

Review

Thirty Years of Research and Methodologies in Value Co-Creation and Co-Design

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Abstract: Value co-creation and co-design strengthen the development of projects and initiatives that involve working with people from interdisciplinary areas. Moreover, both concepts have been adopted in contexts such as health, marketing, education, social issues, software/hardware design, and economic contexts, among others. Co-creation can be one of the strategies to achieve the Sustainable Development Goal (SDG) 17 because co-creation can be a means to implement global partnerships for sustainable development. However, there is a lack of research on methodologies for co-design and co-creation. To fill this gap in the literature in this study, we review studies about value co-creation and co-design and present an overview of the methodologies reported in the literature. The first part of this review was conducted as a bibliometric analysis based on 3858 (co-design) and 3524 (co-creation) scientific documents retrieved from the Scopus database. For the second part, a scoping review was conducted based on the analysis of 71 studies related to co-creation methodologies and 96 in the case of co-design. As a result, we identified 32 methodologies for co-creation and 26 methodologies for co-design. Co-creation and co-design add value to processes with different stakeholders, such as implementing innovations to provide better service in information systems of a wide range of contexts.

Keywords: value co-creation; co-design; research; methodology; sustainable development



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1. Introduction

Co-design and co-creation are gaining momentum in a wide range of contexts (e.g., marketing, educational, social, and economic). Additionally, these concepts have no unique definition, and it depends on the application context. On the one hand, the co-creation concept arises from the marketing field and is defined as the “enactment of interactional creation across interactive system environments (afforded by interactive platforms) entailing ageing engagements and structuring organizations” [1]. Moreover, when it comes to creating a product or a service experience, co-creation enacts a close collaboration between the company and the customer [2]. Co-creation is also considered a collaborative generation of knowledge [3]. One of the most cited definitions of co-creation is “any act of collective creativity, i.e., creativity that is shared by two or more people” [4].

On the other hand, co-design is a concept that is not only applied to processes that involve working with people but is also a particular strategy used in the field of hardware and electronic artifacts [5,6]. In contrast, other definitions highlight that co-design refers to the end-users’ engagement for research purposes by including instances of engagement that are present in all research stages and that range from a passive to an active engagement intensity [7]. Co-design is also considered an instance of co-creation and refers “to the collective creativity of collaborating designers” [4]. Co-design implies an evolution from a user-centered design to a co-designing approach, which might contribute to “more sustainable ways of living in the future” [4].

The importance of co-creation and co-design for sustainable development lies in the fact that co-creation can be one of the strategies to achieve the SDG 17 [8]. Co-creation

can be a mechanism to implement global partnerships to deal with urgent problems and issues for sustainable development [8,9]. However, the use of a co-creation approach requires a methodology that the stakeholders can follow to complete the task and collaborate effectively and successfully. In that regard, it is imperative to identify which co-creation methodologies exist in the literature so that future leaders of co-creation processes can choose the best one to apply. Previous research has shown connections between co-creation and sustainability. For instance, Elliot et al. [10] conclude that customer value co-creation improves environmental sustainability. Botti and Monda [11] introduce a theoretical framework with the main aspects of eHealth ecosystems and identify the main conditions for fostering value co-creation. Lacoste [12] investigates how sustainability influences business-to-business value co-creation. Moons et al. [9] point out that the initial stages of a co-creation process are key for team cohesion and context to complete further stages in co-creation successfully. However, there is a wide variety of methodologies and approaches for co-creation, and it is important to provide an overview of these methodologies in order to open possibilities for consolidating the most effective methodologies for co-creation processes for sustainable development.

In this context, this study presents a bibliometric analysis of the scientific literature reported for both fields, co-design and co-creation. Although in some of the results we compare what is happening in each field, this analysis does not intend to confront both concepts but pretends to give an overview of each one over time. Moreover, a scoping review was conducted to identify methodologies for co-creation and co-design processes.

In the field of co-creation, there are also some bibliometric analyses. For instance, Saha et al. [13] report emerging trends of value co-creation from 458 research studies published between 2004 and 2018. The main findings were that value co-creation has been applied to areas such as customer service, enhancing brand value, and the marketing of services. Nájera-Sánchez et al. [14] also tackled the topic of value co-creation but in the field of technology and innovation management. They analyzed 1708 documents published between 2004 and 2020. They found that open innovation, consumer-centric analysis, and service ecosystem and service innovation were three key research streams in the field and that servitization and the sharing economy were two main trends. In the co-design field, some specific literature reviews use bibliometric co-citation analysis, like the one reported by Noorbergen et al. [15], who analyzed 64 documents about the development of applications for health systems based on mobile technologies. The main findings describe some foundations, frameworks, and mobile health systems based on co-design. However, previous literature reviews cover only research performed in specific timeframes (2004 to 2018 and 2004 to 2020), and the most updated review covers research until 2020. In this regard, an update to 2023 would be important to continue monitoring the field and identify more up-to-date research gaps. Moreover, some of the previous literature reviews have covered very specific fields, but a bibliometric analysis could provide a more general landscape of research in the field. The importance of conducting a bibliometric analysis and a scoping review for the academic community is that co-design and co-creation are approaches that have been used in a wide variety of disciplines, so providing an overview of current research, a compendium of methodologies and trends/future research directions in the field is helpful for other researchers and practitioners in different areas.

The analysis presented in this study addresses journal articles and other types of papers, such as conference papers, books, and book chapters. The research questions that this study aims to answer are as follows:

- RQ1: What is the evolution of co-design/co-creation in terms of scientific production and citations? The rationale behind RQ1 is that the evolution of co-design and co-creation indicates the level of interest in the field and provides insights into the importance of the scientific production around these topics [16];
- RQ2: Who are the most contributing authors in co-design/co-creation in terms of the number of publications and citations? The rationale behind RQ2 is that the most contributing authors and most cited publications are relevant so that future researchers

or new researchers can identify the key studies in the field and the most important authors;

- RQ3: What are the methodologies for co-design/co-creation that have been reported in the scientific literature? The rationale behind RQ3 is that, to the best of our knowledge, this is the first scoping review that summarizes the methodologies defined for co-design and co-creation, and this is one of the most important contributions to the literature in the field for practitioners and other researchers;
- RQ4: What are the trend topics in co-design/co-creation in terms of content analysis based on authors' keywords? The rationale behind RQ4 is that the bibliometric analysis and the scoping review are useful to identify trends and future research directions in the field so that other researchers can focus on specific gaps in research and help the community advance knowledge in the field.

