoiar na formulação de briefings e objetivos de design.

- O exercício no workshop é baseado na sua experiência e realidade.
- Use a empresa onde trabalha ou área de atuação como referência para a reflexão e discussão com o grupo.
- Se for consultoria, considere as empresas que são seus clientes.

Instruções e ferramentas:

1 QUEM SÃO OS ATORES QUE ESTÃO INFLUENCIANDO AS AÇÕES DE TRANSPARÊNCIA PARA SUSTENTABILIDADE?

Ferramenta: Stakeholdermap ou SystemMap

a) Classifique no mapa os atores conforme grau de influência.

b) Discutir:

- Explique o porquê e qual a relação entre eles.
- Falta algum ator?
- De que forma estes atores influenciam a experiência de transparência?

2 QUAIS SÃO OS FATORES QUE ESTÃO MOTIVANDO AS INICIATIVAS DE TRANSPARÊNCIA PARA SUSTENTABILIDADE?

Ferramenta: Cartões de Análise + Escala Diferencial Semântico

a) Revisar os cartões.

b) Discutir:

- São pertinentes? Falta algum? Cite exemplos com base na sua empresa.
- As motivações dos atores mapeados estão contempladas?

c) Classificar os fatores motivadores por frequência.

d) Discutir:

- As motivações mais frequentes são as que criam maior valor para o usuário? Quem é beneficiado?
- Quais motivações ocasionais poderiam receber maior atenção?

3 QUAIS SÃO OS FATORES QUE PODEM HABILITAR OU INIBIR A IMPLEMENTAÇÃO TRANSPARÊNCIA EM SERVIÇOS DIGITAIS?

Ferramenta: Cartões de Análise + Escala Diferencial Semântico

a) Revisar os cartões.

b) Discutir:

- São pertinentes? Falta algum? Como estes fatores se aplicam na sua empresa e usuários?
- Os fatores relacionados com os atores mapeados acima, estão contemplados?

c) Classificar os fatores por influência.

4 QUAIS SÃO AS OPORTUNIDADES PARA MELHORAR A TRANSPARÊNCIA PARA SUSTENTABILIDADE?

Ferramenta: Espectro de Transparência

a) Sinalizar as áreas do mapa onde se localizam as soluções atuais de transparência no mapa.

b) Refletir:

- O que está sendo feito?
- Que valor para o usuário e sustentabilidade e para o usuário as soluções atuais de transparência estão oferecendo?
- Qual é a atividade de empresa quanto a transparência?
- Em quais tipos de serviço estas soluções se concentram? (não-digital, digital, transacional, informacional, inteligência, consumo, conteúdo, automatizado, etc)

c) Sinalizar as áreas com potencial de intervenção no mapa.

d) Refletir:

- Quais são as oportunidades? Novos serviços? Melhorias ou expansão de serviços existentes?
- Quais atores, motivações e fatores habilitadores poderiam ser considerados?
- O que o usuário precisa, percebe ou pode precisar para tomar melhores decisões em direção a sustentabilidade?

Appendix 12: Pilot Study II - Participants evaluation

Criteria	Question	Participants response					
Content		1	2	3	4	5	Average response
Relevance	The content presented in the workshops is relevant to my work context.	-	-	-	28%	71%	4 (agree)
Effectiveness	The content presented in the workshop helped to understand the concepts addressed.	-	-	-	43%	57%	4 (agree)
Completeness	The content presented in the workshop was sufficient to carry out the practical activity.	-	-	14%	29%	57%	4 (agree)
Activity Guide (tool)		1	2	3	4	5	Average response
Relevance	The activity guide is relevant to my work context.	-	-	29%	-	71%	4 (agree)
Effectiveness	The activity guide helped to reflect on the current situation and improvement opportunities of transparency for sustainability.	-	-	-	29%	71%	5 (totally agree)
Completeness	The activity guide is enough to apply in my work context.	-	-	43%	14%	43%	4 (agree)
Factors Cards (tool)		1	2	3	4	5	Average response
Relevance	The tool is relevant to my work context.	-	-	43%	14%	43%	4 (agree)
Effectiveness	The tool helped to guide the reflection on the factors that can influence transparency initiatives for sustainability in digital services.	-	-	-	-	100%	5 (totally agree)
Completeness	The tool is enough to apply in my work context.	29%	-	-	-	71%	3 (sort of agree)
Spectrum (tool)		1	2	3	4	5	Average response
Relevance	The tool is relevant to my work context.	-	-	14%	29%	57%	4 (agree)
Effectiveness	The tool helped to guide the reflection on design scenarios for transparency in sustainability and circularity in my work context.	-	-	-	-	100%	5 (totally agree)
Completeness	The tool is enough to apply in my work context.	14%	-	-	-	86%	4 (agree)

ANALYSIS CRITERIA: 1 (totally disagree); 2 (disagree); 3 (sort of agree); 4 (agree); 5 (totally agree)

Appendix 13: Study III - Activity Guide template

ETAPA
SITUAÇÃO ATUAL

DATA

SERVICE

GUIA DE ATIVIDADE:

DIAGNÓSTICO DA TRANSPARÊNCIA PARA SUSTENTABILIDADE

OBJETIVOS

- Auxiliar no entendimento da transparência para sustentabilidade em serviços.
- Auxiliar na identificação e análise dos elementos-chaves a serem considerados ao abordar transparência para sustentabilidade no design de serviços existentes
- Auxiliar na identificação de oportunidades e prioridades para melhoria da transparência

Instruções e ferramentas:

1 QUAIS SÃO OS ATORES QUE ESTÃO INFLUENCIANDO AS AÇÕES DE TRANSPARÊNCIA EM SUSTENTABILIDADE?
Descrever e caracterizar os atores e fatores que estão influenciando a transparência
 Ferramenta: StakeholderMap

CLIENTE-USUÁRIO TECNOLOGIA RECURSOS MARKETING JURÍDICO GOVERNO

DESIGN MÍDIA CADEIA PRODUTIVA TERCEIROS

Ferramenta auxiliar:
 CARTÕES DOS FATORES MOTIVADORES DA TRANSPARÊNCIA PARA SUSTENTABILIDADE

POLÍTICOS

D1.1 - Legislação e normas
 Transparência: Políticas, Normas e Padrões de Regulação, Normas e Padrões de Qualidade e Avaliação de Impacto, Normas e Padrões de Qualidade e Avaliação de Impacto, Normas e Padrões de Qualidade e Avaliação de Impacto.

D1.2 - Suportes regulamentares
 Exemplo: Diretrizes de transparência, Normas e Padrões de Qualidade e Avaliação de Impacto, Normas e Padrões de Qualidade e Avaliação de Impacto.

TECNOLOGIA

D2.1 - Tecnologias digitais
 Exemplo: Tecnologias digitais, Normas e Padrões de Qualidade e Avaliação de Impacto, Normas e Padrões de Qualidade e Avaliação de Impacto.

D2.2 - Tecnologias analógicas
 Exemplo: Tecnologias analógicas, Normas e Padrões de Qualidade e Avaliação de Impacto, Normas e Padrões de Qualidade e Avaliação de Impacto.

COMERCIAIS

D3.1 - Marketing e branding
 Exemplo: Marketing e branding, Normas e Padrões de Qualidade e Avaliação de Impacto, Normas e Padrões de Qualidade e Avaliação de Impacto.

QUALIDADE

D4.1 - Impactos ambientais, sociais e econômicos
 Exemplo: Impactos ambientais, sociais e econômicos, Normas e Padrões de Qualidade e Avaliação de Impacto, Normas e Padrões de Qualidade e Avaliação de Impacto.

D4.2 - Indicadores e métricas de sustentabilidade
 Exemplo: Indicadores e métricas de sustentabilidade, Normas e Padrões de Qualidade e Avaliação de Impacto, Normas e Padrões de Qualidade e Avaliação de Impacto.

a) Classifique no mapa os atores e fatores no mapa
b) Discutir:

- Explique o porque e qual a relação entre eles.
- Falta algum ator?
- Quais fatores motivadores estão relacionados? (cartões ao lado)
- As motivações mais frequentes são as que criam maior valor para o usuário?
 Quem é principal beneficiado da transparência atual?

