

Review

What Is Design for Social Sustainability? A Systematic Literature Review for Designers of Product-Service Systems

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Abstract: Social sustainability is concerned with the wellbeing and flourishing of societies now and in the future. Despite its importance, it has been largely overlooked compared with environmental and economic dimensions of sustainability. Additionally, although there is a longstanding history of design being used to tackle social and sustainability problems, the concept of design for social sustainability is not well-understood. In light of this, the current study aims to conceptually develop design for social sustainability. It specifically focuses on how this concept can be developed for the design of product-service systems. A systematic literature review of social design and sustainable design literature is conducted to synthesise fragmented knowledge on design for social sustainability. A total of 69 articles are analysed with respect to terminology, context, methods, focus and key themes. In doing so, it helps to summarise current knowledge and identify several promising areas for further research. In particular, it calls for additional contextual and place-based perspectives; development of appropriate metrics, methods and tools; and research on the linkages between design for social sustainability and existing sustainable design approaches and methods. This article contributes to knowledge in three ways: (1) it integrates disparate knowledge on design for social sustainability within the domain of product-service systems, (2) it defines design for social sustainability and makes progress toward operationalising the concept by identifying its key dimensions, and (3) it identifies current gaps in the literature and highlights areas for further research. This study is important for designers of product-service systems because it sheds a light on what is desirable and achievable.

Keywords: design for social sustainability; social sustainability; product-service systems; design; sustainable design; design for sustainability; literature review



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1. Introduction

It is widely accepted that sustainability must include social, economic and environmental dimensions [1]. Social sustainability is a cornerstone of sustainable development as it is concerned with the wellbeing and flourishing of societies now and in the future [2,3]. Despite its importance, it has historically been overlooked within sustainability research [4–8]. For many years, literature on social sustainability was undermined by a lack of conceptual clarity [9–12]. One reason researchers were deterred from tackling social sustainability is that it is intrinsically complex as it deals with social values that are not easily quantified and are difficult to separate from their context [13–15].

To this extent, sustainability discourse has mostly focused on environmental issues, such that sustainability is often used interchangeably with environmental protection [12,16]. Moreover, many integrated sustainability models have placed a disproportionate focus on environmental factors compared with social factors [17]. The same can be said for design for sustainability methods and tools, which have tended to focus on environmental issues. For instance, popular life cycle design and life cycle assessments largely focus on quantitative environmental measures of energy, materials and waste [18]. This is problematic because several studies have shown that people can only begin to actively address environmental issues once their basic needs have been met [19,20].

Despite these concerns, social sustainability seems to be a promising area of research that is turning a corner. In the last few years, there has been a rapid growth in publications on social sustainability and its new-found recognition is contributing to its conceptual and operational development [21,22]. Among multiple definitions in the literature, it is clear that social sustainability is concerned with the human wellbeing and flourishing of societies now and in the future. Khan I [23] describe social sustainability as “social factors that are essential for achieving long-term, social wellbeing”, McKenzie [12] calls it “a life-enhancing condition within communities and a process that can achieve it” and Missimer et al. [24] define it as the preservation of the social system, where “people are not subject to structural obstacles to: health, influence, competence, impartiality and meaning-making”.

Although research on social sustainability is now growing, the role of design is rarely discussed. The exception is within the field of urban design; however, this work is mostly domain-specific and seems to be isolated from other domains. Furthermore, this research tends to be practice-oriented and specifically focuses on how to design the built environment to achieve social sustainability. For example, The Young Foundation produced a report on D4SS which defines important elements for building new communities and urban spaces [25]. A report by the Environment Design Guide also documents how an inclusive design process helped to facilitate more socially sustainable infrastructure and local services [26]. Other authors consider social sustainability as an outcome of urban design, but do not specifically examine the role of design in promoting social sustainability [27–29].

The underdevelopment of D4SS within the domain of product-service systems is contrary to the longstanding role of design in shaping and preserving our social systems. In 1893, William Morris published the *Ideal Book*, calling on designers to reject the poor social conditions and quality of goods resulting from the industrial revolution. Design itself is a deliberate act of moving from the current status quo, to another preferred state [5]. A look at the Italian word for design, *progettare*, reveals a much richer meaning that signifies to plan, to imagine, to envision. Within the word is rooted design’s ability to see beyond what does not yet exist [30]. If we accept that design is a means by which new realities come into being, and that social sustainability is one such reality, it follows that D4SS must be recognised as an important sustainability concept.

This paper aims to conceptually develop D4SS by conducting a systematic review of literature from the fields of social design and sustainable design. It specifically focuses on the relevance and applicability of D4SS for the design of product-service systems. Secondly, It complements and expands on earlier work by the authors to better understand D4SS [31]. This study seeks to draw together disparate knowledge to conceptually develop D4SS, analyse extant research, document current limitations, and identify a future research agenda. In this paper, we first explain the methods used to collect and analyse the literature. Second, we highlight the main terminology, methods, focus and topics covered in the literature. By synthesising social design and sustainable design literature, we define D4SS as design that advances the human wellbeing and flourishing of societies now and in the future. Third, we discuss the key themes and findings from extant work. To our knowledge, this is the first study to provide a knowledge-based definition of D4SS that is relevant for designers of product-service systems. Our presentation of the key themes of D4SS also provides a much-needed foundation for the operationalisation of this concept. Finally, we identify key gaps in the literature that require further attention. We conclude by highlighting the key findings and identifying promising avenues for future research.

