Lee, Jung-Joo; Yap, Christine Ee Ling; Roto, Virpi

How HCI Adopts Service Design : Unpacking current perceptions and scopes of service design in HCI and identifying future opportunities

Published in:
CHI '22: CHI Conference on Human Factors in Computing Systems

DOI:
10.1145/3491102.3502128

Published: 01/04/2022

Document Version
Publisher's PDF, also known as Version of record

How HCI Adopts Service Design

Unpacking current perceptions and scopes of service design in HCI and identifying future opportunities

Jung-Joo Lee
National University of Singapore
jjlee@nus.edu.sg

Christine Ee Ling Yap
National University of Singapore
christine.yap@u.nus.edu.sg

Virpi Roto
Aalto University
virpi.roto@aalto.fi

ABSTRACT

Service design has gained tractions in Human-Computer Interaction (HCI) as an approach to deal with changes of technology design scopes. In the meantime, there are confusions around definitions of service design and its relevance to HCI. Despite the co-existence of interests and confusions, little research has been done for a comprehensive overview of how HCI interprets and adopts service design. This research performed a systematic literature review on extant HCI publications that claim to use service design. The review findings from the 179 publications revealed varying dimensions of service design taken up in HCI, relations between service design scopes and emerging technologies, as well as unclarity to service design in HCI and HCI's current tendency to use service design for the interaction level rather than the system level. We discuss future design and research opportunities for HCI by integrating the system level dimensions of service design.

CCS CONCEPTS

• **Human-centered computing** → Human computer interaction (HCI); HCI design and evaluation methods.

KEYWORDS

Service design, Design methods, Value constellation, Value co-creation

ACM Reference Format:
Jung-Joo Lee, Christine Ee Ling Yap, and Virpi Roto. 2022. How HCI Adopts Service Design: Unpacking current perceptions and scopes of service design in HCI and identifying future opportunities. In *CHI Conference on Human Factors in Computing Systems (CHI '22), April 29–May 05, 2022, New Orleans, LA, USA.* ACM, New York, NY, USA, 14 pages. https://doi.org/10.1145/3491102.3502128

1 INTRODUCTION

Recent years have seen HCI's increasing interest in service design [10, 32, 54, 81, 114, 120]. Information technologies perform in networks of multiple actors in various roles [31, 32, 104], and the usage models for technologies are increasingly servitized (e.g., Software as a Service – SaaS) [120]. Forlizzi [31] called for the need of "service framing" to deal with the multiple changes in HCI design. They are the change of the design context from end-users to multiple stakeholders, the change of design object from a single product to a network of multiple touchpoints, and the change of the impact scope from user experience to a socio-economic system. Service design was recognized as a potential approach to offer logic, approaches and tools to HCI to respond to these changes.

In the meantime, there have been confusions around the intersections between service design and HCI. For example, unclarity on overlaps and boundaries between service design and user experience (UX) design has been observed [81]. There were questions on the relevance of service design to HCI due to service design's strong orientation to business [54, 114]. Furthermore, service design being adopted to many different disciplines and industries resulted in multiple definitions, thus adding the confusion of what service design is [115].

Despite the co-existence of the interests and the confusions, there has been little research that systematically overviews how service design has been adopted and used in HCI research. Responding to this gap, this research performed a systematic literature review on extant publications in HCI that claim to use service design. The aim was to offer a comprehensive review of what are HCI's current perspectives and approaches to service design, what dimensions of service design are considered relevant to HCI, and what are left as under-explored design and research areas. We explore various contexts and scopes of using service design in HCI, differing interpretations of service design, as well as current limitations and future directions of integrating service design in HCI. Before presenting our findings, we will firstly review multiple dimensions of service design from the service design literature and the related work on clarification of the intersections between HCI and service design.

2 RELATED WORK

2.1 Multiple dimensions of service design

Service design emerged in management and operations studies in the 1980s as an approach to manage the quality of service and develop new services based on the customer need [84]. It has been adopted and developed in different fields, including design research, system engineering, information system science, interaction design and so on. While it was gaining attention from various disciplines, service design is also viewed as a somewhat ambiguous and poorly understood notion, due to its varying origins, contexts and methodological traditions [77].

CHI '22, April 29–May 05, 2022, New Orleans, LA, USA

ACM ISBN 978-1-4503-9157-3/22/04.
https://doi.org/10.1145/3491102.3502128

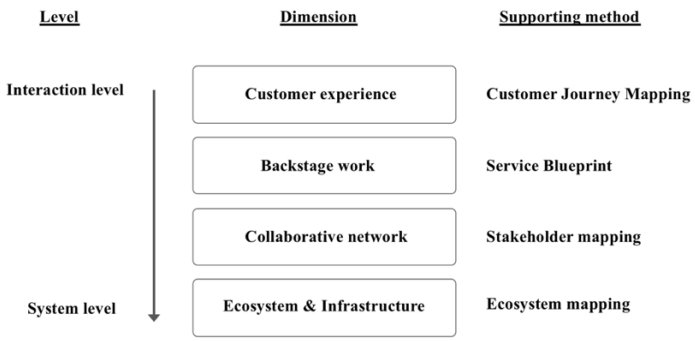

Figure 1: Four dimensions of service design from the interaction level to the system level.

It is observed that there are broadly two ways of understanding service design. One is to view "a service" (countable) as an intangible market offering; the other is to view "service" (non-countable) as the fundamental basis of exchange [49, 54, 100]. The former view, a service as an offering, starts from a distinction between an (intangible) service and a (tangible) product. This conceptualization is well explained by IHIP model that has been developed to explain characteristics of service that is "Intangible, Heterogeneous, Inseparable and Perishable" [60]. In this conceptualization, a service is an object of design, and service design is an approach to deal with this new design object that is different from a tangible product.

On the other hand, the latter view considers service as logic for "proposing and creating new kinds of value relation" [49]. This view is informed by Service-Dominant Logic (S-D Logic) [98], where companies can only make value propositions and customers are active participants in co-creating values. Service design with this perspective, focuses to create a platform or a condition for value co-creation by engaging multiple stakeholders. Identifying relevant stakeholders to bring value in and creating their collaborative networks are primary goals of this notion of service design. Conceptualizing these differences, Kimbell [49] noted the former view of service design as the design of services and the latter view as designing for service. Clarification of these different views to service design is critical as they lead to different design outcomes: for example, a digital banking service from the design of services, and a new software subscription model like Adobe Creative Cloud from designing for service.

Due to these multiple connotations of service design, many scholars have agreed that it is difficult to offer a single definition of service design, but instead they offered clarification of multiple dimensions of service design for a more holistic understanding [64, 76, 100, 115]. This phenomenon is somewhat similar to what HCI communities have seen with UX design [53, 81]. From the abovementioned studies, four dimensions of service design can be commonly identified, spanning from the customer experience level, to the work process level, to the collaborative network level and to the ecosystem and infrastructural level (see Figure 1):

- The customer experience level: Service design deals with customer's experiences with a service process where multiple touchpoints are orchestrated. A service design tool such as customer journey mapping supports this level of design activity.
- The backstage work process level: Service design designs for backstage work processes for service delivery. A tool such as service blueprinting supports this level of design activity.
- The collaborative network level: service design aims to identify new and relevant stakeholders and create new collaborative networks where values are co-created. A tool such as stakeholder mapping supports this level of design activity.
- The ecosystem and infrastructure level: With creation of new collaborative networks for value co-creation, service design proposes a future ecosystem and infrastructure, which might disrupt existing systems and norms. A tool such as ecosystem mapping supports this level of design activity.

We will come back to these four dimensions of service design when discussing the systematic literature review results.

2.2 Intersections between HCI and Service Design

More than a few studies aimed to clarify the intersections between HCI and service design and propose new design vistas over the past decade. Holmlid [38] compared service design and interaction design against various aspects, such as process, material and deliverable. Forlizzi and Zimmerman [32] showcased benefits from service design framing of interaction design projects, addressing service design's systemic perspective. More recently, they wrote a chapter of service design in the Encyclopedia of Human-Computer Interaction and compared service design and UX design, focusing on service design's business orientation and UX design's technology orientation [120]. They highlighted benefits from service thinking for designing for rising trends of technologies, such as SaaS, social computing and crowdsourcing platforms. They also envision future prospects of service design in the continued advances in Artificial Intelligence (AI), to consider a socio-cultural and political impacts of technology applications.

Forlizzi [31] discussed the increasing relevance between technology design and economic models, as "HCI researchers and practitioners realize that pricing models and payment plans have an influence on how people engage with technical systems". She argued

that service design could help HCI encompass economic models as a core part of its design process [31]. Yoo et al. [114] echoed this view and demonstrated the contribution of service design to propose a new value co-creation model in HCI for the viable technological systems design. They both observed that economic models and multiple stakeholders beyond users are currently seen to be out of the scope of HCI research. This observation is supported by Roto et al.'s [81] survey finding that reports UX designers' tendency to regard business models out of their work scope.

While the aforementioned studies revealed boundaries between the two fields and offered implications for future research agenda, they do not provide a holistic overview of current positions of service design in HCI. Their empirical findings are rarely synthesized. Responding to these limitations, this study aims to synthesize existing research by conducting a systematic literature review of HCI publications that use service design. Our primary research question is how HCI adopts service design. Informed by the related works above, our analysis specifically aims to explore the following questions:

- What dimensions or levels of service design have been taken up in HCI?
- What are future prospects for adopting service design in HCI projects?

3 METHOD

3.1 Search Strategy

A systematic literature review was conducted and reported according to the PRISMA statement [67] to identify existing literature in HCI that claims to adopt, use or be informed by service design. We used SCOPUS as a main data source, as it provides significantly more coverage of HCI literature than other sources such as Web of Science, primarily due to its coverage of relevant ACM and IEEE peer-reviewed conference proceedings, thus can be used as a sole data source for citation-based research and evaluation in HCI [62]. We searched for the exact term "service design" appearing in the title, abstract, or author keyword of papers, to include papers that explicitly claim that their work addresses service design or service design plays a salient role in the publication. The timeframe was from anytime the term service design appeared for the first time to the year of 2020.

This resulted in 1,725 documents written in English. We then screened the documents, limiting them to computer science and excluding irrelevant subject areas such as dentistry, chemical engineering, veterinary, agricultural and biological sciences, medicine, biochemistry/genetics/molecular biology or earth and planetary sciences. As results, 667 papers remained.

