How HCI Interprets Service Design: A Systematic Literature Review

Christine Ee Ling Yap[1(✉)], Jung-Joo Lee[1], and Virpi Roto[2]

[1] National University of Singapore, Singapore, Singapore
christine.yap@u.nus.edu, jjlee@nus.edu.sg
[2] Aalto University, Espoo, Finland
virpi.roto@aalto.fi

Abstract. The scope of Human-Computer Interaction (HCI) research is expanding with regard to the studied systems and stakeholders, and its impact areas. Service design has recently gained tractions in HCI as an approach to deal with these expansions. However, there has been confusion around the definitions and roles of service design in HCI, especially with its overlaps and differences with interaction design. To examine how HCI has adopted service design, this paper presents results from a systematic literature review on 52 papers from the most cited HCI publication venues. Our findings show that the adoption of service design concepts and methods in HCI has been sporadic over the past decade. The term service design has been interpreted as a variety of meanings. The most predominantly observed understandings include service design as a term for designing digital services instead of products, and as an approach providing a journey and system perspective to the design of social computing, Internet of Things, or other complex systems. Only a few studies adopted the fundamental logic of new value exchange or co-creation of systems from service design. We discuss the reasons behind the differing interpretations of service design by HCI and future opportunities for HCI to better benefit from service design.

Keywords: Service design · Systematic literature review · Multidisciplinary

1 Introduction

In recent years, Human-Computer Interaction (HCI) researchers have started to discuss service design as information technologies increasingly involve complex systems and multiple stakeholders, and the usage model for technologies becomes a service (e.g. Software as a Service – SaaS) [26, 28, 67, 79]. In 2019, the Encyclopedia of Human-Computer Interaction published a stand-alone chapter of service design by Zimmerman and Forlizzi [95]. In the past INTERACT conferences, albeit few, there has been a call to adopt service design approaches to design for more complex socio-technical systems [1, 20, 72]. Service design framing and approaches are called for to deal with the changes in the landscape of information technologies design, namely the change of the design context from end-users to multiple stakeholders, the change of design object from a

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single product to a system, and the change of the impact area towards a socio-economic system [28]. Previous research [26, 34, 95] argues that service design can offer a logic, approaches and tools to HCI to constructively respond to these changes. On the other hand, technology advancement has enabled the development of traditional services to new digital services, for example, by tapping on mobile technologies [15, 82], cloud computing and IoT [14, 64], social computing [31, 96], artificial intelligence [49] and autonomous systems [42, 52].

While the potentials of service design to HCI have been discussed, there are some concerns and confusions around the intersections between service design and HCI (e.g., see [27, 34, 45, 67]). For example, Roto et al. [67] addressed fuzziness in overlaps and differences between service design and user experience (UX) design. Lee [45] reports her observation that to HCI communities, service design might seem to deal more with business concerns than user concerns, which sets a distance from HCI to service design.

As a matter of fact, service design has grown across various research fields, including marketing and management, design, and information systems engineering. This results in varying perceptions and definitions of service design that co-exist, which makes its concept elusive [45, 92].

A few scholars in service design research observed that there has been a lack of clear understanding around concepts, theories and methodologies of service design due to its varying evolution paths and methodological traditions, which results in poor contextualization of service design by broader communities [62, 92]. Despite the current situation where the interest and confusion co-exist, there has been little research that systematically overviews how service design has been adopted and used in HCI research, to examine how HCI interprets service design and what elements of service design HCI views relevant and beneficial to adopt and by doing so identify limitations and future development directions.

Responding to these gaps, this research examines how HCI research has adopted and interpreted service design in its projects and discourses through a systematic literature review. The study focuses on the review of 83 publications from the top 20 HCI publication venues according to Google Scholar Metrics (refer to Appendix). The results identify different scopes of service design taken up by HCI projects, which imply multiple levels of service design contributions to HCI but also differing interpretations of what service design is. Based on the results, we discuss current limitations in how HCI adopts service design by identifying what is left behind in their uptakes, as well as new opportunity areas the current HCI projects have not fully tackled yet.

For our analytic sensitivity, we gained inspiration from Boehner et al.'s work [11], *How HCI Interprets the Probes*, which diagnosed dominating views and underlying tensions in HCI through the analysis of varying adoptions of the probes. With a similar analytic lens, we aim to shed light on underlying assumptions and tensions in HCI at the boundary with a new approach, in this case, service design with its origins and logic from marketing and management. In other words, our research focuses on *How HCI interprets service design.* In what follows, we begin by introducing the origins and varying scopes of service design, and its current appearance in HCI. Then we describe our findings from the literature review and discuss the underlying interpretations of service design in HCI.

2 Service Design and Its Adoption in HCI

Service design emerged in management and operations studies in the 1980s as a way to manage the quality of service and systematically approach its development [69]. In the early days, the object of design, "a service" is often distinguished with a product upon four characteristics, i.e., intangibility, heterogeneity, inseparability of production and consumption, and perishability [24, 93], often called IHIP framework [51]. The recognition of service design in design communities traces back to the 1990s, when designers started to correspond to the evolution of the service economy [12, 13, 55, 60, 63]. Researchers and practitioners in design have developed methods and strategies to approach this new object of design in a human-centered, creative and tangible way [63, 92]. Their work has been informed by various existing design approaches: for example, interaction design has informed the development of methods for designing service interfaces between users and service systems [68] and co-design has provided methods for stakeholder collaboration in service innovation (e.g., [35, 39]). In the early 2000s, service design has undergone a major shift by meeting the service-dominant logic (S-D logic) [75], from designing intangible service offerings to designing for a set of processes or platforms that facilitate value co-creation [43, 61]. S-D logic blurs the distinction between tangible goods and intangible offerings, as both work as mediums for value co-creation. This indicates that for service design informed by S-D logic, tangibility/intangibility is not a criterion that determines the object of service design versus product design.

With the evolution of service design for the past few decades, there have been scholarly attempts to clarify concepts, methodologies and theoretical frameworks of service design (e.g. see [18, 34, 43, 54, 61, 68, 92]). As a crucial part of the clarification efforts, those studies offer a systematic conceptualization of multiple levels of service design. They mostly agree on the levels as follows, from the interaction level to the infra- and social- structure level [57, 61, 62]:

- First, service designers design for journey experiences of customers, where multiple touchpoints are orchestrated. A service design tool such as customer journey mapping supports this design activity.
- Secondly, service designers design for work processes of service co-production and delivery, by incorporating how employees and support systems should work together. A service design tool such as service blueprinting supports this design activity.
- Thirdly, service designers identify new and relevant stakeholders and design for new collaborative networks where values are co-created. A service design tool such as stakeholder mapping supports this design activity.
- Fourthly, with the development of new value exchange/co-creation models, service designers speculate on new socio-technical and economic models in the future, which often challenges existing structures and norms. Future casting and scenario methods support this design activity.

While there seems to be an exchange of methods between interaction design and service design [67, 68], the adoption of service design in HCI research has not been salient [67, 87]. More recently, a few studies aimed to "explore new opportunities at the intersection

between HCI and service research" [78] and clarify their differences, discussing how the two fields could mutually benefit [9, 10, 19, 67, 79]. They discuss the benefits from engaging in service design in HCI research, especially for emerging technology landscapes such as SaaS, cloud and social computing, and IoT, and reinforce the need for "service framing" [28] to design IT systems [95]. As the advancement of these technologies introduces radical innovation to economic models, those researchers argue that service design can provide a logic, frameworks, and tools for HCI researchers to develop technological applications in line with new economic models. For example, the concepts of value co-creation in service design could "help HCI design teams to identify different types of value each stakeholder holds and wants, and design for interactions that can produce those values" [95]. However, they also address a challenge that designing for values for stakeholders is often considered outside the scopes of HCI research [95].

