



Understanding Service Design and Design Thinking Differences Between Research and Practice: An Empirical Study

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Abstract. Service Design (SD) and Design Thinking (DT) evolved in the last decade and have become popular in the research field of service science. However, the application of SD and DT research outcomes into practice is still scarce. To help understanding the differences between research and practice, we conducted 20 semi-structured interviews with professionals and trainees from four organizations that are involved in service innovation projects. The results reveal several similarities and complementarities, (dis)advantages, requests and obstacles, which hinder companies from implementing and using structured SD and DT approaches. The findings present some challenges for both researchers and practitioners on actions they could take to overcome barriers and foster the SD and DT practice within organizations.

Keywords: Service Design · Design Thinking · Service innovation · Qualitative analysis

1 Introduction

Services industries have expanded fast in the past decades and the rise of service-based business models become crucial to offer services as a company to stay competitive grows [1]. Moreover, in today's digital economy there is a huge demand in managing product-service offerings using structured and digitalized methods and IT tools in companies [2]. This trend, often referred to *service innovation*, can be capitalized on by using Service Science (SS) methodologies. More recently, many producing companies have shown an increasing interest in service innovation due to changing business models, value co-creation, and profit margins and, therefore, have evolved a demand for SS methodologies over the recent years [3].

As such, service design and service innovation activities should create the value constellations [4], beneficial for both business and customer. The knowledge about the benefits of using structured methods and procedures in service innovation, in general can be assumed. However, although many SS methodologies and models are

extensively discussed in relevant literature, only few structured service procedure methodologies are actually implemented and used in practice.

Service Science (SS) evolved in the last years and has become a popular and interdisciplinary field of research that focuses on the structured development of services. SS is defined as the application of scientific, management, engineering and design on tasks that a person, organization or system perform with another person, organization or system, and thus growing the service innovation research [5].

Service design (SD) and design thinking (DT), being part of the SS discipline [6], both represent an interdisciplinary/holistic approach that aims to systematically design service value propositions using frameworks, methods and tools [4, 5, 7].

SD and DT approaches with a strong focus on user centrality, customer integration and multidisciplinary collaboration have recently become highly relevant in SS, driven by the growing emphasis on customer orientation and service systems [7, 8]. Consequently, these methods have been highly suitable for the customer-centered development of smart service innovation.

Being a recent research stream of SS there is a few knowledge about how organizations and businesses understand, implement and apply SD and DT approaches, (e.g. framework, principles, object, processes and tools). Beyond the growing body of literature on service science innovation, empirical exploratory research focusing on SD and DT approaches remains scarce. Even though there is a mass of contributions discussing the concept and the process of DT and SD, there is lack of clarification regarding each approach. In addition, there is little research about how these two approaches relate with each other and how they are being applied in practice, thereby constituting the main challenge of this study. Therefore, we determine the following research questions (RQ) for this contribution:

1. What are the main principles and approaches of SD and DT and how are they understood in practice?
2. What are the differences, shared ground and complementarities between SD and DT?
3. Which are the (dis)advantages of SD and DT in practice?

To help understanding the gap between research and practice of SD and DT approaches, we conducted 20 semi-structured interviews with 7 experts from several organizations, and 13 trainees involved in structured development of services-and-product-innovation. To address the research questions, this paper is organized as follows: Sect. 2 presents the theoretical underpinnings of this study, reviewing the state-of-the-art with respect to SD and DT research. Methodology and sample characteristics of the empirical study are detailed described in Sect. 3. The results of the interviews are presented in Sect. 4. Section 5 discusses the main findings of this study, as well as the main faced challenges. Finally, recommendations for practitioners and some topics for future research are suggested.

2 Service Design and Design Thinking

In the past decades the Service Science research has increased and attracted the attention of the academic community [5–7]. More recently, service innovation is on the agenda of a lot of different research streams [9] e.g. business literature, service management & marketing [10], IS literature, and more recently on smart services literature [11, 12], as well as in practice.

Service innovation refers to the creation of new and/or enhanced service offerings, service processes, and service business models [13]. Innovations can be driven by a detailed understanding of people's needs and their preferences. Hence, with the change of the overall business landscape, human-centered, creative, iterative and practical approaches are required to produce innovative ideas, developing integrated solutions of product-services so that companies gain competitive advantage [14, 15].