3.2 Screening Criteria

We screened the 667 papers to identify the publications that are only relevant to the main focus of our study. Figure 2 shows our screening procedure. First, we filtered unintended keyword search results, where "service" and "design" were each of two separate parts in a sentence (n = 11). 19 entries that were not accessible to our academic institutions were also excluded. This filtering resulted in 637 publications. We then narrowed the publication pool to studies that are more elaborate in how the field of "HCI" adopts service design. This filtering excluded a number of publications from Service Engineering, Operations Management, Service Information Software and System where the definition of service design has been established in their own disciplines (e.g., [1]). Studies from service design research communities that are considered far from HCI were also excluded as they are not relevant to how "HCI" adopts service design (e.g., [6, 45]). After these exclusions, 227 publications remained.

Furthermore, we screened 42 papers where service design does not play any role in the project or discussion in publications, but merely mentioned. We did not exclude extended abstracts or workshop proposals as long as they demonstrate the publication authors' standpoints and usage of service design in their work (e.g., [80, 104]). We, however, excluded the workshop proposals or panel abstracts that do not present any perspective to service design without citing any references (n=6). As results, a total of 179 publications remained for the final analysis.

To account for inter-rater effects in our screening process, both the first author and the second author did the first screening of 30 papers containing unintended keyword search and not accessible entries. Then the second author screened 637 papers, and the first author randomly screened 20% of the papers using the same screening criteria. 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.

3.3 Analysis

Our analysis firstly focused on revealing overall patterns of the adoption of service design in HCI, via summative analysis of service design publication numbers in HCI venues over the years, and the service design methods adopted in these publications. Secondly, an in-depth analysis was conducted to identify dimensions of service design adopted in HCI studies. For this analysis, we employed inductive content analysis [28] to analyze the 179 papers. The first author started the analysis by open coding 20% of the papers, which resulted in 20 codes. The first and second author then discussed the codes against the research questions in a workshop where they gained consensus on 16 final codes. Using the final codes, the second author coded all 179 papers, and the first author coded 40% of the papers. The first and second author resolved all discrepancies, then repeated the process until the inter-rater reliability, Cohen's unweighted kappa, was above 0.6 for all variables. The 16 final codes were categorized into 3 categories of *scope of design*, *scope of actors*, and *needs for clarification*, and further synthesized into 7 subthemes and two higher order themes, as reported in the next section.

4 RESULTS

In this section, we report the results of the summative and inductive analyses of our sample of 179 publications. First, we report the timeline of service design publications as annual volumes (subsection 4.1), and then the kinds of service design methods adopted by HCI research (4.2). The methods analysis is informed by the notion that the adoption of methods indicates how the practice is understood [11]. The inductive content analysis resulted into two higher order themes. The first theme reveals the varying *scopes of service*

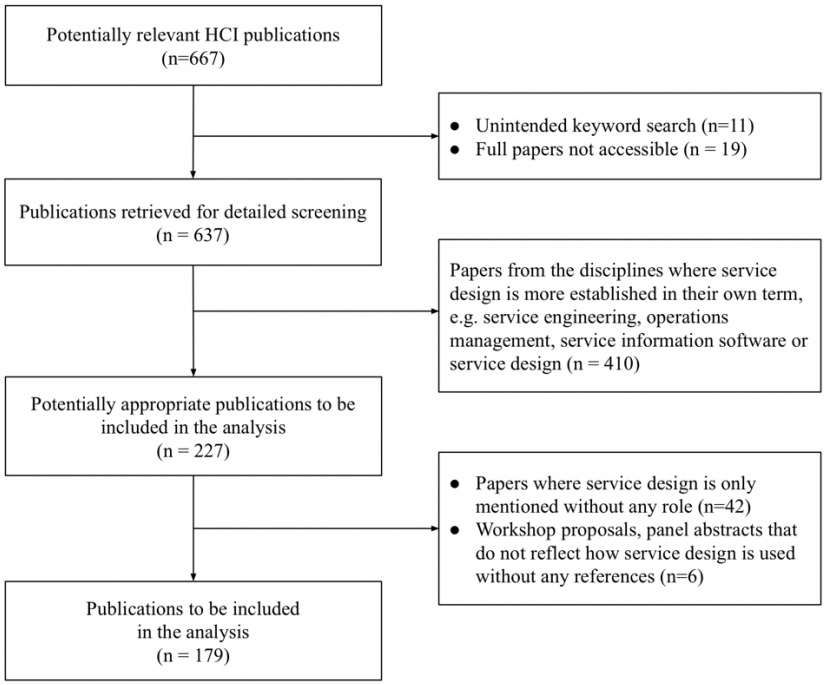

Figure 2: The publication screening procedure in this study.

design adoption in HCI, which indicate current contribution areas of service design in HCI. This first theme includes 7 subthemes that elaborate those various scopes. The second theme concerns with *relations of service design scopes and emerging technologies*. This theme consists of two subthemes, one focusing on social computing/crowdsourcing technologies and the other on AI-related technologies.

4.1 Annual volumes of service design publications in HCI

The first analysis of the service design literature included mapping of the 179 publications over their publication years to see any pattern of increase in service design work in HCI. Figure 3 depicts the annual volumes resulted from the analysis.

The term service design firstly appeared in the author keywords of the paper in 2004 [105] and another one in 2005 [97]. These papers focused on usability of the software systems and included service design as an author keyword as a generic term that refers to the design process of intangible products (i.e. digital services). In the inductive content analysis to be reported later in this section, such type of papers was coded under *C16: Using SD loosely*. Besides the total number of publications each year, we separately counted the papers under C16, to see whether the studies that did not regard service design as a distinct approach but refer to it as merely the process of designing digital services, is decreasing or not. In other words, we wanted to see whether there is an increasing pattern of HCI's recognition of service design as a distinct approach. Figure 3 shows both the total number of publications and the number of publications where service design loosely refers to designing of digital services. As seen in Figure 3, there is no decrease of those papers till recent years, which might indicate the poor recognition of service design as a distinct approach in HCI.

There was the first notable increase in 2010, and since then till 2019, there have been nine to 17 papers each year without a clear pattern of increase for the past decade. Multiple papers from this period originated from a handful of research teams and their projects. For example, the sets include the studies on "incidental users" from 2010 [42] and 2012 [43], a series of publications on crowd-sourced bus schedule information from 2010 [112], 2011 [119], and 2013 [113], multiple publications on robot services in 2010 [55] and 2012 [56, 57], multiple publications on "experience vision" in 2013 [37, 95, 107], and a series of publications on pattern language from 2011 to 2015 [4, 5, 46, 47]. The multiple publications from a few research teams is not a strong evidence on wide-spread adoption of service design in HCI communities.

In 2020, however, there was a remarkable increase of service design publications (total 35 papers). Interestingly, about 46% of the papers in 2020 (n=16) are from various institutes in China. We will unpack the possible reason for this recent sudden increase of publications from China in Discussion section.

4.2 Adoption of methods

4.2.1 Types of service design methods used. We analyzed what service design methods were used in the 132 publications that adopted service design as a distinct approach (Table 1). Methods that are introduced as service design methods in various service design textbooks (e.g., [78, 90]) were identified as service design methods in this analysis. Service design methods in these terms

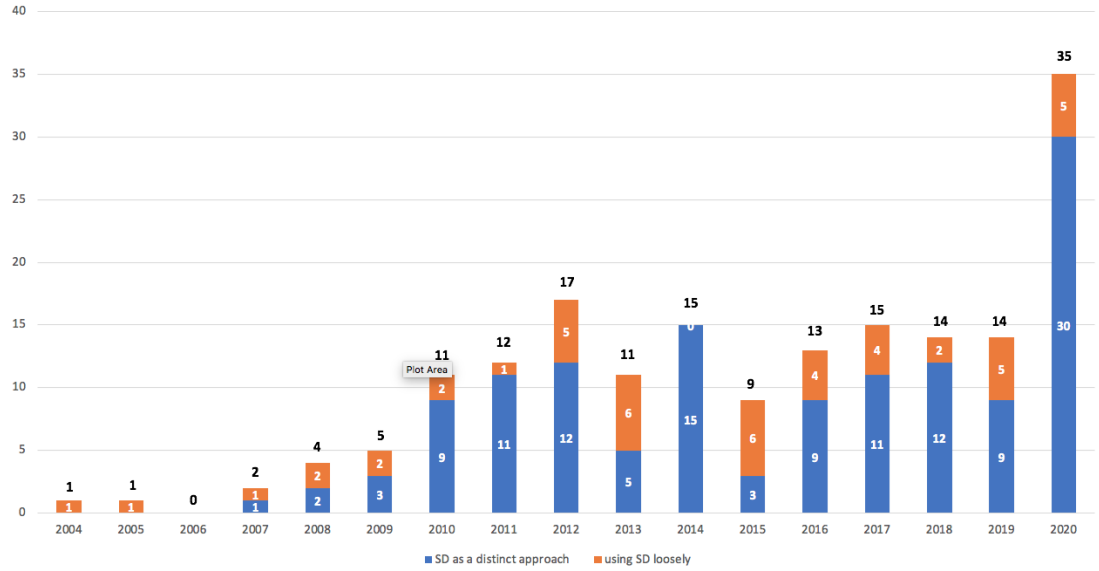

Figure 3: 179 HCI publications that adopted service design over the years.

Table 1: The number of methods in our sample of the literature

Methods	Number of papers (%*)
Interview	36 (27.2%)
Co-design / participatory design workshop	32 (24.2%)
Customer journey map	26 (19.7%)
Service blueprint	26 (19.7%)
Observation (ethnography, shadowing, contextual inquiry)	22 (16.7%)
Persona	17 (12.9%)
Prototyping	11 (8.3%)
Storyboarding	10 (7.6%)
(eco-) System mapping	9 (6.4%)
Stakeholder mapping	8 (6.1%)
Scenario	8 (6.1%)
Probes	5 (3.8%)
Service safari	1 (0.8%)
Service staging (for prototyping)	1 (0.8%)
Role play	1 (0.8%)

*Percentage is calculated by (no. of papers / 132 papers that used SD as a distinct approach – excluding 47 papers coded in C16).

also include methods that are generally used across various design fields, such as, interview methods, observation, prototyping and persona.

The result shows that an interview method is the most frequent one (n=36) in this set of publications. While many studies focused on interviewing end-users, some studies used interviews to involve service providers' perspectives and experiences (e.g., [12, 23, 50, 58, 101]). Co-design/participatory design workshops were the second most frequent methods (n=32). They were used mainly for three purposes: to bring different perspectives from multiple stakeholders and co-envision their collaborative networks (e.g., [12, 24, 47, 61]), to facilitate dialogues between users and service providers (e.g., [93, 112]) and to engage users' point of view to technological systems development (e.g., [22, 40, 52, 113]). For the two former cases, HCI designers or researchers facilitated collaboration among users, service providers and other stakeholders.