As service design has been developed across various domains, from marketing and management to design, there are multiple perspectives to defining what service design is and possibly due to that reason, service design has been poorly understood and contextualized in other domains. In HCI, while there has been a growing interest, there is no clear picture of how HCI has engaged in service design in its research. The following sections of this paper explain the conduct of a systematic literature review to delve into this topic.

3 Systematic Literature Review

Our analysis is two-fold. First, we want to see the trends of design spaces and contribution areas that intersect between service design and HCI. To do so, we carried out quantitative analysis by looking at the technology enablers used, domains, and methods adopted by the papers. Secondly, we want to look at how HCI defines and perceives service design - its logic, scope, and capacity. For this second aim, we conducted an inductive content analysis [25] to identify themes that reflect the papers' understandings of service design.

3.1 Search Strategy

A systematic literature review was conducted and reported according to the PRISMA statement [58] to identify existing literature in HCI that adopt service design as a process, method, logic, or practice. We searched for the term "service design" in the top 20 publication venues in the field of HCI (according to Google Scholar metrics, as of July 2020, refer to Appendix). We restricted the search to papers with "service design" appearing in the title, abstract, or keyword, because our main goal is to analyze papers where service design plays a salient role.

3.2 Article Screening

All resulting papers from the top 20 HCI publication venues (n = 83) were screened to identify papers from the field of HCI that clearly convey how service design has informed or been adopted in the study. Figure 1 illustrates the screening procedure.

Exclusion Criteria. A total of 31 papers were categorized as "*excluded – irrelevant works or insufficient information"*), according to the criteria are as follows:

- "Service design" is mentioned without sufficient elaboration (e.g., listed as future work, listed in an abstract of a keynote, panel discussion or workshop proposals without elaboration showing how service design is adopted in its research setting) (n = 16)
- Papers from the field of Service/Software Engineering that only focus on how software is constructed (e.g., Service Oriented Architecture, RESTful service, SOAP (Simple Object Access Protocol)). (n = 2)
- Papers from the field of Service Marketing, Operations Management, or design communities that are not relevant to HCI adopting service design. (n = 6)
- Unintended keyword search results, where "service" and "design" were each of two separate parts in a sentence (e.g., "…public information service || design principles…") (n = 4)
- Papers that did not cite any literature (n = 3)

Out of the remaining 52 papers, 21 papers were categorized as *"using 'service design' loosely"*, as these papers use the term "service design" loosely to just refer to designing digital services, without any link to service design as a distinct approach of design and research.

The remaining papers (n = 31) that show service design being adopted as a process, method, logic, or practice are categorized as *"adopting service design"*.

To account for inter-rater effects, after the first author screened all 83 papers, the second author randomly screened 20% of the papers. The first author and the second author resolved the discrepancies, then repeated the screening process until the inter-rater reliability, Cohen's unweighted kappa, was above 0.6. A final pool of 52 papers was shortlisted for in-depth analysis (31 papers categorized as *"adopting service design"* and 21 papers categorized as *"using 'service design' loosely"*, refer to the link in the appendix for the full list). The 21 papers categorized *as "using 'service design' loosely"* were included in the quantitative analysis for identifying the overall trends but were not included in our inductive content analysis [25], as these papers did not provide any insights related to how service design is engaged in.

3.3 Analysis

To overview patterns and trends of design spaces and contribution areas that intersect between service design and HCI, we first mapped the 52 papers (31 papers categorized as *"adopting service design"* and 21 papers categorized as *"using 'service design' loosely"*) according to the year published, service domain, technology enablers, design methods used, and region. We then delved into the varying scopes and perceptions of service design in HCI through inductive content analysis [25] of the 31 most relevant papers (categorized as *"adopting service design"*). The first and second author coded all papers separately, then held four meetings to discuss and resolve all coding discrepancies.

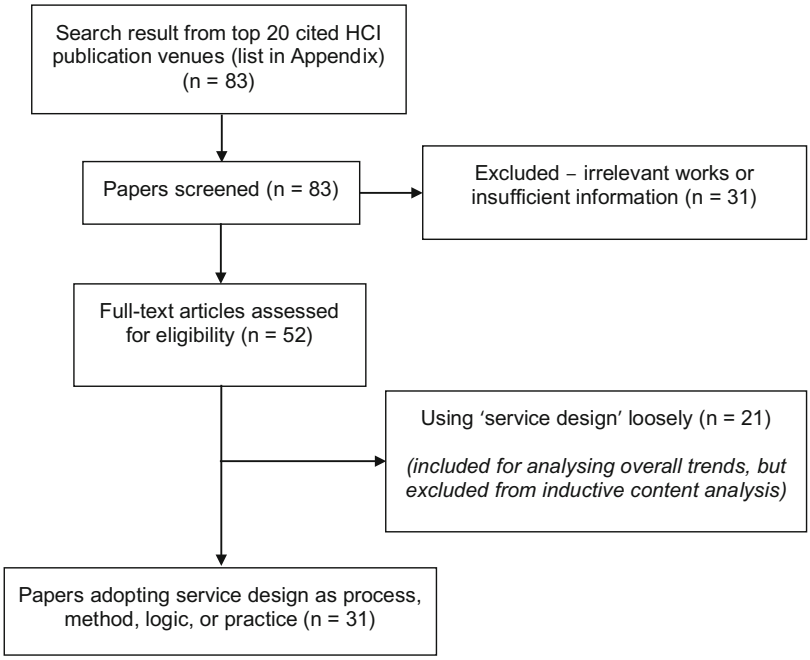

Fig. 1. The article screening procedure in this study.

4 Results

4.1 Overview of Service Design Adoptions

Number of HCI Papers Adopting Service Design over the Years. To see the frequency of occurrences of service design in HCI over the years, we firstly map all 83 papers where service design appears in the title, abstract or author keywords in the timeline. As seen in Fig. 2, the first appearance of the term "service design" in the title, abstract, or author keywords within the top 20 HCI publication venues was in 2004 [80], focusing on the visual appeal of user interface design, continued with a few till 2006. Out of the three earliest papers included from 2006, two papers [16, 40] were of student design competitions at CHI. Considering this, the adoption of service design in HCI starts to be salient only for the past 10 years, with the distribution of publications appearing to be quite sporadic. The years of 2012 and 2013 have the highest number of papers, with or without the 31 papers categorized as *"excluded - irrelevant works or insufficient information"*. They are, however, contributed by a few research teams publishing multiple papers from their projects (first team [36, 37], second team [88, 89, 96], third team [46–48], fourth team [33, 73, 83]), rather than indicate the increase of service design adoptions in HCI.

No Recognition of Service Design as a Distinct Design Approach. As mentioned in Sect. 3.2, there are 21 papers categorized as *"using 'service design' loosely"*. These papers use the term "service design" without referring to it as a distinct research field

or practice. While having "service design" listed as an author keyword or an area of contribution, they did not project or build on any concepts or methods of service design as a distinct design approach or methodology but deal with digital services. These papers appear to perceive service design as a subset of interaction design where objects of design or final design outcomes are digital services rather than tangible products. For example, [70] only focuses on identifying the features of mobile service offerings for children (e.g., "low calling costs", "charge-free emergency numbers to parents"), [56] focuses on identifying the information architecture for an IT service request portal, and [23, 32, 80] evaluate the usability elements of user interfaces for digital solutions with-out any methods or logic of service design included. These papers adopt user-centered design and user experience design in designing digital solutions, but did not include the logic or approaches of service design in their literature review, methods, or design out-comes.