This perspective is embedded in the *Service-dominant* (S-D) logic which is supported by the value-in-use and co-creation of value rather than the value-in-exchange and embedded-value, concepts of the goods-dominant (G-D) logic [16]. Although, the service is designed aiming to provide experiences to the customer, these experiences cannot be pre-designed [17]. Hence, a service must be designed in a holistic and adaptable way, allowing customers to co-create experiences regarding their preferences [18]. As such, services are increasingly created in service value networks with multiple agents that cooperate and exchange resources [7, 19]. This view on *service design* offers new possibilities for innovation based on resource sharing, but it also signifies that the network of multiple agents has to be taken into account in service engineering [20].

Service Design (SD) is understood as an interdisciplinary, creative and holistic approach which is becoming commonly used to improve and create services. This approach considers the customer or user as the starting point for launching a new service or improve an existing one [21]. Therefore, the main focus of SD is to provide a holistic and well-planned customer experience, always taking into consideration the customer problems and needs [22], and the processes involving the service, the tangible evidences and the technology solutions supporting the experience/system/service [18].

Design Thinking (DT) is a human-centered approach to innovation based on design tools to integrate the needs of people, the potential technologies and the requirements in order for businesses to have success [14]. It is useful for any type of organization, as it allows to work with open and complex problems [23, 24].

SD and DT are a new field of design investigation where the vocabulary and paradigm are still developing. Both are *human-centered* and can be applied regarding problem framing, information gathering and interpretation, solution ideation and evaluation in the development of an existing service or designing a new service solution. Equally, SD and DT are involved in the called *Human-Centered Design* which captures insights and produces innovative solutions that reflect the needs of the consumers [14]. Therefore, in this perspective SD and DT presents similarities and complementarities.

There is a sort of different models in literature, as well on practice (e.g. on companies' websites) regarding the SD and DT process and, these process models vary

according to the number of steps or the precision identified in each phase. In general, these models and methodologies aim to assist companies in executing the service innovation development process in a structured manner and reduce the difficulty of the project by ex-ante defining the different phases.

A description of the state-of-the-art in research of SD and DT regarding both concept, principles, object, models, process, methods and tools is summarized, respectively on Tables 2 and 3, on Sect. 4.

3 Research Method

To address the research questions, an exploratory study using qualitative research was conducted, as it is suitable to acquire in-depth understanding about a subject [25–27]. In accordance to the authors, we conducted semi-structured interviews with practitioners to obtain qualitative information regarding the knowledge and usage of SD and DT approaches on service innovation projects. Semi-structured interviews have been chosen as a suitable methodology to address the stated research questions, since they promise exploring, understanding and learning about experiences and behaviours with openness [28], providing good practical data from experts of leading organizations in service innovation field. To achieve our goal, some principles and practices of Grounded Theory were used to acquire in-depth understanding about the emergent concepts during the interviews when compared with the ones in theory [29]. In a first stage, an interview guideline has been prepared to ensure the coverage of topic-related information. Secondly, we evaluate the first interaction of the guideline within a pre-test with other researchers to prevent ambiguity, complexity of terms and to obtain first insights about time spent and other constraints, as scientific questionnaires are extensive in nature. The questions and structure of the interview guideline is divided into three sections: (1) the interviews started with an introduction about the goal and scope of the research and general questions regarding the practical background of the interviewee and which innovation project(s) the participants were involved. Besides, the interesting insides about the interviewee, it introduces them about the basic questions to the situation and reduces barriers in terms of the relationship between interviewer and interviewee. In addition, a contextualisation was also made and some documentation with definitions shown, in case of hypothetical doubts about the subject. Afterward, the main part of the interviews (2) focus on participant's point of view and insights regarding the usage of SD and DT approaches involved for application on service innovation projects in practice, namely: the followed principles, steps, processes, methods and tools, as well as its perceived advantages and disadvantages. Closing with (3) final comments and opinions of the interviewees about the expected results. Interviews took on average 28–30 min.