2 QUAIS SÃO OS ELEMENTOS DO SISTEMA DO SERVIÇO E DIMENSÕES PARA SUSTENTABILIDADE?
Descrever e caracterizar os elementos do sistema que são candidatos a transparência para sustentabilidade
 Ferramenta: System Map

GOVERNANÇA

S1.1
 RESPONSABILIDADE E ÉTICA COM SUSTENTABILIDADE

S1.2
 COMPLIANCE E ORIENTAMENTO SUSTENTABILIDADE

S1.3
 COMPROMISSOS E AÇÕES PARA SUSTENTABILIDADE

SOCIAL

S2.1
 DIVERSIDADE E INCLUSÃO

S2.2
 CONSUMO RESPONSÁVEL E EDUCAÇÃO PARA SUSTENTABILIDADE

S2.3
 CONDIÇÕES DE TRABALHO E EMPREGO

S2.4
 JUSTIÇA, EQUIDADE E COESÃO SOCIAL

AMBIENTAL

S3.1
 RECURSOS NATURAIS

S3.2
 RECURSOS MATERIAIS

S3.3
 CIRCULARIDADE

ECONÔMICO

S4.1
 MODELO DE NEGÓCIO

S4.2
 ECONOMIA LOCAL E GERAÇÃO DE RENDA

S4.3
 CULTURA E RECURSOS E ESTRUTURAS LOCAIS

S4.4
 ORGANIZAÇÃO EM REDE

INFRAESTRUTURA DIGITAL

S5.1
 GESTÃO DE DADOS E INFORMAÇÕES

S5.2
 DESENVOLVIMENTO DE SERVIÇOS DIGITAIS

a) Descrever/representar no mapa o sistema do serviço em termos de processos, atores, recursos (entradas), impactos (saídas)
b) Discutir:

- Explique o porque e qual a relação entre eles.
- Quais dimensões da sustentabilidade estão relacionadas com quais elementos do sistema? (cartões ao lado)
- Quais elementos são comunicados atualmente e quais ainda não?

ETAPA

SITUAÇÃO ATUAL

DATA

SERVICE

3

QUAIS SÃO AS INTERAÇÕES DIGITAIS ENTRE O SERVIÇO E O USUÁRIO ?
 Descrever onde se localizam e caracterizar as práticas de transparência atuais
 Ferramenta: Service Blueprint

	JORNADA PRÉ-SERVIÇO	JORNADA CORE DO SERVIÇO	JORNADA PÓS-SERVIÇO
ESTÁGIOS DA JORNADA DE USUÁRIO			
PERFIL DO USUÁRIO			
AÇÕES DOS USUÁRIOS			
PONTOS DE CONTATO DIGITAIS			
AÇÕES DO SERVIÇO			
Transparência			
PRÁTICAS DE TRANSPARÊNCIA			
Backstage			
AÇÕES DO SERVIÇO			
PROCESSOS DE SUPORTE			

PROPOSTA DE VALOR DO SERVIÇO:

PROPOSTA DE VALOR DA TRANSPARÊNCIA PARA SUSTENTABILIDADE:

ESTÁGIOS DA JORNADA DO SERVIÇO ONDE SE LOCALIZAM AS PRÁTICAS ATUAIS:

PRÁTICAS DE TRANSPARÊNCIA:

4

QUAIS SÃO AS OPORTUNIDADES e PRIORIDADES PARA MELHORIA DA TRANSPARÊNCIA PARA SUSTENTABILIDADE?
 Delinear as oportunidades e lacunas na situação atual; identificar as prioridades para melhoria da transparência
 Ferramenta auxiliar:
 Espectro Transparência para Sustentabilidade

RELACIONAL

MAIOR VALOR PARA SUSTENTABILIDADE

MAIOR VALOR PARA USUÁRIO

TIPO DA JORNADA DE USUÁRIO

JORNADA PÓS-SERVIÇO
Service recovery efforts
Building stronger customer relationship
Customer feedback / reviews / recommendation

JORNADA CORE (SUO / CONSUMID)
Core Interactions
Fulfill foundational customer needs

JORNADA PRÉ-SERVIÇO
Awareness building
Information search
Initial contact
Onboarding

OPACIDADE
NÃO HÁ COMUNICAÇÃO OU TRANSPARÊNCIA
Quebra de sigilo, transmissão de informações, visibilidade

NORMATIVA
ATESTAR CONFORMIDADE E GARANTIR DE DIREITO DO USUÁRIO
Conformidade, Proteção, Suspeito, Construção de Confiança, Resolução de Conflitos

FORMATIVA
PARA APOIAR A TOMADA DE DECISÃO INFORMANDO O USUÁRIO
Conscientização, Esclarecimento, Educação, Tomada de Decisão

PARTICIPATIVA
PARA APOIAR A COLABORAÇÃO DO USUÁRIO NO SERVIÇO
Participação, Cocriação, Compartilhar, Colaborar

REATIVA

TRANSACIONAL

ATITUDE E DESAFIO DO SERVIÇO EM TRANSPARÊNCIA PARA SUSTENTABILIDADE

ATIVA

a) Sinalizar as áreas nos mapas onde se localizam as práticas atuais de transparência para sustentabilidade.

b) Sinalizar as áreas nos mapas onde se localizam as prioridades de melhoria da transparência para sustentabilidade.

c) Sinalizar as áreas nos mapas onde se localizam as prioridades de novas ofertas da transparência para sustentabilidade.

5 EXPLORAR CRIATIVAMENTE OS TEMAS PRIORITÁRIOS PARA MELHORIA DA TRANSPARÊNCIA PARA SUSTENTABILIDADE.

Gerar ideias para os temas prioritários e caracterizar os cenários para design

Ferramenta: Matriz de polaridade

- a) Descrever as ideias utilizando os Princípios de Design da Transparência para Sustentabilidade
b) Classificar as ideias de acordo com o estado de transparência alvo

Ideias para Transparência Normativa



Ideias para Transparência Formativa



Ideias para Transparência Participativa



c) Priorizar as ideias:

- Ler a ideia em voz alta para feedback
- Classificar na matriz de polaridade conforme critério seleção: *desenvolvibilidade (valor para empresa e usuário) x viabilidade para empresa*
- Agrupar e seleccione as ideias que seguiram para criar conceitos



6 QUAIS SÃO OS CENÁRIOS PRIORITÁRIOS PARA MELHORIA DA TRANSPARÊNCIA PARA SUSTENTABILIDADE?

Caracterizar os cenários e briefing para design

Ferramenta: Post cards from the future e Ficha briefing

- a) Caracterizar os cenários para design, a partir dos temas de ideias priorizados, utilizando o template de notícia do futuro e ficha de briefing.

- b) Refletir sobre os pontos fortes e fracos das propostas de melhoria, com relação ao cenário atual.



JORNAL DO RIO DE JANEIRO

PROBLEMA / OPORTUNIDADE DE TRANSPARÊNCIA PARA SUSTENTABILIDADE

MATÉRIA DE MANEIRA

TÍTULO DA MANCHETE

SUB-TÍTULO

ILUSTRAR

O QUE É O CONCEPT?
O que precisa acontecer para, de acordo com o cenário futuro, ter a sustentabilidade integrada ao negócio da empresa? Qual o momento atual? Como isso pode ser alcançado? Qual o momento futuro? Como isso pode ser alcançado? Qual o momento futuro? Como isso pode ser alcançado?

QUAL É A INFLUÊNCIA PARA VERSÃO ANTERIOR E CONSEQUENTE?
Qual a influência para a versão anterior e consequente? Qual a influência para a versão anterior e consequente? Qual a influência para a versão anterior e consequente?