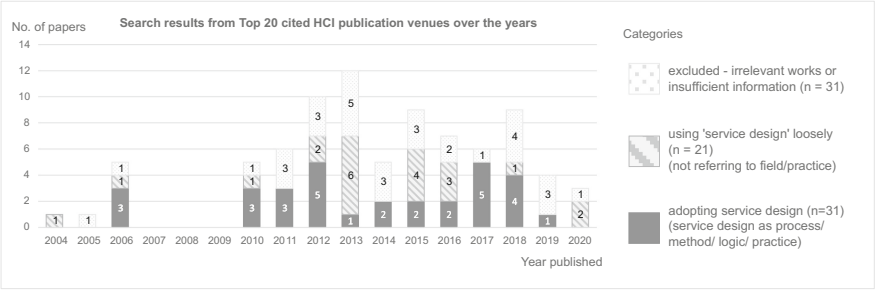

Fig. 2. Search result from the top 20 HCI publication venues over the years

Domains. Types of domains where service design was applied were analyzed for the 52 shortlisted papers (31 papers adopting service design +21 papers using "service design" loosely) to see the contribution domains that intersect between HCI and service design (Table 1). 14 papers (26.9%) do not specify any service domain, only reporting the studies on the computational technologies for digital services in general. The most commonly applied service domain is healthcare (10 papers, 19.2%), with the papers focusing on improving hospital services with technology [4, 85], general wellbeing [2, 40], or elderly healthcare [32]. Community service and transportation are the next most applied service domains (6 papers each, 11.5%). This finding is in line with that of service design communities, where service design is the most frequently used for healthcare and community sectors [55].

Technology Enablers. Types of technologies that are part of service concepts as touch-points or support systems were identified to see what kind of technology development service design is used for and vice versa, what kind of technologies enable the service concepts. Out of 52 papers, nine papers deploy more than one type of technology enablers in designing service encounter interactions (e.g., an autonomous vehicle, a chat-bot, and identification technology for an autonomous taxi service journey in [42]) and support systems (e.g. [86] use AI matching algorithms for a shared housing service, together with virtual reality for customer interaction). Mobile applications are the most frequently appeared technology enabler (e.g., see [2, 3, 15, 21, 32, 82], followed by interactive display (e.g., see [17, 21, 36–38, 76]. They serve as touchpoints for customers.

Table 1. Domains of service design applied in HCI.

Domain	Number of papers (%)*
Not specified *(focus on computational technologies for digital services in general)*	14 (26.9%)
Healthcare *(hospital systems/ equipment, vaccination program, diet recommendation, sports tracking, dementia care)*	10 (19.2%)
Community service *(engaging homeless individuals, distribution of donations, elderly welfare, refugee resettlement)*	6 (11.5%)
Transportation *(public transportation, ridesharing)*	6 (11.5%)
Food service *(food delivery, dining experience)*	5 (9.6%)
Logistics *(delivery drones)*	2 (3.8%)
Government service	2 (3.8%)
Social networking	2 (3.8%)
Finance *(mobile banking)*	1 (1.9%)
Housing service	1 (1.9%)
Retail	1 (1.9%)
Smart home environment	1 (1.9%)
Workplace	1 (1.9%)

* Percentage was calculated using (number of papers/52 shortlisted papers).

We also mapped the technology enablers over the years to identify possible trends (Fig. 3). While the usages of the different technology enablers are sporadic in the past decade, more recent studies for the past five years used service design for more advanced technologies such as artificial intelligence [42, 49, 85, 86], augmented/virtual reality [41, 86], drones [22, 52] etc. These studies use service design to envision future opportunities (e.g., algorithms for distributing donation) or visualize future operation models around those new technologies that do not exist yet [22, 52, 96]. There are more than a few papers that built new services based on technology networks, from ubiquitous computing [16, 38, 40] (a term referring to technology embedded environments in the mid-2000s), to social computing [31, 88, 89, 96], cloud computing [14], or IoT [64, 94]. Technologies that connect to digital platforms such as identification technology (e.g. RFID [16, 40], NFC [42]) and more recently QR code [82] were also used as they facilitate user's journey experience across various touchpoints. More conventional technologies such as 2G/3G mobile phones or web technologies that were identified after 2010 are used in service design projects for technologically marginalized communities (e.g. [5, 76]).

Methods Used. As adoption of methods indicates the adoption of practices [11], we also looked at what kinds of methods that are known as representative service design methods have been used in the 31 papers categorized as "adopting service design". Be-sides rather general design research methods, such as ethnographic observations, in-depth or focus group interviews, contextual inquiries, or prototypes; service blueprint (seven papers: [5, 41, 42, 50, 85, 86, 89]) and customer journey map (five papers: [15, 41, 42, 74, 90])

Technology enabler \ Year of paper's publication	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total number of papers related*
Mobile application *(tablet/ smartphone applications)*									1	1		5						7
Interactive display *(interactive tabletop surface, double screen/ touch panel display, public LED display)*			1				1	1	1			1		1				6
Web technology *(website, web portal)*	1								2				1	1				5
Artificial intelligence *(algorithms, machine learning, chatbot)*													1	2		1		4
Social computing *(crowdsourcing)*							1	2		1								4
Identification technology *(smart card, biometric, RFID/NFC)*			2										1			1		4
Ubiquitous computing *(term largely used in 2000s) (integration of computers into environmental objects in daily life)*			3															3
Augmented reality/ Virtual reality									1					1	1			3
Robot							1		2									3
2G/3G mobile phone (non-smartphone)			1							1			1					3
Cloud computing									1				1					2
IoT												1			1			2
Wearable sensor												1			1			2
Drones											2				2			2
Autonomous vehicle																1		1
QR code												1						1

*Some papers have >1 technology enabler. This chart does not include studies that do not specify any technology enabler for service

Fig. 3. Technology enablers over the years

are the top two service design methods used in HCI papers. This finding matches with our qualitative analysis, where the adoption of service design in HCI mainly resides in creating a journey perspective and backstage processes. Some papers use service blueprint to map out and design new workflows enabled by new technology design (e.g. [5, 86]), whereas some use it unconventionally, for example, [50] use the service blueprint to map out the postural changes of a clinician while performing a series of work actions to redesign the clinician's chair. Two papers [82, 90] present system maps, and two other papers [15, 74] use stakeholder mapping to visualize the coordination, relationships or value exchange between organizations and users.

4.2 Qualitative Analysis

The inductive content analysis yielded 13 codes that were categorized under three high-level dimensions, D1 - scope of design, D2 - scope of actors, and D3 - mutually benefitting relations between HCI and service design. Dimension 1 (D1) tells us how the HCI papers view the scope of design for service design projects; D2 indicates the breadth of actors or level of a systemic perspective in terms of actors accounted for; D3 hints at the benefitting relations between HCI and service design, implying possible future directions for synergy. Each paper was coded multiple codes (e.g. [42] was coded C3, C4, C6, C11), hence the percentage of papers in Table 2 does not total up to 100%.

The following sections present five themes that depict the current status of service design adoptions in HCI.

