# Mixing UX and SD to Improve a Data Science Studio – learning from practice

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*Experience Design Meets Service Design – Method Clash or Marriage?*
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## Abstract

Teaming up with a global leading company using Data Science (DS) for fraud fighting in finance, our aim is to design a system to digitally support DS activities, targeting a wide range of user profiles, regardless of technical background and with shorter lifecycles.
How to design such a system in i) fast-changing and competitive environment; with ii) scarce access to end-users, while iii) meeting agile pace deadlines and low latency performance metrics?

As part of an ongoing design science research project, we present a systematic literature review for papers on UX and Service Design methods. The review method kept in mind our research question. We found potential on hybrid methods, integrating tools and approaches from the two disciplines, albeit the need for orientation over time. We share some of the difficulties in practice, contributing to discussion and potential future work.

## Author Keywords

User experience design; service design; data science; design methods; systematic literature review

## ACM Classification Keywords

H.5.2. Information interfaces and presentation (e.g., HCI): User Interfaces; H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

**Our Motivation:** Data Science is a needed literacy. Facing a practical problem of shortage of data-scientists, we teamed up with a global leading company to create a digital self-service, targeted to non-data user/consumer profiles, improving the user experience and interaction.

**This paper presents** a systematic literature review, focusing on the crossroad of user experience design and service design thinking. The review was done in order to learn *how to design, evaluate and improve the quality of a digital prototype* for data science and constitutes the theoretical background of an ongoing DSR project.

**On the workshop,** we share our field experience, using the review as a starting point to the discussion. We aim to contribute to a research agenda and to strengthen a community of practice in the crossroad of current digital user-centered transition design approaches.

## Introduction

We present part of the ongoing work of a Design Science Research (DSR) [12,33,38] project, with a global leading company using Data Science (DS) for fighting fraud in finance.

The enterprise combines a high-performance Machine Learning (ML) engine with a workflow for scoring, in real time, large amounts of incoming data streams. Global competition, high variety of solutions and growing data volume, diversity and quality requires high customization of ML models and shorter DS lifecycles (from design to production). Our main goal is to design a competitive DS service, to be used by data scientists and other domain specialists.

For research purposes, we started by conducting a systematic literature review [23,31,46] for papers about the design of IT-artefacts, over three databases, using a twofold perspective:

1. **UX Design**: to design and improve the user experience and usability of a digital prototype to support the complex, creative and collaborative DS process (targeting DS and non-DS professionals);
2. **Service Design**: to design a digital system to support the core business service of a global leading company, enhancing their competitive advantage.

We retrieved a total of 685 papers (*UX Design*: 266; *Service Design*: 419). By using *'design methods'* and *'design approach'* as keywords, we refine and narrow these to a list to 30 publications for content analysis and further categorization, aiming to find specific design approaches or good practices to attack the problem and inform our DSR project in practice.

The next section presents the search strategy and the paper categorization, bounded to the aforementioned research and practical questions to be addressed. Then, we share some findings from the literature review and from our practice, discussing shortcomings on the crossroad of service and experience-centred methods. Last section addresses conclusions and further work.

## Research Method and Search Strategy

For theoretical background and to "analyse the past to prepare the future" [46], we did a systematic literature review [4,23,31], a formal iterative approach based on a replicable process to locate, retrieve, analyse and report evidence knowledge [23,41,46]. We conducted a straight forward search process, focusing on journal and conference proceeding articles on *User Experience Design* and *Service Design* research and practice. The work was carried out integrating both technical and social perspectives [23,46].

We expanded the search over Web of Science (WOS), Science Direct (SD) and ACM Digital Library (ACM), for their interdisciplinary coverage of the main topics, not considering citations nor patent indexes. The overall search was carried out on 24th January of 2018, and grasped the period from 1st January 2017 until 31st December 2017. The review process kept in mind our main research question. Table 1 illustrates the search query for publications retrieval from the databases:

1. Boolean combinations of the primary terms were searched, using the database search engines, for cross-reference work in each relevant area.
2. Secondary terms were used to refine the retrieved results of 1).

| | 'UX Design' | 'Service Design' |
|---|---|---|
| WOS | 257 | 15 |
| SD | 29 | 133 |
| ACM | 16 | 271 |
| Σ | 302 | 419 |
| Removing duplicates: | **266** | **419** |
| **Total** | **685** | |

**Table 2:** Initial Search results (number of papers found)

| | 'UX Design' | 'Service Design' |
|---|---|---|
| 'design method' | 4 | 16 |
| 'design approach' | 7 | 6 |
| Σ | 11 | 22 |
| Removing duplicates: | **10** | **20** |
| **Total** | **30** | |

**Table 3:** Initial Search results, refined mentioning 'design method' or 'design approach' in Title, Keyword or Abstract (papers for content analysis)

| Terms | Searched Keywords |
|---|---|
| Primary Terms | 'user experience; 'UX design', 'service design'; 'design thinking' |
| Secondary Terms | 'method'; 'approach'; 'process'; 'practice'; 'usability'; 'HCI' |

**Table 1**: Search query was done using combinations of AND and OR between the terms in each row

We used the respective database search engines to locate and retrieve articles with '*User Experience Design*' (or '*UX Design'*) or '*Service Design*' in their *Title*, *Keywords* or *Abstract*. Other searched keywords included '*human computer interaction*'; '*method'* OR '*approach'* OR '*process'* as well as derivatives of these terms, such as '*practice*' or '*interactive systems design*'.

Moreover, we did backward and forward searches (back and forward authors and references) [46], to locate extra significant papers. All papers were imported into the Mendeley reference management tool. Duplicates found in more than one data source were eliminated and we only considered journal and proceeding publications, excluding book sections, book reviews, editorials, prefaces, workshop or tutorial reports.