QUAL É O DESENVOLVIMENTO DESEJADO COM A NOVA TRANSPARÊNCIA?
Qual o desenvolvimento desejado com a nova transparência? Qual o desenvolvimento desejado com a nova transparência? Qual o desenvolvimento desejado com a nova transparência?

Ferramenta auxiliar:
FICHA DE BRIEFING

FICHA: BRIEFING DE TRANSPARÊNCIA PARA O DESIGN

PROBLEMA / OPORTUNIDADE DE TRANSPARÊNCIA PARA SUSTENTABILIDADE:

Descreva aqui:

DESAFIO DE DESIGN (QUE):

Como ...?

TRANSPARÊNCIA ALVO PARA QUEM?

☐ NORMATIVA ☐ FORMATIVA ☐ PARTICIPATIVA

JORNADA ALVO DA TRANSPARÊNCIA:

☐ DESCOBERTA - AQUISIÇÃO ☐ USO - CONSUMO ☐ PÓS-USE - CONSUMO POST

DESENVOLVIMENTO DE SUSTENTABILIDADE ALVO DA TRANSPARÊNCIA:

☐ GOVERNANÇA ☐ SOCIA ☐ AMBIENTAL ☐ ECONÔMICA ☐ DIGITAL

ELEMENTOS DO SERVIÇO ALVO DA TRANSPARÊNCIA:

☐ PROCESSO ☐ ATOR ☐ RECURSO ☐ IMPACTO

USUÁRIO CLIENTE ALVO:

PRIORIDADES:

☐ ALTA ☐ MÉDIA ☐ BAIXA

DESIGN:

☐ MELHORIA ☐ INOVAÇÃO

FACTORES CRÍTICOS PARA O DESIGN:

Appendix 14: Action III - Participants evaluation

Criteria	Question	Participants response					
Content		1	2	3	4	5	Average response
Relevance	The content presented in the workshops is relevant to my work context.	-	-	-	-	100%	5 (totally agree)
Effectiveness	The content presented in the workshop helped to understand the concepts addressed.	-	-	-	20%	80%	5 (totally agree)
Completeness	The content presented in the workshop was sufficient to carry out the practical activity.	-	-	-	20%	80%	5 (totally agree)
Activity Guide (tool)		1	2	3	4	5	Average response
Relevance	The activity guide is relevant to my work context.	-	-	-	-	100%	5 (totally agree)
Effectiveness	The activity guide helped to reflect on the current situation and improvement opportunities of transparency for sustainability.	-	-	-	-	100%	5 (totally agree)
Completeness	The activity guide is enough to apply in my work context.	-	-	-	-	100%	5 (totally agree)
Factors Cards (tool)		1	2	3	4	5	Average response
Relevance	The tool is relevant to my work context.	-	-	-	20%	80%	5 (totally agree)
Effectiveness	The tool helped to identify the factors influencing current transparency initiatives and identifying opportunities.	-	-	-	20%	80%	5 (totally agree)
Completeness	The tool is enough to apply in my work context.	-	-	-	20%	80%	5 (totally agree)
Spectrum (tool)		1	2	3	4	5	Average response
Relevance	The tool is relevant to my work context.	-	-	-	-	100%	5 (totally agree)
Effectiveness	The tool helped to guide the reflection on design opportunities and priorities in my work context.	-	-	-	-	100%	5 (totally agree)
Completeness	The tool is enough to apply in my work context.	-	-	-	-	100%	5 (totally agree)
Briefing (tool)		1	2	3	4	5	Average response
Relevance	The tool is relevant to my work context.	-	-	-	-	100%	5 (totally agree)
Effectiveness	The tool helped to formalize the design opportunities and priorities in my work context.	-	-	-	-	100%	5 (totally agree)
Completeness	The tool is enough to apply in my work context.	-	-	-	-	100%	5 (totally agree)

ANALYSIS CRITERIA: 1 (totally disagree); 2 (disagree); 3 (sort of agree); 4 (agree); 5 (totally agree)

Appendix 15: Study IV - Activity Guide template

GUIA DE ATIVIDADE 1:
DIAGNÓSTICO DA TRANSPARÊNCIA PARA SUSTENTABILIDADE

O diagnóstico é um procedimento analítico que tem como objetivo apoiar designers na análise de problemas e oportunidades em serviços existentes, sob a perspectiva da transparência para sustentabilidade como mecanismo de criação de valor para usuário.

Instruções:

1 ESTUDO DO USUÁRIO
Para caracterizar o perfil de transparência em sustentabilidade do usuário alvo

Instruções:

1. Colete informações para te ajudar a entender os diferentes perfis de usuários do serviço sob estudo;
2. Selecione o **perfil de usuário que será o foco do estudo** e proposições;
3. Colete informações para te ajudar a entender o **tipo de jornada** de usuário com o serviço, que será o foco do estudo e proposições;
4. Identificar o **perfil de transparência sobre sustentabilidade do usuário alvo**.

Ferramentas do Design de Serviço que podem te ajudar:

- **Persona** **
- **Mapa de Empatia**
- **Mapa Jornada de Usuário**

Ferramentas para te ajudar na análise da transparência:

- **CARTÕES DO PERFIL DE USUÁRIO**
- **CARTÕES DOS FATORES MOTIVADORES DO USUÁRIO**
- **CARTÕES DOS FATORES HABILITADORES DO USUÁRIO**

2 ESTUDO DO SERVIÇO
Para caracterizar como o serviço está configurado e as condições de transparência para sustentabilidade

Instruções:

1. Colete informações para te ajudar a entender a **elementos/componentes** que compõem o sistema atual no qual o serviço está inserido;
2. Relacione os componentes do sistema do serviço; com os **aspectos de sustentabilidade** pertinentes ao contexto;
3. Colete informações para te ajudar a entender o **contexto de transparência** onde o serviço sob estudo está inserido

Ferramentas do Design de Serviço que podem te ajudar:

- **Mapa do Sistema** **
- **Mapa de Stakeholders**
- **Diagrama do Serviço**
- **Mapa de Ofertas**

Ferramentas para te ajudar na análise da transparência:

- **CARTÕES DO PERFIL DE SERVIÇO**
- **CARTÕES DAS FATORES MOTIVADORES DO SERVIÇO**
- **CARTÕES DOS FATORES HABILITADORES DO SERVIÇO**

3 ESTUDO DOS CENÁRIOS DE TRANSPARÊNCIA PARA SUSTENTABILIDADE
Para caracterizar os problemas e oportunidades de transparência em sustentabilidade

Instruções:

1. Revise e reflita com as descobertas ao longo das atividades, identificando os principais problemas de transparência;
2. Selecione o **problema / oportunidade** que será tratada como **desafio alvo** para elaborar proposições por meio do **design**. Considere o problema/oportunidade com potencial de oferecer **maior valor/benefícios para o usuário** a partir da transparência sobre sustentabilidade;
3. Explorar criativamente por meio da **geração de alternativas** e criação de **peças conceitos** que ilustrem o cenário de oportunidade mapeado, usando os **princípios transparência**.

Ferramentas do Design de Serviço que podem te ajudar:

- **Mural de Insights**
- **Storyboard**

Ferramentas para te ajudar na análise da transparência:

- **MAPA DO ESPECTRO DA TRANSPARÊNCIA****
- **MAPA DO PRINCÍPIO DA TRANSPARÊNCIA**
- **FICHA DA TRANSPARÊNCIA NO CONCEITO****

FERRAMENTA: CARTÕES DE APOIO A PESQUISA COM USUÁRIO

objetivo

Ferramenta de apoio às atividades de coleta e análise de dados para pesquisa com usuários do serviço, que guia sobre os fatores chaves a respeito da transparência para sustentabilidade.

ASPECTOS DE PERFIL DO USUÁRIO EM RELAÇÃO A TRANSPARÊNCIA PARA SUSTENTABILIDADE

PU.1 USUÁRIO

QUE PRECISA

Quais são as **necessidades, benefícios esperados** com transparência para sustentabilidade de acordo com o usuário?

PU.2 USUÁRIO

QUE NÃO FUNCIONA

Quais são as **dificuldades ou barreiras** que atrapalham o acesso ou uso da transparência em sustentabilidade?