The main contributions of this article for practitioners are, on the one hand, a general overview of how research on co-design and co-creation has evolved since 1993 in terms of the most contributing authors, the trending topics, and the methodologies adopted or proposed by different authors. On the other hand, this study gives an overview of the different methodologies reported in the scientific literature in terms of phases, steps, or components that authors reported to use for co-design and co-creation studies. This information might be of special interest to researchers and practitioners so that they can focus on the most notable topics in these fields. Moreover, people interested in fostering initiatives or research projects can understand how to manage a co-design or a co-creation process (or a combination of both) independently of the implementation setting. Other practitioners and researchers can take the list of methodologies presented in this study and easily find the most appropriate methodology for their respective fields from the tables in Appendix A. This might save time for practitioners who want to use co-creation and co-design approaches in their fields. Finally, an overview of the methodologies for co-creation and co-design can contribute to achieving the SGD 17 in terms of how to properly follow a co-creation approach to solve urgent issues in sustainability.

The rest of this study is organized as follows: Section 2 describes the methodology followed in this bibliometric and scoping review, Section 3 presents the results, and Section 4 discusses the results. Section 5 describes the main future research directions derived from the bibliometric analysis and the scoping review. Finally, Section 6 summarizes the main conclusions and limitations.

2. Methodology

This section describes the methodology followed for the bibliometric analysis and the scoping review. The research questions addressed in this study focus on both concepts, co-creation and co-design. The datasets used for the analysis were retrieved separately (one for co-design and one for co-creation) because, in a co-design process, the stakeholders participate with insights on creating or improving a product, service, or process and rarely take part in the production itself. In contrast, in a co-creation process, the stakeholders take a more active role and participate in different stages of the process [17].

2.1. Bibliometric Analysis

Bibliometric is a statistical analysis that provides quantitative results of information from different documents (books, articles, etc.) [16]. A bibliometric analysis provides a more objective and reliable analysis from a very large body of information based on statistical analysis. With a bibliometric analysis, different types of articles can be considered and analyzed to draw accurate conclusions about the research in specific or general fields. The bibliometric analysis has been adopted by many literature research studies in settings such as education [18,19], economics [20], psychology [21], and biology [22], among others. It can be used to obtain a general or detailed overview of the literature in a research field. Moreover, this kind of analysis can be complemented with the use of specialized tools and a more detailed analysis of the research findings. In this study, we used the filtering options

from the Scopus database, the bibliometrix R package [23], and the VOSviewer analysis tool [24].

2.1.1. Inclusion and Exclusion Criteria

The inclusion criteria are listed as follows:

- The title should include the term for each field (i.e., co-creation and co-design);
- Journal articles, reviews, conference papers, short surveys, editorials, books, and book chapters indexed in Scopus;
- Articles focused on co-design/co-creation.

The exclusion criteria are listed as follows:

- Book reviews, notes, letters, preprints, and erratum were not considered in the bibliometric analysis;
- Documents with undefined author names;
- Documents with undefined affiliation.

2.1.2. Article Information Retrieval and Filtering

After searching in the Scopus database using the search query TITLE (“co-design”), a dataset of 4007 records was obtained. The search was performed in May 2023. After applying inclusion and exclusion criteria, with this search query, TITLE (“co-design”) AND (EXCLUDE (AFFILCOUNTRY, “Undefined”)) AND (LIMIT-TO (DOCTYPE, “ar”) OR LIMIT-TO (DOCTYPE, “cp”) OR LIMIT-TO (DOCTYPE, “ch”) OR LIMIT-TO (DOCTYPE, “re”) OR LIMIT-TO (DOCTYPE, “bk”) OR LIMIT-TO (DOCTYPE, “sh”) OR LIMIT-TO (DOCTYPE, “ed”)) AND (EXCLUDE (SRCTYPE, “Undefined”)), a total of 3858 documents were included in the analysis about co-design.

Using the search query TITLE (“co-creation”), a dataset of 3622 records was obtained. After applying inclusion and exclusion criteria, with this search query, TITLE (“co-creation”) AND (EXCLUDE (AFFILCOUNTRY, “Undefined”)) AND (LIMIT-TO (DOCTYPE, “ar”) OR LIMIT-TO (DOCTYPE, “cp”) OR LIMIT-TO (DOCTYPE, “ch”) OR LIMIT-TO (DOCTYPE, “re”) OR LIMIT-TO (DOCTYPE, “bk”) OR LIMIT-TO (DOCTYPE, “sh”) OR LIMIT-TO (DOCTYPE, “ed”)) AND (EXCLUDE (SRCTYPE, “Undefined”)), a total of 3524 documents were included in the analysis about co-creation.

Results obtained were exported into the CSV file format, including citation information (author(s), document title, year, source title, volume, issue, pages, citation count, source, document type, and DOI), bibliographic information (affiliations, serial identifiers, publisher, editor(s), language of original document, correspondence address, and abbreviated source title), abstracts, keywords (author keywords and index keywords), and references. The CSV files were loaded into the VOSviewer tool to conduct some of the bibliometric analysis.

2.2. Scoping Review

We also conducted a new search in May 2023. The purpose of the new search was to retrieve studies specifically for the scoping review (which is different from the bibliometric analysis). In this case, we search for papers that define methodologies for co-design and co-creation, so a new search query is needed. This is a specific search because the terms co-design/co-creation and method* are only filtered by the article title. Additionally, only journal articles were included in this search to identify peer-reviewed scientific articles. The search string is:

- (TITLE (“co-design”) AND TITLE (method* OR framework)) AND (LIMIT-TO (DOCTYPE, “ar”)) AND (LIMIT-TO (OA, “all”));
- (TITLE (“co-creation”) AND TITLE (method* OR framework)) AND (LIMIT-TO (DOCTYPE, “ar”)) AND (LIMIT-TO (OA, “all”)).

In the specific search to identify methodologies, methods, or frameworks for co-design and co-creation, we focused only on journal articles and on documents in which the title

has the keyword (co-design or co-creation) and other specific words like words starting with “method”, or the word “framework”.

3. Results

3.1. Dataset Main Information

Figures 1 and 2 show the dataset’s main information for each of the fields (co-design and co-creation), including the timespan, number of sources, number of documents, rate of annual growth, number of authors, authors of single-authored, authors in collaboration, authors’ keywords, number of references, the average age of a document, and the average citations per document.



Figure 1. Dataset main information—co-design—Bibliometrix.



Figure 2. Dataset main information—co-creation—Bibliometrix.

The timeframe, the number of sources, and the number of documents are higher in the co-design field than in the co-creation field. However, other information suggests that the co-creation field has had a stronger development in terms of the annual growth rate, the co-authoring, the number of references, and the average citations per document.