2. Methods

To examine existing knowledge on D4SS, a number of initial search terms were identified related to design, social sustainability, and similar terms. Literature was gathered using Scopus and Google Scholar, with the following searches: “social sustainability” AND “design”; “design for social sustainability”; “socially sustainable design”; “design for social impact”; “design for sustainable social impact”; “design for sustainable social change”.

As this resulted in only a small number of articles, it was also decided to expand the literature to include search terms from the domains of social design and sustainable design, including: “socially useful design”; “socially responsible design”; “sustainable product design”; “universal design”; and “inclusive design”. The aim of these searches was to look for literature at the intersection of these domains that considered design and social sustainability (see Figure 1). All articles were examined up until March 2019. When using Google Scholar, the first two pages for each search were retrieved for screening. This resulted in a total of 787 articles for review.

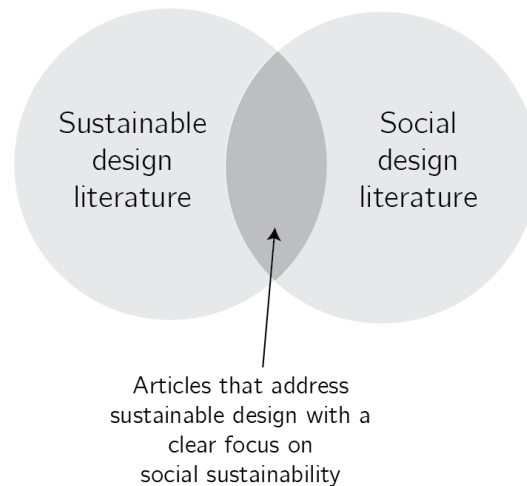


Figure 1. Searching for literature on design and social sustainability.

The inclusion/exclusion criteria were established to support the review process (see Table 1). In an effort to seek high-quality results, only peer-reviewed journals in English were included. Books, book chapters, conference papers and reports were therefore initially excluded (to maintain the high quality of academic papers). The second criterion determined that articles must address sustainability with a clear focus on social sustainability. For example, articles that only mentioned social factors superficially, with a major focus on environmental factors, were therefore excluded. Thirdly, as the study aimed to develop the D4SS concept for designers of product-service systems, articles from operations or management domains, and urban design were excluded to begin with. The decision to exclude articles from urban design was motivated by the desire to focus explicitly on the domain of product-service systems. Whilst the built environment and product-service systems are both subjects of design, they originate from different bodies of knowledge, they are subject to different constraints and processes, and of course, result in different types of outcomes. For this reason, a focused study on D4SS in product-service systems was decided upon.

Table 1. Initial inclusion and exclusion criteria for systematic review.

Inclusion Criteria		Exclusion Criteria
1.	Peer-reviewed journal in English	Books, book chapters, conference papers, reports.
2.	Articles that address sustainable design with a clear focus on social sustainability	A lack of focus on social sustainability and design, and instead a focus on environmental sustainability.
3.	Articles that are related to product-service systems design	Articles related to urban design, supply chain, general management and strategy.

An initial review of titles and, if necessary, abstracts was used to determine relevant papers. This resulted in the exclusion of 710 articles (41 were duplicates, 55 were not peer reviewed and 614 were irrelevant). This left 77 articles for full paper review. At full paper review, 17 papers were removed as 11 papers were not relevant to social sustainability, and six papers were not relevant to product-service system design. This resulted in a total of 60 papers that met the criteria identified. A further nine papers were identified using snowballing, resulting in a total of 69 papers. Upon reviewing the papers, a decision was made to include two papers related to urban design despite the initial inclusion/exclusion criteria. These papers were highly cited and cited among other papers that met the criteria. Furthermore, one book chapter [32] was included from an author whose papers were separately identified as making key contributions. Although this item did not meet the initial criterion for a peer-review journal, it was deemed significant due to the fact it was highly cited and reference by other papers. See Figure 2 for an overview of this review process.

