Towards A New Agenda for Service Design Research

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This paper presents the findings from a systemic enquiry into the current research on Service Design (SD). It examines academic publications on SD over the last two decades using a summative content analysis of 305 articles that use SD as one of its ‘author provided subjects’. The analysis revealed: (1) three distinct groups of publications that use SD differently, with research rooted in Design (142 articles) seen as the driver for development of SD as a discipline; (2) a typological overview of SD research including nine categories differentiated by ‘knowledge’ and ‘methods’. The findings suggest that SD research is largely comprised of practice-oriented and phenomenological studies based on interpretative approaches. Research underpinned by objectivism is noticeably rarer. Future research needs to go beyond practice-based research, to embrace more objective and systemic approaches.

Keywords: Design Research; Service Design Research; Summative Content Analysis

# Introduction

Service Design (SD) is of growing interest for academic research in Design and other related disciplines. Research activities in SD have flourished in recent years. One example is the establishment and growth of ServDes (the Service Design and Innovation Conference), which began as an annual Nordic conference in 2009, and is now a bi-annual international conference dedicated to SD and design-related service innovation. When it started in 2009, 17 papers were presented at the conference. This figure increased dramatically to 106 by 2018 (ServDes 2019). Likewise, a number of special issues have been published by leading journals to promote and disseminate SD research, including *Design Studies* in 2018, the *Journal of Service Research* in 2017, the *Design Journal* in 2015, and the *International Journal of Design* in 2009.

## Service Design in Marketing and Operations Management Research

SD as a research topic can be traced back to the late 70s’ literature on Marketing and Operations Management, when design relevant concerns emerged about the processes of invention, development and commercialisation of new services (Secomandi and Snelders 2018). Service blueprinting (Shostack, 1982, 1984) was a key approach to ensure the coherence of service systems for the delivery of consistent customer experience. Since then, SD has been researched from various disciplinary perspectives, such as Service Engineering and Service Architecture (Voss and Hsuan 2009; Silvestro and Lustrato 2015; Løkkegaard, Mortensen, and McAloone 2016; Lin and Pekkarinen 2011); Service Innovation Management (Bitner, Ostrom, and Morgan 2008; Tether 2008; Chew 2016; Carvalho and Goodyear 2018; Bantau and Rayburn 2016); and Service Marketing (Edvardsson, Gustafsson, and Roos 2005). SD in these fields was perceived differently depending on their theoretical roots and methodological traditions. For example, Service Marketing saw design as concerned with the ‘idea generation’ part of the New Service Development process (Edvardsson et al. 2000), whereas Service Engineering interpreted it as concerned with the design of the overall service delivery process (Johnson *et al.*, 2000).

## SD in Design Research

Interestingly, design academia only started to consider SD as a research topic in the early 1990s. Hollins and Hollins (1991) and Voss (1992) were amongst the early scholars investigating the role of design in the service sector, mainly from a Design Management perspective, exploring the service sector as a new territory for design.

Since 2000, a flourish of design literature has clearly established SD as a primary research topic, and through case studies and theoretical discussion from the perspective of design, has introduced and explained the practice of SD. . Contributions to the literature during that period include Morelli (2002), Mager (2008), Cipolla and Manzini (2009), Kimbell (2011), Meroni and Sangiorgi (2011), and Secomandi (2011). It is generally agreed that SD entails a human-centred, holistic, creative, and iterative approach to creating new service futures (Meroni and Sangiorgi 2011), building on a design thinking process of exploration, ideation, reflection, and implementation. Its root in Design significantly distinguishes this stream of literature from the interpretations of SD from other disciplines.

Two distinct views concerning how ‘design’ is related to ‘service’ emerge from the above cited literature: designing services or design for service. ‘Designing services’ considers that ‘services’ are the object of design activities, just like products are the object of product design. This view seems to be shared by the majority of SD agencies as demonstrated in their taglines, for example: ‘Livework designs better services’ (Livework 2019) and ‘Designing remarkable services and customer experiences’ (Engine Service Design 2019).

The ‘design for service’ perspective is more prevailing in academia. Service is considered as a context and platform where design activities take place. As Manzini (2011) argues, the term ‘designing for service’, instead of ‘designing services’, recognizes that what is being designed is not an end result, but rather a platform for action, with which diverse actors will engage over time. Similarly, Kimbell (2011) considers the concept of ‘design for service’ as a particular kind of SD. This view points out the collaborative nature of SD and its limitation in the wider process of service innovation.