Customer journey map and service blueprint methods appeared the equal number of times (n=26). 11 papers used both methods in their projects (e.g., [27, 40, 47, 87, 117]). Several studies used system mapping (n=9) and stakeholder mapping (n=8) to elaborate how various stakeholders collaborate on new technological systems (e.g., [14, 16, 17, 69, 71, 85, 108]). A few studies used a service design-specific term for a method, such as "service safari" [78] (see [108]) and "service staging" [90] (see [27]).

Table 2: Scopes of service design adoption

Category	Code (C)	Number of papers (%)
Scope of Design	C4: Journey perspective	66 (36.9%* / 50.0%**)
	C5: Backstage work process	58 (32.4% / 43.9%)
	C6: Collaborative networks involving multiple roles	58 (32.4% / 43.9%)
	C3: Multiple touchpoints	48 (26.8% / 36.4%)
	C2: UI/UX features	40 (22.3% / 30.3%)
	C7: Value exchange / value co-creation	33 (18.4% / 25%)
	C1: Single touchpoint interaction	18 (10.1% / 13.6%)
	C10: Business model	11 (6.1% / 8.3%)
	C9: Service/value constellation	5 (2.8% / 3.8%)
	C8: Speculating future infrastructure	3 (1.7% / 2.3%)
Scope of Actors	C14: Multiple, networked stakeholders	54 (30.2% / 40.9%)
	C11: Only end-users	35 (19.6% / 26.5%)
	C13: End-users & service providers	27 (15.1% / 20.5%)
	C12: Customers of end-users / end-users as service providers	6 (3.4% / 4.5%)
Needs for Clarification	C16: Using SD loosely	47 (26.2%*)
	C15: Clarification efforts between SD & HCI	19 (10.6%*)

* Percentage is calculated by (no. of papers / 179 included papers).

**Percentage is calculated by (no. of papers / 132 papers that used SD as a distinct approach – excluding 47 papers in C16).

4.2.2 Development of new methods. Several studies developed new methods to apply service design notions and scopes to HCI. For example, Nass et al. [69] designed a method called "Tangible Ecosystem Design" that incorporates business transactions, platform capabilities and external contexts (e.g. policy), to design for software ecosystem. While prototyping methods from interaction design, such as Wizard-of-oz [3, 56, 65], paper prototyping [5, 75] or interactive mockups [18, 75] were popularly used, a few studies developed technology-enabled service prototyping tool, for example, using a virtual space [48] or AR/VR technologies [22].

4.3 Scopes of service design adoption

The first theme that emerged from the in-depth inductive analysis, *scopes of service design adoption*, was based on three categories. First, *Scope of design* indicates which dimension of service design was taken up in the HCI papers; Secondly, *scope of actors* indicates the breadth of actors or the systemic perspective to actors; Lastly, *needs for clarification* pertains to contrasting views and unclarity to service design in HCI. Table 2 presents the codes for each category in the order of frequency. In the following subsections, we report the 7 subthemes, derived from the 16 codes under the three categories.

4.3.1 User journey as the most addressed design scope. 66 papers, which take up half the 132 publications using service design as a distinct approach, were coded under *C4: Journey perspective*. Those papers used a customer journey map mostly to describe user journeys (e.g., [40, 47, 87]). This indicates that a journey perspective to user's actions was the scope most taken up from service design in the HCI work. This finding is also in line with our earlier finding from section 4.2 that a customer journey map is the most frequently used method, besides general design research methods such as interviews and co-design workshops.

Many papers coded under C4 dealt with orchestration of multiple touchpoints (*C3: Multiple touchpoints*, n=37), but 10 papers used journey mapping for a single product to support various phases of user interactions with the product, such as a snack robot [57], mobile apps [25, 44, 68] or an interactive table [18]. 24 papers among the 66 studies dealt with only end-users. A journey perspective being the most frequent design scope for service design in HCI, dealing with only end-users, might be resulted from HCI's prevailing focus on end-users [31]. In fact, more than one third of papers under C4 had a main focus on UI/UX features (C2: *UI/UX features*, n=24).

4.3.2 Integrating the backstage work process and employee experiences. The next most frequent code under the scope of design category was *C5: Backstage work process* (n=58). Some of those papers elaborated the backstage work process by using a service blueprint (e.g., [111, 114, 116]), while some other studies described in the text how the backstage should be operated to support an intended service delivery (e.g., [12, 109]). Some studies described how human actors operate in the backstage to maintain technological systems users interact with, for example, a backstage operation for robot [56], "backstage control mechanism" behind an interactive table [18], and government officers' work to process reports by citizens [50]. Some other studies explained how human actors collaborate with technological systems to support user's journey, for example, how service staff and chatbots work together during the service breakdowns [106].

Going beyond the mapping of the work process, a few papers addressed the employees' experiences and pain points, especially healthcare staff (e.g., [12, 51, 73, 117]). By interviewing healthcare staff, their work aimed at improving not only patient's experiences but also healthcare staff's.

4.3.3 Designing for collaborative relationships of multiple stakeholders and value co-creation. C6: Collaborative networks involving multiple roles was also the second most frequent code in the scope

of design category (n=58). In those papers, the consideration of collaborative networks goes beyond multiple groups of users but deal with stakeholders who may influence the development, delivery and maintenance of the proposed services, such as government organizations (e.g., [50, 59, 112]), community representatives (e.g., [24, 41, 58]), manufacturing companies (e.g., [17]), insurance companies (e.g., [102]) and so on. Those studies focused on identifying new stakeholders who would bring new resources to sustain proposed services and create new types of values. For example, Davoli and Redström's work [24] envisioned a new partnership between communities and existing private service providers to handle maintenance and management of drone-based post services. Another example is Wang et al.'s work [102] that proposed to involve an insurance company as a stakeholder of the intergenerational interaction platform, as a financial sponsor who will collect the elderly-related data.

As such, the way those studies elaborate collaborative relationships among multiple stakeholders is different from collaborative task flows around technological systems, and focused on resource exchanges. Quite a few studies coded under C6 addressed value exchange/value co-creation models (*C7: Value exchange / value co-creation*, n=32). Some papers elaborated their new value co-creation models citing the original concepts of S-D logic by Vargo and Lusch [98] and value co-creation by Grönroos and Hell [36] (e.g., [14, 47, 74, 99, 114]). The other studies described how multiple stakeholders in collaborative networks exchange their resources to sustain the service and create new types of revenue streams through stakeholder mapping or system mapping (e.g., [3, 17, 102, 103]).

4.3.4 Dealing with business models. 11 papers (8.3% among 132 papers that adopted service design as a distinct approach) were found to deal with business models (*C10: Business models*). They addressed new business models as an implication from, or an enabler for, their new value co-creation models (e.g., [3, 17]). 8 papers out of 11 dealing with business models were coded *C7: Value exchange/ value co-creation.*

A few papers dealt with business models as a main focus of their work rather than implication. For example, Stenros and Sotamaa [89] analyzed new economic models of game industries informed by a service paradigm and offered future design directions. Quite a few papers discussed new business models around new economies, such as a sharing economy (e.g., [27, 103, 111, 118]) or a platform economy (e.g., [69, 89]). These papers stress the notion that technology companies now need to think of products as "platforms for all sorts of upgrades and value-added services" [89]. Interestingly, 9 papers out of the 11 papers discuss business models around social computing [3, 89, 102, 103] and AI-related technologies [17, 27, 111, 116]. They propose new business models enabled by crowdsourcing platforms or AI-integrated services. We look at this finding further in details in section 4.4.

Although not many, 5 papers dealt with value constellation (*C9: Service/value constellation*). Value constellation is a notion that describes how values from various different stakeholders are entangled in complex networks, beyond linear value chains [76, 88]. This notion addresses a broader scope of service design. Interestingly, 3 studies among these 5 papers dealt with government services, to be able to provide holistic and life-long services to citizens, based on a value constellation and service bundle [29, 59, 94].

4.3.5 Speculating infrastructural systems and operations of future technologies. A few studies used service design to speculate infrastructures for future service implementation for new technologies (*C8: speculating future infrastructure,* n=3). For example, Davoli and Redström's [24] speculative design of a community-owned drone delivery network and Lundberg et al.'s [61] co-design work to envision the future context for an unmanned air traffic management system. They designed for and experimented with advanced technologies or "first-of-a-kind systems" [61], speculating what infrastructural changes and socio-technical issues the design of technologies might bring in.

4.3.6 End-user focused with new design strategies. While the abovementioned findings present the expanded design scopes including backstage work and stakeholder networks, there were a considerable number of studies that focus on end-user experiences. 35 papers dealt with only end-users (*C11: Only end-users*) and 40 papers had their focus on user interface (UI) or user experience (UX) features of technology systems (*C2: UI/UX features*). A few papers used service design to mainly bring user experiences to the software development, regarding it as a synonym to user-centered design (e.g., [66]) or design thinking (e.g., [70]).

However, it was also observed that service design informed new design strategies to the studies focusing on end-user experiences. As reflected in C12, 6 papers addressed new types of users, such as customers of end users [42, 43] or users as service providers [19, 27, 111]. Inclusion of customers of end users led to the development of new UX design strategies [42, 43]. Users' multiple roles are discussed in ICT-enabled collaborative services [19] or sharing economy platforms [27, 111]. Another interesting case is Lee et al.'s [55] work that was informed by the concepts of service breakdown and service recovery from service management literature [9] and proposed new design strategies for human-robot interaction.

4.3.7 Service design as a distinct versus non-distinct approach. We found 47 papers coded under *C16: Using SD loosely* (26.2% of the179 papers), which refers to the studies that did not recognize service design as a distinct approach. While listing "service design" as an author keyword, those papers did not address any concepts or methods of service design, as if they regarded their approach as service design just because they dealt with digital services (e.g., e-services [39], or web services [96]) or technologies used for service offerings (e.g., a remote service kiosk [91] or a museum content service [20]). In this sense, those studies seem to consider service design part of interaction design where objects of design are just digital services.

Contrary to C16, there were a body of papers (n=19) coded under *C15: Clarification efforts between SD & HCI.* Those studies explicitly highlight service design as a distinct approach from HCI, by explaining the origins of service design and its disciplinary backgrounds (e.g., [30, 46, 74, 80]). They include workshop proposals with an explicit aim to clarify relations between service design and HCI (e.g., [21, 104]) or full papers that offer clarification between the two fields and possible scenarios for integration (e.g., [82, 114]).