PU.3 USUÁRIO

QUE FUNCIONA

Quais são os exemplos de **práticas de transparência que funcionam** para o usuário e por que?

PU.1 USUÁRIO

COMPETÊNCIAS

Quais são as **habilidades e conhecimentos** que o usuário precisa desenvolver para se beneficiar da transparência em sustentabilidade?

PU.2 USUÁRIO

RECURSOS

Quais são as **ferramentas e infraestrutura** que o usuário precisa ter acesso para se beneficiar da transparência em sustentabilidade?

PU.2 USUÁRIO

SIGNIFICADOS

Quais são as **entendimentos e crenças**, que o usuário possui sobre o tema alvo da transparência em sustentabilidade?

FATORES QUE MOTIVAM OU PROVOCAM DEMANDAS DE TRANSPARÊNCIA NO USUÁRIO

PU.1 USUÁRIO

COMPORTAMENTAL

Desconfiança, Incertezas e desconhecimento

Exemplo: Pessoa gostaria de entender melhor os condições de produtos de uma marca

PU.2 USUÁRIO

COMPORTAMENTAL

Mudança de estilo de vida, rotina de cuidados e hábitos de consumo

Exemplo: Pessoa precisa adotar dieta baseada em orgânicos por motivo de saúde

PU.3 USUÁRIO

COMUNICACIONAL

Acesso e uso de determinados dados e informações

Exemplo: Pessoa gostaria de ter certeza que o produto não é produzido com matéria-prima ilegal da Amazônia

PU.1 USUÁRIO

CONTEXTO

Influências sociais, culturais, econômicas e políticas

Exemplo: mudança climáticas

PU.2 USUÁRIO

CONTEXTO

Denúncias, escândalos e conflitos no seu entorno

Exemplo: Reportagens alertando sobre aumento agrotóxicos nos alimentos e trabalho escravo

FATORES QUE FACILITAM OU IMPEDEM O USUÁRIO DE SE BENEFICIAR DA TRANSPARÊNCIA

PU.1 USUÁRIO

COMPETÊNCIA

Grau de habilidade do usuário em acessar e usar a comunicação

PU.2 USUÁRIO

COMPETÊNCIA

Grau de conhecimento do usuário no assunto de sustentabilidade

PU.3 USUÁRIO

COMPETÊNCIA

Habilidade de interpretação e cognição do usuário

FERRAMENTA: CARTÕES DE APOIO AO ESTUDO DO SISTEMA DO SERVIÇO

objetivo

Ferramenta de apoio às atividades de coleta e análise de dados para estudo da configuração do sistema do serviço, que guia sobre os fatores-chave a respeito da transparência para sustentabilidade.

ASPECTOS DE PERFIL DO SERVIÇO EM RELAÇÃO A TRANSPARÊNCIA PARA SUSTENTABILIDADE

FS.1 SERVIÇO COMPONENTE DIGITAL TIPOS DE INTERAÇÃO / FUNCIONALIDADE	FS.1 SERVIÇO COMPONENTE DIGITAL TIPOS DE CONTEÚDOS (DADOS E INFORMAÇÕES)	FS.1 SERVIÇO COMPONENTE DO SISTEMA RECURSOS OU MATERIAIS	FS.1 SERVIÇO PRÁTICAS DE GOVERNANÇA RESPONSABILIDADE E ÉTICA COM SUSTENTABILIDADE	FS.1 SERVIÇO PRÁTICAS DE GOVERNANÇA COMPLIANCE E CREDENCIAMENTO SUSTENTABILIDADE	FS.1 SERVIÇO PRÁTICAS DE GOVERNANÇA COMPROMISSOS E AÇÕES PARA SUSTENTABILIDADE
FS.1 SERVIÇO COMPONENTE DO SISTEMA PROCESSOS E ATIVIDADES	FS.1 SERVIÇO COMPONENTE DO SISTEMA REDE DE ATORES	FS.1 SERVIÇO COMPONENTE DO SISTEMA IMPACTOS OU EMISSÕES	FS.1 SERVIÇO PRÁTICAS SOCIAIS DIVERSIDADE, INCLUSÃO E JUSTIÇA	FS.1 SERVIÇO PRÁTICAS SOCIAIS CONSUMO RESPONSÁVEL E EDUCAÇÃO PARA SUSTENTABILIDADE	FS.1 SERVIÇO PRÁTICAS SOCIAIS CONDIÇÕES TRABALHO E EMPREGO
FS.1 SERVIÇO COMPETÊNCIAS Quais são as habilidades e conhecimentos que o serviço precisa desenvolver para uma transparência ativa da sustentabilidade?	FS.2 SERVIÇO RECURSOS Quais são as ferramentas e infraestrutura que o serviço precisa para uma transparência ativa da sustentabilidade?	FS.2 SERVIÇO SIGNIFICADOS Quais são os entendimentos e valores, que o serviço possui sobre o tema alvo da transparência em sustentabilidade?	FS.1 SERVIÇO PRÁTICAS AMBIENTAIS PREVENÇÃO A REGENERAÇÃO DOS RECURSOS NATURAIS	FS.1 SERVIÇO PRÁTICAS AMBIENTAIS PREVENÇÃO A OTIMIZAÇÃO DOS RECURSOS MATERIAIS	FS.1 SERVIÇO PRÁTICAS AMBIENTAIS ESTRATÉGIAS DE CIRCULARIDADE
			FS.1 SERVIÇO PRÁTICAS ECONÔMICAS MODELO DE NEGÓCIO COMPARTILHADO, DISTRIBUIÇÃO, COMÉRCIO JUSTO, ETC.	FS.1 SERVIÇO PRÁTICAS ECONÔMICAS ECONOMIA LOCAL E GERAÇÃO DE RENDA	FS.1 SERVIÇO PRÁTICAS ECONÔMICAS CULTURA, INSUMOS E ESTRUTURAS LOCAIS

FATORES QUE MOTIVAM OU PROVOCAM AÇÕES DE TRANSPARÊNCIA NO SERVIÇO

FS.1 SERVIÇO POLÍTICO E LEGAL Legislação e normas Exemplo: Política Nacional de Resíduos Sólidos que torna obrigatória a realização da logística reversa / restituição dos resíduos pela empresa.	FS.1 SERVIÇO POLÍTICO E LEGAL Suspeitas ou denúncias Exemplo: Denúncias sobre as condições de trabalho na cadeia produtiva de setor de moda.	FS.1 SERVIÇO TECNOLOGICO Acesso a novas tecnologias Exemplo: passaporte digital para armazenar histórico dos produtos e autenticação via QR Code scan e blockchain.
FS.1 SERVIÇO MARCA E COMERCIAL Marketing e branding Exemplo: campanha que associa o impacto social e ambiental que a compra está associada.	FS.1 SERVIÇO CLIENTES Necessidades e percepções dos usuários Exemplo: as pessoas gostariam de poder reparar seus equipamentos, mas em geral as marcas não oferecem esta opção.	FS.1 SERVIÇO GOVERNANÇA Críticas de qualidade e prestação de contas Exemplo: certificação de que uma empresa está atendendo a altos padrões de desempenho em critérios de sustentabilidade.
FS.1 SERVIÇO OBJETIVOS E COMPROMISSOS Programas e projetos socio-ambientais Exemplo: espaço cultural e criativo onde os visitantes podem observar, aprender e aplicar práticas de upcycling usando banco de resíduos.		