However, both views adopt ‘SD’ as the disciplinary terminology, although its definition, boundaries and object are still debated (Sangiorgi et al. 2015). Under the term, the focus is more on articulating what service designers do and can do for service and how this connects to existing fields of knowledge and practice.

In more recent literature, as suggested by Sangiorgi and Junginger (2015), SD has entered a stage where discussions and research need to move beyond descriptions and justifications of what SD is and how it works. The focus has moved to contextualized studies on the impact and role of SD in business and society (e.g. Jürisoo, Lambe, and Osborne 2018; Kurtmollaiev et al. 2018; Prendiville 2018; Trischler et al. 2018), and to more interdisciplinary views, synchronizing with other disciplines, namely service innovation (Patrício, Gustafsson, and Fisk 2018), service science (Sangiorgi, Patricio, and Zurlo 2018; Wieland et al. 2012; Vargo and Lusch 2008; Ng and Vargo 2018) and transformative service research (Nasr et al. 2018; Yu and Sangiorgi 2018; Ostrom et al. 2010; Andreassen et al. 2016; Anderson, Nasr, and Rayburn 2018).

## The Gap and The Aim

Over the past decades academic research has produced considerable bodies of knowledge about SD. SD has been approached from a range of disciplinary perspectives and through different research practices resulting in a significant diversity of knowledge about SD. Systematic reviews have been undertaken to understand particular topics about SD. For example, Følstad and Kvale (2018) reviewed a total of 45 papers on the customer journey to understand the terminology and its approach; Furrer et al. (2016) reviewed literature in design, marketing and service science to propose an integrated framework to evaluate innovative service design. These studies produce in-depth understanding of particular topics in literature, but they do not provide an overview of the research about SD across the wide spectrum of disciplines. A systemic awareness of SD knowledge across different disciplines is lacking.

SD was recognised as an emerging field in Design ten years ago (Mager 2009). It is now considered well established in design research with its own distinct relevance (Secomandi and Snelders, 2018). Several studies have initiated discussion about the nature of SD knowledge, such as its research (Madano Partnership 2012; Sangiorgi, Prendiville, and Ricketts 2014), curriculum (Morelli and Götzen 2017) and career prospective (Sun and Runcie 2016; Fayard, Stigliani, and Bechky 2017). Although it is too early to pursue a discipline epistemology (Boyd, Gasper, and Trout 1991; Sosa 1991) of SD, these kinds of inquiry are clearly needed to build an initial step towards exploring epistemology.

These types of studies are also needed for a long-term discussion about design research in general (Michel 2012), especially with SD being such a promising subject area in Design.

Believing that discussion about the scope and content of a young field of research helps to form the identity of its scientific community (Friedman 2000), this paper examines the use of SD as a terminology in academic literature to:

* Raise awareness of how SD is perceived systematically across different disciplines
* Provide a typological overview of the academic literature on SD differentiated by ‘type of knowledge’ and ‘methods.’

# Design Research - A Framework of Analysis

Design knowledge and methods are two most coherent discourse topics in design research. Growing out of the design science movement [[1]](#footnote-1), Archer (1981) and Cross (1982) were two amongst scholars who recognised the distinctiveness of Design from technology, science and humanities. They suggested that Design be a coherent discipline in its own right, and saw design research as a ‘designerly’ paradigm of knowledge generation. This has further developed towards the concept of ‘research through design’ and ‘project-grounded research’ as termed by (Findeli et al. 2008), also called ‘practice-based research’”, ‘practice research’, ‘action research in design’, and ‘clinical research’. This research is guided through design process logic and design is supported by phases of scientific research and inquiry (Jonas 2007). However, the foundations of ‘designerly’ inquiry are seen as controversial; it deviates from the taken-for-granted epistemological traditions, methodological guidelines, and academic standards of more advanced disciplines (Grand and Jonas 2012).

Cross (2001), however, proposed a scientific approach, ‘science of design’ – the study of the principles, practices and procedures of design. This approach attempts to improve our understanding of design through scientific methods of investigation, and was also coined ‘research about design’ by Findeli et al. (2008), or ‘basic research’ by Buchanan (2001). This type of research is critiqued by the design community for lacking relevance to design practice (Findeli et al. 2008).