Sampling. The interviewees are primarily professionals/teaching assistants and former students/trainees of Porto Design Factory (PDF) working directly in services innovation projects, where students from different areas and nationalities cooperate in order to develop innovative projects with business organizations. The interviewed former students are from the ME310 – Product and Service Innovation Post-Graduation which is focused on teaching students the innovation methods and processes for designers,

engineers, and future project managers, and the SQUAD program focused on digital design and experience design. Additionally, experts from leading enterprises on service innovation were included, to obtain a richer understanding regarding the SD and DT practice, as well, to allow a comparison of the results between practitioners with different levels of expertise (e.g. novices vs experts). To get a variety of insights enterprises experts have been chosen, since they were proficient and are spread in different service areas (ICT, consultancy, health-care, customer service). The sample design is split into professionals and trainees to understand the different points of view of practitioners with different levels of expertise regarding service innovation approaches. As showed in Table 1, a list of all organizations and their interviewed position is presented. In total, 20 in-depth interviews were conducted: 13 trainees and 7 professionals were interviewed. ME310 students have already finished their degree and have background in design and engineering. SQUAD students have finishing their degree and have background in design, marketing and social sciences. Regarding the professionals, the teaching assistants have already attended a course at PDF and the remaining interviewees have background in engineering, design and economics and work at companies that use DT and SD to develop their projects.

Table 1. Sample characteristics.

Interviewee and position		Number
Trainees	ME310 – product and service post graduation	9
	SQUAD program	4
Professionals	Teaching assistant at PDF	2
	Arts and design teacher	1
	Healthcare industry lead	1
	Service line manager	1
	UX specialist	1
	Former ME310 student and teacher	1
Total		20

Data Analysis. To evaluate the transcribed interviews, we follow the several steps of the qualitative content analysis, according with Charmaz [28]. The first step of the process was the transcription of the interviews in several segments. Afterwards, the process called initial coding started, that aims coding and reducing the statements into a set of relevant and meaningful categories and subcategories, helping in the analytic process. This process was iterative as it requires the constant analyses, as the research evolves, and data was coded several times in different categories and concepts. Next step, called axial coding, is the process of relating the codes (categories and subcategories) to each other, creating a hierarchy. For example, when an interviewee described a principle within the Service Design approach, that information is coded in the following way: “Service Design; Principles; Human-Centered”, where Principles and Human-Centered are subcategories of the category Service Design. All steps are performed using the software NVivo12 (NVivo Transcription). To address the research questions, the SD and DT categories are divided into seven subcategories: definition,

principles, object of study, process, tools, advantages and disadvantages. The results of our analysis will be following explained.

4 Results

4.1 Design Thinking Research Versus Practice

To address the RQ, a description of the state-of-the-art for DT in research, regarding both concept, object, models, process and tools, and the results of the interviews for the DT practise, on the five subcategories are summarized in Table 2.

Table 2. Design thinking comparison between research and practice

Categories	DT research	DT practice	Common
Concept	Conceptualized as a human-centered approach as it applies the tools of a designer and embraces human skills to stimulate transformation and development [14]	Considered a human-centered mindset which uses visual tools to promote the abductive thinking in order to solve problems	Human-centered
Principles	Empathy; collaboration; testing; human-centered [32]	No criticism; testing; build on top; build to think, don't think to build; collaborative; iterative; real; human-centered	Testing; collaboration; human-centered
Objects	Product; service; experiences [23]	Service; product service system; products	Product; service
Process	3 I Model: inspiration, ideation and implementation [33]; HCD model: hearing, creating and delivering [33]; Double diamond: divergent and convergent phases [30]; The design thinking model by the Hasso-Plattner-Institute: empathize; define; ideate; prototype; test [31]	Double diamond empathize; define; ideate; prototype; test	Double diamond empathize; define; ideate; prototype; test
Tools	Interviews; observation; conversations; personas; role objectives; explore customer's pain points; body storming; mind mapping [31]; sketching; value chain analysis; brainstorming; concept development assumption; customer co-creation; learning launch [34]; stakeholders map; customer journey map; service blueprint, business model innovation; rapid prototyping tools [35]; "How might we?" questions [32]	Prototypes; interviews; ideation techniques mainly brainstorming; benchmarking; observation; personas; empathy map; business model canvas; user journey map	Interviews; prototyping; user journey map

When compared DT between research and usage by practitioners, as results show, the main differences essentially arise in the definition of the concept, since in literature DT is considered an approach and in interviews is referred as a mindset. Regarding the principles, in practice the respondents see DT more broadly, however they also focus on essential points present in literature. Concerning the objects, process and tools responses have many similarities with the literature. Regarding the process, participants mainly use the “Double Diamond” [30] and the steps of The Design Thinking Model by the Hasso-Plattner-Institute [31]. The most common used tools are “Interviews; Prototyping and User Journey Map”. Globally, in practice DT is not referred as a methodology, since people do not see DT as something to follow rules, but rather a way of freely thinking without censorship, being iterative in nature and promoting abductive thinking.