FATORES QUE FACILITAM OU IMPEDEM O SERVIÇO DE OFERECER TRANSPARÊNCIA

FS.1 SERVIÇO Receio da empresa em se expor ou abrir	FS.1 SERVIÇO Grau da relação de confiança entre usuário e serviço Conhecimento do usuário e perfil	FS.1 SERVIÇO Competências e grau de digitalização empresa Influenciando o tipo de funcionalidade e conteúdos disponíveis, sua usabilidade e acessibilidade.
FS.1 SERVIÇO Diferencial competitivo da empresa	FS.1 SERVIÇO Complexidade da estrutura organizacional da empresa ou do seu ecossistema	FS.1 SERVIÇO Sigilo dos conteúdos e processos
FS.1 SERVIÇO Grau de abertura para conteúdos gerados pelos usuários	FS.1 SERVIÇO Grau de qualidade e integridade do conteúdo da transparência	FS.1 SERVIÇO Natureza do conteúdo de transparência (positiva e negativa)

FERRAMENTA: MAPA DO ESPECTRO DE CENÁRIOS DE TRANSPARÊNCIA PARA SUSTENTABILIDADE

OBJETIVO

Ferramenta de apoio as atividades de análise de dados e tomada de decisão. A partir dos estudos realizados previamente, é possível sinalizar no mapa as áreas onde se concentram as práticas atuais e as áreas de oportunidades para design.

RESPONSÁVEL

MAIOR VALOR PARA USUÁRIO

MAIOR VALOR PARA SUSTENTABILIDADE

REATIVA

FUNCIONAL

ATIVA

PROPOSTA DE VALOR DA TRANSPARÊNCIA PARA USUÁRIO

CENÁRIO ATUAL

Sinalize no espectro (quando aplicável):

- a **proposta de valor atual** do serviço com relação a transparência
- o tipo de jornada de usuário onde se localizam os **problemas** de transparência

CENÁRIO FUTURO

Sinalize no espectro:

- a **proposta de valor desejada** do serviço com relação a transparência
- o tipo de jornada de usuário onde se localizam as **oportunidades** de transparência

PRIORIZAÇÃO E SELEÇÃO

Qual é o problema / oportunidade selecionada para design e por que? (sugestão: utilizar como critério de escolha desejabilidade/valor para usuário)

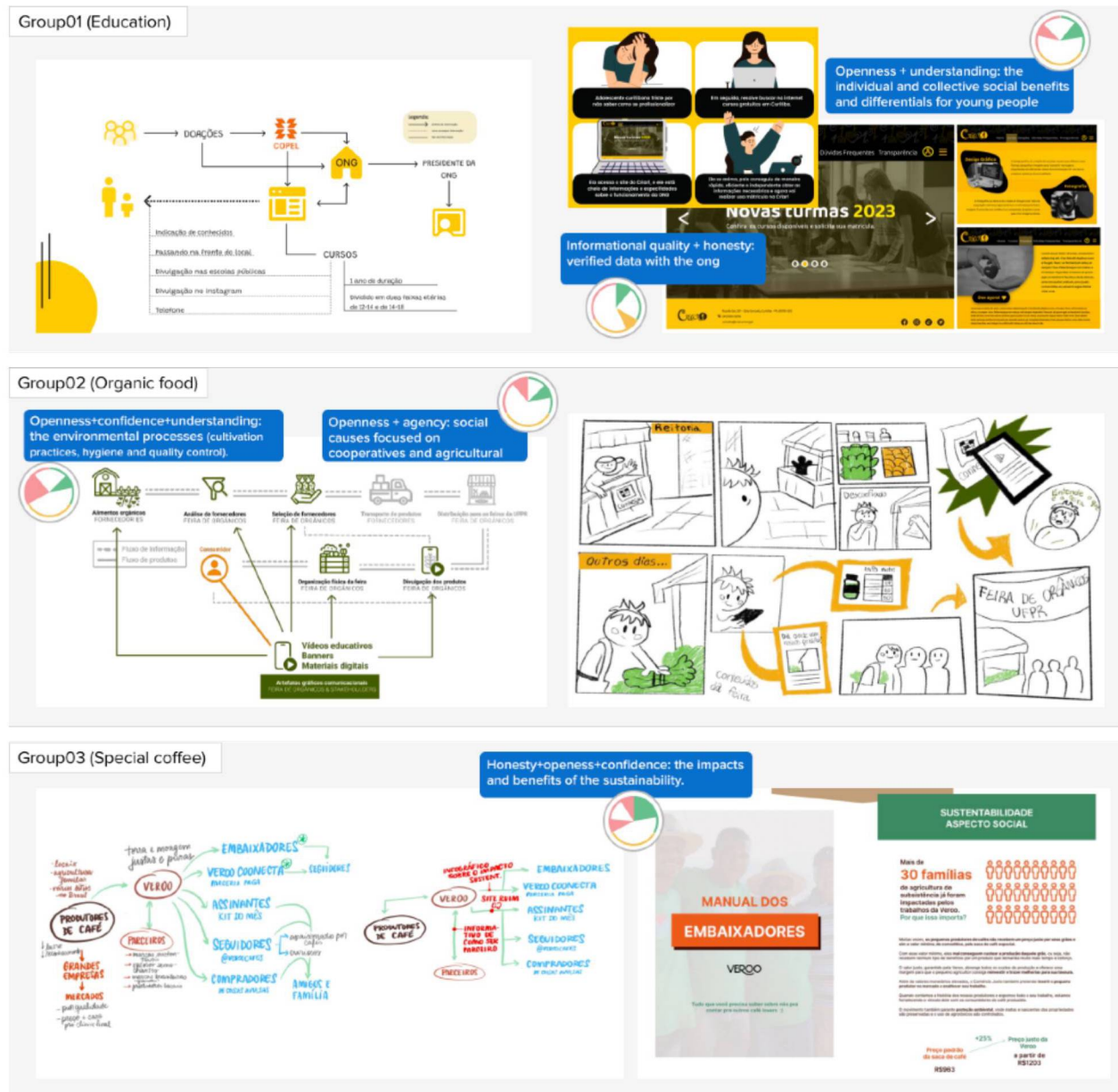
ASPECTOS DE SUSTENTABILIDADE ALVO DA TRANSPARÊNCIA:

☐ GOVERNANÇA ☐ SOCIAL ☐ AMBIENTAL ☐ ECONÔMICO

ELEMENTOS ALVO DA TRANSPARÊNCIA:

☐ PROCESSO ☐ ATOR ☐ RECURSOS ☐ IMPACTOS

Appendix 16: Study IV - Example of the main outcomes



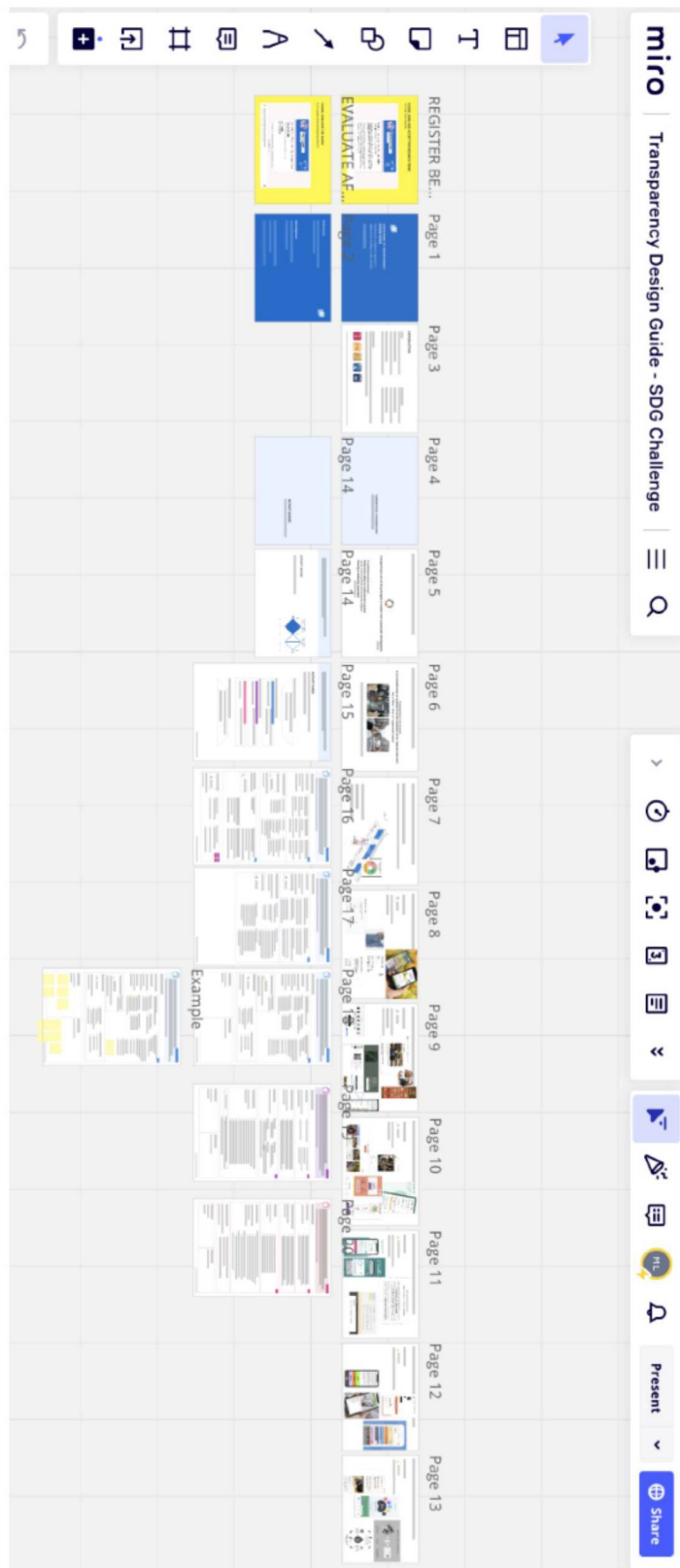
Appendix 17: Study IV - Participants evaluation