Table 1 shows the number of documents per type of document (article, book, book chapter, conference paper, editorial, review, and short survey).

Table 1. Number of documents per type of document.

Type of Document	Co-Design	Co-Creation
Article	2180	2227
Conference paper	1469	787
Book chapter	113	374
Review	56	91
Editorial	20	25
Book	17	11
Short survey	3	9

3.2. Scientific Production and Citations

Figure 3 depicts the annual scientific production for both fields: co-design and co-creation. Both have had a similar trend. Since 2013 and 2014, the number of documents published by year has risen in both fields. Before 2013, the co-design field had a higher number of publications per year than the co-creation field. However, in the last 10 years, the co-creation field has been growing more in the co-design field regarding published documents. It is important to note that the decline in scientific production in 2023 is explained by the fact that the search was performed in May 2023, so not all the publications from 2023 are included in the results.

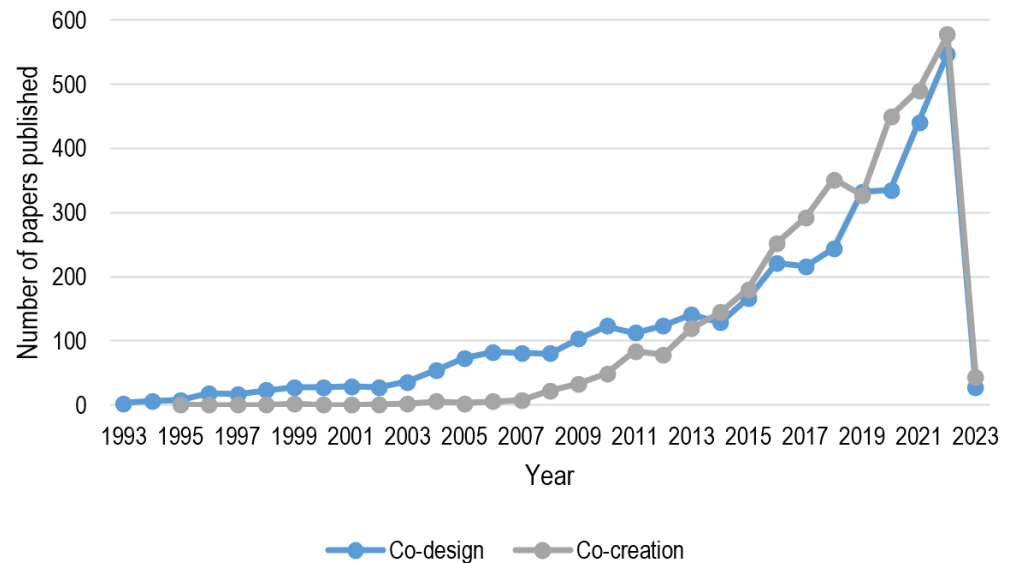


Figure 3. Annual scientific production—Scopus.

Regarding the country's scientific production, the United Kingdom, the United States, and China are the most productive countries in both fields, with more than 300 documents published, followed by countries such as Australia, Spain, Germany, France, and Italy, with at least 200 documents published. The rest of the countries in this top 20 have at least 50 documents published in both fields and include the following countries with their corresponding percentages for co-creation: Spain (5.5%), Italy (5.3%), Finland (5.2%), Germany (4.9%), the Netherlands (4.9%), Sweden (4%), Japan (3.6%), Denmark (3.2%), Norway (3.2%), France (3.2%), Taiwan (3.1%), India (2.9%), Portugal (2.4%), Canada (2.3%), Belgium (2.2%), and Brazil (2.1%). For co-design, the rest of the countries in this top 20 are Italy (5%), France (5%), Canada (4%), Sweden (3%), Spain (3%), India (3%), the Netherlands (3%), Japan (3%), Taiwan (2%), Belgium (4%), Finland (2%), South Korea (2%), Singapore (1%), Switzerland (1%), and Brazil (1%). Figure 4 shows the top five countries in scientific production. Moreover, although the number of documents published by the top five countries in the co-design field is higher than in the co-creation field, co-design has received fewer citations than co-creation. A possible interpretation of this result is that the co-creation concept has been widely adopted in different settings, and it implies a more active participation of the stakeholders involved in the process.

Figure 5 presents the average citations per year for both fields. There is a notable difference between co-creation and co-design regarding the citation count because the co-creation field has two important peaks of citations, one in 2004 with 35 citations and the other in 2008 with 18 citations. Without considering those peaks (2004 and 2008), Figure 5 shows a period from 1996 to 2003 in which the co-design field gained more popularity than the co-creation field. However, after 2003, the co-creation field has had a higher average of citations per year. The average number of citations shows the importance of the field in terms of the number of citations that publications receive.

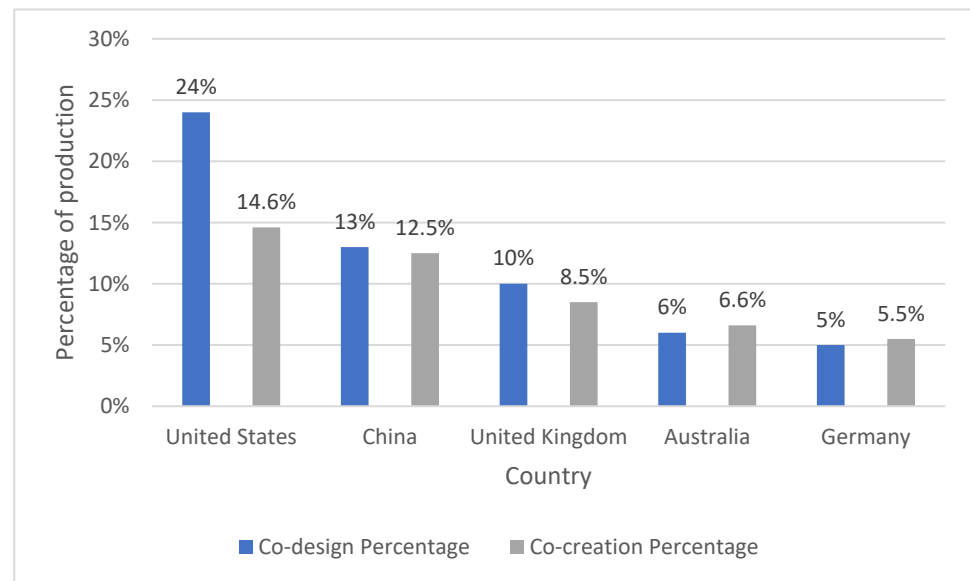


Figure 4. Percentage of production for the top five countries in scientific production in co-design and co-creation.