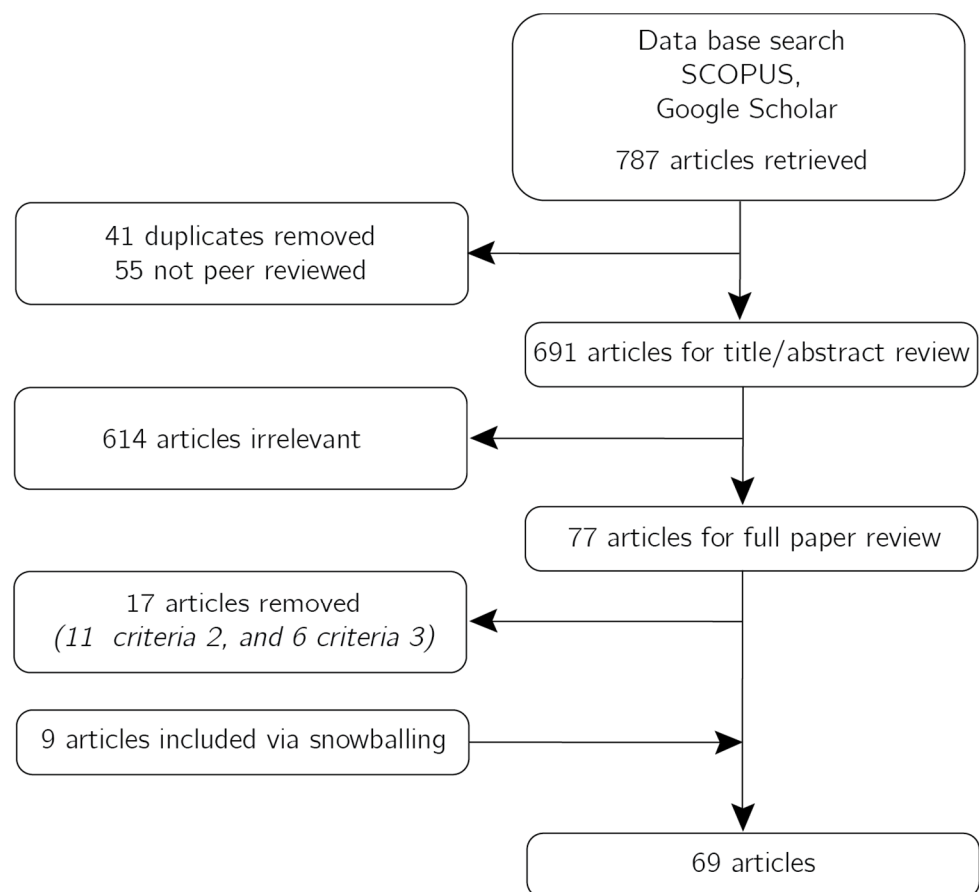


Figure 2. Systematic literature review process.

Analysing the Literature

To begin with, each of the articles was carefully read and analysed with respect to the main findings, terminology used (e.g., socially responsible design, design for sustainable development, etc.), main focus (e.g., design education, design theory, design methods, metrics, etc.), topics covered (e.g., participatory design, codesign, systems thinking, behavioural change, etc.), methodology (e.g., case study, action research, interviews, etc.), and research context (e.g., Global North, Global South, industrialised, community-scale). This detailed analysis guided interpretation of the literature and key themes of D4SS were documented for each article.

Thematic analysis was selected to investigate the key themes of D4SS found within the literature. Thematic analysis is concerned with finding explicit (“semantic”) and implicit (“latent”) themes within data [33,34]. It is a useful approach for interpreting data in order to provide detailed accounts [35]. An initial analysis of the literature resulted in 46 themes. The key themes of D4SS were then analysed using a systematic process of defining categories and identifying the relationships between those categories in order to group conceptually similar themes [34]. This resulted in 36 sub-themes, which were further grouped into 15 themes. For example, the sub-themes ‘democratic/participatory’, ‘collaborative’, ‘cooperative’, ‘bottom up’, and ‘relational/people focused’ were used to describe the participation of different actors in the design process and therefore formed the higher-level theme ‘participatory’. Similarly, ‘culturally sensitive design’, ‘situated design’, ‘appropriate technology’ and ‘local suitability’ were concerned with design that is appropriate for the context, and these themes were grouped together to form the key theme ‘contextual’.

3. Results

3.1. Terminology

It was found that a wide range of terms were used inconsistently throughout articles to refer to the same phenomena. Of the 64 articles that met the criteria, 10 specifically used the terms “social sustainability in design”, “socially sustainable design”, “socially sustainable products”, “design for socio-ethical sustainability” or “design for social sustainability”. However, different terms were often used throughout the articles. For example, multiple articles used the term “socially sustainable products” interchangeably with “socially responsible design” or “design for social innovation”, and “design for social innovation” was used interchangeably with “social sustainability” and “sustainable development”. These findings reflect a lack of precision in the literature and highlight that existing knowledge is disparate and fragmented between different approaches. Table 2 provides a summary of the related terminology to D4SS found in the literature and offers some exemplary definitions of these related terms. This table is roughly organised in chronological order to reveal the evolution of different approaches in the field. Figure 3 shows the cumulative frequency of publications on D4SS. This figure indicates a steady growth in publications related to D4SS, mainly dating from the last two decades.

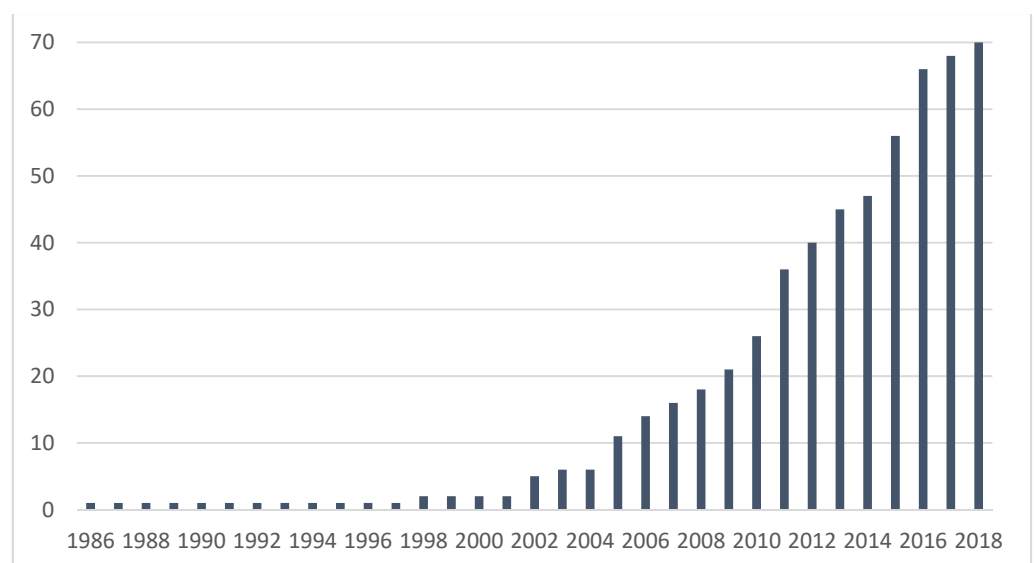


Figure 3. Cumulative frequency of publications on D4SS related to product-service systems.