The essence of this discourse is around two fundamental paradigms: a) what constitutes design knowledge? and b) how can we obtain design knowledge? Based on these two paradigms, it is possible to develop a typological framework to profile research in SD. Further literature on design knowledge and design research methodology is reviewed for this purpose.

## Design Knowledge

In Design, research is considered as the development, articulation and communication of design knowledge (Archer 1981) and design knowledge resides in people, processes and products (Cross 1999). Cross’s (1999) taxonomy of design research is one of the most widely referenced frameworks and includes: design epistemology, design praxeology and design phenomenology.

In a recent study by Burns, Ingram, and Annable (2016), Cross’s (1999) taxonomy is adapted as a framework to review articles published on Design to understand the nature of design research, knowledge and theory. Their study proved the appropriateness of this framework in understanding knowledge in Design. Therefore, their framework is adapted to inform the dimension of ‘knowledge’ in this study. The taxonomy is explained in Figure 1: Figure 1 Knowledge Taxonomy

## Epistemological Positions

The second paradigm is the epistemological positions taken by researchers, which determine the methodological approaches. Applying Crotty’s (1998) framework of research epistemological positions, Feast and Melles (2010) suggest three types to understand design research: subjectivism, constructivism and objectivism. These positions further determine the theoretical perspective, methodology and methods, as shown in . The spectrum of epistemological positions provides a comprehensive view towards design research. Therefore, it is adapted in this study to develop the framework of analysis.



Figure 2 Epistemological Positions and Design Research Examples

## The Framework

Combining these two paradigms (‘knowledge’ and ‘methods’), a matrix can be developed as show in Figure 3, revealing a total of nine categories of research.

Shown as the vertical axis in this framework (Figure 3), Burns, Ingram, and Annable (2016)’s framework is used to classify knowledge into three groups: ‘epistemics’, ‘praxeology’, and ‘phenomenology’. Crotty’s (1998) framework is adapted to include three distinct epistemological positions: objectivist, constructivism, and subjectivism, shown as the horizontal axis.

Using this framework of analysis, this study attempts to classify the knowledge and epistemological positions associated with research on SD.



Figure 3 The Framework of Analysis

# Methodology

## Summative Content Analysis

This study used a summative content analysis approach to analyse literature with SD as the primary research subject. Summative content analysis involves counting and comparisons, usually of keywords or content, followed by the interpretation of the underlying context (Hsieh and Shannon 2005). A summative content analysis goes beyond mere word counts to include latent content analysis (Holsti 1969) and the focus is on discovering underlying meanings of the words or the content (Babbie, 1998). The goal is to provide knowledge and understanding of the phenomenon under study (Downe Wamboldt 1992). In this study, academic publications on SD were the phenomena under investigation. Summative content analysis was adopted to categorize SD publications into the framework developed (see Figure 3). Thematic coding (Braun and Clarke 2006; Maguire and Delahunt 2017), as an analysis technique, was used to identify common themes and to index them into the categories.

## Data

The sample publications were retrieved from a UK University’s[[2]](#footnote-2) library online resource that covers a wide range of databases as listed in Table 1. The search period was from 1990 when SD first appeared in this data base to June 2018 when the data was collected. The terms used for search were: [‘Subject’ ‘is (exact)’ ‘SD’]. The search engine automatically identifies ‘Author Provided Keywords’ as the subjects for the article. It can therefore be assumed that for the articles retrieved using these search terms, the authors recognize (1) SD as an appropriate term to reference SD research; and (2) SD as the primary research focus of their work.

Rather than using the term, ‘SD’, some articles reference the terms, ‘design for policy’, ‘design for services’, and ‘service innovation design’, indicating that in these articles, SD is yet not recognised as a research subject on its own right. Therefore, these 12 articles were excluded from the sample. A total of 305 articles[[3]](#footnote-3) were retrieved from the online database sources as shown in Table 1, providing a sufficient sample size and coverage required for the analysis.