Table 3: Numbers of the papers dealing with social computing/crowdsourcing technologies

Technology	Category	Code (C)	Number of papers (%)
Social computing /crowdsourcing technologies (n=28)	Scope of Design	C6: Collaborative networks involving multiple roles	15 (53.6%* / 25.9%**)
		C7: Value exchange / value co-creation	13 (46.4% / 39.4%)
		C5: Backstage work process	11 (39.3% / 19.0%)
		C3: Multiple touchpoints	7 (25% / 14.6%)
		C4: Journey perspective	6 (21.4% / 9.1%)
		C10: Business models	5 (17.9% / 45.5%)
		C2: UI/UX features	3 (10.7% / 7.5%)
		C1: Single touchpoint interaction	2 (7.1% / 11.1%)
		C9: Service/value constellation	1 (3.6% / 20%)
		C8: Speculating future infrastructure	0 (0% / 0%)
	Scope of Actors	C14: Multiple, networked stakeholders	11 (39.3% / 20.4%)
		C11: Only end-users	5 (17.9% / 14.3%)
		C13: End-users & service providers	3 (10.7% /11.1%)
		C12: Customers of end-users / end-users as service providers	1 (3.6% /16.7%)

*Percentage is calculated by (no. of papers / 28 papers that deal with social computing/crowdsourcing technologies).

**Percentage is calculated by (no. of papers / no. of papers under the same code from the all 179 papers from Table 2). For example, for C6: Collaborative networks involving multiple roles, 25.9% is calculated by 15 papers in this subset of papers / all 58 papers coded under C6.

These two different codes, C15 and C16, indicate contrasting perceptions to service design that currently co-exist in HCI, which we will discuss further in Discussion section.

4.4 Relations of service design scopes and emerging technologies

Zimmerman and Forlizzi [120] envisaged the opportunities that service design could bring into designing of emerging technologies. Inspired by their work, we identified the papers that deal with emerging technologies and found that they focused mainly on two families of technology. First, 28 papers focused on social computing and crowdsourcing technologies. Second, 12 papers focused on big data and AI-related technologies such as machine learning systems, chatbots, AI-based autonomous vehicles, and blockchains. Our aim was to discover to what extent service design is adopted when designing with and for those emerging technologies. Thus, we closely looked into the 40 papers against the 14 codes concerned with the scopes of design and actors.

4.4.1 Collaborative networks for social computing and crowdsourcing technologies. Our first finding focuses on service design scopes for social computing and crowdsourcing technologies (Table 3). Among the 28 papers that deal with these technologies, *C6: Collaborative networks involving multiple roles* was the most appearing code (n=15), followed by *C7: Value exchange / value co-creation* (n=13) and *C5: Backstage work process* (n=11). *C4: Journey perspective*, which was the most appearing code from the total set of 179 papers, appeared only 6 times in this set of publications. Based on these findings, service design seems to be used to identify and create collaborative relationships of multiple stakeholders around the social computing and crowdsourcing technologies. For example, citizen-participatory crowdsourcing platforms [50, 112] aimed to coordinate views from service providers and other stakeholders (e.g., local governments). Yoo et al. called for the establishment of "ongoing dialog and collaboration between the users and the service providers" as a success factor for crowd-powered services [112].

13 out of the 15 papers coded under C6 elaborated value co-creation models underlying their proposition of collaborative networks. These studies mention the transitions of user roles into co-producers of services (e.g., [13, 86, 103]) or value co-creators (e.g., [34, 50, 119]), facilitated by the technologies. For example, King and Brown [50] discussed the benefit of crowdsourcing technologies to engage citizens as value co-creators and empower citizens to control their own well-being through participation. While the highest number of papers under the scope of actors, dealt with multiple, networked stakeholders (C14, n=10), several papers dealt with only end users (C11, n=5), focusing on peer-to-peer collaboration enabled by crowdsourcing technologies (e.g., [15, 19, 113, 118, 119]).

5 papers considered new business models (*C10: Business models*) in their design of social computing, such as a shared bike business [103] and capital flows in a smart canteen service system [3]. We found that almost half of the papers (45.5%) addressing business models from the total set of 179 papers deal with social computing/crowdsourcing technologies. Almost 40% of the papers addressing value co-creation (C7) from the total set also deal with this family of technologies.

4.4.2 Customer journey and backstage work for AI.. The second finding focuses on service design scopes and AI-related technologies, including machine learning systems and AI-based chatbots, autonomous vehicles and blockchains (Table 4).

Among the set of the 12 papers identified, a journey perspective was the most appearing design scope (*C4: Journey perspective*, n=8). Most papers under C4 in this set of publications used a journey perspective to identify design opportunities for AI-based systems or delineate the procedure of users interacting with the automated systems. For example, healthcare staff's decision-making paths for a heart pump implant [109], a customer journey of the bike-sharing

Table 4: Numbers of the papers dealing with AI-related technologies coded

Technology	Category	Code (C)	Number of papers (%)
AI-related technologies (machine learning, AI-based chatbot, autonomous vehicle, blockchain) (n=12)	Scope of Design	C4: Journey perspective	8 (66.7%* / 12.1%**)
		C3: Multiple touchpoints	7 (58.3% / 14.6%)
		C5: Backstage work process	6 (50% / 10.3%)
		C6: Collaborative networks involving multiple roles	6 (50% / 10.3%)
		C7: Value exchange / value co-creation	4 (33.3% / 12.1%)
		C10: Business models	4 (33.3% / 36.4%)
		C2: UI/UX features	3 (25% / 7.5%)
		C1: Single touchpoint interaction	1 (8.3% / 5.6%)
		C8: Speculating future infrastructure	0 (0% / 0%)
		C9: Service/value constellation	0 (0% / 0%)
	Scope of Actors	C11: Only end-users	5 (41.7% / 14.3%)
		C14: Multiple, networked stakeholders	4 (33.3% / 7.4%)
		C13: End-users & service providers	2 (16.7% / 7.4%)
		C12: Customers of end-users / end-users as service providers	0 (0% / 0%)

*Percentage is calculated by (no. of papers / 12 papers that deal with AI-related technologies).

**Percentage is calculated by (no. of papers / no. of papers under the same code from the all 179 papers from Table 2). For example, for C4: Journey perspective, 12.1% is calculated by 8 papers in this subset of papers / all 66 papers coded under C4.

service using a blockchain technology [27], and a passenger's journey using a robo-taxi service [65]. Some other papers used a customer journey just to describe new service concepts [33] where AI is incorporated to provide personalized services based on big data (e.g., [63, 111, 116]).

6 papers coded under *C5: Backstage work process* explained how the backstage systems integrated with automated technologies and machine learning algorithms, support the customer journeys (e.g., [27, 111, 116]). A few studies among those 6 papers focused on collaboration between human actors and automated systems in the backstage, to support breakdowns [106] or mitigate decision-making conflicts [58, 109].

6 papers addressed multiple stakeholder collaborations (*C6: Collaborative networks involving multiple roles*, n=6). Those studies under C6 addressed new collaborative relationships enabled by big data and AI-based services [17, 27, 111, 116] or value conflicts of various stakeholders around the automated systems [58, 109]. Lee et al.'s [58] work is a good example where the authors discuss implications for future algorithmic services for donation allocation by identifying multiple stakeholders' value conflicts, roles and expectations.

All 4 publications on new collaborative networks enabled by big data and AI-based services [17, 27, 111, 116] also proposed new value co-creation models (*C7: Value exchange / value co-creation*, n=4) and furthermore business models (*C10: Business models*, n=4). For example, on-demand promotion and cross-platform ticketing service [116], a business model tapping on a shared economy [27, 111], and a business collaboration with insurance companies and manufacturers interested in healthcare data [17]. These 4 papers dealing with business models and AI-related technologies take up almost 40% of all 11 papers coded under C10.

5 DISCUSSION

Our systematic literature review on the 179 HCI publications revealed several trends of service design scopes in HCI, which indicate HCI's current perceptions of service design as well as limitations and future opportunities. While the increasing relevance of service design has been recently promoted [31, 54, 120], our study did not find a notable increase of service design adoptions in HCI, only except the steep increase in 2020. We noted that almost half of this steep increase in 2020 was contributed by Chinese universities (16 papers out of 35). This phenomenon can be explained by the Chinese government's current focus of research programs promoting the development of public and social services using AI technologies [79]. This finding might reflect a current rising interest in service design in Eastern Asian countries for their national growth [7], whereas service design had originally emerged and evolved in the United States and Western Europe [2]. Below, we reflect on our findings against the two main research questions.

5.1 HCI's current perceptions and adoptions of service design

According to our inductive content analysis. a journey perspective to user interaction, employee's backstage work processes and collaborative networks of multiple stakeholders were the most commonly found service design scopes in HCI publications. Inclusion of employees' backstage work and multiple stakeholders' value co-creation networks evinces that the HCI works using service design expand conventional scopes of HCI into stakeholder networks beyond end-users and political and economic landscapes around technology systems. This expansion through service design framing was envisioned by Forlizzi [31] about a decade ago and our findings demonstrate the current phenomenon.

One may argue that employees' work processes and multiple actors' collaborations have been topics of HCI since its early years, saliently in Computer-Supported Cooperative Work (CSCW) (e.g.,

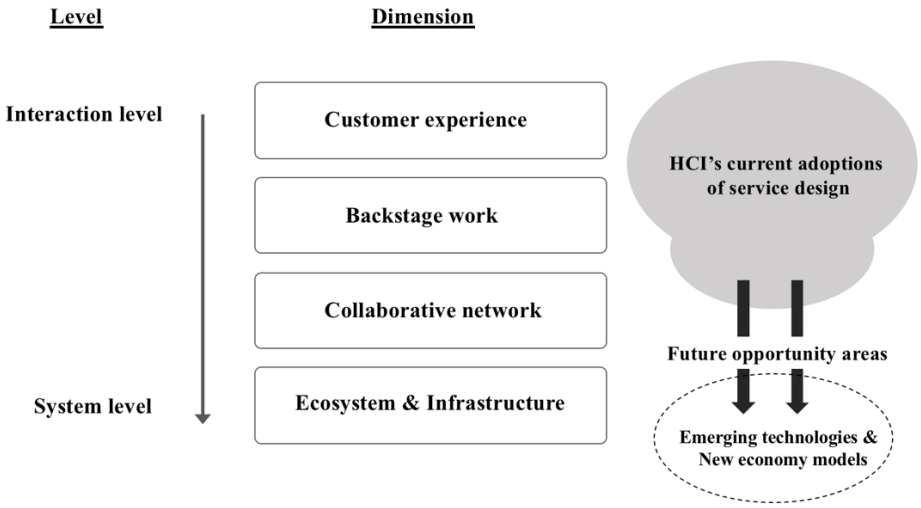

Figure 4: HCI's current adoptions of service design against the four dimensions and future opportunity areas.