Journey Perspective as the Most Frequently Adopted. As shown in Table 2, the most frequent code is C4: *includes journey/ end-to-end perspective* (18 papers, 58.1%). 10 of these papers [5, 15, 41, 42, 50, 74, 86, 89, 90] illustrate the journey perspective by employing the customer journey map or service blueprint (as mentioned in Sect. 4.1, subsection "methods used"), while the other eight papers explain the user journey through written paragraphs or lists. Among the papers coded C4, the scope and granularity of

Table 2. The number of papers coded under the three dimensions, D1, D2, and D3.

Dimension (D)	Code (C)	Number of papers (%) *
D1: Scope of design	C4: Includes journey/ end-to-end perspective	18 (58.1%)
	C6: Including backstage work process	16 (51.6%)
	C7: Designing a collaborative network involving multiple stakeholders	14 (45.2%)
	C5: Service design for designing technological systems (technology-focused)	11 (35.5%)
	C2: Mainly focuses on UI/ UX/ usability/ features	9 (29.0%)
	C1: Focuses mainly on single touchpoint interaction design	8 (25.8%)
	C3: Consists of multiple touchpoints	7 (22.6%)
	C8: Value exchange / value co-creation among stakeholders	7 (22.6%)
	C9: Speculating future service systems (envisions future scenario to see the possibilities)	5 (16.1%)
D2: Scope of actors	C11: Considers multiple stakeholders	18 (58.1%)
	C10: Only focuses on end-users	10 (32.3%)
D3: Mutually benefitting relations	C12: Service design enabling new method/framework development for HCI	5 (16.1%)
	C13: HCI enabling new method/framework development for service design	1 (3.2%)

* Percentage is calculated by (no. of papers/ 31 included papers)

journey perspective vary. Some papers focus on mapping the detailed journey within a service encounter (e.g. [17, 40]), while some extend the journey perspective to include pre-service and post-service activities (e.g. [82, 86]). The former case papers focus on immediate contexts of interacting with technology, and the latter case papers include operation and management perspective, e.g., customer onboarding and retention, strategies for sustained use and development of the proposed technology systems [82]. While a journey mapping often includes user's interactions with multiple touch-points orchestrated in a service journey [91], more than a few papers use journey map-ping for a single product in our analysis: as seen in Table 2, only seven papers out of 18 papers coded C4,

are coded C3: *consists of multiple touchpoints.* The journey map-ping appears to offer a new way to analyze the user's interaction with a single product, considering his/her various touchpoints with a single product over the course of inter-action (e.g., see [50]).

Expanded Design Space Including Backstage Processes and Stakeholder Collaborations. The next two most frequent codes in D1 are C6: *including backstage work process* (16 papers, 51.6%) and C7: *designing a collaborative network involving multiple stakeholders* (14 papers, 45.2%). Among the papers coded C6, [85, 89] analyze existing backstage workflows to identify problems or new design opportunities, [42, 46] simulate backend operations for user test, while [86] maps out the backstage workflow of the proposed service using a service blueprint. For the papers coded C7, the consideration of collaborative networks goes beyond multiple groups of "users" but include stakeholders who may influence the development and delivery of new services, such as government, policymakers, or community representatives (e.g., see [44, 49]).

11 papers (35.5%) were identified as adopting service design for designing technological systems beyond a single product (C5). These papers employ service design concepts and approaches in aligning multiple technological components with the needs of multiple stakeholders. For example, [52] uses co-design to develop the air traffic management system for logistic services using unmanned drones, [49] looks into the possibilities of a "fair" algorithm to prioritize donation services that involve complex user requirements, while [96] prototypes a crowdsourcing system to engage citizens in the co-production of public transportation services.

Although not many, 7 papers (22.6%) consider new value co-creation models enabled by technology platforms (C8: *value exchange/ value co-creation among stakeholders*). Especially, the papers dealing with crowdsourcing technologies [31, 96] or AI [86] explicate models of exchanges of values or resources in multiple-stakeholder collaborations. Some papers explicitly explain the notion of value co-creation based on customer competence [96] and co-design [89], while one paper illustrates a value exchange model through ecosystem mapping [82].

Informing New Interaction Design Strategies. While service design is used for the expanded design space as described above, more than a few papers using service design focus on a single product interaction. Nine (29%) focus more on evaluating UX or usability of the digital service in the study (C2), and eight (25.8%) focus on designing interactions of a single touchpoint (C1), half of which are also coded C2. While these papers deal with rather conventional design scopes in HCI, service design appears to inform new interaction design strategies to them. Some studies use the notion of service marketing to create "service interactions". For example, [47] proposes new human-robot interactions based on the notion of service breakdown and service recovery [7]. Other examples are [36, 37], where service design helped them to include "customers" of end-users in their design consideration.

Speculating the Infrastructural System of Future Technologies. A few recent papers use service design to speculate future service systems with emerging technologies (C9: *Speculating Future Service Systems*). For example, [22]'s speculative design of a community-owned drone delivery network and [52]'s co-design sessions to envision the

future context for the unmanned air traffic management system. They design for and experiment with advanced technologies or "first-of-a-kind systems" [52], speculating what kind of infrastructural changes and issues the design of technologies may bring in terms of socio-cultural contexts. Speculating future scenarios has been a favorable research topic in HCI and interaction design [30, 59, 81]. While future speculations in the interaction design approach focus on relationships between humans and future technologies, and possible value conflicts and implications for socio-technical systems, service design seems to enable HCI research to systematically visualize the new infrastructure by incorporating multiple stakeholders roles (e.g. [22, 52]), value contributions and their implications in the system change (e.g. [88, 89, 96]). Those works are informed by the theories of service design, such as value co-creation, and the tools, such as stake-holder mapping and value-exchange modelling..

Mutually Benefitting Relations. D3 shows different ways service design and HCI can benefit from each other. Not only the papers show how service design is adopted in HCI, some works also show how two areas complement each other by borrowing and modifying methods and theoretical frameworks. Some used service design approaches to enable new methods or frameworks for HCI (C12). For example, [77] incorporates the concept of touchpoints and user journey to create a holistic user experience map of mobility and [41] develops an experience prototyping tool that incorporates a journey perspective and the physical environment (servicescape [6]). Vice versa, a subset of service design methods has been already informed by interaction design, for specifying user interactions with touchpoints. As such adoption of methods has already been part of the historical evolvement of service design, we did not code for this deliberately. However, we still found one paper that proposes a new framework of service design by incorporating the HCI concept of Technology Acceptance Model [4].

5 Discussion

Our systematic literature review reveals the sporadic adoptions of service design in HCI over the past decade. While HCI's interest in service design is arguably increasing, this research does not necessarily show that there is growth in service design literature in the most cited publication venues of HCI. While a mobile application is the most used technology platform, more recent studies use service design to deal with emerging technologies, such as AI, social computing, drones etc. Our inductive content analysis found that there are varying levels of understandings and adoptions of service design in the current HCI literature, in terms of the scopes of design and actors. In this section, we infer HCI's current understandings of service design based on the varying levels of adoptions and discuss future agendas by unpacking underlying tensions and what is left unexplored.