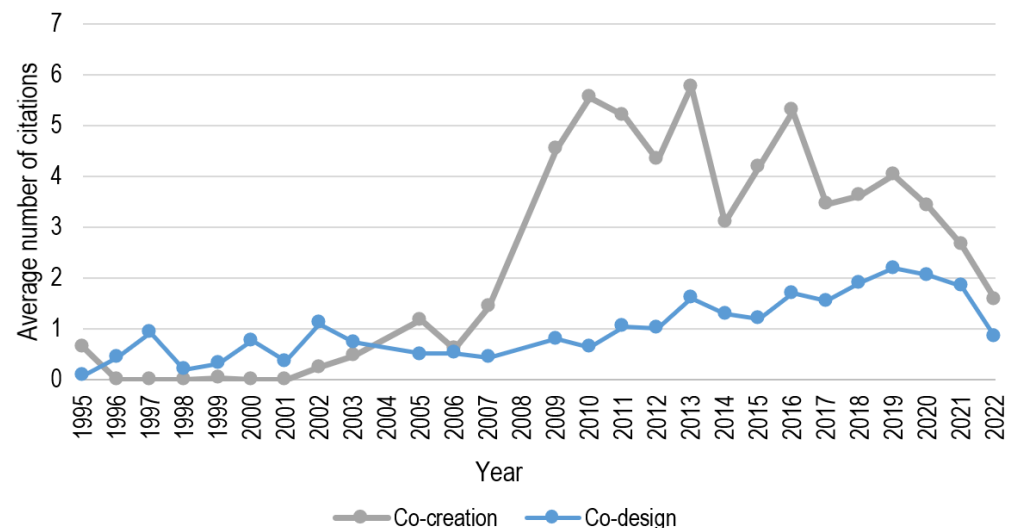


Figure 5. Average citations per year without higher peaks—Bibliometric.

3.3. Author Analysis

The information of the top 10 contributing authors is the result of analyzing the search results tool of the Scopus database. Figure 6 depicts the top 10 contributing authors in the co-design and co-creation fields. Regarding co-design, Allison J.T, Chen C, Nedjah N, Roy K, Wane S, Wang A, Guo G, Tenhunen H, and Zheng L.R have the highest number of documents published with 11 or more documents. The rest of the authors have between 9 and 10 documents published.

Regarding co-creation, Figure 6 shows that Buhalis D., Kosaka M., Hajli N., Hong S.G, Alves H., Ramaswamy V., Shirahada K., and Steen T. have the highest number of documents published with 10 or more documents. The rest of the authors have between eight and nine documents published.

The information about the top-cited authors is taken from the bibliographic coupling by authors calculated in VOSviewer.

According to Figure 7, all authors in the top 20 cited authors of the co-design field have more than 300 citations, including Peng C., Robert G., and Yang T.C., and the most cited authors with more than 500 citations.

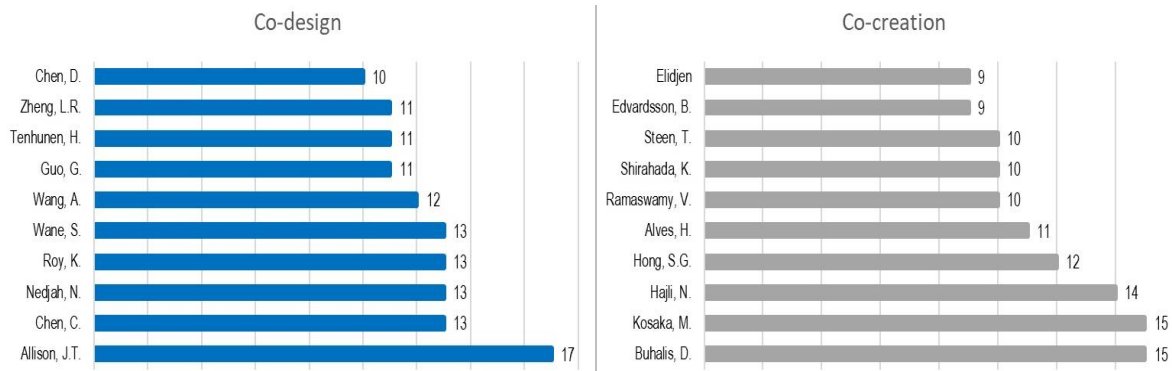


Figure 6. Top 10 contributing authors in the co-design and co-creation fields—Scopus.

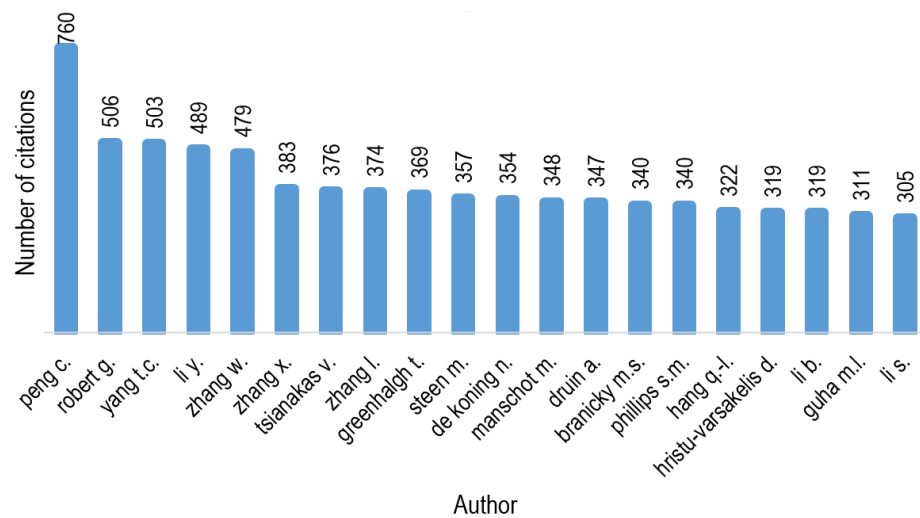


Figure 7. Top 20 cited authors in the co-design field—VOSviewer.

In the co-creation field, the most cited authors have more than 800 citations, highlighting the author Ramaswamy V., who has 4316 citations. Other authors, such as Prahalad C.K., Storbacka K., Maglio P.P., Grönroos C., Frow P., and Payne A.F., also have a higher number of citations with more than 2000 citations. The top 20 cited authors in this field are presented in Figure 8.