[35]). The main focus of those HCI studies was to understand employees' tasks and collaborations to be able to design work technologies and collaborative systems. In other words, employees were the main users of design. Different from this, the HCI publications using service design in our dataset focus on the backstage work of employees that aligns organizational processes and user's journey. Instead of collaborative actions among multiple employees, the collaborative networks in the present HCI publications using service design focus on identifying new stakeholders to sustain a service concept [33] and proposing new value co-creation models that speculate new economic and social platforms.

While we saw the expansions of the design scope, we also found the frequent focus on user experience in the service design work of the HCI publications. A product-centric view was also observed from the findings that more than 30% of the 132 papers that used service design as a distinct approach focused on UI/UX features and more than 10% of the papers dealt with only single touchpoints. This observation is in line with Zimmerman and Forlizzi's [120] earlier concern of the conventional HCI work to be product-centric, which might hinder HCI communities from integrating a systemic perspective of service design. It is also important to note that a significant number of papers did not seem to consider service design as a distinct approach, but as part of interaction design where objects of design are digital services. Our analysis on annual volumes did not show any decreasing pattern of such publications. These findings indicate that service design is not clearly defined yet in HCI, as similarly expressed by Yu [115].

The abovementioned findings demonstrate that HCI's current perception on service design seems to remain closer to the interaction-level dimensions, i.e., the customer experience and the backstage work process, than the other two dimensions closer to the system level (see Figure 4). In terms of Kimbell's [49] conceptualization, HCI's perception on service design is closer to *the design of services*, in which services are considered as intangible objects of design, than *designing for service* that focuses on creating conditions for value co-creation [100].

A few reasons can be speculated for this "slow" and partial adoption of service design in HCI. First, service design as a discipline itself is not substantially matured yet in that many service design scholars work on the development and clarification of its disciplinary and professional identities [76, 92, 100, 115]. Secondly, whereas the interaction level service design tends to offer clear relevance and practical methodologies to HCI design, the system level service design that deals with value networks, ecologies and markets might appear business-oriented. Thus, the understanding of the system level might require a disciplinary leap for many HCI designers [88], and designing for stakeholders' values is often considered outside the scope of HCI design [81, 120]. A practical reason for the modest inclusion of the system level in HCI might be that the system level service design requires a longer-term engagement than typical HCI design projects to produce transferrable and publishable outcomes [26].

5.2 Future prospects of service design for emerging technologies and new economy models

Our analysis revealed that the body of HCI studies dealing with social computing/crowdsourcing technologies and AI-related technologies are nearest to the system level dimensions of service design. Those studies adopted service design for a broader consideration of multiple actors with political and economic concerns [83, 110], as well as new conceptualizations of system behaviors, from prescribed to unpredictable [72].

While several earlier studies argued business being out of the scope of HCI [31, 81, 114], our review revealed that HCI research starts to embrace the current interplays between technology design and business models. In fact, business has been a topic in HCI

for a long time (e.g., [10]), but the growing impact of S-D logic in technology companies and the important role of technologies as enablers of new economic models urge stronger consideration of business in technology design [88, 120].

Speed and Maxwell [88] have put forward an acute perception of the stakeholder networks, ecosystem and markets in HCI design and argued that designer's understanding of ecosystem and value constellation would extend the role of design and designers beyond being a hired hand somewhere in a linear value chain. We believe that system-level service design, or service ecosystem design [100], which intends to facilitate the emergence of desired forms of value co-creation, can inform frameworks and methodologies for such design tasks. For example, data-based technologies requiring continuous user participation will benefit from the methodic understanding of ecologies of value-in-use and value constellation offered by service ecosystem design, as it will allow designers to reveal and propose new forms of causality around their design interventions [88]. Future HCI studies dealing with AI-related technologies could benefit from integrating more system-level dimensions of service design, too, for tackling the complexity in designing fair AI systems [72, 110] and their ethical and political issues [8]. Designing with autonomous vehicles, as a platform for data and value constellation, would be a promising area for system-level service design as well.

Considering value constellation and business models might require a substantial leap in disciplinary expertise for many HCI designers. We believe that service design, more accurately service ecosystem design, can offer a valuable stepping stone. Future agenda for researchers who work across both fields of service design and HCI would be to develop methodologies and frameworks to bring business dimensions to technology design. A few precedent studies from service management have already shared methodological insights to integrate business perspectives of service design and user experience perspectives from interaction design [76, 92]. They focus on a sequential relationship between service design and interaction design where service design develops a value constellation model that informs what user interactions need to be designed. More multi-disciplinary research projects involving service design, interaction design, computer science, social science, and business would enable similar and advanced development.

6 CONCLUSION AND FUTURE WORK

This paper presents the analysis of 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. Due to the methodological choice of systematic literature review, this study only focuses on research projects and scholarly work. Future work on analysis of how HCI practitioners use service design in their work will provide a more comprehensive picture to our research questions, i.e. how HCI adopts service design. For further probing of the future prospects of service ecosystem design for emerging technologies, more in-depth studies on exemplary cases will be useful to elaborate future design and research scenarios.

ACKNOWLEDGMENTS

This research was funded by the Singapore Ministry of Education Academic Research Fund. Grant no: R-290-000-012-114.

REFERENCES

[1] Dionisis X. Adamopoulos. 2008. Design activities for supporting the evolution of service-oriented architecture. Paper presented at the ICSOFT 2008 - Proceedings of the 3rd International Conference on Software and Data Technologies. Retrieved from https://www.scitepress.org/Papers/2008/18848/18848.pdf

[2] Yoko Akama and Joyce Yee. 2016. Seeking Stronger Plurality: Intimacy and Integrity in Designing for Social Innovation. In Cumulus 2016 Conference Proceedings, edited by Cecile Kung, Elita Lam and Yanki Lee, 173–180. Hong Kong: Hong Kong Design Institute

[3] Ruiqian An and Tao Xi. 2020. Research on the Service Design of Smart Campus Based on Sustainable Strategy – Taking Smart Canteen as an Example. In: Marcus A., Rosenzweig E. (eds) Design, User Experience, and Usability. Case Studies in Public and Personal Interactive Systems. HCII 2020. Lecture Notes in Computer Science, vol 12202. Springer, Cham. https://doi.org/10.1007/978-3-030-49757-6_2

[4] Uday Athavankar, Pramod Khambete, Debjani Roy, Sujata Chaudhary, Sanjay Kimbahune, Pankaj Doke, and Sujit Devkar. 2014. Multidisciplinary Team Dynamics in Service Design- The Facilitating Role of Pattern Language. In Proceedings of the India HCI 2014 Conference on Human Computer Interaction (IndiaHCI '14). Association for Computing Machinery, New York, NY, USA, 16–25. https://doi.org/10.1145/2676702.2676703

[5] Uday Athavankar, Pramod Khambete, Pankaj Doke, Sanjay Kimbahune, Sujit Devkar, Debjani Roy, and Sujata Chaudhary. 2014. Exploring Cards for Patterns to Support Pattern Language Comprehension and Application in Service Design. In Proceedings of the India HCI 2014 Conference on Human Computer Interaction (IndiaHCI '14). Association for Computing Machinery, New York, NY, USA, 112–115. https://doi.org/10.1145/2676702.2676717

[6] Joon Sang Baek and Ezio Manzini. 2009. Designing collaborative services on the digital platform. In Proceedings of the 2009 ACM SIGCHI Conference on Creativity and Cognition, 325-326. https://doi.org/10.1145/1640233.1640282

[7] Begüm Becermen and Luca Simeone. 2020. Current and future trajectories for Service Design education: Views from educators in academia. In ServDes.2020 Tensions, Paradoxes and Plurality Conference Proceedings, 2-5th February 2021, Melbourne, Australia, Linköping Electronic Conference Proceedings 173:35, s. 369-383.

[8] Abeba Birhane. 2021. Algorithmic injustice: a relational ethics approach, Patterns, 2(2). https://doi.org/10.1016/j.patter.2021.100205

[9] Mary Jo Bitner, Bernard H. Booms and Mary Stanfield Tetreault. 1990. The Service Encounter: Diagnosing Favorable and Unfavorable Incidents. Journal of Marketing, 54(1), 71-84.

[10] Jeanette Blomberg and Shelley Evenson. 2006. Service innovation and design. CHI '06 Extended Abstracts on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 28–31. https://doi.org/10.1145/1125451.1125460

[11] Kirsten Boehner, Janet Vertesi, Phoebe Sengers, and Paul Dourish. 2007. How HCI interprets the probes. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 1077–1086. https://doi.org/10.1145/1240624.1240789

[12] Simon Bowen, Andy Dearden, Peter Wright, Daniel Wolstenholme, and Mark Cobb. 2010. Participatory healthcare service design and innovation. In Proceedings of the 11th Biennial Participatory Design Conference (PDC '10). Association for Computing Machinery, New York, NY, USA, 155–158. https://doi.org/10.1145/1900441.1900464

[13] John M. Carroll, Jiawei Chen, Chien Wen Tina Yuan and Benjamin V. Hanrahan. 2016. In Search of Coproduction: Smart Services as Reciprocal Activities. Computer, 49(7), 26-32. https://doi.org/10.1109/MC.2016.194

[14] Jesus Mario Verdugo Cedeño, Lea Hannola and Ville Ojanen. 2019. Knowledge requirements for sustainable smart service design. In Proceedings of the 11th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management. 10.5220/0008069201950202.

[15] Yesool Cha, Jinman Kim, Byoungha Park, Youngchoong Park, and Seong-Dong Kim. 2017. Development of an ICT Car Service Applying a Human-Centered Design. KSII Transactions on Internet and Information Systems, 11, 6, (2017), 3071-3085. DOI: 10.3837/tiis.2017.06.015.

[16] Kuo Ping Chang, Yu Wei Huang, Shu Yin Hsueh, Yuh Tyng Chen, Shun Nung Huang, Chien-Hsu Chen, and Sheng-Fen Chien. 2014. HIDDEN LION: a location based app game of sword lion searching. In Proceedings of the first ACM SIGCHI annual symposium on Computer-human interaction in play (CHI PLAY '14). Association for Computing Machinery, New York, NY, USA, 323–326. https://doi.org/10.1145/2658537.2662975

[17] Shanshan Chen and Yajun Li. 2020. A Study on Oral Health Care System Designing for the Middle-Aged Based on SAPAD-PCA. In: Stephanidis C., Antona M.