5.1 Varying Levels of Adoption

Out of the 52 papers in our analysis, 21 papers use the term service design loosely, without mentioning what kinds of concepts, processes or methods of service design

have been used. Service design in those papers merely refers to the designing of digital services, arguably perceived as a subset of interaction design where the design objects focus on intangible services. Given that this is a considerable portion of the publications (40%), it could be inferred that service design is not fully recognized yet as a distinct design approach with its own logic, concepts and methodologies in HCI. Our goal is not to present this phenomenon as necessarily erroneous, but to highlight a poor definition of service design in HCI, which might hinder HCI researchers from fully benefitting from broader scopes and notions of service design.

Among the literature where service design plays a distinct role, our inductive content analysis shows varying scopes of service design work in HCI, ranging from end-user experience to backstage operation processes to future collaboration networks. In that spectrum, a customer journey appears to be the most prevalent design scope. There was also a considerable number of service design work (10 out 31 papers in the category "adopting service design") that only focuses on end-users, rather than considering multiple stakeholders which is often described as a distinct work scope of service design comparing to other fields of design. Those papers focusing on end-users use a journey perspective to design for a holistic experience of end-users around either a single product or user's seamless interaction across various touchpoints. These findings imply that end-users experience is a strong focus of the current service design work in HCI.

Service design considers not only the service users, but also the backstage service operations and the multiple stakeholders directly or indirectly involved in the service delivery. In the studied literature, we did find the expansion of design scopes engaging in backstage technology operations and multiple stakeholders. Service design helps these studies manifest the backstage work process to enable desirable user-technology interactions, identify possible pitfalls in actual operation scenarios and take into consideration socio-technical and political settings.

While more than a few studies consider or design for multiple stakeholder collaborations around technologies, the notions of value exchange and value creation, however, do not seem to be broadly taken up by HCI yet. There are a few studies that explicitly use value co-creation models to create a plausible collaborative system with crowdsourcing computing [88, 96] and designed new collaborative networks enabled by drone technology [22, 52], but they are found only in a limited number of research groups. On one hand, we acknowledge the limited number of studies that might come from the limited set of data in our study. On the other hand, this might also indicate that the notion of value co-creation might appear out of the scope of HCI to many HCI researchers, as addressed in Zimmerman and Forlizzi [95] and Lee [45]. HCI "tends to follow a product-centric design process, focusing on producing a thing – hardware and/or software" [95], and this product-centric view might have formed a challenge in adopting a broad notion of service design informed by S-D logic [75]. In addition, service design might appear to HCI to be associated with economic models or human resource management, as reflected from its vocabularies such as "customers" or "value exchanges". This 'business'-related connotation might have hindered HCI, which is deeply rooted in the user-centric mindset, from adopting service design more broadly and benefitting from its full potential [45, 66]. Based on this diagnosis on what is underexplored, the following subsection presents future opportunities between service design and HCI.

5.2 Future Agenda

While our findings reveal the potential of using service design for new technological systems, such as crowdsourcing technologies, social computing, AI, etc., we also found the HCI expansion towards service design has still remained in limited research groups, and there is no evident growth of such work over the past decade. As proposed by Zimmerman and Forlizzi [95] and Forlizzi [28], "service framing" [28] can provide HCI teams with a holistic lens to define a thoroughgoing design space when dealing with new technologies for complex systems and non-conventional actors in the design process, such as distributors or policymakers. The service framing can also enable them to design for new interactions based on the logic of value-in-use and value co-creation [75]. A few of the papers in our analysis did hint at these potentials. For example, [96]'s work on cloud computing for bus system shows co-creation of value by tapping on customer competence. [22] illustrates how service design can help to design for infrastructure for new technology by identifying new collaborative actors and mapping their resource (value) exchanges. Still, service framing would deserve more attention from those who study service design in HCI.

Service design can connect technological design with emerging forms of economy, such as shared economy and gig economy [45]. The notion of value co-creation and S-D logic [75] from service design, which goes beyond merely a method to design intangible services characterized into an IHIP model [51], holds innovative potentials for HCI to deal with those economic platforms. HCI has always been dealing with digital technologies and interfaces (which are nowadays often referred to as digital services). However, how those technologies are delivered have changed [95] from software inside physical products to a subscription model where multiple business stakeholders are involved and interacting with end-users. Service design and S-D logic help HCI researchers and design teams deal with this business model change as a new design material to continue providing positive user experiences. Designing for technological platforms, collaboration models and user experiences of subscription-based models (e.g. movie streaming [53], online games [71]) or peer-economy services (e.g. Waze [95]) is a good example. For this reason, Forlizzi [28] has proposed that the new economics may become a material for design in HCI, later echoed by Yoo et al. [87] and Lee [45]. Investigating the intersection of technologies and emerging economics through service design is a promising area for further research.

In addition, service design can be useful for value-sensitive design [29] and sustainable HCI [8, 65] due to its strengths in coordinating differing values of stakeholders and systems thinking. A few studies in our review demonstrate the potential for this in HCI. For example, Lee et al. [49] combine value-sensitive design and service design to explicate differing values of various stakeholders around donation allocation and propose an algorithm system that coordinates different wishes, needs and resources. In another work, Bisht and Mishra [5] demonstrate how service design contributes different models for technology-enabled financial services to be inclusive of the urban poor community. They called for a joint effort between policymakers, partner agencies, as well as researchers in the fields of information technology and services for financial inclusion initiatives in a developing economy [5]. Service design has been commonly used for social innovation projects [84] since systems thinking is in its nature. Therefore, HCI research that deals

with complex social problems or aims at sustained change can lean to service design to unpack networked issues around the wicked problem.

We also believe that service design and HCI can mutually benefit from each other based on their overlapping interests, such as user experiences and social issues, and distinct expertise, e.g., value co-creation logic from service design and technological innovation from HCI. In the early days of service design, HCI provided a pool of methods and frameworks for user research, prototyping, and evaluation for service designers [78]. By doing so, HCI helped to bring attention to the experiences and emotions of customers in service encounters. As our literature review shows, HCI and interaction design have been adopting service design methods to deal with the expanded design spaces, and even led to the development of new methods in combination with computational technologies [41]. While service designers seem to be more conservative in choosing the technologies to use [95], the works like [22, 41, 86] in our literature review demonstrate the design of new types of services enabled by emerging technologies. HCI can push for technological advancement in the design for services through its strong technology orientation.

For the mutually benefitting relations and development, service design researchers' ongoing attempts at clarifying varying and multiple notions of service design will hopefully help HCI researchers to gain a clearer understanding of service design. Similarly, establishing more profound service design theories and methodologies (e.g. see [61, 68, 92]) will hopefully make it easier for HCI researchers and practitioners to engage in service design in their work. This will go beyond the narrow definition of service design that equals service design to the design of digital services. HCI researchers might embrace the increasing interplays between technology design and business models to be included in their design materials and research agenda [28, 45, 87]. For example, what kind of technological innovation can support and advance a shared economy? What kind of new value co-creation models are possible through the meaningful alignment of cloud computing technologies? These kinds of questions will open new, timely-relevant design vistas in HCI, which requires collaboration with various other disciplines, including service design.

6 Conclusion and Future Work

This paper presents the analysis on HCI's current understandings and adoptions of service design, by conducting a systematic literature review. HCI being a multidisciplinary field in its nature, clarification of understandings and benefits of new disciplines around HCI will help the field better collaborate with other disciplines and evolve. The systematic literature review conducted in this study is part of the ongoing clarification efforts.