Table 2. Overview terminology used in the literature.

Terminology	Main Focus	Papers	Example Definition
Socially useful design	The design of useful products that are accessible and affordable to everyone. Design that resists market forces.	[37]	“Socially useful design not merely exposes this process [existing production/consumption patterns] but also presents constructive alternatives.” [37]
Universal design, inclusive design	The design of products to be usable by as many people as possible at little or no extra cost.	[38–42]	“Universal design targets needs, social participation and access to goods and services by the widest possible range of users.” [39]
Sustainable design, sustainable product design, sustainable product development, design for sustainability.	The design of products that minimise negative impacts on the environment, whilst creating economic and social benefits.	[18,32,43–56]	“Design for sustainability is design with the intention to achieve sustainable outputs. It is design that considers the environmental and social impacts of a product, service or system at the same level that economic concerns are considered” [32]
Sustainable product service systems (S. PSS)	The design of product-service systems where the economic interest of the providers continuously creates environmentally and socially ethical solutions.	[50,57]	“An offer model providing an integrated mix of products and services that... continuously seeks environmentally and socio-ethically beneficial new solutions” [52]
Social design, design for social impact	The design of products that seek to bring about positive social change. Tends to focus on design in small projects or communities.	[58–67]	“Social design and social designers might be used to reconfigure and create better social-cultural technical relations, thereby constructing sustainable social infrastructures grounded in local participation and indigenous knowledge.” [55]
Design for sustainable behaviour	The design of products that make people adopt desired sustainable behaviour and stop unwanted sustainable behaviour.	[48,49,68]	“To reduce use impacts by purposefully shaping behaviour towards more sustainable practices” [43]
Socially responsible design, design responsibility	The design of product-systems that address global social, environmental and economic issues. Typically linked to Design for Bottom of the Pyramid (BoP), Design in Global South, Design for Development or Humanitarian Design.	[69,70]	“Socially responsible design refers to design within the realm of social need, and upheld by a definition where it is “grounded in human dignity and human rights” [71]“Socially responsible design is a system perspective approach by which design decisions can incorporate the three dimensions of financial, environmental, and social issues” [72]
Socially responsive design	The design of product-systems which address social, environmental and economic issues, and sits within the marketplace.	[73,74]	“[Its] potential for generating ‘innovation’ in terms of the marketplace, may mean it does not simply equate with some purist definitions of socially responsible design... Socially responsive design tends to start with designers individually, or as a group, trying to make their intervention through practice” [66]

Table 2. Cont.

Terminology	Main Focus	Papers	Example Definition
Design for social innovation, socially innovative design	Design processes that develop and scale up social innovations. Emphasis on the role that people and communities can play in driving local change.	[4,54,75–80]	“[Design for] Social innovation is a process of change emerging from the creative re-combination of existing assets (from social capital to historical heritage, from traditional craftsmanship to accessible advanced technology), the aim of which is to achieve socially recognized goals in a new way” [74]
Social sustainability in design, socially sustainable design, socially sustainable products, design for socio-ethical sustainability	The design of products that seek social sustainability. Incorporating social sustainability into design processes and practices.	[4,36,57,71,81–86]	“Social sustainability in design, therefore calls for a deep understanding of human behaviour, fulfilling human needs and wants whilst being cognisant of (amongst other things) environmental limits, product responsibility, resource use and carrying capacities. As well as paying due attention to history; traditions; engaging in dialogue; having equity in expressing ideas; compromise; self-fulfilment and altruism in design practice are fundamentals in working towards social sustainability.” [36] “Socially sustainable product development is the processes and practices that lead to products whose lifecycles have a less negative impact on the social system.” [78]
Design for sustainable social change	Design of products-systems that can sustain social change.	[87]	“Creating multiple opportunities for sustaining and scaling projects, beyond the agency of individual actors, within larger communities and across domains and stakeholders at various levels of authority.” [83]

Among the 10 articles that explicitly use the terms “design for social sustainability” or “socially sustainable design”, precise definitions are notably lacking. For example, Chick [4] refers to social sustainability, but uses this term synonymously with sustainable development, social impact and design for social innovation. Within the literature, the most detailed definition is provided by McMahan and Bhamra [36], who examined how social sustainability might be integrated into design education. They explain that social sustainability in design:

“calls for a deep understanding of human behaviour, fulfilling human needs and wants whilst being cognisant of (amongst other things) environmental limits, product responsibility, resource use and carrying capacities. As well as paying due attention to history; traditions; engaging in dialogue; having equity in expressing ideas; compromise; self-fulfilment and altruism in design practice are fundamentals in working towards social sustainability.”

This definition makes clear that D4SS must respond to human needs, and that in order to do so, D4SS must consider a broader set of socio-cultural themes such as tradition, equity, and self-fulfilment. This definition provides a useful starting point; however, it is worth noting that the emphasis of McMahan and Bhamra’s [36] work is mainly on the cultivation of responsible and ethical design practices, what they call social sustainability *in* design. We suggest that D4SS could be taken one step further, considering both social sustainability *in* design and social sustainability *by* design. In other words, D4SS seeks out socially sustainable design practices, and also positions design as a means by which social sustainability might be achieved.