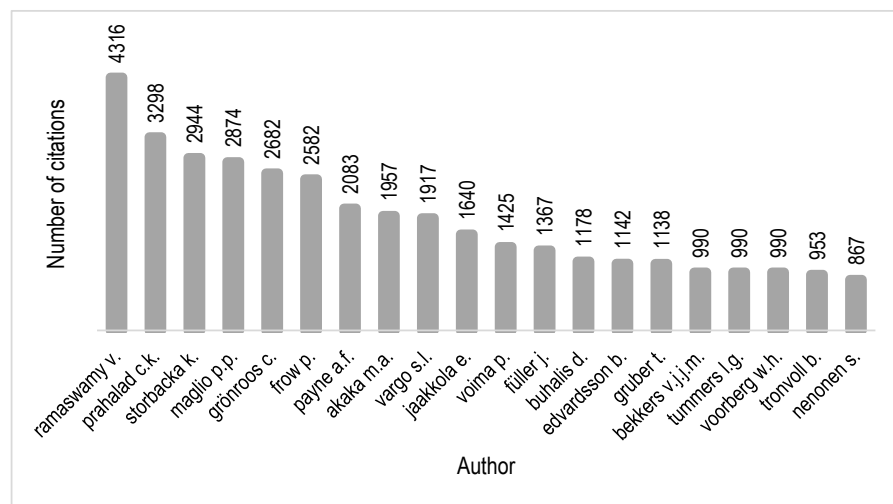


Figure 8. Citations of the top 20 cited authors in the co-creation field—VOSviewer.

There is a notable difference between both fields in terms of citations. It is important to note that the co-creation concept has been more cited than the co-design concept.

3.4. Co-Citation Network

Figure 9 shows the co-citation network for the co-design concept. Sanders E. B. N. 2008 and Braun V. 2006 are the most cited according to this network. Meanwhile, the network shows that Vargo S. L. 2004, 2008, and Prahalad C. K. are the most cited for the co-creation concept. Moreover, Figure 10 shows the co-citation network for co-creation. In these figures, the lines between the dots represent a citation from one author/paper to another. If at least one paper cites another, a line is created between the two dots. The importance of co-citation for researchers is that it allows them to find semantically related documents to trace the origins or antecedents of a theory or concept.

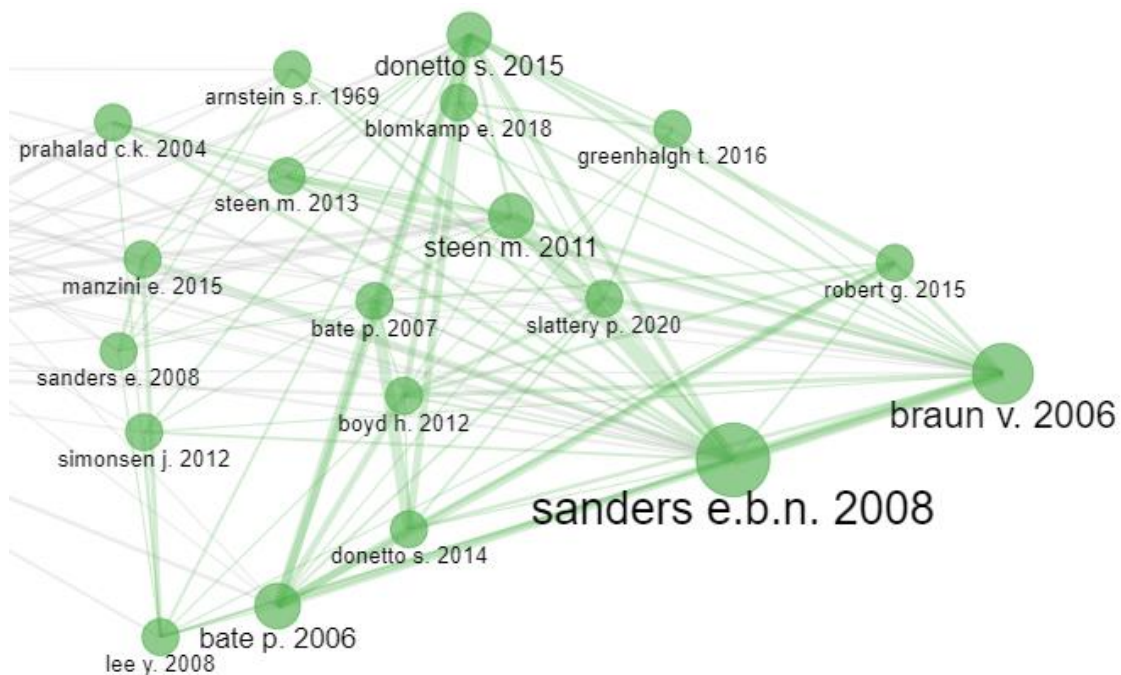


Figure 9. Co-citation network—co-design—VOSviewer—Bibliometrix.

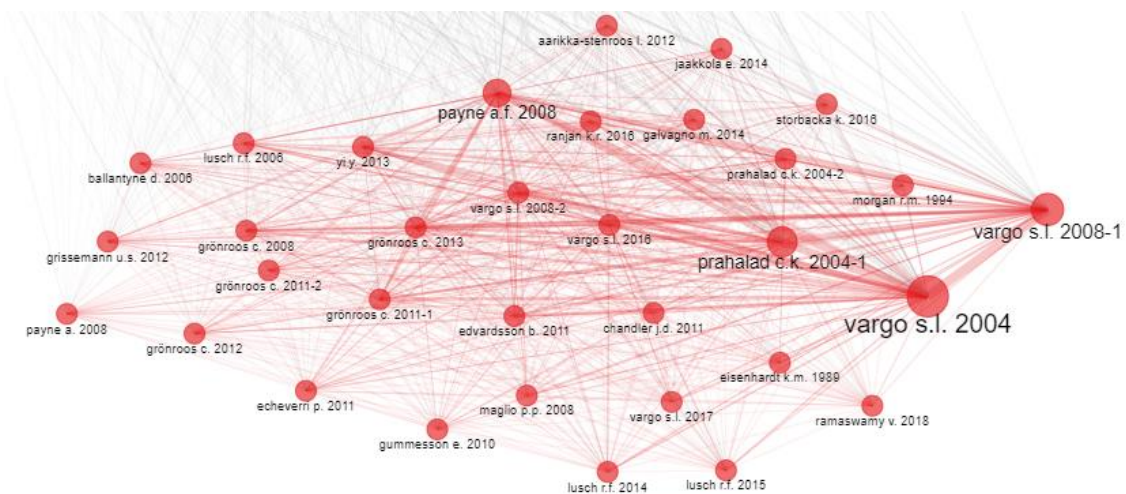


Figure 10. Co-citation network—co-creation—Bibliometrix.