4.2 Service Design Research Versus Practice

Table 3 summarizes the most important findings of SD comparison between research and practice, regarding the five subcategories: concept, principles, object, process, methods and tools. The results of the interviews concerning SD in practice are only from professionals, since interviewees of PDF were not aware of SD practice.

Basically, the main conceptual difference is that respondents define SD as a creative process, since it allows access to physical evidences and thus enable the solutions to provide the desired form. Regarding the SD principles, interviewees strongly agree that SD has iterative stages of receiving feedback, designing the service, prototype and test. They also refer SD as a cyclic process, allowing to do quick changes and refinements, which in turn enables to create other development opportunities. Besides, it permits to improve the quality of the solution since there are continuous improvements (e.g. “*Stages can be repeated according to the context and needs of the project.*” Professional, Healthcare Industry Lead, about SD principles).

Furthermore, the respondents add some principles, referring SD an open-mindset and co-creative, which are not denoted in research.

Concerning the process, interviews practice is similar with the research reviewed. However, results show a new one: respondents add the “Design Sprints” used in the ideation phase, when projects have a short time frame.

Concerning the methods and tools interviews results have many similarities with research. SD in practice uses several common methods and tools, although the large number of methods and tools described in research. SD being a Human-Centered process mainly uses observation, focus groups, prototypes and service Blueprint. Unexpectedly, experts recognize “Design Thinking” as a creative process within SD tools. This finding is not in line with literature, which we discuss further on conclusions.

Table 3. Service design comparison between research and practice

Sub-categories	SD research	SD practice	Common
Concept	It is a creative, iterative and human-centered approach, once it seeks for understanding the users and stakeholders and their context [1]	Human-centered process used to develop innovative services through maximizing results by the integration of everything that is part of the services such as people and processes	Human-centered
Principles	Human-centered; collaborative; iterative; sequential; real; holistic [22]	Open mindset; human-centered; co-creative; collaborative; real; iterative	Human-centered; collaborative; real; iterative
Objects	Service; service systems [1]	Service	Service
Process	Service design process; exploration, ideation, reflection; implementation [18, 23] double diamond: discover, define, develop, deliver [36]; TISDD service design framework: research, ideation, prototyping and implementation [22]; four design activities of a design process: analysing, generating, developing and prototyping [37]	Exploration; ideation; prototype and test; implementation design sprints	Exploration; ideation; prototype; implementation
Methods and Tools	Affinity diagram; blueprint; brainstorming, character profiles; conjoint analyses; contextual interview; customer journey map; cultural probes; documentaries; empathy tools/probes; ethnographic user research; focus group; immersion (workshop); observations; prototyping; questionnaires/surveys; role play; scenarios; service prototype; shadowing; stakeholders map; storyboarding; task analysis grid [38]	Benchmarking; user journey map; eye tracking; focus groups; ideation techniques; interviews; personas; prototypes; service blueprint; service system architecture; service system navigation; service value constellation; design thinking as a creative process	Observation; prototypes; focus groups; service blueprint

4.3 Advantages and Disadvantages of DT and SD in Practice

Final RQ specifically address the advantages and disadvantages of the usage of DT and SD (respectively) in practice, explicitly expressed by interviewees. Results are given in Tables 4 and 5, which are explained below.