3.2. Methods, Focus and Topics Covered

The analysis also revealed that the majority of articles are case studies (23 papers), conceptual papers (20 papers), or review papers (10 papers). Only a handful of papers used design experiments or tests (five papers), action research (three papers), surveys (two papers) or design ethnography (one paper). These findings are consistent with the emergent nature of this topic in that many papers are still exploring and clarifying the role of design with respect to social sustainability. In terms of the research context, it was found that the majority of papers are focused on community/small-scale projects (23 papers) as opposed to industrialised projects (six papers), with 34 not specifying the context at all. It is perhaps not surprising that D4SS seems well-suited to community-based projects where social relations play an important role in the design process. Roughly even proportions of papers focused on projects in the Global North and Global South; however, many of the papers emphasised the relevance of D4SS in designing for marginalised people. For example, Lie (2016) states: “designers connected to this movement generally focused on disadvantaged sectors of society, using alternative and appropriate technology and encouraging an efficient use of resources.”

Further analysis of the key focus of the papers and topics covered is shown in Table 3. It was found that the majority of papers (28 papers) focus on developing new design methods and practices. For example, Melles et al. [53] explores the topic of participatory design and proposes eight criteria for guiding socially responsible design; therefore, this paper was classified as both “development of design methods and practice”, and “participatory design”. Another group of papers (22 papers) reflect on concepts or theory, by suggesting new ways of thinking about design. For example, Hillgren et al. [77] examines participatory design, by developing the concept of ‘infrastructuring’; thus, this paper was classified as “conceptual and theoretical reflections” and “participatory design”. A small number of papers focus on how to teach social design approaches (10 papers), and how to measure its impact (six papers). Only three papers focus on D4SS related principles or definitions, and one paper provides a detailed design history. In terms of the topics covered, a common set of subject-matters emerged across the papers. In particular, participatory design, co-design, human-centred design, collaboration, democracy, distributed design, local design and networks emerged as some of the most frequently mentioned topics.

Table 3. Focus and topic covered in the papers reviewed.

Focus	Topics Covered	Papers	#
Development of design methods and practice (ways of doing design)	Participatory design, co-design, systems, collaboration, relationships, social work, agency, holistic design, networks, production paradigms, late-comer industrialisation, product sustainability, process sustainability, product innovation, product-service systems, spacio-social systems, socio-technical systems, prototyping, tacit knowledge, behaviour change, user behaviour, design culture, design competencies, triple bottom line, life-cycle analysis, capacity building, change management.	[4,18,36,43,45,48,49,54,56,58,60,63,64,66–69,71,72,74,87–93]	28
Conceptual and theoretical reflections (ways of thinking about design)	Participatory design, co-design, human-centred design, democracy, expert design, design thinking, systems, product-service systems, distributed design, localisation, networks, socio-technical systems, prototyping, infrastructuring, market-led design, design against crime, universal design, strategic design, culture, resilience, decision making.	[37–39,49,51,57,59,61,65,70,73,75,77–79,82,92,94–98]	22
Design education	Participatory design, human-centred design, empathy, culture, designer competencies.	[40–42,81,85,86,90,94,99,100]	10
Measures and indicators	Impact assessment, social sustainability indicators, product lifecycle.	[44,47,52,83,85,86]	6

Table 3. Cont.

Focus	Topics Covered	Papers	#
Principles and definitions	Empathy, dialogue, ethics, inclusion, education, reflection, engagement, flexibility.	[46,76,84]	3
Design history	Participatory design, co-design, Scandinavian design.	[62]	1

3.3. Perspectives from the Literature on D4SS Dimensions

At the end of this section, Table 4 shows the key themes of D4SS that were derived from the literature. As shown in the table, many authors point towards similar themes and these are regarded as important building blocks of D4SS. Some of the themes have implications for the design process (e.g., systemic, local, distributed, etc.), whereas other themes are related to expected design outcomes (e.g., wellbeing, manufacturability, affordability, etc.). The themes identified in Table 4 provide a basis for the conceptual development of D4SS. The following section will discuss these themes and the main findings of the articles.

It is clear from the literature that design has an important role to play in promoting social sustainability. Among the earlier works, Margolin [46] quotes Papanek's claim that "industrial design has put murder on a mass-production basis" and calls on designers "to envision and give form to material and immaterial products that can address human problems on a broad scale and contribute to human well-being". The origins of design as an industry that enables the purchase of goods makes design the "engine room" of capitalism. The view that design is both a source of unsustainability and an important means for achieving sustainability is repeated throughout the literature [37,51,53,92]. Whilst many authors are critical about mainstream design, they are also hopeful that the growth of 'design activism' signals a new era of designers who are more conscious of their impacts on society [51,62,101].

McMahon and Bhamra [84] suggest that complex challenges can be reframed as opportunities for meeting people's needs, and Chick [4] proposes that design can trigger, facilitate and scale up social impact. Nonetheless, design is specifically criticised for overlooking the social dimensions of sustainability [32,36,51,84]. According to Bhamra et al. [32] the neglect of social sustainability has undermined the search for much-needed solutions. They argue that social factors must be included in order to transition from incremental to systems wide innovation. McMahon and Bhamra [36,84] emphasise that addressing social sustainability is a difficult but urgent task to bring about sustainable development.

Above all, participatory approaches are highlighted as an integrated part of D4SS [74,75,77,78,87]. Smith [87] proposes that participatory design can offer far-reaching impacts through the creation of tangible artefacts, and the development of new skills and new ways of seeing the world. Lie [62] explains the integrated history of codesign and social design to argue for more participatory design approaches. Manzini [79] claims that social innovation is necessarily participatory. This builds on related approaches such as inclusive design and universal design, which promote the perspectives of multiple actors [90].