According to the present literature review, service design work in HCI has not increased since the first years of 2004–2006, and the peak in publications in 2012–2013 is largely dependent on four research groups publishing in the top HCI venues. One reason behind the slow adoption may be the deeply rooted user-centered mindset of HCI. The most cited publications on service design come from management studies (e.g., [69, 75]) and for HCI, service design may seem too business-oriented. We discussed areas where HCI could benefit from adopting ideas from service design, such as systems thinking to handle the increasingly complex technology contexts in HCI, or

value co-creation to create new collaborative networks in this complex context. On the other hand, service design would continue benefitting from adopting the HCI methods and frameworks for user research, prototyping, and evaluation. Service designers could also learn a lot about the opportunities provided by the interaction technologies.

Based on our findings, many HCI researchers do not recognize service design as a distinct design approach of its own. The service design term in many of the publications is used as a generic reference to designing digital services, rather than as a reference to a design approach including the core logic, concepts and methodologies of the service design community.

We proposed several topics to the future agenda of research to exploit the potential of closer collaboration between HCI and service design. We echo the calls for more research on service framing in designing ICT systems, and collaboration between service design and HCI in identifying new technological opportunities from systemic changes, such as the emerging economic models.

While we identified a set of patterns from the data set of this research, we acknowledge a shortcoming with the limited dataset from the top 20 HCI publication venues according to Google Scholar metrics, as of July 2020. We are currently expanding this research with a wider pool of the literature from Scopus to verify and further discuss our findings. With the methodological choice of a systematic literature review, our analysis only focuses on research projects and scholarly work. Analysis of how HCI practitioners use service design in their work would provide a more holistic picture to our research question – *how HCI interprets service design.*

Appendix

Top 20 HCI Publication Venues Used in This Study

Table 3. Top HCI publication venues as of July 2020 (Source: Google Scholar metrics)

	Publication Venue	h5-index *	h5-median #
1	Computer Human Interaction (CHI)	87	117
2	ACM Conference on Computer-Supported Cooperative Work & Social Computing	60	82
3	ACM Conference on Pervasive and Ubiquitous Computing (UbiComp)	57	84
4	ACM Symposium on User Interface Software and Technology (UIST)	46	69
5	IEEE Transactions on Affective Computing	42	71
6	ACM/IEEE International Conference on Human Robot Interaction	40	58

(*continued*)

Table 3. (*continued*)

	Publication Venue	h5-index *	h5-median #
7	International Journal of Human-Computer Studies	39	58
8	IEEE Transactions on Human-Machine Systems	36	54
9	Behaviour & Information Technology	36	47
10	Conference on Designing Interactive Systems (DIS)	33	46
11	International Conference on Multimodal Interfaces (ICMI)	33	46
12	International Journal of Human-Computer Interaction	31	47
13	ACM Transactions on Computer-Human Interaction (TOCHI)	30	48
14	HCI International	29	45
15	Mobile HCI	28	38
16	IEEE Transactions on Haptics	28	34
17	International Conference on Intelligent User Interfaces (IUI)	27	36
18	International ACM Conference on Assistive Technologies (Assets)	26	31
19	International Conference on Tangible, Embedded, and Embodied Interaction	25	35
20	International Conference on User Modeling, Adaptation and Personalization	25	33

* "h5-index is the h-index for articles published in the last 5 complete years. It is the largest number h such that h articles published in 2015–2019 have at least h citations each" (source: Google Scholar metrics).
# "h5-median for a publication is the median number of citations for the articles that make up its h5-index" (source: Google Scholar metrics).

The full list of all 83 papers and how they are categorized in this study can be found at https://www.notion.so/List-of-papers-in-used-in-systematic-literature-review-566010db676c402182595758e0d2fbb9.

References

1. Abdelnour-Nocera, J., Clemmensen, T.: Socio-technical HCI for ethical value exchange. In: Clemmensen, T., Rajamanickam, V., Dannenmann, P., Petrie, H., Winckler, M. (eds.) INTERACT 2017. LNCS, vol. 10774, pp. 148–159. Springer, Cham (2018). https://doi.org/10.1007/978-3-319-92081-8_15
2. Alhonsuo, M., Hapuli, J., Virtanen, L., Colley, A., Häkkilä, J.: Concepting wearables for ice-hockey youth. In: Proceedings of MobileHCI 2015, pp. 944–946. ACM (2015)
3. Bergvall-Kåreborn, B., Wiberg, M.: User driven service design and innovation platforms. In: Stephanidis, C. (ed.) HCI 2013. CCIS, vol. 373, pp. 3–7. Springer, Heidelberg (2013). https://doi.org/10.1007/978-3-642-39473-7_1

4. Bhandari, G., Snowdon, A.: Design of a patient-centric, service-oriented health care navigation system for a local health integration network. Behav. Inf. Technol. **31**(3), 275–285 (2012)
5. Bisht, S.S., Mishra, V.: ICT-driven financial inclusion initiatives for urban poor in a developing economy: implications for public policy. Behav. Inf. Technol. **35**(10), 817–832 (2016)
6. Bitner, M.J.: Servicescapes: the impact of physical surroundings on customers and employees. J. Mark. **56**(2), 57–71 (1992)
7. Bitner, M.J., Booms, B.H., Tetreault, M.S.: The service encounter: diagnosing favorable and unfavorable incidents. J. Mark. **54**(1), 71–84 (1990)
8. Blevis, E.: Sustainable interaction design: invention and disposal, renewal and reuse. In: Proceedings of CHI 2007, pp. 503–512. ACM (2007)
9. Blomberg, J., Evenson, S.: Service innovation and design. In: Proceedings of CHI EA 2006, pp. 28–31. ACM (2006)
10. Blomberg, J.: Participation frameworks in service design and delivery. In: Proceedings of PDC 2010, p. 299. ACM (2010)
11. Boehner, K., Vertesi, J., Sengers, P., Dourish, P.: How HCI interprets the probes. In: Proceedings of CHI 2007, pp. 1077–1086. ACM (2007)
12. Buchanan, R.: Design research and the new learning. Des. Issues **17**(4), 3–23 (2001)
13. Buchanan, R.: Wicked problems in design thinking. Des. Issues **8**, 5–21 (1992)
14. Burda, D., Teuteberg, F.: Exploring consumer preferences in cloud archiving – a student's perspective. Behav. Inf. Technol. **35**(2), 89–105 (2016)
15. Chakraborty, A., Hargude, A.N.: Dabbawala: introducing technology to the Dabbawalas of Mumbai. In: Proceedings of MobileHCI 2015, pp. 660–667. ACM (2015)
16. Chand, A., Gonzalez, M., Missig, J., Phanichphant, P., Sun, P.F.: Balance pass: service design for a healthy college lifestyle. In: CHI EA 2006, pp. 1813–1818. ACM (2006)
17. Chen, T.-H., Lin, H.-H., Yen, Y.-D.: Mojo iCuisine: the design and implementation of an interactive restaurant tabletop menu. In: Jacko, J.A. (ed.) HCI 2011. LNCS, vol. 6763, pp. 185–194. Springer, Heidelberg (2011). https://doi.org/10.1007/978-3-642-21616-9_21
18. Clatworthy, S.: Service innovation through touch-points: development of an in-novation toolkit for the first stages of new service development. Int. J. Des. **5**(2) (2011)
19. Colley, A., Häkkilä, J.: Service design methods for human computer interaction. In: Proceedings of MUM 2018, pp. 563–566. ACM (2018)
20. Colley, A., Marttila, H.: Introduction to service design for digital health. In: Bernhaupt, R., Dalvi, G., Joshi, A., K. Balkrishan, D., O'Neill, J., Winckler, M. (eds.) INTERACT 2017. LNCS, vol. 10516, pp. 395–398. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-68059-0_38
21. Colley, A., Rantakari, J., Häkkilä, J.: Dual sided tablet supporting doctor-patient interaction. In: Proceedings of CSCW'15 Companion 2015, pp. 13–16. ACM (2015)
22. Davoli, L., Redström, J.: Materializing infrastructures for participatory hacking. In: Proceedings of DIS 2014, pp. 121–130. ACM (2014)
23. de Sá, M., Churchill, E.: Mobile augmented reality: exploring design and prototyping techniques. In: Proceedings of MOBILEHCI '2012, pp. 221–230. ACM (2012)
24. Edgett, S., Parkinson, S.: Marketing for service industries. Serv. Indust. J. **13**(3), 19–39 (1993)
25. Elo, S., Kyngäs, H.: The qualitative content analysis process. J. Adv. Nurs. **62**(1), 107–115 (2008)
26. Forlizzi, J., Zimmerman, J.: Promoting service design as a core practice in interaction design. In: 5th IASDR World Conference on Design Research 2013. IASDR Press (2013)
27. Forlizzi, J.: All look same? a comparison of experience design and service design. Interactions **17**(5), 60–62 (2010)
28. Forlizzi, J.: Moving beyond user-centered design. Interactions **25**(5), 22–23 (2018)