Which refers DT practice, the interviews revealed nine advantages and six disadvantages. As demonstrated in Table 4 - panel A, regarding the advantages of DT, the majority of respondents point out that DT as an iterative (70%) and explorative (55%) approach, allows to explore several times the problem and the solution in order to know if the solution fits the resolution of the problem. Additionally, almost half of the interviewees state that DT allows testing product-service solutions with the user (45%). Tests are considered fundamental, and it is critical to spend time with the end-user, in order to get some understanding of their problems and needs. Most of respondents (40%) also find interesting working in multidisciplinary teams since everyone is essential at a point of the project. Further stated advantages (with 35% each) are open-minded approach with focus on innovative ideas. Open-minded refers to a mind-set to freely generate innovative ideas, since it does not censor anything and all ideas that arise are analysed. Respondents also refer that DT verbs are more open when innovating which allows to extend hypotheses. Lastly, DT allows to have different perspectives (25%) in the sense that it is an innovative approach that enables to see problems in a different perspective, being iterative, permitting, in turn the improvement of the solution. Therefore, these results strengthen the reasons to foster DT use by practitioners.

Table 4. Results of DT (dis)advantages in practice/number of respondents

A - Advantages	Professionals (n = 7)	Trainees (n = 13)	Total
Iterative approach	5	9	14 (70%)
Explorative approach	3	8	11 (55%)
Testing with the end user	4	5	9 (45%)
Working in multidisciplinary teams	2	6	8 (40%)
Understanding the user	2	5	7 (35%)
Improves the creation of ideas	3	4	7 (35%)
Open hypothesis	2	5	7 (35%)
Do not censor anything	1	5	6 (30%)
Allows to have a different perspective	0	5	5 (25%)
B - Disadvantages			
Time consumer	2	8	10 (50%)
Seems like a vicious cycle	0	7	7 (35%)
Sometimes seems inefficient	1	5	6 (30%)
Get lost in ideas	0	5	5 (25%)
Lack analytical rigor	1	3	4 (20%)
Subjective approach	0	3	3 (15%)

From the results of the stated disadvantages, presented in Table 4 - panel B, particularly one DT disadvantage stands out, which is time consumer (50%). Half of the respondents state that it is spent a lot of time on the ideation phase that could sometimes be shortened. However, they suggest that this can be solved through practice and with the improvement of the project management. Furthermore, respondents (only trainees) refer that sometimes DT looks like a vicious cycle (35%, 7 respondents), since it is necessary to do a lot of tests, which do not necessarily achieve a positive result and sometimes seems inefficient, being difficult not to get lost with ideas (25%, 5 respondents), as they are always discovering new ones and dropping others. These disadvantages were stated only by trainees, which may suggest the influence of less experience of novices on these difficulties. The last two disadvantages are related to statements concerning the lack of analytical rigor on DT approach (20%), as it works with insights and with what people say, but sometimes the number of elements of these focus groups is not enough to validate the results. Hence, respondents find DT subjective (15%), as it depends a lot on the personal hint of each one gives to and, it depends on how people understand for example the observation they are making.

Therefore, these results highlights shortcomings within the DT usage, specifically rejection.

Concerning SD, the conducted interviews revealed 5 advantages and 3 disadvantages that were mentioned by the questioned experts with respect to the practical applicability of SD within their companies. As mentioned before, currently no trainees interviewed indicated that they are aware of SD approach ($n = 13$; 0%). As such, results of the expressed (dis)advantages of SD, presented on Table 5, are only from professionals.

Table 5. Results of SD (dis)advantages in practice/number of respondents

A - Advantages	Professionals (n = 7)
Achieve results	3 (43%)
Close relation with the user	3 (43%)
Allows to improve constantly	3 (43%)
Iterative approach	2 (29%)
Allows creativity	1 (14%)
B - Disadvantages	
Expensive	3 (43%)
Time consuming	2 (29%)
Constant restarts can lead to frustration	1 (14%)

As shows Table 5 – panel A, the interviewees are split equally (43%, 3 respondents each) over the most cited advantages of SD, and therefore, either find SD an approach/process which achieves good results since every phase is co-created with the several stakeholders involved, which allows to better understand their needs. Naturally, this advantage relates to the next one, since participants think that is valuable to have a close contact with the user. Also, interviewees find positive that SD is an iterative process (29%), since it is possible to test several times before implementing the solution. With these tests, solutions are constantly being improved, so they could meet

the needs of the end user. The last advantage relates to a single statement (14%) which refers SD allowing creativity, since to develop an innovative solution, it is important to have also innovative ideas. Therefore, during the process it is possible to become more involved with the problem and starting to generate original ideas.

Therefore, these results set additional light into reasons that lead to SD practice within organizations.