Many of the papers also consider the changing role of the designer in participatory design. Calvo and De Rosa [82] specifically examine community codesign from the perspective of D4SS. They analyse how design of community spaces strengthens relationships between people and places. Calvo and De Rosa suggest a close relationship between participatory design and social sustainability; however, they do not provide a proper discussion of D4SS. In other work, Kang [60] positions the designer as a device that can facilitate the design process and empowers participants to use their tacit knowledge. Thorpe and Gamman [74] contend that the designer should assume a more active role as a co-actor, which is consistent with Manzini's [80] criticism of 'post-it design' in which design experts are relegated to administrative actors. On the whole, however, the literature is vague in describing exactly how participation should happen. Thorpe and Gamman [74] suggest a possible maternalistic model (whereby the designer provides 'small doses of help') and a fraternalistic model (that democratises responsibility) to replace paternalistic approaches.

At the same time, they highlight that totally participatory approaches are unrealistic and unnecessary. As they put it: “we argue that as designers working within complex social design scenarios we can seek consensus and create conditions that foster it, but we cannot force it—and that has to be good enough.” For D4SS, this highlights the importance of supporting collaborative approaches whilst recognising its limitations.

Going hand in hand with calls for more participatory approaches is the recognition that D4SS necessitates a contextual, locally driven approach [66]. This is consistent with views that sustainability itself is contextual [56] and that design is situated [70], dialogical [76] and dynamic [82]. Manzini [78] emphasises the importance of connecting local and global knowledge, advocating for a design practice that is small, local, open and connected. This approach marks a shift towards a new regime that is that is more resilient and sustainable Manzini [80]. Similarly, Morelli [54] highlights the symbiotic relationship between local and global design, and Vezzoli [98] advocates for local, collaborative and network-based initiatives. Specifically, these authors reflect on applications of digital technologies that are enabling more connected and collaborative networks. Such network approaches may go some way to addressing concerns that D4SS is limited by its ‘small scale approach’ and that there is a lack of scalable models [59].

The new emphasis on endogenous design also necessitates a change in attitudes towards the ‘local’. Er and Kaya [91] highlight the phenomena of late-comer industrialisation in developing countries, suggesting that modernist development paradigms which focus on importing technologies have undermined local knowledge. They focus on the history of design in Turkey to reveal that local knowledge and skills have been regarded as inferior and therefore limited the potential for local development. Among the papers that focus on design in the Global South, local ownership is a key theme. Thomas [55] highlights that many designs which were aimed at alleviating poverty failed because local communities did not take ownership of them. In a similar vein, [90] call on design to empower communities and Melles et al. [53] advocates a bottom-up approach that supports local control. According to Vavik [45] and Rains [43], D4SS should respect and reinforce cultural diversity and inclusion. It is clear that D4SS must support the agency of local actors [60,88]. Shifting from the status quo to a more locally driven model will require a change in attitudes and the creation of new platforms to mobilise local resources [92].

An important finding from the literature is that D4SS requires a systemic approach, which is holistic, long-term and open-ended. Sustainability must be embedded early on and designed ‘into’ solutions [48,55]. The authors of [75] set out the need for a long-term, holistic outlook that shifts design from projecting (i.e., discrete projects with pre-determined goals) to infrastructuring (i.e., long term, open-ended commitments). Bjögvinsson et al. [75] also discuss the shift from designing things or objects to things or socio-material assemblies. Elsewhere, this discussion can be found in the call for a product-service systems approach [57,98]. In their discussion of the Malmö Living Lab, Bjögvinsson et al. [75] explain the transformation of one thing to another thing. Design does not end with the creation of a product but is an ongoing process of relationship building between different actors. D4SS is thus firmly positioned as an ongoing and open-ended process.

Other authors underline that strong sustainability requires systems change [18,53,98]. According to Dewulf [44] and Maxwell and van der Vorst [52], a full-life cycle approach is needed from the cradle to the grave. Some authors call for radical changes in global production and consumption to achieve this [53]. Koo and Cooper [96] point out the inherent tension between the ethical designer and the designer for consumerism. On the other hand, [73] put forward that social design is not necessarily opposed to market-based design, and [95] argues that socially responsible design must integrate market-led, designer-led and regulation-led design. Whilst it is clear that the designer cannot isolate themselves from the socio-economic impacts of their creations, we speculate this might present an idealised perspective that is hard to reconcile in practice.

Reflecting on radical versus incremental approaches to social design, Koskinen and Hush [61] distinguish between three different models of social design. To begin with,

they introduce utopian design as the mainstream approach. In their opinion, utopian design is mainly inspired by Papanek's [102] vision of a 'good society' which argues that "good design should not be the prerogative of the rich North only". They criticise this approach for imposing exogeneous views of a 'good society' and suggest two feasible alternatives: molecular and sociological design. Molecular design is focused on changing society incrementally, without a larger vision. This approach tends towards bottom-up, small-scale change. In contrast, sociological design targets social structures and social inequalities, as well as the practices that uphold them. In conclusion, they suggest that these approaches are not necessarily mutually exclusive. These findings suggest that D4SS should adopt a holistic outlook that iterates between broad and narrow thinking.

Table 4. Dimensions of D4SS emerging from the literature.