Table 1 Online Sources from which articles were retrieved

|  |  |  |  |
| --- | --- | --- | --- |
| **Online database source** | **Number of****retrieved****articles \*** | **Online database source** | **Number of****retrieved****articles \*** |
| Taylor & Francis Online - Journals | 84 | Inderscience Journals | 7 |
| ScienceDirect Journals (Elsevier) | 67 | JSTOR Archival Journals | 6 |
| Emerald Insight | 34 | IET Digital Library | 5 |
| ProQuest Social Sciences Premium Collect | 33 | JSTOR Current Journals | 4 |
| Arts & Humanities Full Text | 27 | IEEE Journals & Magazines | 4 |
| SAGE Journals | 26 | ERIC (U.S. Dept. Of Education) | 3 |
| Wiley Online Library | 26 | PMC (PubMed Central) | 3 |
| SpringerLink | 21 | Berg Publishers (IngentaConnect) | 1 |
| IEEE Conference Publications | 10 | ACM Digital Library | 1 |
| INFORMS Journals | 7 | PsycARTICLES (American Psychological Association) | 1 |
| \* Note: some articles may be retrieved from more than one source |

## Analysis Process

The analysis included four stages. Stage one involved word counting of SD and a review of the content to determine the level of specifics and related domain knowledge as shown in Figure 4. The analysis revealed three distinct groups of articles and the breakdowns by year are shown in Figure 4. As the purpose of the study is to understand SD from the perceptive of design research, group 3 (142 articles) was sampled for further analysis.



Figure 4 Stage 1 Analysis

Stage two aimed to categorize the knowledge types by reviewing the articles, with particular focus on abstracts, discussion and conclusions. A range of sentences and keywords were identified for thematic coding, resulting in the subcategories for each knowledge type as in Figure 5.



Figure 5 Thematic Themes of Knowledge (Stage 2 Analysis)

Stage three underwent a similar process as stage two with the aim of categorizing the epistemological positions and methodologies of the sample articles. The keywords were identified from the abstracts and methodology sections of each article, which are further grouped into three epistemological positions, as in Figure 6.



Figure 6 Keywords indicating epistemological positions (Stage 3 Analysis)

The findings from stages two and three were crosschecked by another independent researcher to limit the bias and omission that may have occurred during the analysis process. In stage four, the numbers of articles classified under each category from the previous stages were counted for cross tabulation and further illustrated in the framework. The key findings are explained in the following section.

# Findings

## Finding 1: Three distinct groups using SD as a term differently

Stage 1 analysis revealed three distinct groups of articles through how SD is used as illustrated in Figure 4 and Figure 7.

The first group of articles (39%) use SD as a general term that could potentially be replaced with words like ‘plan’, ‘scheme’ or ‘development’. The considerably high percentage implies that the awareness of SD as a new subject is relatively low amongst wider academia.



Figure 7 Numbers of Publications by Year

The second group of articles (15%) use SD for various meanings depending on their subject backgrounds, including Operations Management and Marketing. The lack of a shared view or attempt to define SD suggests that SD is not meant used as a subject domain by authors of this group of articles. This implies that although SD research in the early days may have begun in these disciplines, these disciplines did not drive the development of SD as a discipline in its own right.

The third group of articles (47%) are rooted in Design. There is a shared tendency to explain and/or explain SD using design literature. This group is further analysed to populate the framework.

Figure 7 shows that the overall number of articles on SD grows, but also clearly shows that the growth is mainly from group 3. It is interesting to note that group 3 overtook group 2 in 2010. This is consistent with the general impression that SD research launched around 2010. Publications in 2017 then rose to 8 times the number in 2010.

## Finding 2: Nine research types determined by knowledge and methods

The number of articles under the two aspects, ‘knowledge types’ and ‘epistemological positions’ has been cross-tabulated as shown in Table 2.

Table 2 Cross Tabulation of Number of Articles

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | Objectivism | Constructivism | Subjectivism | Total |
| Epistemics | 2 | 16 | 10 | 28 |
| Praxiology  | 5 | 34 | 16 | 55 |
| Phenomenology  | 8 | 34 | 17 | 59 |
| Total  | 15 | 84 | 43 | 142 |

### Dimension 1: Knowledge Types

 ‘Praxiology’ and ‘Phenomenology’, representing 80% of the sample, have significantly more articles than ‘Epistemics’. SD practice (process, management, methods, tools and technology) and service phenomenon (especially how SD is related to the contexts) are popular research topics. This reflects the fact that SD is still a new research topic, and the study of knowledge in SD is still at its early stage. As SD practice advances its research, studies about its practice are increasingly popular. While SD is defining itself, its meaning and practice has expanded to include new territories; therefore, studies about the application of SD in different contexts are equally popular.