Regarding the results of SD disadvantages, presented in Table 5 - panel B, interviews refer that sometimes the process can be expensive (43%) and consequently, the owners of a project may not be willing to pay. Besides, experts point out that SD takes time (29%) and therefore, the innovative solution risks to become obsolete (e.g. *“When the design ends, although it has planned current and future needs, it may happen that the political or economic moment no longer is the same.”* Professional, Healthcare Industry Lead). The explanations thereby were when the service design is planned and structured too much in advance, companies express fear of being obsolete and losing flexibility and adaptability in terms of service features and its execution. Lastly, one participant (14%) refers that the SD processes may lead to some frustration, as it is necessary to deal with constant restart, in consequence of potential failures.

Resulting the insights given, the stated disadvantages could hinder the use of SD by experts, within their organizations.

5 Conclusion

The results of our study reveal that there are no relevant differences between SD and DT in research and practice, except for students/trainees participating in service innovation projects.

Indeed, experts reveal a strong knowledge about DT and SD, despite trainees do not know about SD approach or acknowledge the benefits of its processes, methods and tools. Beneficial for both research and practice this *“knowledge gap”* with respect to SD approach among novices, can be tackled with further information provision and training.

Beneficial for both research and practice the most dominant differences refer SD as an open mind-set and co-creative process, adding *“Design Sprints”* in the ideation stage of short time frame projects. Unexpectedly, experts also recognize Design Thinking as a creative process within SD methods and tools. Despite this finding is not consensual with literature, the novelty of the result could trigger a future research challenge.

Additionally, our findings demonstrate that DT presents several similarities with SD perceptions. As such, these overlaps also suggest the integration of the DT approach on SD processes, methods and tools.

In terms of the advantages of SD and DT for businesses, its iterative nature, collaboration with multidisciplinary teams and stakeholders, allows to achieve better results driving customized service innovation and preventing future service encounters failures. Forcibly, the ongoing iterations have several costs (e.g. time, financial, opportunity) that may risk the market entry of service innovations and business competitiveness (e.g. first to the market).

Still, some obstacles identified from the disadvantages and SD “knowledge gap” have to be overcome:

From a practical perspective, regular education and trainings, especially in the field of SD and the development of service innovation offerings, need to be implemented in order to build a sustainable knowledge base about advantages, benefits and best-practices of SD and DT. Moreover, experts on SD and executives need to spread these outcomes in order to benchmarking, strengthen on the corporate benefits obtained by SD and DT practices. Also, top level management is encouraged to develop corporate research in partnership with external I&D centres, with multidisciplinary teams integrating the final user/customer (e.g. to provide a proof-of-concept, prototype and test highly customer-experience product-service; living labs cooperation), as well as, investing on highly and especially educated employees on SD.

From a research point a view, additional effort is needed on the integration of DT approach on SD practice, since the results demonstrate some overlaps between both approaches and are still mostly perceived as indistinctive. Therefore, research need to identify and clarify the boundaries and complementarities of both SD and DT, in order to obtain synergies and remove redundancy.

Since the identified disadvantages could hinder the use of SD and DT practice, existing project management methods should build the base of the procedure method to improve and optimize time of iteration stage and reduce complexity. For example, for smaller projects there is no need for a systematic SD, since the costs might exceed the benefits. The costs themselves, related to time needed to affect to systematic design, in the case of project complexity, and the associated expenses (e.g. budget restrictions) have been referred to as an obstacle for SD practice.

However, a major limitation of this study need to be considered: The findings of SD practice are based on a small number of interviews with experts from companies. Further research needs to verify the results within a larger scope of experts. Hence, expanding the interview towards a larger set of interviewees coming from a more diverse background that is more dissimilar seems to be a fruitful direction for successive work.

Another interesting research setup would be to take practitioners, e.g. business people in charge of developing services in some innovative companies, identify those with training and research knowledge in SD/DT and those without and, then compare what they accomplish and how they do it. Also, comparing the definition of SD and DT that could be found in the job description (if exist), could be beneficial to have a complete picture concerning SD and DT: (i) literature, (ii) competences required by the business, (iii) what people (differentiating per role) think and know about the concepts. Moreover, examining how SD and DT have really contributed for value creation, for both service firms and customers, could be an interesting future research challenge.

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