Criteria	Question	Participants response					
Participants Knowledge-Building		1	2	3	4	5	Average response
Before	My knowledge on the subject before the workshop is very low or basic.	-	-	11%	22%	67%	4 (agree)
After	The workshop and materials enabled my leanings on the subject.	-	-	44%	33%	22%	4 (agree)
Content		1	2	3	4	5	Average response
Relevance	The content presented in the workshops is relevant to my work context.	-	-	-	33%	67%	5 (totally agree)
Effectiveness	The content presented in the workshop helped to understand the concepts addressed.	-	-	-	22%	79%	5 (totally agree)
Completeness	The content presented in the workshop was sufficient to carry out the practical activity.	-	-	-	44%	56%	4 (agree)
Activity Guide (tool)		1	2	3	4	5	Average response
Relevance	The activity guide is relevant to my work context.	-	-	22%	22%	56%	4 (agree)
Effectiveness	The activity guide helped to reflect on the current situation and improvement opportunities of transparency for sustainability.	-	-	-	44%	56%	4 (agree)
Completeness	The activity guide is enough to apply in my work context.	-	-	11%	22%	67%	4 (agree)
Cards (tool)		1	2	3	4	5	Average response
Relevance	The tool is relevant to my work context.	-	-	22%	33%	44%	4 (agree)
Effectiveness	The tool helped to guide the reflection on the factors that can influence transparency initiatives for sustainability in digital services.	-	-	-	44%	56%	4 (agree)
Completeness	The tool is enough to apply in my work context.	-	-	11%	33%	56%	4 (agree)
Spectrum (tool)		1	2	3	4	5	Average response
Relevance	The tool is relevant to my work context.	-	-	22%	22%	56%	4 (agree)
Effectiveness	The tool helped to guide the reflection on design scenarios for transparency in sustainability and circularity in my work context.	-	-	-	56%	44%	4 (agree)
Completeness	The tool is enough to apply in my work context.	-	-	11%	33%	56%	4 (agree)

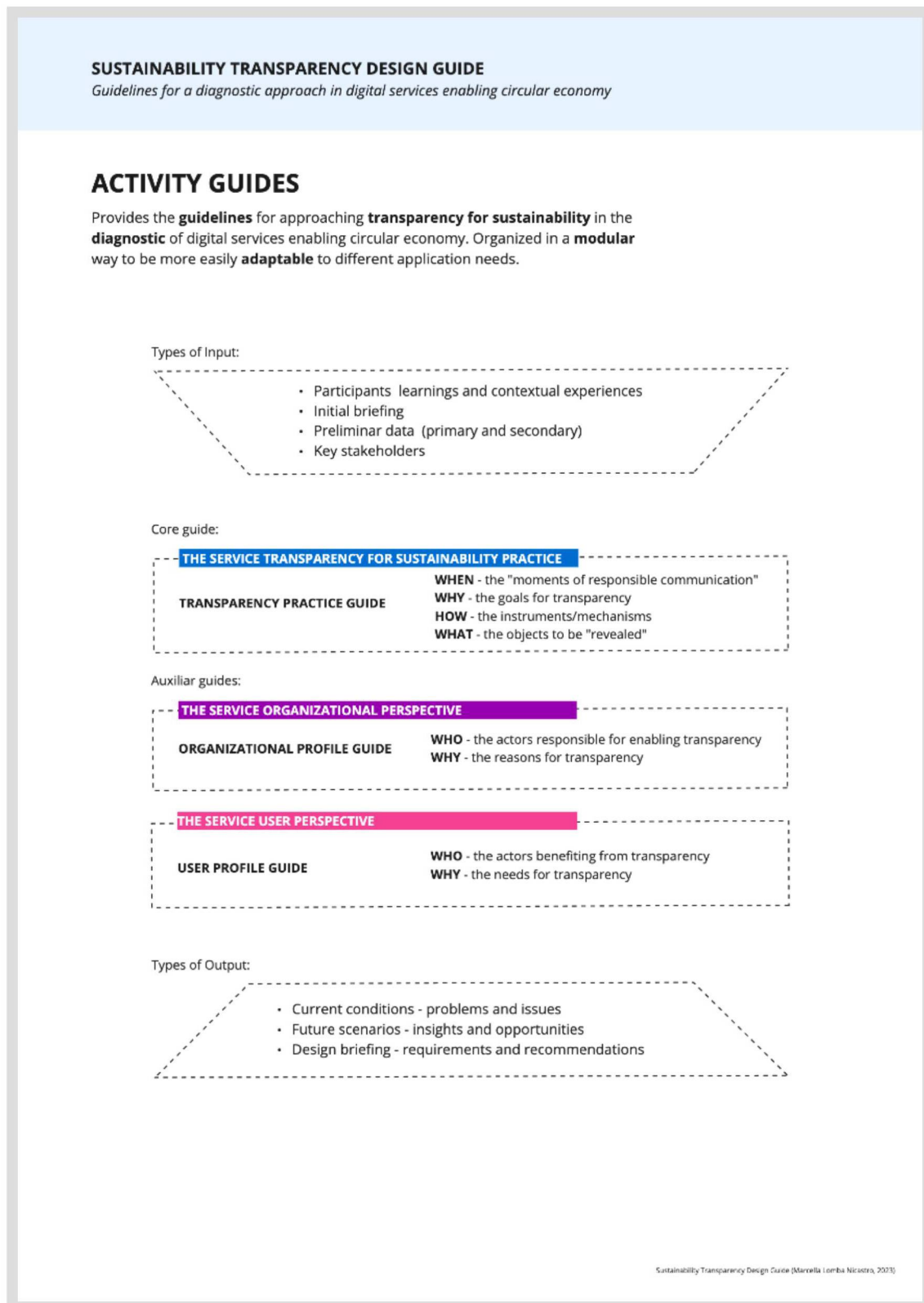
ANALYSIS CRITERIA: 1 (totally disagree); 2 (disagree); 3 (sort of agree); 4 (agree); 5 (totally agree)

Source: the author

Appendix 18: Study V - Design Guide overview



Appendix 19: Study V - Activity Guide templates





THE TRANSPARENCY FOR SUSTAINABILITY PRACTICE

When, What & How

ACTIVITY GUIDE: TRANSPARENCY PRACTICE

To guide the diagnosis of the transparency for sustainability.