### Dimension 2: Epistemological Positions and Methods

As shown in Table 2, constructivism is most popular with a total of 84articles, representing 60% of the sample. This means that SD research tends to take an interpretative perspective, and favours ethnography, grounded theory, and phenomenological research as the methodology. Thus, case studies based on observation and reflection are the most popular methods used. In contrast, objectivism is the least popular and represented by only 15 articles and 10% of the sample, which means that research based on statistical analyses or questionnaires is uncommon.

### The Framework of SD research

The framework is further illustrated in Figure 8 showing the results for the 9 categories of articles. The number of articles in each category is represented by the size of each bubble. In Figure 9, an article representing each category is cited as an example to highlight the distinct differences between the groups with similar volumes of articles, A, B and C.



Figure 8 SD Research on the Framework

Trends interpreted from the A-C categories in Figure 8 imply that SD research is comprised of practice oriented research and phenomenological studies based on interpretative approaches; whilst, research at the objectivism end of the spectrum is noticeably rare. Epistemics knowledge is sparse, indicating that SD is a relatively young discipline.

# Discussion

Research in SD is heavily dominated by constructivism. This means that knowledge about SD is largely produced through designers’ intellectual reflection upon their activities and interpretation of the phenomena in question. This type of research resonates with the concepts of: ‘research through design’ and ‘project-grounded research’ (Findeli et al. 2008). Jonas (2007) considers that this type of research provides the epistemological means for the development of a genuine design research paradigm. He believes that only design research conducted under the ‘designerly’ paradigm can contribute to design´s methodological development and its disciplinary stability and autonomy. This approach has certainly gained popularity in the research community of SD.

Buchanan (2001) recognises that the type of research that designers and design educators adopt is usually a form of clinical research, often cut off from more fundamental applied and basic research*.* He highlights the importance of other types of research for design:

Applied research is critical to this task, since it seeks to establish connections among many individual cases. And basic research is the most difficult and critical to the future of the field, because it seeks to establish which are the significant facts and connections in our experience of design’. (Buchanan, 2001) P17

Similarly, Friedman (2000) questions the rigor and relevance of the current design research in theory building, in comparison with more scientific approaches. He believes that more systemic approaches offer a level of robust understanding that becomes a foundation of effective practice. He considers that ‘*most design theories involve clinical situations or micro-level grounded theories developed through induction. This is necessary, but it is not sufficient for the kinds of progress we need.’* (Friedman, 2003).

The debate in design research in general depicts the current situation in SD research revealed in this study. It raises the question about the relevance of these different kinds of research to the advancement of the discipline of SD and its practice.

Thinking of the research agenda proposed by the SD research communities, the disciplinarity of SD has always been a topic of discussion, as noted in the Madano Partnership (2012) report: ‘*the definition and boundaries of SD as a discipline are contested in both academia and in professional practice’*. Strengthening its theoretical foundation has gained more attention in recent years, e.g. (Patrício, Gustafsson, and Fisk 2018). The need for studies on the impact of SD and its validity in business and society is also recognised, e.g. (Sangiorgi and Junginger 2015).

These views seem to suggest that research should move away from a succession of unique cases towards broad explanatory principles. Thus, it requires a more systemic way of asking questions that go beyond specific research / ‘clinical’ research, and allow more critical thinking and theory building. In order to do this, objective approaches seem highly relevant, requiring SD to be taken as the subject of research. In this respect, research about SD (about its objects, processes, actors and stakeholders, its meaning and significance for society, business, culture, etc.) is needed. If this is the case, those types of research located in the left side of Figure 8 ought to have greater relevance in the future research agenda of SD.

Examples of these types of research can be found in the first column of Figure 9, including researching topics in SD through machine learning (Antons and Breidbach 2018), through evaluating success of design processes with customer involvement (Storey and Larbig 2018) and assessing the impact of technology-driven initiatives in the field of financial services by differentiating them on the basis of SD (Bisht and Mishra 2016). All three studies approach the topics from an objective perspective. In comparison with constructive approaches, they seem more likely to generate broad principles of SD. These studies can also be considered as ‘basic research’, considered by Buchanan (2001), necessary to establish the significant facts and connections in the experience of design. Although these objective approaches are criticized for their perceived relevance by the design community (Findeli et al. 2008). However, Friedman (2000) argues that the broad principles and theories generated from these types of research will benefit SD practice in the long run.