(eds) HCI International 2020 - Posters. HCII 2020. Communications in Computer and Information Science, vol 1226. Springer, Cham. https://doi.org/10.1007/978-3-030-50732-9_82

[18] Ting-Han Chen, Hsin-Hou Lin, and Yi-Di Yen. 2011. Mojo iCuisine: the design and implementation of an interactive restaurant tabletop menu. In Proceedings of the 14th international conference on Human-computer interaction: towards mobile and intelligent interaction environments - Volume Part III (HCII'11). Springer-Verlag, Berlin, Heidelberg, 185–194.

[19] Eun-Ji Cho. 2011. Interpersonal interaction for pleasurable service experience. In Proceedings of the 2011 Conference on Designing Pleasurable Products and Interfaces (DPPI '11). Association for Computing Machinery, New York, NY, USA, Article 68, 1–4. DOI:https://doi.org/10.1145/2347504.2347578

[20] Hee-soo Choi, Sang-Heon Kim. 2017. A content service deployment plan for metaverse museum exhibitions—Centering on the combination of beacons and HMDs. International Journal of Information Management. 37(1). 1519-1527.

[21] Ashley Colley and Jonna Häkkilä. 2018. Service Design Methods for Human Computer Interaction. In Proceedings of the 17th International Conference on Mobile and Ubiquitous Multimedia (MUM 2018). Association for Computing Machinery, New York, NY, USA, 563–566. DOI:https://doi.org/10.1145/3282894.3291046

[22] Ashley Colley, Mari Suoheimo, and Jonna Häkkilä. 2020. Exploring VR and AR Tools for Service Design. In 19th International Conference on Mobile and Ubiquitous Multimedia (MUM 2020). Association for Computing Machinery, New York, NY, USA, 309–311. DOI:https://doi.org/10.1145/3428361.3432074

[23] Anita Das and Anne Lise Sagen Major. 2016. MediTake, a medication app to improve adherence - A service design evaluation. Paper presented at the CEUR Workshop Proceedings. Retrieved from http://ceur-ws.org/Vol-1574/paper2.pdf

[24] Lorenzo Davoli and Johan Redström. 2014. Materializing infrastructures for participatory hacking. In Proceedings of the 2014 conference on Designing interactive systems (DIS '14). Association for Computing Machinery, New York, NY, USA, 121–130. DOI:https://doi.org/10.1145/2598510.2602961

[25] Retha De la Harpe. 2012. Lessons learnt from the participatory design of a mobile care data application in a resource-restricted context. In Proceedings of the 12th Participatory Design Conference: Exploratory Papers, Workshop Descriptions, Industry Cases - Volume 2 (PDC '12). Association for Computing Machinery, New York, NY, USA, 125–128. DOI:https://doi.org/10.1145/2348144.2348184.

[26] Cat Drew, Cassie Robinson, and Jennie Winhall. 2021. Systems-shifting design. An emerging practice explored. Design Council. Retrieved from: https://www.designcouncil.org.uk/sites/default/files/asset/document/Systemic%20Design%20Report.pdf

[27] Evelyn Durugy, Oussama Darouichi, and Emmanuel Fragniere. 2020. Staging Blockchain Technology In The Customer's Journey Through Service Design: A Bike-sharing Case Study To Improve Quality And Trust Perception. In Proceedings of the 2nd International Conference on Industrial Control Network And System Engineering Research (ICNSER2020). Association for Computing Machinery, New York, NY, USA, 70–76. DOI:https://doi.org/10.1145/3411016.3411161

[28] Satu Elo and Helvy Kyngäs. 2008. The qualitative content analysis process. Journal of Advanced Nursing 62(1), 107-115.

[29] Regina Erlenheim, Dirk Draheim, and Kuldar Taveter. 2020. Identifying design principles for proactive services through systematically understanding the reactivity-proactivity spectrum. In Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance (ICEGOV 2020). Association for Computing Machinery, New York, NY, USA, 452–458. https://doi.org/10.1145/3428502.3428572

[30] Jodi Forlizzi. 2010. All look same? a comparison of experience design and service design. Interactions 17(5), 60–62.

[31] Jodi Forlizzi, 2018. Moving beyond user-centered design. Interactions 25(5), 22–23.

[32] Jodi Forlizzi and John Zimmerman. 2013. Promoting service design as a core practice in interaction design. In: 5th IASDR World Conference on Design Research 2013. IASDR Press.

[33] Susan Meyer Goldstein, Robert Johnston, JoAnn Duffy, and Jay Rao. 2002. The service concept: the missing link in service design research? Journal of Operations management 20, 2, 121-134.

[34] Delia Grenville. 2014. Using a service design perspective to create an employee community of practice. In Proceedings of the 13th Participatory Design Conference: Short Papers, Industry Cases, Workshop Descriptions, Doctoral Consortium papers, and Keynote abstracts - Volume 2 (PDC '14). Association for Computing Machinery, New York, NY, USA, 145–149. https://doi.org/10.1145/2662155.2662236

[35] Kaj Grønbæk, Morten Kyng, and Preben Mogensen. 1993. CSCW challenges: cooperative design in engineering projects. Commun. ACM 36, 6 (June 1993), 67–77. https://doi.org/10.1145/153571.163272

[36] Christian Grönroos and Pekka Helle. 2010. Adopting a service logic in manufacturing: Conceptual foundation and metrics for mutual value creation, Journal of Service Management, 21(5), 564-590.

[37] Seiji Hayakawa, Yoshihiro Ueda, Kentaro Go, Katsumi Takahash, Koji Yanagida and Kazuhiko Yamazaki. 2013. User Research for Experience Vision. In: Kurosu M. (eds) Human-Computer Interaction. Human-Centred Design Approaches, Methods, Tools, and Environments. HCI 2013. Lecture Notes in Computer Science, vol 8004. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-39232-0_9

[38] Stefan Holmlid. 2007. Interaction design and service design: Expanding a comparison of design disciplines. In: Nordes 2007.

[39] Yuan-Chu Hwang. 2011. A study on healthcare support e-service design for senior citizens. Journal of Computers, 6(3), 397-403. doi:10.4304/jcp.6.3.397-403

[40] Pirita Ihamäki and Katriina Heljakka. 2020. Out of the box, into the cubes: Envisioning user experiences through a tool for gamification, toyification and playification. In: Vol. 328 LNICST. Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering, LNICST (pp. 49-68). https://doi.org/10.1007/978-3-030-53294-9_5

[41] Hedvig N. K. Iipito (Mendonca) and Izak Van Zyl. 2014. Youth empowerment: the role of service design and mobile technology in accessing reproductive health information. In Proceedings of the 13th Participatory Design Conference: Short Papers, Industry Cases, Workshop Descriptions, Doctoral Consortium papers, and Keynote abstracts - Volume 2 (PDC '14). Association for Computing Machinery, New York, NY, USA, 103–106. DOI:https://doi.org/10.1145/2662155.2662176

[42] Ohad Inbar and Noam Tractinsky. 2010. Interface-to-face: sharing information with customers in service encounters. CHI '10 Extended Abstracts on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 3415–3420. https://doi.org/10.1145/1753846.1753994

[43] Ohad Inbar and Noam Tractinsky. 2012. Lowering the line of visibility: incidental users in service encounters, Behaviour & Information Technology, 31:3, 245-260, DOI: 10.1080/0144929X.2011.563796

[44] Liu Jingdong, Zheng Shuang, Fu Si, and Fei Hao. 2017. The Medical Experiential Service Design Based on Users. 2016 Intl IEEE Conferences on Ubiquitous Intelligence & Computing, Advanced and Trusted Computing, Scalable Computing and Communications, Cloud and Big Data Computing, Internet of People, and Smart World Congress (UIC/ATC/ScalCom/CBDCom/IoP/SmartWorld), 2016, pp. 1039-1044, doi: 10.1109/UIC-ATC-ScalCom-CBDCom-IoP-SmartWorld.2016.0162.

[45] Anu Kankainen, Kirsikka Vaajakallio, Vesa Kantola, and Tuuli Mattelmäki. 2012. Storytelling Group – a co-design method for service design. Behaviour & Information Technology 31(3), 221-230. https://doi.org/10.1080/0144929X.2011.563794

[46] Pramod Khambete. 2011. A pattern language for touch point ecosystem user experience: a proposal. In Proceedings of the 3rd International Conference on Human Computer Interaction (IndiaHCI '11). Association for Computing Machinery, New York, NY, USA, 68–74. https://doi.org/10.1145/2407796.2407805

[47] Pramod Khambete, Debjani Roy, and Sujit Devkar. 2015. Validation of a Service Design Pattern Language as an Effective Framework for Multidisciplinary Design. In Proceedings of the 7th International Conference on HCI, IndiaHCI 2015 (IndiaHCI'15). Association for Computing Machinery, New York, NY, USA, 1–9. https://doi.org/10.1145/2835966.2835967

[48] Han-Jong Kim, Chang Min Kim, and Tek-Jin Nam. 2018. SketchStudio: Experience Prototyping with 2.5-Dimensional Animated Design Scenarios. In Proceedings of the 2018 Designing Interactive Systems Conference (DIS '18). Association for Computing Machinery, New York, NY, USA, 831–843. https://doi.org/10.1145/3196709.3196736

[49] Lucy Kimbell. 2011. Designing for service as one way of designing services. International Journal of Design 5, 41-52.

[50] Stephen F. King and Paul Brown. 2007. Fix my street or else: using the internet to voice local public service concerns. In Proceedings of the 1st international conference on Theory and practice of electronic governance (ICEGOV '07). Association for Computing Machinery, New York, NY, USA, 72–80. https://doi.org/10.1145/1328057.1328076

[51] Olli Korhonen and Minna Isomursu. 2017. Identifying personalization in a care pathway: A single-case study of a Finnish healthcare service provider. In Proceedings of the 25th European Conference on Information Systems (ECIS), Guimarães, Portugal, June 5-10, 2017 (pp. 828-841).

[52] Joanna Kwiatkowska, Agnieszka Szóstek, and David Lamas. 2014. Design artefacts as service design concepts: a case study from a telecommunication domain. In Proceedings of the 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational (NordiCHI '14). Association for Computing Machinery, New York, NY, USA, 89–92. https://doi.org/10.1145/2639189.2639253

[53] Effie Lai-Chong Law, Virpi Roto, Marc Hassenzahl, Arnold P.O.S. Vermeeren, and Joke Kort. 2009. Understanding, scoping and defining user experience: a survey approach. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 719–728. https://doi.org/10.1145/1518701.1518813

[54] Jung-Joo Lee. 2020. Service design and blind mice. Interactions 27(2), 20–21.