Theme	Sub-Theme	Citations
Participatory	Participatory/democratic	[4,37,39,51,53,58–60,63,65,75–78,81,85,87,90,92,97,100]
	Collaborative/cooperative	[36,37,45,53,84]
	Bottom up	[79,100]
	People focused/Relational	[77,90]
Contextual	Local suitability	[4,36,37,45,53,58,60,63,65,75–78,80,81,84,100]
	Culturally sensitive design	[38,40,51,86,90,94,98]
	Appropriate technology	[62,64]
	Situated design	[60,76]
Systemic	Long-term approach	[42,43,65,75,77]
	Systemic/holistic	[4,18,32,37,38,47,50,53,57,61,65,76,90,98,99]
	Catalyses social change	[73]
	Full-life cycle	[44,52]
	Product and process	[71]
Empowerment	Empowering/emancipatory	[37,58,70,76,87,88]
	Local control/local ownership	[90,100]
	Agency	[94,100]
Employment, skills and education	Job creation/employment	[37,53,55,58]
	Educational/advancing local knowledge	[53,58,70,75,92]
	Capacity building	[67]
Wellbeing	Needs-based	[37,53,55,63,76,93]
	Preventing harm/reducing harm	[46,55,70]
	Promoting wellbeing	[85]
Local	Local design	[53,54,74,78–80,92,98,100]
Distributed, connected	Distributed design/networks	[54,78,80,92,100]
	Open/connected	[78,80]
	Small/local scale	[59]

Table 4. Cont.

Theme	Sub-Theme	Citations
Responsive	Reflective/challenging norms	[36,42]
	Empathetic	[40,64,76,88,103]
	Ethical	[95,96]
Inclusivity	Inclusive	[39,76,94]
	Accessibility	[38,39,94]
Financial independence	Financial independence	[37,55,58]
Product-led	Product-led	[48]
Manufacturability	Manufacturability	[55]
Affordability	Affordability	[53,55]
Usability	Usability	[41,53]
Flexibility	Flexibility	[41]

In addition, empowerment and capacity building are identified as important dimensions of D4SS. In general, Thorpe and Gamman [74] recommend that design should shift its focus from fixing problems to building capacity. Similarly, Tromp and Hekkert [66] suggest that problems can be reframed as phenomena to reflect this changing scope. Several authors identify capacity building and education as a key driver of impact [58]. For Bjögvinsson et al. [75], capacity building is directly related to participatory design, another key theme of D4SS. The authors of [53] take this further to suggest that design should create employment, alongside the advancement of local skills. Melles et al. [53] present a social impact project in Guatemala that aims to create employment for women through the production and sale of traditional textiles. Education and financial independence are highlighted as key enablers of social impact. Similarly, Thomas [55] emphasises the importance of financial independence in the description of a project to manufacture cookstoves in Kenya. He explains that the women who produce the stoves have benefited both economically and socially through their ability to make a ‘decent income’.

Elsewhere, Cooley [42] puts forward that design should expand human capacity: “design, manufacture and use [should] enhance human skill and ingenuity . . . and help human beings rather than control, deskill and maim them.” Cooley is particularly fearful about technology that subjugates workers. In a similar vein, De Vere et al. [90] emphasise freedom as a key dimension of sustainability. They draw on the philosophy of Karl Popper to argue that education is inherently related to freedom, and only through education can people understand the limits of their freedom.

From another perspective, it is understood that in order to progress D4SS, new design competencies must be cultivated. Several papers explore ways to integrate social sustainability in design education. McMahan and Bhamra [36] reflect on how collaborative design projects can help integrate social sustainability into student design practice. They explore the design competencies required by students to design for social sustainability. In later work, they conduct a delphi study to identify that reflection, dialogue, engagement and flexibility are key design competencies [84]. Other research emphasises the importance of developing design ethics and virtues as part of a responsive design practice [39,40,70]. Design students should be made aware of how norms, values and other social constructs are reproduced in society through design solutions and design interactions [42]. Moreover, empathy is recognised as a fundamental competency that enables designers to create more sustainable solutions [64,88,103]. Finally, Asheim et al. [81] suggests that introducing design students to social issues, before environmental ones, provides an effective introduction to sustainability. In total, it is clear the D4SS necessitates the capacity building of both expert and diffuse (non-expert) designers [80].

Most of the papers take a broad view of D4SS and do not indicate requirements for specific product features. However, there is a clear expectation that any solution must enhance wellbeing and reduce harm. Haug [46] reflects on the reality that design can cause harm, and specifically calls on ethical designers to mitigate harm across all stages of a product's lifecycle. Bezerra and Brasell-Jones [70] argue the case for the responsible designer who seeks to prevent harm. Gould et al. [83] specifically define socially sustainable product development as the "processes and practices that lead to products whose lifecycle have a less negative impact on the social systems". Taking this further, Mendoza et al. [85] identifies that design should actively promote wellbeing, positioning products as 'wellbeing enhancers'.

Several articles emphasise the importance of needs-based design to fulfil these ambitions. For example, Melles et al. [53] identify the fulfilment of needs as a primary success criterion for design. Margolin and Margolin [63] draw on practices from social work to define a new model of design based on social need. Cipolla and Bartholo [76] build on this work to propose a dialogical, needs-based approach that is situated and contextual. Other authors recommend that products should be inclusive [76,94], usable [53] and affordable [53,55].

4. Future Research Agenda

This study has helped to clarify and conceptually develop D4SS by bringing together fragmented literature from the fields of social design and sustainable design. It has identified some core concepts of D4SS, in particular related to participatory, contextual and systemic approaches that seek to empower communities. In doing so, it has also helped to put a spotlight on some key areas for further research, which we will outline below.