In SD research, another interest is the interdisciplinary perspective of SD. Sangiorgi, Prendiville, and Ricketts (2014) suggest that exploring theoretical frameworks from interdisciplinary fields may offer a new lens for SD research. This approach is not new to the SD research community, which has introduced theories and concepts from other disciplines since early on. These include for example, Product Service Systems by Morelli (2002), Service Marketing by (Secomandi, Fernando, Snelders, 2011), Service Science by (Kimbell, 2009), and organisational change by (Junginger and Sangiorgi, 2011). These publications tend to be located on the right side of the framework (in Figure 8).

To develop our understanding of the relevance of these concepts and theories to SD, a more systemic review of the literature from related fields is needed to harmonize multiple perspectives. This also requires a more systemic approach to research. As inter-disciplinarity is an integrated approach to answering a question that recognizes the limitations inherent in the compartmentalized system of academic subjects (Toomey et al. 2015), it is equally important to have disciplines other than Design become an integral part of the development of SD research.

However, this does not mean that SD should abandon the existing research practice, but rather encourage a more interdisciplinary approach to include objectivism (left-hand side in Figure 8) and systemic literature review (right-hand side in Figure 8), in order to generate theories and general principles that guide the practice. Grand and Jonas (2012) have envisioned a convergence towards a new ‘trans-domain’ where distinction between design and science research cultures are disappearing. Although this is not what this study has revealed, the convergence is probably the future direction of Design research. After all, it is the synergy between relevance, rigor and the contributions that define good research (Hevner 2007).

# Conclusion

With the aim of better understanding the current research in SD, this study has developed a framework of analysis that combines two key aspects of research: knowledge and methods. This framework guided the content analysis of SD academic publications. The analysis resulted in:

* three distinct groups of articles using SD differently as shown in Figure 7, amongst which, the majority of articles were rooted in Design (142 articles) which is therefore seen to be the driver of SD’s development towards a discipline.
* nine research types within the 142 articles were differentiated by the two research paradigms: knowledge and methods, which is further illustrated in the framework shown in Figure 8.

The populated framework (Figure 8) reveals that the research in SD resonates with the design research culture in general. The mainstream research in SD is comprised of practice-oriented research and phenomenological studies based on interpretative approaches; whilst, research at the objectivism end of the spectrum is noticeably rarer. It is also noticeable that research in epistemics related to SD is relatively sparse, indicating that SD is an immature research topic.

Considering the need to advance SD as a discipline, the findings suggest future research should include more systematic inquires leading to theory building, to address various research agendas proposed by the SD research community, such as the need to integrate with other related disciplines, to understand the impact of SD, and to develop coherent disciplinary boundaries.

Although this seems to contradict the idea of developing a ‘designerly’ paradigm of research to strengthen SD disciplinary autonomy, studies ‘about’ SD, not ‘through’, are much needed in this case. In this argument, improving scientific rigor is not the aim, but rather recognising the integrity of theory in advancing SD as a discipline.

This is amongst a handful of research studies, which focus on SD research as a topic. It involves a systematic way of understanding the research in SD, aiming to advance SD as a discipline as well as a research topic. It provides a starting point for further discussion about the directions of SD research and its trajectory. More in-depth research is needed to understand SD research practice, for example, the theory building in relation to tacit and explicit knowledge, and relevance of theory to practice.

This study contributes to our understanding of design research in general. The framework developed for the analysis provides a taxonomy of design research. The current taxonomy of design research is based on the type of knowledge produced. It does not consider the approaches that produce the knowledge. However, discussion about epistemological positions for design research has been an integral part of design research discourse. This framework combines these two important aspects of discourses in design research and further defines its nature. However, as this is not the primary aim of the study, it is suggested future studies could develop this framework further, with a fuller critical evaluation.

Figure 9 Article Examples



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1. The relevance of design research in the scientific world was debated during the so-called ‘design science decade’ between 1965 to 1975. Scholars attempted to create scientific knowledge about products or engineering components and their interfaces, to systematise the design process and develop rigorous design methods. The idea was eventually abandoned by its advocators, when they recognised the difference between how science and Design approach research. [↑](#footnote-ref-1)
2. In REF2014, this University was ranked a top ten research University in the Times Higher Education (THE) intensity rankings. [↑](#footnote-ref-2)
3. During the process of sampling, it was noticed that *Design Issues* by MIT Press does not include a list of subjects provided by authors. As *Design Issues* is one of the top journals for design publications, a separate search term [‘Keywords’ ‘is(exact)’ ‘SD’] was used to sample articles in this journal, which resulted in retrieval of 6 articles. [↑](#footnote-ref-3)