29. Friedman, B., Hendry, D.G.: Value Sensitive Design: Shaping Technology with Moral Imagination. MIT Press (2019)
30. Fry, T.: Design Futuring: Sustainability, ethics and New Practice. Berg, Oxford, UK (2009)
31. Fu, Z.: Design for public service application based on collective intelligence in China. In: RDURP 2011, pp. 3–6. ACM (2011)
32. Harrington, K., Fulton, P., Brown, M., Pinchin, J., Sharples, S.: Digital wellbeing assessments for people affected by dementia. In: Kurosu, M. (ed.) HCI 2015. LNCS, vol. 9171, pp. 409–418. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-21006-3_39
33. Hayakawa, S., Ueda, Y., Go, K., Takahash, K., Yanagida, K., Yamazaki, K.: User research for experience vision. In: Kurosu, M. (ed.) HCI 2013. LNCS, vol. 8004, pp. 77–84. Springer, Heidelberg (2013). https://doi.org/10.1007/978-3-642-39232-0_9
34. Holmlid, S.: Interaction design and service design: expanding a comparison of design disciplines. In: Nordes 2007 (2007)
35. Hyvärinen, J., Lee, J.-J., Mattelmäki, T.: Fragile Liaisons: challenges in cross-organizational service networks and the role of design. Des. J. **18**(2), 249–268 (2015)
36. Inbar, O., Tractinsky, N.: Interface-to-face: sharing information with customers in service encounters. In: CHI EA 2010, pp. 3415–3420. ACM (2010)
37. Inbar, O., Tractinsky, N.: Lowering the line of visibility: incidental users in service encounters. Behav. Inf. Technol. **31**(3), 245–260 (2012)
38. Itoh, Y., et al.: Communication service design by interhuman interaction approach. In: CHI EA 2006, pp. 905–910. ACM (2006)
39. Kankainen, A., Vaajakallio, K., Kantola, V., Mattelmäki, T.: Storytelling group – a co-design method for service design. Behav. Inf. Technol. **31**(3), 221–230 (2012)
40. Kim, E., Koh, B., Ng, J., Su, R.: myPyramid: increasing nutritional awareness. In: CHI EA 2006, pp. 1843–1848. ACM (2006)
41. Kim, H.-J., Kim, C.M., Nam, T.-J.: SketchStudio: experience prototyping with 2.5-dimensional animated design scenarios. In: Proceedings of DIS 2018, pp. 831–843. ACM (2018)
42. Kim, S., et al.: Autonomous taxi service design and user experience. Int. J. Hum.-Comput. Interact. **36**(5), 429–448 (2019)
43. Kimbell, L.: Designing for service as one way of designing services. Int. J. Des. **5**, 41–52 (2011)
44. Kotamraju, N.P., van der Geest, T.M.: The tension between user-centred design and e-government services. Behav. Inf. Technol. **31**(3), 261–273 (2012)
45. Lee, J.J.: Service design and blind mice. Interactions **27**(2), 20–21 (2020)
46. Lee, M.K., Forlizzi, J., Kiesler, S., Rybski, P., Antanitis, J., Savetsila, S.: Personalization in HRI: a longitudinal field experiment. In: Proceedings of HRI 2012, pp. 319–326. ACM (2012)
47. Lee, M.K., Kielser, S., Forlizzi, J., Srinivasa, S., Rybski, P.: Gracefully mitigating breakdowns in robotic services. In: Proceedings of HRI 2010, pp. 203–210. IEEE Press (2010)
48. Lee, M.K., Kiesler, S., Forlizzi, J., Rybski, P.: Ripple effects of an embedded social agent: a field study of a social robot in the workplace. In: Proceedings of CHI 2012, pp. 695–704. ACM (2012)
49. Lee, M.K., Kim, J.T., Lizarondo, L.: A human-centered approach to algorithmic services: considerations for fair and motivating smart community service management that allocates donations to non-profit organizations. In: CHI 2017, pp. 3365–3376. ACM (2017)
50. Liu, X., Qian, D., Wu, L., Xu, J.: Assessment of the working chair using affects the whole service process in b ultrasonic examination. In: Stephanidis, C. (ed.) HCI 2017. CCIS, vol. 713, pp. 540–547. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-58750-9_75
51. Lovelock, C., Gummesson, E.: Whither services marketing? In: Search of a New Paradigm and Fresh Perspectives. Journal of Service Research 7(1), 20–41 (2004).