Firstly, future work should build on this newly established definitional clarity of D4SS. With the exception of [36], it was challenging to find a precise definition of D4SS in the literature. Whilst their definition provides a useful starting point, it focuses mainly on social sustainability *in* design, overlooking the possibility for social sustainability *by* design. Having conducted this systematic literature review, we believe that the following definition of D4SS as "*design that advances the human wellbeing and flourishing of societies now and in the future provides*" provides a foundation for guiding future research. We encourage researchers and designers of product-service systems to use and explore this definition in practice. For instance, further research could be conducted collaboratively with researchers and practitioners to develop contextually relevant definitions and conceptions.

Secondly, the literature draws attention to the difficult but necessary task of developing appropriate metrics, methods and tools to help operationalise D4SS [45,84]. Addressing the lack of practical tools, Hanush and Birkhofer [84] focus on methods to support social sustainability in product development. Although they fall short of providing an actual tool, they identify a process for doing so based on analysing a variety of socially sustainable products. Maxwell and van der Vorst [52] propose a sustainable product and service development method for assessing products based on triple bottom line principles. However, they adopt a fairly narrow view of social impact that is mainly focused on health and safety and neglects the more expansive definition of social sustainability that now exists. Similar criticisms can be applied to Howarth and Hadfield's [47] tool for assessing social and environmental sustainability of products. Dewulf [44] and Gmelin and Seuring [45] both investigate the potential for a life-cycle analysis tool that considers social impacts; however, both fail to provide a comprehensive tool for evaluation. Woodcraft [86] provides an assessment framework for urban design projects based on the dimensions of social and cultural life, voices and influence, and amenities and infrastructure. They create a set of industry-specific indicators for each dimension and a tool for scoring each indicator. In related work, McMahon and Bhamra [84] focus on how D4SS can be integrated into design education. Alongside the development of practical methods and tools, future work should consider how best to cultivate the new mindsets, skills and capabilities that are needed to advance D4SS. It is imperative that D4SS should not just be seen as an adjunct to traditional

design methods but should underpin all design work. By identifying the key dimensions of D4SS, this study has provided a much-needed foundation for the operationalisation of this concept in the product-service systems domain.

Thirdly, we put forward that there is an opportunity to develop more contextual perspectives on D4SS. Over half of the surveyed literature did not specify a particular context, which made it difficult to interrogate the certain contextual factors that may influence D4SS. Reflecting on the finding that D4SS is compatible with contextual and localised solutions [63,78,80], we call on future work to embrace more place-based research. In this review, we highlighted the criticism that earlier social design approaches too often imposed an exogenous view of development. In response, D4SS acknowledges the need for a multi-faceted approach to history, traditions and dialogue [36]. Following this, we suggest that the field would benefit from case studies that help to illuminate the relationships between the D4SS concept and its context of study. Exploring D4SS in different settings (e.g., industrial versus community-based projects, urban versus rural, Global North versus Global South, etc.) might help to tease out some of its (possibly varied) dimensions.

Finally, we recommend that future research should explore the linkages between D4SS and existing design for sustainability approaches. The initial motivation for studying D4SS is that the field of sustainable design has tended to minimise social factors by largely focusing on more easily quantified environmental factors. Whereas social issues are often considered as an afterthought in integrated sustainability models, D4SS positions social factors as a fundamental starting point for sustainability. In comparison with other social design approaches, D4SS is broader in outlook and is naturally focused on longer term horizons. Furthermore, whilst the majority of social design practices focus on the creation of products that create social impact (or at least limit negative impact), D4SS goes further to explicitly advocate for design that leads to the preservation of social systems and the removal of fundamental obstacles that destroy these systems. D4SS pays particular attention to the need for equity between current and future generations in bringing about human flourishing and wellbeing. That said, we do not wish for D4SS to remain an island from mainstream sustainability discourse. Further work should explore meaningful ways to integrate D4SS with other sustainability concerns.

5. Conclusions

Although design is widely recognised as an important change agent, it has been largely neglected in research on social sustainability. Prior to this study, there was a lack of conceptual clarity about D4SS within the product-service systems literature. Although the term has been in use for some time, we noted that it has been used with little precision and definitional consensus. A lack of specificity about what D4SS means in product-service systems has been obfuscating its development and operationalisation. This study has helped to resolve these concerns by delineating D4SS and thus illuminating what is acceptable, desirable and achievable. That said, a limitation of any literature review is that it provides a summary of current knowledge that may obfuscate the dynamic character of concepts. It is inevitable that the D4SS concept has changed over time, and we expect that it will evolve in the future.

This study has made several contributions to knowledge. Firstly, this paper has helped to bring together disparate knowledge to develop an understanding of D4SS that is relevant to the design of product-service systems. Secondly, it has provided a knowledge-based definition of D4SS that integrates extant literature. Whereas the term was previously used with little clarity or precision, our study defines D4SS as “*design that advances the human wellbeing and flourishing of societies now and in the future provides*”. Thirdly, this study expands knowledge on D4SS by identifying its key dimensions. Specifically, it has highlighted that participatory, contextual and systemic approaches are integral to D4SS. These dimensions provide useful starting points for developing appropriate methods and tools for D4SS in product-service systems. Finally, this study helped to identify areas which have been poorly

addressed by the literature to date. Based on this, several key areas for further research have been put forward. Specifically, we believe that there is a need to operationalise D4SS via the development of metrics, methods and tools; greater contextual and place-based perspectives are needed to enhance D4SS; and future research should consider the linkages between D4SS and broader sustainable design approaches. Overall, this paper has helped to synthesise fragmented knowledge and develop a new research agenda for D4SS in product-service systems.

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