3.5. Content Analysis

3.5.1. Keywords Analysis and Trend Topics—Co-Design

Among the most frequent keywords, the topic of co-design has been addressed in studies related to hardware–software co-design, computer hardware, circuits, field-programmable gate arrays (FPGA), embedded systems, computer-aided design, computer software, product design, and computer architecture, among others. The co-design concept seems to have been widely applied to the design and development of hardware devices.

Regarding co-design, Figure 11 shows that the most occurrent terms in recent years are FPGA, hardware/software co-design, and networked systems. Among the other terms, “participatory design” appears, which refers more to the collaborative participation of people when designing a new idea, product, or service.

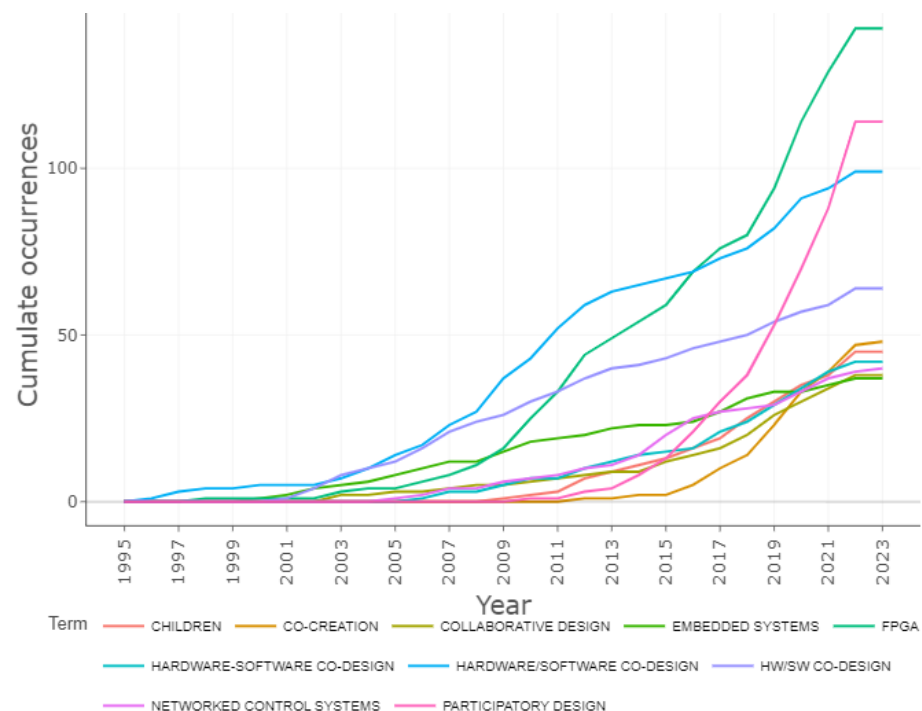


Figure 11. Word dynamics through time—co-design.

According to the trend topics tendency depicted in Figure 12, the co-design concept gained more attention in 2019, and in recent years, other social topics like children, cancer, and participatory design have gained more attention.

Similarly, the tree map (see Figure 13) depicts the number and the percentage of documents that have addressed the different topics related to co-design. The highest number of documents deals with topics such as participatory design, hardware/software co-design, children, and networked control systems. It might suggest that co-design is a topic mainly focused on the design of physical devices. However, the connection between co-design and other topics, such as sustainable development or co-design for social issues, is still blurred.

3.5.2. Keywords Analysis and Trend Topics—Co-Creation

Among the most frequent keywords, the topic of co-creation has been addressed in studies related to value co-creation, sales, innovation, information systems, social networks, human–computer interaction, commerce, healthcare, and sustainable development, among others.

According to Figure 14, all the topics in the co-creation field have gained attention among researchers in recent years, with value co-creation and service-dominant logic the topics with the highest growth rate.

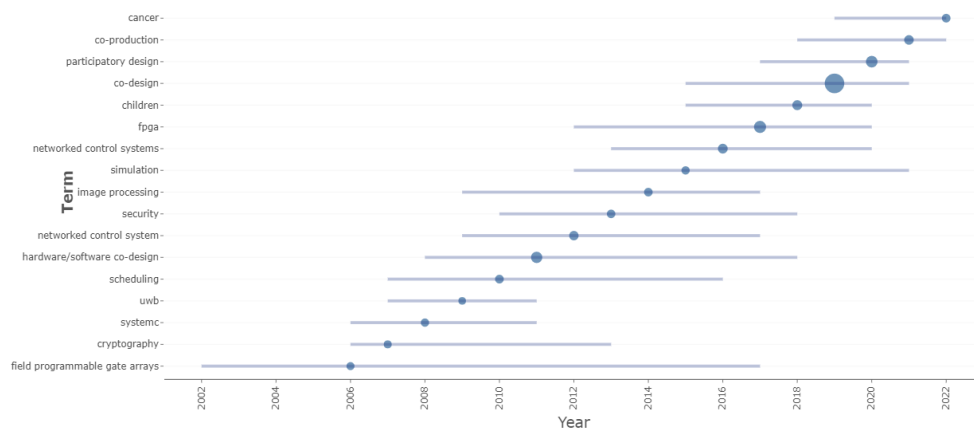


Figure 12. Trend topics—co-design.

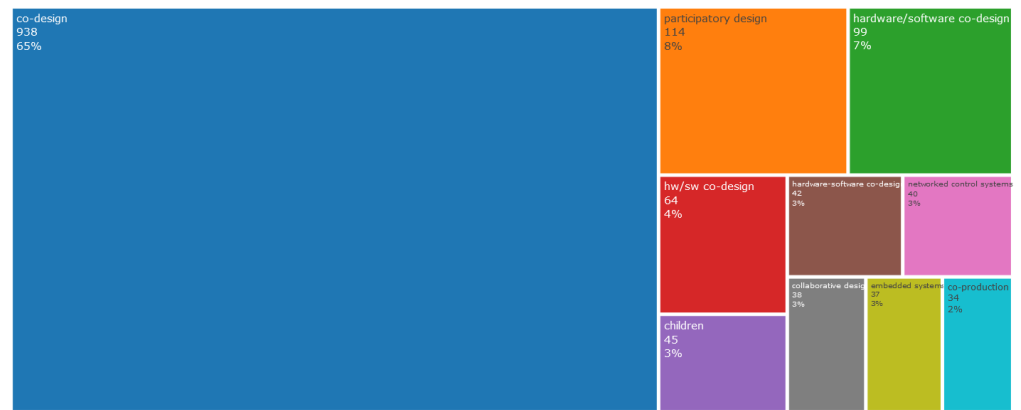


Figure 13. Tree map—co-design field—Bibliometrix.