[55] Min Kyung Lee, Sara Kielser, Jodi Forlizzi, Siddhartha Srinivasa, and Paul Rybski. 2010. Gracefully mitigating breakdowns in robotic services. In Proceedings of the 5th ACM/IEEE international conference on Human-robot interaction (HRI '10). IEEE Press, 203–210.

[56] Min Kyung Lee, Jodi Forlizzi, Sara Kiesler, Paul Rybski, John Antanitis, and Sarun Savetsila. 2012. Personalization in HRI: a longitudinal field experiment. In Proceedings of the seventh annual ACM/IEEE international conference on Human-Robot Interaction (HRI '12). Association for Computing Machinery, New York, NY, USA, 319–326. https://doi.org/10.1145/2157689.2157804

[57] Min Kyung Lee, Sara Kiesler, Jodi Forlizzi, and Paul Rybski. 2012. Ripple effects of an embedded social agent: a field study of a social robot in the workplace. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 695–704. https://doi.org/10.1145/2207676.2207776

[58] Min Kyung Lee, Ji Tae Kim, and Leah Lizarondo. 2017. A Human-Centered Approach to Algorithmic Services: Considerations for Fair and Motivating Smart Community Service Management that Allocates Donations to Non-Profit Organizations. Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 3365–3376. https://doi.org/10.1145/3025453.3025884

[59] Na Liu, Alex Gavino, and Sandeep Purao. 2014. A method for designing value-infused citizen services in smart cities. In Proceedings of the 15th Annual International Conference on Digital Government Research (dg.o '14). Association for Computing Machinery, New York, NY, USA, 34–43. DOI:https://doi.org/10.1145/2612733.2612753

[60] Christopher Lovelock and Evert Gummesson. 2004. Whither Services Marketing? In: Search of a New Paradigm and Fresh Perspectives. Journal of Service Research 7(1), 20-41. https://doi.org/10.1177/1094670504266131

[61] Jonas Lundberg, Mattias Arvola, Carl Westin, Stefan Holmlid, Mathias Nordvall, and Billy Josefsson. 2018. Cognitive work analysis in the conceptual design of first-of-a-kind systems – designing urban air traffic management, Behaviour & Information Technology, 37(9), 904-925, https://doi.org/10.1080/0144929X.2018.1505951

[62] Lokman I. Meho and Yvonne Rogers. 2008. Citation counting, citation ranking, and h-index of human-computer interaction researchers: A comparison of Scopus and Web of Science. 59(11), 1711-1726. https://doi.org/10.1002/asi.20874

[63] Yidan Men, Robert Chen and Xiaoping Hu. 2020. User Experience of Interaction Design in Local Cultural Heritage Museum Based on Digital Information Services and Navigation Support. In: Rauterberg M. (eds) Culture and Computing. HCII 2020. Lecture Notes in Computer Science, vol 12215. Springer, Cham. https://doi.org/10.1007/978-3-030-50267-6_15

[64] Anna Meroni and Daniela Sangiorgi. 2011. Design for Services. Gower.

[65] Johanna Meurer, Christina Pakusch, Gunnar Stevens, Dave Randall, and Volker Wulf. 2020. A Wizard of Oz Study on Passengers' Experiences of a Robo-Taxi Service in Real-Life Settings. Proceedings of the 2020 ACM Designing Interactive Systems Conference. Association for Computing Machinery, New York, NY, USA, 1365–1377. https://doi.org/10.1145/3357236.3395465

[66] Jessica Meyerson, Patricia Galloway, and Randolph Bias. 2012. Improving the user experience of professional researchers: Applying a user-centered design framework in archival repositories, Proceedings of the American Society for Information Science and Technology, 49(10), 1-7.

[67] David Moher, Alessandro Liberati, Jennifer Tetzlaff, and Douglas G Altman for the PRISMA Group. 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS med. 2009 Jul 21;6(7):e1000097. doi: 10.1371/journal.pmed.1000097

[68] John Murphy, Frederica Densley, and Stuart Ross. 2019. Service Design - Forensic Evaluation Model (SD-FEM): Towards a practical model for evaluation of a mobile application to support forensic clients with drug and alcohol addiction. In Proceedings of the 31st Australian Conference on Human-Computer-Interaction (OZCHI'19). Association for Computing Machinery, New York, NY, USA, 513–517. https://doi.org/10.1145/3369457.3369544

[69] Claudia Nass, Marcus Trapp, and Karina Villela. 2018. Tangible design for software ecosystem with Playmobil®In Proceedings of the 10th Nordic Conference on Human-Computer Interaction (NordiCHI '18). Association for Computing Machinery, New York, NY, USA, 856–861. https://doi.org/10.1145/3240167.3240278

[70] Antônio Carlos F. Nunes, De Souza, Carolina Thaines Moreira de Souza, and Claudio Fabricio de Assis Lourenço da Silva. 2018. A new approach to conceive user-focused services and solutions. Paper presented at the TNC 2018 - Intelligent Networks, Cool Edges https://tnc18.geant.org/getfile/3951

[71] Danny Ronald Nyatuka and Retha de la Harpe. 2019. Evaluating mHealth Interventions in an Underserved Context Using Service Design Strategy: A Case of Kenya. In Proceedings of the third International Conference on Medical and Health Informatics 2019 (ICMHI 2019). Association for Computing Machinery, New York, NY, USA, 153–160. https://doi.org/10.1145/3340037.3340060

[72] Thomas Olsson and Kaisa Väänänen. 2021. How does AI challenge design practice? interactions 28, 4 (July - August 2021), 62–64. https://doi.org/10.1145/3467479

[73] Otake-Matsuura M. *et al.* 2020. Services for Cognitive Health Co-created with Older Adults. In: Gao Q., Zhou J. (eds) Human Aspects of IT for the Aged Population. Technologies, Design and User Experience. HCII 2020. Lecture Notes in Computer Science, vol 12207. Springer, Cham. https://doi.org/10.1007/978-3-030-50252-2_5

[74] Tim Overkamp, Johan Blomkvist, Vanessa Rodrigues, Mattias Arvola, and Stefan Holmlid. 2018. Resource integration as a perspective on value in interaction design. In Proceedings of the 32nd International BCS Human Computer Interaction Conference (HCI '18). BCS Learning & Development Ltd., Swindon, GBR, Article 79, 1–5. https://doi.org/10.14236/ewic/HCI2018.79

[75] Gert Pasman. 2011. Lost in transition: issues in designing crossmedia applications and services. In Proceedings of the 29th ACM international conference on Design of communication (SIGDOC '11). Association for Computing Machinery, New York, NY, USA, 175–180. https://doi.org/10.1145/2038476.2038511

[76] Lia Patrício, Raymond P. Fisk, João Falcão e Cunha, and Larry Constantine. 2011. Multilevel Service Design: From Customer Value Constellation to Service Experience Blueprinting. Journal of Service Research 14(2), 180-200. https://doi.org/10.1177/1094670511401901

[77] Lia Patrício, Anders Gustafsson, and Raymond P. Fisk. 2017. Upframing Service Design and Innovation for Research Impact. Journal of Service Research 21(1), 3-16. https://doi.org/10.1177/1094670517746780

[78] Andy Polaine, Lavrans Løvlie, and Ben Reason. 2013. Service Design: From Insight to Implementation. Rosenfeld Media.

[79] Huw Roberts, Josh Cowls, Jessica Morley, Mariarosaria Taddeo, Vincent Wang, and Luciano Floridi. 2021. The Chinese approach to artificial intelligence: an analysis of policy, ethics, and regulation. AI & Soc 36, 59–77. https://doi.org/10.1007/s00146-020-00992-2

[80] Virpi Roto, Jung-Joo Lee, Tuuli Mattelmäki, and John Zimmerman. 2018. Experience Design meets Service Design: Method Clash or Marriage? In Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems (CHI EA '18). Association for Computing Machinery, New York, NY, USA, Paper W26, 1–6. https://doi.org/10.1145/3170427.3170626

[81] Virpi Roto, Jung-Joo Lee, Effie Lai-Chong Law, and John Zimmerman. 2021. The Overlaps and Boundaries Between Service Design and User Experience Design. In Designing Interactive Systems Conference 2021 (DIS '21). Association for Computing Machinery, New York, NY, USA, 1915–1926. DOI:https://doi.org/10.1145/3461778.3462058

[82] Joanna Saad-Sulonen, Amalia de Götzen, Nicola Morelli, and Luca Simeone. 2020. Service design and participatory design: time to join forces? In Proceedings of the 16th Participatory Design Conference 2020 - Participation(s) Otherwise - Volume 2 (PDC '20). Association for Computing Machinery, New York, NY, USA, 76–81. DOI:https://doi.org/10.1145/3384772.3385133

[83] Katie Shilton. 2018. Values and Ethics in Human-Computer Interaction. Found. Trends Hum.-Comput. Interact. 12, 2 (16 7 2018), 107–171. DOI:https://doi.org/10.1561/1100000073

[84] G. Lynn Shostack, 1982. How to design a service. European Journal of Marketing 16(1), 49-63.

[85] Shyama V.S., Ulemba Hirom, Sylvan Lobo, Sujit Devkar, Pankaj Doke and Nikita Pandey. 2017. Participatory Design of Vaccination Services with Less-Literate Users. In: Stephanidis C. (eds) HCI International 2017 – Posters' Extended Abstracts. HCI 2017. Communications in Computer and Information Science, vol 714. Springer, Cham. https://doi.org/10.1007/978-3-319-58753-0_45

[86] Giulia Simeone and Marta Corubolo. 2011. Co-design tools in 'place' development projects: an ongoing research case. In Proceedings of the 2011 Conference on Designing Pleasurable Products and Interfaces (DPPI '11). Association for Computing Machinery, New York, NY, USA, Article 4, 1–8. DOI:https://doi.org/10.1145/2347504.2347509

[87] Rafael Soldatelli, Liberatore Prando, Graziella; Xavier da Costa and Filipe Campelo. 2008. The narrative of experience: Modelling user experience through the use of literary narratives for the construction of the user journey. Paper presented at the Proceedings from the 6th Conference on Design and Emotion 2008.