- Use de guidelines **to discover the current situation and frame improvement opportunities**;
- Use this **template** as a **checklist/canvas**, combined with other representation tools such as system map, service blueprint, and design scenarios.

Guidelines:

WASTE MANAGEMENT STAGE

In the context of services/projects enabling circular economy, consider the waste management stage in which the service/project offerings are situated.

☐ Prevention and minimization

eg.: services mitigating and reducing the environmental impact of consumption, promoting the sharing economy.

Transparency enabling sustainable consumption:

"Should I buy this product?
If you buy it, should it be new or used?
If new, which one to choose?"

☐ Preserve and extend life-span

eg.: services encouraging the reuse of waste, product repair, refurbish, remanufacture.

Transparency enabling sustainable usage of products and parts:

"Should I continue using a product?
How should I take care of it?
If I'm not going to use it anymore, what should I do?"

☐ Waste as resource

eg.: services recycling, and recovering resources from waste, properly treating and disposing waste.

Transparency enabling sustainable revaluation of waste:

"Should I keep it for a while?
Should I just keep it or repair it?
If I'm going to get rid of it, what should I do?"

When

USER FLOWS / JOURNEYS SERVICE DIGITAL-ENCOUNTER

TRANSPARENCY COMMUNICATION FORM



CONTEXT

Adapts sustainability communication, by setting content and interactions according to the context of use.

☐ Pre-service journey

General user activities / tasks

- ☐ Awareness building
- ☐ Discover/Search
- ☐ Shop/Subscribe
- ☐ Setup/Onboarding

☐ Core-service journey

General user activities / tasks

- ☐ Core service interactions
- ☐ Fulfill user needs
- ☐ First-time/recurring use

Circular user activities / tasks

- ☐ Separation, cleaning, storage
- ☐ Transport, collection, delivery
- ☐ Repair, reuse, donation, selling, logistic reverse, etc

☐ Others:

☐ Post-service journey

General user activities / tasks

- ☐ Recovery / maintain relationship
- ☐ Upgrade / Downgrade
- ☐ Feedbacks / reviews
- ☐ Abandon/Cancel

☐ Others:

TRANSPARENCY STATE

For a specific user journey, identify the transparency enabling state.



TRANSPARENCY VALUE FUNCTION

☐ Opacity

no communication, secrecy

☐ Normative

communication aimed to comply with regulations

Enables user's **confidence** in sustainability transparency, by **ensuring service compliance, credibility and protection of rights**

to avoid user's feeling insecure, suspicious or unsupported

☐ Formative

communication aimed to knowledge building

Enables user's to gain **understanding** from the transparency, by **ensuring awareness and knowledge-building**.

to avoid lacking in guidance or educating the user on the meanings

☐ Participative

communication aimed o customization and collaboration

Enables user's to gain sustainability **agency** from the transparency, by **customization (individual) and collaboration (others)**.

to avoid restricting the potential for users to take action

Why

TRANSPARENCY ETHICAL ATTITUDE



INCLUSIVE

Favours the inclusion of a **diversity of users and stakeholders** in the service sustainability communication.

Organizational perspective

- ☐ Supporting different stakeholders sustainability transparency maturity
- ☐ Supporting power-sharing and stakeholders participation

User perspective

- ☐ Supporting different sustainability capabilities, needs and behaviours
- ☐ Supporting different functional capabilities (motor, cognitive, sensorial) in digital spaces
- ☐ Supporting the user's resource integration with the service-system

Who Why
Who Why



THE TRANSPARENCY FOR SUSTAINABILITY PRACTICE

When, What & How

ACTIVITY GUIDE: TRANSPARENCY PRACTICE

To guide the diagnosis of the transparency for sustainability.

- Use de guidelines **to discover the current situation and frame improvement opportunities**;
- Use this **template as a checklist/canvas**, combined with other representation tools such as system map, service blueprint, and design scenarios.

Guidelines:

SUSTAINABILITY DIMENSIONS

Consider the different aspects of the service system governance, environmental, social and economic dimensions of sustainability, as the target of the transparency mediations.

TRANSPARENCY ETHICAL ATTITUDE



OPENNESS

Governance

Managing sustainability and accountability efforts from policies to practices level

- ☐ Responsibility and ethics
- ☐ Compliance and accreditation
- ☐ Commitments and actions

Social

Ensuring a just society, with cohesion and equity, respect for human rights

- ☐ Diversity, inclusion and justice
- ☐ Responsible consumption
- ☐ Sustainability education
- ☐ Working and employment conditions

Environmental

Mitigation of environmental impact from prevention to regeneration

- ☐ Prevention and regeneration of natural resources
- ☐ Prevention and optimization of material resources
- ☐ Circular economy strategies

Economic

New economy paradigms based on promoting decentralization, cooperation and respect for the individuals and communities.

- ☐ Business model
(circular, shared, distributed, fair trade, etc.)
- ☐ Local economy and income generation
- ☐ Local culture, resources and infrastructures

What

SERVICE SYSTEM-CONFIGURATION ELEMENTS

Consider the backstage of actors network, processes, resources and impacts associated with social, environmental and economic aspects of the service-system.

TRANSPARENCY ETHICAL ATTITUDE



OPENNESS

Resources and materials

- ☐ Industry / Donated material
(feather, textile, rubber, etc.)
- ☐ Industry / Material banks
- ☐ Social-economic resources / Local Actors
- ☐ Natural resources
- ☐ Others:

Processes and activities

- ☐ Business and Brand Governance
- ☐ Commercial and Marketing
- ☐ Customer Service Operations
- ☐ Digital-Channels Operations
- ☐ Production-Repair Operations
- ☐ Supply-Chain Operations
- ☐ Others:

Impacts and emissions

- ☐ Industry footprint / Origen of materials
- ☐ Product footprint impact / How and of what it's made
- ☐ Product footprint impact / Material composition
- ☐ Product footprint impact / Product life-cycle extension
- ☐ Product footprint impact / Creative and design history
- ☐ Individual footprint impact / Item usage conditions
- ☐ Individual footprint impact / Used item donated
- ☐ Others:

Actors network

- ☐ Manufacturer
- ☐ Technology
- ☐ Retail
- ☐ Government
- ☐ Customers / users
- ☐ Business
- ☐ Local creative economy and makers partners
- ☐ Local material suppliers
- ☐ Others:



THE TRANSPARENCY FOR SUSTAINABILITY PRACTICE

When, What & How

ACTIVITY GUIDE: TRANSPARENCY PRACTICE

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- Use the guidelines to **discover the current situation and frame improvement opportunities**;
- Use this **template** as a **checklist/canvas**, combined with other representation tools such as system map, service blueprint, and design scenarios.

Guidelines:

CONTENT AND INTERACTIONS SERVICE DIGITAL- ENCOUNTER

There is a wide variety of types of content and interactions that can be used as mediation tools in the digital space. Here you can find the main ones as a starting point.

The types of content and interactions can be used as signals/indicators of sustainability transparency in digital services.

☐ Types of content

To be communicated as data, information or insights

Brand and Governance

- ☐ Principles and values
- ☐ Commitments and priorities
- ☐ Initiatives and programs
- ☐ Marketing and campaign

Sustainability

- ☐ Educational
- ☐ Causes / volunteer / activism

Circularity

- ☐ Quality and usage conditions
- ☐ Packaging conditions
- ☐ Care and repair guides
- ☐ Reuse guides
- ☐ Recycling and disposal guides
- ☐ Indicators
*usage, reparability, upgradeability
indicators parts availability*

Footprint

- ☐ Industry-sector level
- ☐ Production-chain level
- ☐ Product level
- ☐ Individual/Communities level

☐ Type of interactions

Features / Functionalities

General Features

- ☐ Content display
- ☐ Informational Search / Navigation
(filter and customization)
- ☐ Call to action / Contact / Request features
- ☐ Notification, alerts and messaging features
- ☐ Waiting and follow-up features
- ☐ Product/Service Reviews
- ☐ Sustainable behaviour tools
(consume impact, carbon calculator)
- ☐ Actions / Tasks / Challenges
(Gamification-oriented)
- ☐ Surveys
(research and customer service)
- ☐ Sharing and co-creation
- ☐ Feedbacks and rewards
- ☐ Footprint scoring and ranking
- ☐ Learning and self-clarification and quantification support
- ☐ Decision-making and action-taking support

TRANSPARENCY COMMUNICATION FORM



AESTHETICS

Favours the aesthetics in the communication of sustainability, by **making content and interactions identifiable, attractive and meaningful to users**.