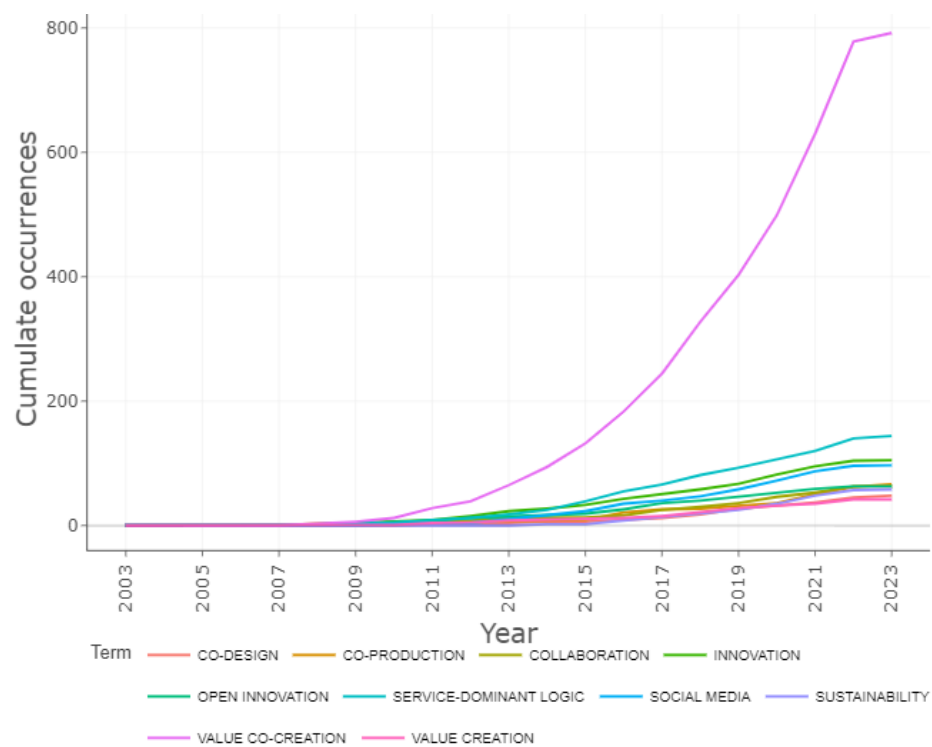


Figure 14. Word dynamics through time—co-creation.

Based on an analysis of the trend topics, Figure 15 shows that, between 2007 and 2017, the most common terms were related to services, knowledge creation, open innovation, and crowdsourcing; meanwhile, in the last few years, the proper term of co-creation has gained more attention as well as other terms such as co-production, artificial intelligence, and COVID-19.

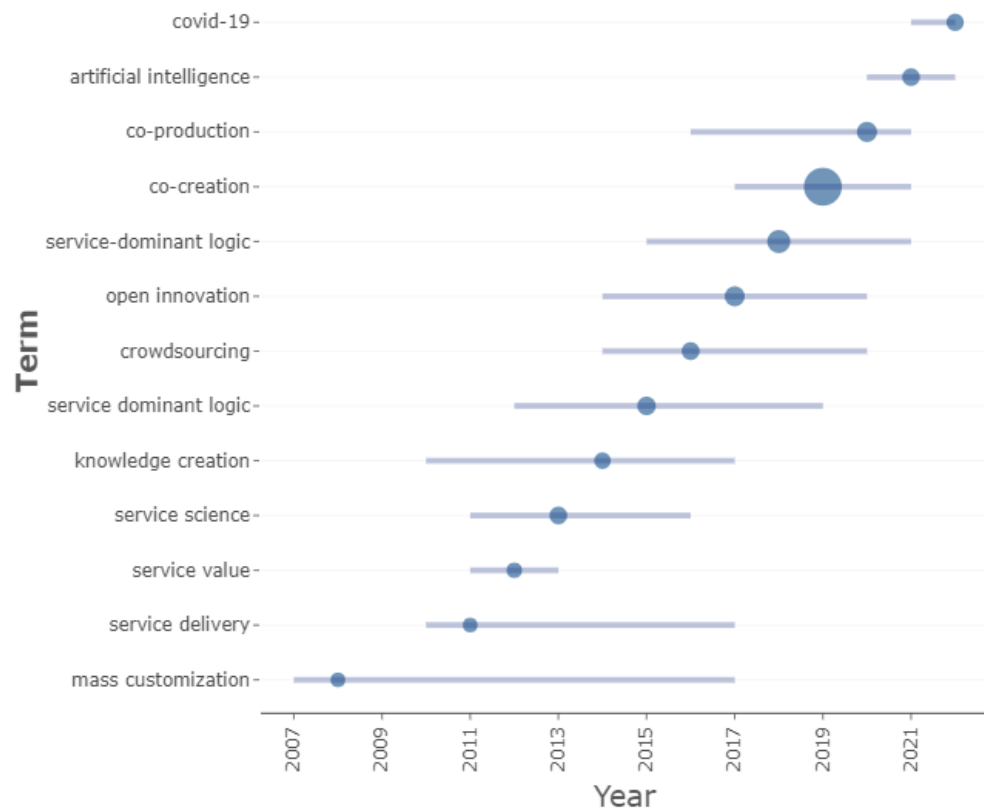


Figure 15. Trend topics—co-creation.

Similarly, the tree map (see Figure 16) depicts the number and the percentage of documents that have addressed the different topics related to co-creation. The highest number of documents deals with topics such as service-dominant logic, innovation, social media, co-production, open innovation, collaboration, sustainability, and co-design. It might suggest that co-creation is a topic mainly focused on management and marketing areas, but research in the field of co-creation for sustainable development is still emerging.

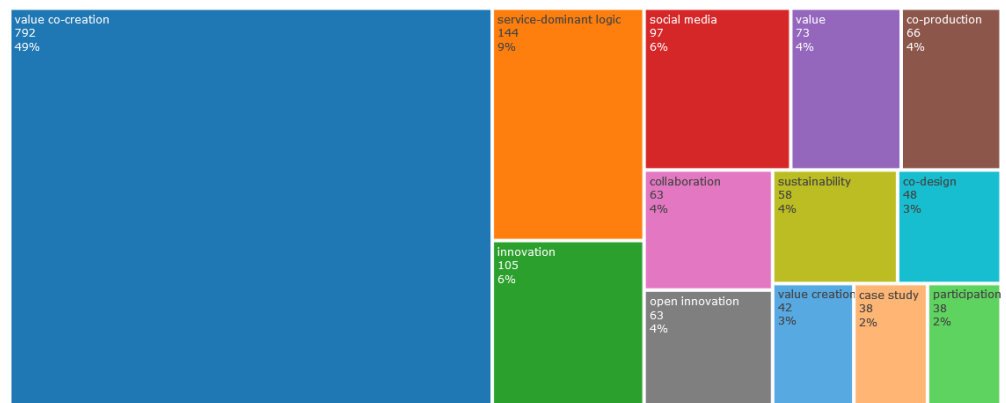


Figure 16. Tree map—co-creation.