52. Lundberg, J., Arvola, M., Westin, C., Holmlid, S., Nordvall, M., Josefsson, B.: Cognitive work analysis in the conceptual design of first-of-a-kind systems – designing urban air traffic management. Behav. Inf. Technol. **37**(9), 904–925 (2018)
53. Lusch, R., Nambisan, S.: Service innovation: a service-dominant logic perspective. MIS Q. **39**, 155–175 (2015)
54. Mager, B.: Service design as an emerging field. In: Miettinen, S., Koivisto, M. (eds.) Designing Services with Innovative Methods. Otava Book Printing LTD, Keu-ruu, Finland (2009)
55. Mager, B.: Service Design Impact Report: Public Sector. Service Design Network, Cologne (2016). http://www.service-design-network.org/books-and-reports/impact-report-public-sector
56. Meckem, S., Carlson, J.L.: Using "rapid experimentation" to inform customer service experience design. In: CHI EA 2010, pp. 4553–4566. ACM (2010)
57. Meroni, A., Sangiorgi, D.: Design for Services. Gower (2011)
58. Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G.: Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med. **6**(7), e1000097 (2009). https://doi.org/10.1371/journal.pmed.1000097
59. Nardi, B.: Designing for the future: but which one? Interactions **23**(1), 26–33 (2016)
60. Pacenti, E., Sangiorgi, D.: Service Design research pioneers: an overview of Service Design research developed in Italy since the '90s. Swedish Des. Res. J. **1**(10), 26–33 (2010)
61. Patrício, L., Fisk, R.P., Falcão e Cunha, J., Constantine, L.: Multilevel service design: from customer value constellation to service experience blueprinting. J. Serv. Res. **14**(2), 180–200 (2011)
62. Patrício, L., Gustafsson, A., Fisk, R.: Upframing service design and innovation for research impact. J. Serv. Res. **21**(1), 3–16 (2017)
63. Polaine, A., Reason, B., Løvlie, L.: Service Design: From Insight to Implementation. Rosenfeld Media (2013)
64. Rau, P.-L.P., Huang, E., Mao, M., Gao, Q., Feng, C., Zhang, Y.: Exploring interactive style and user experience design for social web of things of Chinese users: a case study in Beijing. Int. J. Hum Comput Stud. **80**, 24–35 (2015)
65. Remy, C., et al..: Evaluation Beyond Usability: Validating Sustainable HCI Research. In: Proceedings of CHI 2018 2018, p. Paper 216. ACM (2018)
66. Roto, V., Lee, J. J., Law, F., Zimmerman, J.: The overlaps and boundaries between service design and user experience design. In Proceedings of DIS 2021, ACM (2021)
67. Roto, V., Lee, J. J., Mattelmäki, T., Zimmerman, J.: Experience design meets service design: method clash or marriage? In: CHI EA 2018, p. Paper W26. ACM (2018)
68. Secomandi, F., Snelders, D.: Interface design in services: a postphenomenological approach. Des. Issues **29**(1), 3–13 (2013)
69. Shostack, L.G.: How to design a service. Eur. J. Mark. **16**(1), 49–63 (1982)
70. Szóstek, A., Kwiatkowska, J., Górnicka, O.: The needs of early school children and their parents with respect to the design of mobile service offers. In: CHI EA 2013, pp. 2345–2346. ACM (2013)
71. Stenros, J., Sotamaa, O.: Commoditization of helping players play: rise of the service paradigm. In: DiGRA Conference 2009 (2009)
72. Teixeira, J., Patrício, L., Nunes, N.J., Nóbrega, L.: Customer experience modeling: designing interactions for service systems. In: Campos, P., Graham, N., Jorge, J., Nunes, N., Palanque, P., Winckler, M. (eds.) INTERACT 2011. LNCS, vol. 6949, pp. 136–143. Springer, Heidelberg (2011). https://doi.org/10.1007/978-3-642-23768-3_11
73. Ueda, Y., Go, K., Takahashi, K., Hayakawa, S., Yamazaki, K., Yanagida, K.: Structured scenario-based design method for experience vision. In: Kurosu, M. (ed.) HCI 2013. LNCS, vol. 8004, pp. 500–509. Springer, Heidelberg (2013). https://doi.org/10.1007/978-3-642-39232-0_54

74. V.S., S., Hirom, U., Lobo, S., Devkar, S., Doke, P., Pandey, N.: Participatory design of vaccination services with less-literate users. In: Stephanidis, C. (ed.) HCI 2017. CCIS, vol. 714, pp. 301–308. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-58753-0_45
75. Vargo, S.L., Lusch, R.F.: Evolving to a new dominant logic for marketing. J. Mark. **68**(1), 1–17 (2004)
76. Vilaza, G.N., Mähönen, J., Hamon, C., Danilina, O.: StreetHeart: Empowering homeless through art and technology. In: CHI EA 2017, pp. 93–99. ACM (2017)
77. Wienken, T., Krömker, H.: Experience maps for mobility. In: Kurosu, M. (ed.) HCI 2018. LNCS, vol. 10902, pp. 615–627. Springer, Cham (2018). https://doi.org/10.1007/978-3-319-91244-8_47
78. Wild, P.J., van Dijk, G., Maiden, N.: New opportunities for services and human–computer interaction. Behav. Inf. Technol. **31**(3), 205–208 (2012)
79. Wild, P.J.: HCI and the analysis, design, and evaluation of services. In: BCS - HCI 2008, pp. 207–208. BCS Learning & Development Ltd. (2008)
80. Williams, D., Kelly, G., Anderson, L.: MSN 9: new user-centered desirability methods produce compelling visual design. In: CHI EA 2004, pp. 959–974. ACM (2004)
81. Wong, R.Y., Khovanskaya, V.: Speculative Design in HCI: from corporate imaginations to critical orientations. In: Filimowicz, M., Tzankova, V. (eds.) New Directions in Third Wave Human-Computer Interaction: Volume 2 - Methodologies. HIS, pp. 175–202. Springer, Cham (2018). https://doi.org/10.1007/978-3-319-73374-6_10
82. Wu, C.-C., Hong, S.-M., Huang, Y.-H.: GoodGuide: reconnecting the homeless and others. In: CHI EA 2015, pp. 55–60. ACM (2015)
83. Yamazaki, K., Go, K., Takahashi, K., Hayakawa, S., Ueda, Y., Yanagida, K.: Proposal for experience vision. In: Kurosu, M. (ed.) HCI 2013. LNCS, vol. 8004, pp. 137–145. Springer, Heidelberg (2013). https://doi.org/10.1007/978-3-642-39232-0_16
84. Yang, C.-F., Sung, T.-J.: Service design for social innovation through participatory action research. Int. J. Des. **10**, 21–36 (2016)
85. Yang, Q., Zimmerman, J., Steinfeld, A., Carey, L., Antaki, J.F.: Investigating the heart pump implant decision process: opportunities for decision support tools to help. In: CHI 2016, pp. 4477–4488. ACM (2016)
86. Yi, T., Rhim, J., Lee, I., Narangerel, A., Lee, J.-H.: Service design of intergeneration home-sharing system using VR-based simulation technology and optimal matching algorithms. In: Stephanidis, C. (ed.) HCI 2017. CCIS, vol. 714, pp. 95–100. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-58753-0_15
87. Yoo, D., Ernest, A., Serholt, S., Eriksson, E., Dalsgaard, P.: Service design in HCI research: the extended value co-creation model. In: HTTF 2019, p. Article 17. ACM (2019)
88. Yoo, D., Zimmerman, J., Hirsch, T.: Probing bus stop for insights on transit co-design. In: CHI 2013, pp. 409–418. ACM (2013)
89. Yoo, D., Zimmerman, J., Steinfeld, A., Tomasic, A.: Understanding the space for co-design in riders' interactions with a transit service. In: Proceedings of CHI 2010, pp. 1797–1806. ACM (2010)
90. Yoo, J., Pan, Y.: Expanded customer journey map: interaction mapping framework based on scenario. In: Stephanidis, C. (ed.) HCI 2014. CCIS, vol. 435, pp. 550–555. Springer, Cham (2014). https://doi.org/10.1007/978-3-319-07854-0_96
91. Yu, E.: Looking into service representation tools through the multidimensional nature of service experience. Des. J. **22**(4), 437–461 (2019)
92. Yu, E.: Toward an integrative service design framework and future agendas. Des. Issues **36**(2), 41–57 (2020)
93. Zeithaml, V.A., Parasuraman, A., Berry, L.L.: Problems and strategies in services marketing. J. Mark. **49**(2), 33–46 (1985)

94. Zhao, S.: Research on future-oriented manager service design under the background of new retail. In: Stephanidis, C. (ed.) HCI 2018. CCIS, vol. 852, pp. 343–355. Springer, Cham (2018). https://doi.org/10.1007/978-3-319-92285-0_47
95. Zimmerman, J., Forlizzi, J.: Service design. In: The Encyclopedia of Human-Computer Interaction (2019)
96. Zimmerman, J., et al.: Field trial of Tiramisu: crowd-sourcing bus arrival times to spur co-design. In: Proceedings of CHI 2011, pp. 1677–1686. ACM (2011)