Visual content

- ☐ Real pictures and videos
- ☐ Graphic symbols, illustrations and diagrams

TRANSPARENCY ETHICAL ATTITUDE



HONESTY

Honestly communicates the reality of the service sustainability, by **providing true, evidenced and verifiable content**.

☐ Types of content

Brand and Governance

- ☐ Credentials and certifications
- ☐ Generated by users or community
- ☐ Reviews and stories
(social impression)

☐ Others:

☐ Type of interactions

- ☐ Connectivity and traceability
(connect and scan products)
- ☐ Verification
(data-information checker)
- ☐ Others:

CURRENT SITUATION

Frame the current transparency for sustainability issues and problems.

IMPROVEMENT OPPORTUNITIES

Frame the insights and opportunities of improving transparency for sustainability.



THE SERVICE ORGANIZATIONAL PERSPECTIVE

ACTIVITY GUIDE: SERVICE ORGANIZATIONAL PROFILE

Who & Why

To guide the diagnosis of the transparency for sustainability.

- Use the guidelines to **discover the current situation and frame improvement opportunities**;
- Use this **template** as a **checklist/canvas**, combined with other representation tools such as stakeholders map and personas

Guidelines:

CRITICAL STAKEHOLDERS

Consider the core internal and external stakeholders who might have a role and responsibility in sustainability transparency.

- ☐ Internal stakeholders: direct contact
- ☐ External stakeholders: intermediaries and third-parties

- manufacturers, retail and value chain partners
- technology
- sector organizations
- government and regulations
- communication, design, business
- service and operational partners
- others

Who

SUSTAINABILITY TRANSPARENCY ATTITUDE

Consider the perspective of specific stakeholders or the service as a whole. Also, may consider sustainability in general or circularity.

- ☐ Inactive
indifferente
- ☐ Reactive
Regulations requirements, conflicts
- ☐ Active
Improve customer service

TRANSPARENCY DRIVERS

Consider what provokes, motivates or causes user demands for sustainability transparency.

- Political and Legal
- ☐ Legislation and standards
 - ☐ Suspicions or complaints

- Experience
- ☐ Marketing and branding
 - ☐ User needs and perceptions
 - ☐ Others:

- Technological
- ☐ Access to new digital technologies
 - ☐ Biological and chemical technologies

- Organizational
- ☐ Environmental, social and economic impacts
 - ☐ Service/company quality criteria

Why

TRANSPARENCY INFLUENCING FACTORS

Consider what organizational and contextual factors facilitates or prevents the service in providing sustainability transparency.

- ☐ Fear of the company in exposing itself or opening
- ☐ Degree of trust between user and service
- ☐ Degree of usability and accessibility of digital services
- ☐ Competitive advantage of the company
- ☐ Complexity of the organizational structure of the company or its ecosystem
- ☐ Secrecy of contents and processes
- ☐ Degree of openness to user-generated content
- ☐ Degree of quality and integrity of the transparency content
- ☐ Nature of content transfer (positive and negative)
- ☐ User knowledge and profile
- ☐ Skills and degree of company digitization



TRANSPARENCY
COMMUNICATION FORM

Informational Quality

- ☐ Ability to provide complete, consistent, and accurate informational digital content.

☐ Others:

CURRENT SITUATION

Frame the current transparency for sustainability issues and problems.

IMPROVEMENT OPPORTUNITIES

Frame the insights and opportunities of improving transparency for sustainability.



THE SERVICE USER PERSPECTIVE

ACTIVITY GUIDE: SERVICE USER PROFILE

Who & Why

To guide the diagnosis of the transparency for sustainability.

- Use de guidelines to **discover the current situation and frame improvement opportunities**;
- Use this **template** as a **checklist/canvas**, combined with other representation tools such as stakeholders map, persona, and user journey.

Guidelines:

TYPES OF USERS/CUSTOMERS

Consider the different types of users, by approaching the extreme profiles

- ☐ **First time users**
First time using the service, and or this type of service
- ☐ **Recurrings users**
Already a customer of this service or similar one, having experience and expectations
- ☐ **Others**

Who

SUSTAINABLE BEHAVIOURS

In the context and theme of the service/project, consider the user's engagement with sustainability

- ☐ **Indifferent**
Does not change lifestyle, is indifferent to sustainability issues
- ☐ **Reactive**
Adopts changes when it is mandatory or when it is something more personal or of interest
- ☐ **Active**
Conscious, open for change behaviors and experiencing changes

TRANSPARENCY DRIVERS

Consider what provokes, motivates or causes user demands for sustainability transparency.

- ☐ **Mistrust, uncertainty and ignorance**
- ☐ **Lifestyle change, care routine and consumption habits**
- ☐ **Access and use of certain data and information**
- ☐ **Social, cultural, economic and political influences**
- ☐ **Denunciations, scandals and conflicts in your surroundings**
- ☐ **Others:**

Why

TRANSPARENCY INFLUENCING FACTORS

Consider what factors facilitates or prevents the user benefiting from sustainability transparency, such as potential communication barriers, preferences, limitatons.

Competences

- ☐ **User's degree of ability to access and use the communication**
- ☐ **Degree of user knowledge on the subject of sustainability**
- ☐ **Interpretation ability and user cognition**
- ☐ **User's degree of sustainable behaviour/maturity**

Resources

- ☐ **Digital tools and infrastructure that the user needs to have access**

Meanings and value system

- ☐ **The understandings and beliefs that the user has**

- ☐ **Others:**

SUSTAINABILITY TRANSPARENCY NEEDS

Consider the functional problems and expectations which the service communication should satisfy or solve for the user benefit from the sustainability transparency.

Transparency supports social inclusion for people such as:

- people insecure or distrustful
- people with special / specific needs / requirements
- people interested in adopting more sustainable behaviours
- people adopting new products and service offerings
- people in asymmetric power relations with brands and ecosystems

CURRENT SITUATION

Frame the current transparency for sustainability issues and problems.

IMPROVEMENT OPPORTUNITIES

Frame the insights and opportunities of improving transparency for sustainability.

Appendix 20: Study V - Participants evaluation

Criteria	Question	Participants response					
Participants Knowledge-Building		1	2	3	4	5	Average response
Before	My knowledge on the subject (transparency for sustainability in digital services) before using the provided Design Guide, was initial/basic.	-	-	-	22%	79%	5 (totally agree)
After	The Design Guide enabled my knowledge building to approach the subject (transparency for sustainability in digital services) in projects.	-	-	-	28%	71%	4 (agree)
Content (derived from the Theoretical Framework)		1	2	3	4	5	Average response
Relevance	The content presented in the workshops was relevant to my project context.	-	-	-	22%	79%	5 (totally agree)
Effectiveness	The content presented in the workshop helped to understand the concepts addressed.	-	-	-	43%	57%	4 (agree)
Completeness	The content presented in the workshop was sufficient to carry out the practical activity.	-	-	44%	33%	22%	4 (agree)
Activity Guide (transparency pra)		1	2	3	4	5	Average response
Relevance	The activity guide was relevant to my project context.	-	-	-	28%	71%	4 (agree)
Effectiveness	The activity guide helped to reflect on the current situation and improvement opportunities of transparency for sustainability.	-	-	-	43%	57%	4 (agree)
Completeness	The activity guide was sufficient to apply in my project context.	-	-	44%	33%	22%	4 (agree)

ANALYSIS CRITERIA: 1 (totally disagree); 2 (disagree); 3 (sort of agree); 4 (agree); 5 (totally agree)