This effort resulted in **685 publications retrieved** (WOS=272, SD=162 and ACM=287). Table 2 presents the pruned initial search results, by database and research topic.

Then we searched these results for those mentioning '*design method*' or '*design approach*' in *Title*, *Keyword* or *Abstract*. This resulted on **a list of 30 publications for content analysis** and further paper categorization. Table 3 and Table 4 distribute these results by area.

| In Title, Keywords or Abstract | UX Design | Service Design |
|---|---|---|
| 'design method' | [5,9,18,27] | [2,6,15,19,21,22, 31,33,35,37,39,40, 43,44,47,51] |
| 'design approach' | [9,11,12,17, 19,37,39] | [8,11,22, 42,44,45] |

**Table 4:** Papers explicitly mentioning the use of or proposing a 'design method/approach' to guide the research reported work.

## Findings and Discussion

*From the literature review*

We are aware of certain limitations of our searches. Some articles may have not been retrieved, partly due to the different database search functionalities and to the search method. For instance, 48 publications (23 in UX Design and 25 in Service Design) mention a "design process" or a "user-centred design process" (*Title, Keywords and Abstract*). We restricted the content analysis to those explicitly proposing a "method" or an "approach" to the process of design on the work done.

We found no paper mentioning both service and user experience design (in *Title*, *Keyword* or *Abstract*). While somehow surprising, that reveals separation of work in the two areas, at least, in the academic discourse. Plus, we found different understandings for 'user experience', 'usability' or 'service design'. On 'usability', authors may focus on evaluating "practical" attributes of the product/service (e.g. ease of use or efficiency) or more "emotional" qualities (e.g. aesthetics for the pleasure of the experience [8] or using "user experiences as predictors" of a continuous use [14]).

Some papers adopt 'service design' as the design of autonomous components under a Service-Oriented Architecture (SOA) [22,47]. Service design also means to enhance a product with service components, combining a holistic view of business and technical perspectives, as in the design of Product-Service Systems [2,21]. As some services are increasing web or mobile, UX design and evaluation is called to assist along the development and in early prototype design phases, considering end-users as well as business stakeholders [9,17] or as a "means of transferring traditional product design and interface design to commercial services" [43].

While not finding a "design method" that fully guide our real-life challenge, we did find some insights. There are some similarities between UX and Service Design methods emerging from the work reported. All methods tend to address and evolve around (at least) three phases of Design: *Concept* – to understand the problem and context and envision an alternative; *Prototype*(s) – creation of an initial version of a solution, to be used and tested; and a focus on the *Evaluation* – several tools to evaluate the prototype, by asking users or consult stakeholders (prior to the actual service *Implementation*, a fourth phase). Plus, all methods are, in some way, *iterative*, allowing for updated versions (of mock-ups and prototypes) to fine tune the design and/or the development of a solution.

Literature show that professionals and researchers combine diverse UX design tools and approaches to create, explore and evaluate early prototypes, so to inform the service design process [17,32,34,43]. In these cases, the development process integrates tools from user experience (e.g. User interviews, Service Blueprinting, Storytelling or Eye tracking) into service design process. Tools are used to gather data to inform next steps or to increase the design process efficiency. The design is regarded as "a process of continual updates based on the responses of users who are observed and monitored" [43]. Sometimes, practitioners may confuse techniques (e.g. storytelling with storyboarding and scenarios [34]) or shortcut to a lighter process (e.g. design a prototype after a single stakeholders meeting and question users before the actual design [17]). General research techniques such as user interviews, audio (and video) content analysis reveal practical applicability and tend to be preferred for gathering user data, both in qualitative and quantitative studies.

Specific to our project context, only eight publications mention the "Big Data" context (not mentioning "data science", though), revealing a research gap in HCI investigation. DS is a complex process and an emerging interdisciplinary research area [7,29]. Its broad application from Health [35,48], to Agriculture [13,49], to Research [1,10,16,26] and Education [3,20,25] sectors, urge for tools and services to make DS available and comprehensible to domain specialists rather than data scientists alone. Improving the usability of available tools or design new integrated solutions for broad range of user profiles is a fertile field of inquiry in design theories and methods.

*From our practice*

We share the concept of Service Design to be an interdisciplinary approach that combines different methods and tools from various disciplines [36]. From our practice, the combination of different tools and approaches is possible, yet, we struggle to find advice

on which ones to use and when and how to implement them, in fast pace environments, where design happens while in use. Some tools lack efficiency or amounts to too much work, falling behind the fast-pace of agile development teams. Teams need to have a strong understanding of the strengths and limitations of each tool, including when and how to apply them during the development lifecycle.

Other times, the issues and improvements found (even when agreed between users and stakeholders), have to wait for opportunity in software production pipelines. This can demotivate users, expecting that "issues are to be solved soon" or minimize the priority of user experience/usability threads in the development cycle.

## Conclusions and Further Work

We conducted a systematic literature review for paper on user experience design and service design methods.

We found differing views towards key concepts, such as usability or user experience, with papers focusing more on tools and techniques for evaluating the ease of use, utility (e.g. looking for efficiency of the design process and service) and others focused on emotional and more experiential qualities (e.g. attractiveness, willingness to use or create pleasurable products). The particular view determines which tools and methods are combined and when and how are used in the specific project.

From our literature review, no single design method or approach fully orients or covers all the aspects for the design and evaluation of a DS as a service. Though, the work shows the potential for the development of hybrid methods of design, further bridging UX and SD theory and practice, as a promising research area, for both researchers and practitioners.

By sharing our experience and discuss with other professionals and researchers, we aim to help contribute to a research agenda of design methods that effectively meet the challenging times facing interactive service design and evaluation, from the human, organizational and social standpoints.


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