[88] Chris Speed and Deborah Maxwell. 2015. Designing through value constellations. Interactions 22, 5 (September-October 2015), 38–43. DOI:https://doi.org/10.1145/2807293

[89] Jaakko Stenros and Olli Sotamaa. 2009. Commoditization of helping players play: Rise of the service paradigm. Paper presented at the Breaking New Ground: Innovation in Games, Play, Practice and Theory - Proceedings of DiGRA 2009. http://www.digra.org/wp-content/uploads/digital-library/09287.24201.pdf

[90] Marc Stickdorn and Jakob Schneider, 2012. This is service design thinking: Basics, tools, cases. Wiley.

[91] Anna-Liisa Syrjänen, Vesa Sihvola, Kari Kuutti, and Raisa Vilmunen. 2012. Human-to-human interfaces for remote service kiosks: the potential of audiovisual communication. In Proceedings of the 7th Nordic Conference on Human-Computer Interaction: Making Sense Through Design (NordiCHI '12). Association for Computing Machinery, New York, NY, USA, 288–297. DOI:https://doi.org/10.1145/2399016.2399062

[92] Jorge Grenha Teixeira, Lia Patrıcio, Ko-Hsun Huang, Raymond P. Fisk, Leonel Nobrega, and Larry Constantine. 2017. The MINDS Method: Integrating Management and Interaction Design Perspectives for Service Design. Journal of Service Research. 20(3). 240-258.

[93] Hanne E. Thomassen and Babak A. Farshchian. 2016. A technology-enhanced service for person-centered dementia care: Preliminary results from a field trial. In Proceedings of the 9th ACM International Conference on PErvasive Technologies Related to Assistive Environments (PETRA '16). Association for Computing Machinery, New York, NY, USA, Article 52, 1–4. DOI:https://doi.org/10.1145/2910674.2910722

[94] Karim Touloum, Djilali Idoughi and Ahmed Seffah. 2017. User Experience in Service Design: A Case Study from Algeria. IT Professional, 19(1), 56-58. doi:10.1109/MITP.2017.1 https://doi.org/10.1109/MITP.2017.1

[95] Yoshihiro Ueda, Kentaro Go, Katsumi Takahashi, Seiji Hayakawa, Kazuhiko Yamazaki, and Koji Yanagida. 2013. Structured scenario-based design method for experience vision. In Proceedings of the 15th international conference on Human-Computer Interaction: human-centred design approaches, methods, tools, and environments - Volume Part I (HCI'13). Springer-Verlag, Berlin, Heidelberg, 500–509. DOI:https://doi.org/10.1007/978-3-642-39232-0_54

[96] Kaisa Väänänen-Vainio-Mattila and Minna Wäljas. 2009. Developing an expert evaluation method for user eXperience of cross-platform web services. In Proceedings of the 13th International MindTrek Conference: Everyday Life in the Ubiquitous Era (MindTrek '09). Association for Computing Machinery, New York, NY, USA, 162–169. DOI:https://doi.org/10.1145/1621841.1621871

[97] Krista Van Laan and Eva Jonshult. 2005. Improving the usability of VeriSign®SSL certificate enrollment. In Proceedings of the 2005 conference on Designing for User eXperience (DUX '05). AIGA: American Institute of Graphic Arts, New York, NY, USA, 12–es.

[98] Stephen L. Vargo and Robert F. Lusch. 2004. Evolving to a New Dominant Logic for Marketing. Journal of Marketing 68(1), 1-17.

[99] Polyxeni Vassilakopoulou, Miria Grisot and Margunn Aanestad. 2016. Enabling Electronic Interactions between Patients and Healthcare Providers: a service design perspective, Scandinavian Journal of Information Systems: Vol. 28 : Iss. 1 , Article 3.

[100] Josina Vink, Kaisa Koskela-Huotari, Bard Tronvoll, Bo Edvardsson, and Katarina Wetter-Edman. 2021. Service ecosystem design: propositions, process model, and future research agenda. Journal of Service Research, 24(2), 168-186.

[101] Anne Carlijn Vis. 2017. Co-design in specialist care - Aspects to consider. Paper presented at the CEUR Workshop Proceedings. Retrieved from http://ceur-ws.org/Vol-2001/paper6.pdf

[102] Sheng-Ming Wang, Sara Sanchez, Yu-Chen Wang, Wei-Jie Pan and Cheng-Yen Lin. 2020. Service Design for Proposing an Innovative Intergenerational Interaction Platform. In: Rau PL. (eds) Cross-Cultural Design. User Experience of Products, Services, and Intelligent Environments. HCII 2020. Lecture Notes in Computer Science, vol 12192. Springer, Cham. https://doi.org/10.1007/978-3-030-49788-0_17

[103] Zhengyu Wang, Meiyu Zhou, Zhengyu Shi and Jiayi Lian. 2020. Research on Design of Shared Bicycle Service System Based on Kansei Engineering. In: Stephanidis C., Antona M. (eds) HCI International 2020 - Posters. HCII 2020. Communications in Computer and Information Science, vol 1226. Springer, Cham. https://doi.org/10.1007/978-3-030-50732-9_90

[104] Peter J. Wild. 2008. HCI and the analysis, design, and evaluation of services. In: BCS - HCI 2008, pp. 207–208. BCS Learning & Development Ltd.

[105] Don Williams, Gavin Kelly, and Lisa Anderson. 2004. MSN 9: new user-centered desirability methods produce compelling visual design. In CHI '04 Extended Abstracts on Human Factors in Computing Systems (CHI EA '04). Association for Computing Machinery, New York, NY, USA, 959–974. DOI:https://doi.org/10.1145/985921.985952

[106] Philipp Wintersberger, Tobias Klotz, and Andreas Riener. 2020. Tell Me More: Transparency and Time-Fillers to Optimize Chatbots' Waiting Time Experience. In Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society (NordiCHI '20). Association for Computing Machinery, New York, NY, USA, Article 76, 1–6. DOI:https://doi.org/10.1145/3419249.3420170

[107] Kazuhiko Yamazaki, Kentaro Go, Katsumi Takahashi, Seiji Hayakawa, Yoshihiro Ueda and Koji Yanagida. 2013. Proposal for Experience Vision. In: Kurosu M. (eds) Human-Computer Interaction. Human-Centred Design Approaches, Methods, Tools, and Environments. HCI 2013. Lecture Notes in Computer Science, vol 8004. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-39232-0_16

[108] Chia-Han Yang and Shun-Nung Huang. 2016. Building the empowered community towards a service design perspective: Case study of West Central District in Tainan, International Conference on Orange Technologies (ICOT), pp. 63-66, doi: 10.1109/ICOT.2015.7498507.

[109] Qian Yang, John Zimmerman, Aaron Steinfeld, Lisa Carey, and James F. Antaki. 2016. Investigating the Heart Pump Implant Decision Process: Opportunities for Decision Support Tools to Help. Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 4477–4488. DOI:https://doi.org/10.1145/2858036.2858373

[110] Qian Yang, Aaron Steinfeld, Carolyn Rosé, and John Zimmerman. 2020. Re-examining Whether, Why, and How Human-AI Interaction Is Uniquely Difficult to Design. Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 1–13. DOI:https://doi.org/10.1145/3313831.3376301

[111] Taeha Yi, Jimin Rhim, Injung Lee, Amartuvshin Narangerel and Ji-Hyun Lee. 2017. Service Design of Intergeneration Home-Sharing System Using VR-Based Simulation Technology and Optimal Matching Algorithms. In: Stephanidis C. (eds) HCI International 2017 – Posters' Extended Abstracts. HCI 2017. Communications in Computer and Information Science, vol 714. Springer, Cham. https://doi.org/10.1007/978-3-319-58753-0_15

[112] Daisy Yoo, John Zimmerman, Aaron Steinfeld, and Anthony Tomasic. 2010. Understanding the space for co-design in riders' interactions with a transit service. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 1797–1806. DOI:https://doi.org/10.1145/1753326.1753596

[113] Daisy Yoo, John Zimmerman, and Tad Hirsch. 2013. Probing bus stop for insights on transit co-design. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 409–418. DOI:https://doi.org/10.1145/2470654.2470714

[114] Daisy Yoo, Anya Ernest, Sofia Serholt, Eva Eriksson, and Peter Dalsgaard. 2019. Service Design in HCI Research: The Extended Value Co-creation Model. In Proceedings of the Halfway to the Future Symposium 2019 (HTTF 2019). Association for Computing Machinery, New York, NY, USA, Article 17, 1–8. DOI:https://doi.org/10.1145/3363384.3363401

[115] Eun Yu. 2020. Toward an Integrative Service Design Framework and Future Agendas. Design Issues 36(2), 41-57.

[116] Xiaofang Yuan and Qiujie Jiang. 2020. Behavioral Research and Service Innovation of Cinema Viewers in China. In: Stephanidis C., Antona M. (eds) HCI International 2020 - Posters. HCII 2020. Communications in Computer and Information Science, vol 1226. Springer, Cham. https://doi.org/10.1007/978-3-030-50732-9_93

[117] Wu Yue and Xin Chen. 2020. Exploring Information Support in Mobile Terminal Guidance in the Context of Medical Service. In: Marcus A., Rosenzweig E. (eds) Design, User Experience, and Usability. Case Studies in Public and Personal Interactive Systems. HCII 2020. Lecture Notes in Computer Science, vol 12202. Springer, Cham. https://doi.org/10.1007/978-3-030-49757-6_27

[118] Di Zhu, Wei Liu and Yanrui Qu. 2020. User Research on Digital Consumption Behavior and Design Guidelines in Connecting Vehicle Context. In: Marcus A., Rosenzweig E. (eds) Design, User Experience, and Usability. Design for Contemporary Interactive Environments. HCII 2020. Lecture Notes in Computer Science, vol 12201. pp.716-729. Springer, Cham. https://doi.org/10.1007/978-3-030-49760-6_50

[119] John Zimmerman, Anthony Tomasic, Charles Garrod, Daisy Yoo, Chaya Hiruncharoenvate, Rafae Aziz, Nikhil Ravi Thiruvengadam, Yun Huang, and Aaron Steinfeld. 2011. Field trial of Tiramisu: crowd-sourcing bus arrival times to spur co-design. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. Association for Computing Machinery, New York, NY, USA, 1677–1686. DOI:https://doi.org/10.1145/1978942.1979187

[120] John Zimmerman and Jodi Forlizzi. 2019. Service Design. In Encyclopedia of Human-Computer Interaction (2nd. ed.). Interaction Design Foundation. Retrieved December 22, 2021 from https://www.interaction-design.org/literature/book/theencyclopedia-of-human-computer-interaction-2nd-ed/service-design