3.6. Thematic Evolution

The thematic evolution chart (Sankey diagram) is based on the authors' keywords and two cutting points (2017 and 2020). Regarding co-design (Figure 17), recently, the focus of research has been on the following topics: machine learning, optimization, hardware/software co-design, networked control systems, and issues in the field of health, such as cancer. Regarding co-creation (Figure 18), there are more topics of interest for researchers, such as product/service/brand co-creation, social media, customers, innovation, value co-creation, knowledge generation, artificial intelligence, living labs, and virtual reality. Notably, the topic of networked control systems has a large body of literature that refers to co-design. However, most of the articles do not clearly define why the term co-design is used in that context, and there is no reference to established methodologies in the field.

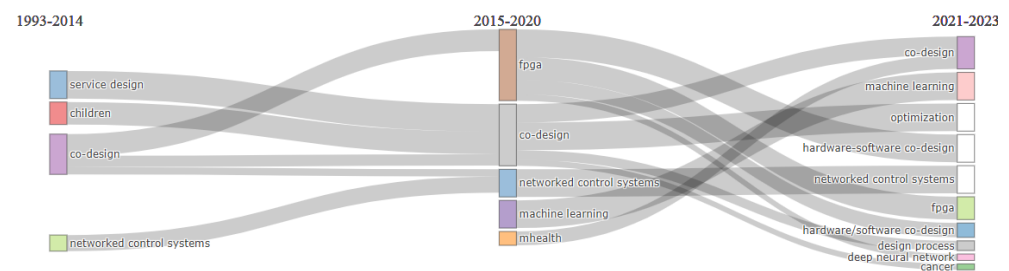


Figure 17. Thematic evolution—co-design.

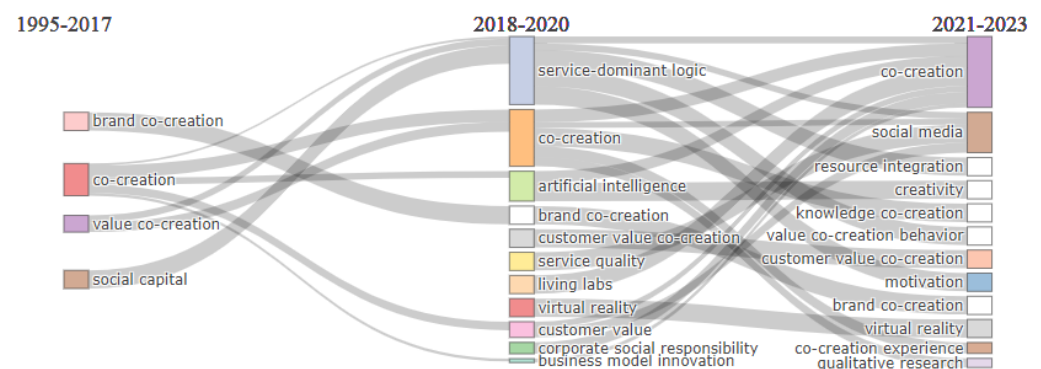


Figure 18. Thematic evolution—co-creation.

In the specific search to identify methodologies, methods, or frameworks for co-design and co-creation, 96 results were retrieved for co-design, while in the co-creation field, there were 71 articles. In Section 4.4, the analysis and discussion of these methodologies are presented.

4. Discussion

4.1. RQ1: What Is the Evolution of Co-Design/Co-Creation in Terms of Scientific Production and Citations?

This bibliometric analysis shows that the annual growth of publications is approximately 7% (co-design) and 14% (co-creation). Although this is a small rate, it should be noted that the search was performed considering that the keywords “co-design” or “co-creation” appear only in the article title to make the search more specific. However, the research interest in articles addressing the topic of co-design or co-creation, in particular, has been growing faster in the last 10 years, with the highest peak of publications in 2022 for both fields. This result is in line with other literature reviews in the co-creation field [14]. Regarding co-design, there are fewer literature reviews, and as pointed out by Wang et al. [25], by 2022, there were no reviews on methods for evaluating co-design in general; indeed, to the best of our knowledge, there is no review of the research in the use of the co-design concept in general addressed from the perspective of bibliometric analysis.

The bibliometric analysis allowed us to identify that co-design and co-creation are trend topics and are gaining momentum due to the current world work dynamics involving interdisciplinary and diverse teams and stakeholders. Moreover, co-design and co-creation have been applied to a wide range of contexts because it is better to integrate the ideas and the task force of people interested in or related to the development of a particular idea, product, or project. However, the scoping review also shows that co-creation for sustainable development is still an emerging area of research that deserves more attention from researchers. In the same vein, there is a need for more research on methodologies for co-creation with a special focus on sustainable development.

4.2. RQ2: Who Are the Most Contributing Authors in Co-Design/Co-Creation in Terms of the Number of Publications and Citations?

The term co-creation was probably coined in the marketing field due to the DART framework introduced by Prahalad C. K. and Ramaswamy V., who appear in this analysis as two of the most cited authors in the authors' production over time analysis. DART stands for dialog, access, risk-benefits, and transparency, which are the common elements in an interaction between a customer and a company [2].

4.3. RQ3: What Are the Methodologies for Co-Design/Co-Creation That Have Been Reported in the Scientific Literature?

4.3.1. Methodologies for Co-Creation

All 71 documents retrieved for the scoping review passed a screening process conducted by the authors. Each paper was read and analyzed to identify the research field, the specific context of the application, the stakeholders, and the components or steps of each methodology reported in the articles. Articles that do not clearly define the steps followed in the methodology were not included in this analysis. Such information is presented in the Appendix A as Table A1. A total of 32 out of the 71 articles describe or introduce phases related to co-creation.

Giner and Peralt's study does not introduce a specific co-creation methodology but gives an interesting list of methods for working with co-creation processes. Such a list includes participatory design, ethnographic fieldwork, lead users, empathic design, co-design, face-to-face workshops, online workshops, appreciative inquiry, contextual design, consumer crowdsourcing, virtual worlds, and living labs.

There is no specific consensus about steps for co-design or co-creation processes; however, there are common steps in some of the methodologies and frameworks.

It is important to note that, in the scoping review, we identified only two studies that report co-creation methodologies and are directly related to sustainability: the study by Scanagatta and Condotta [26] about human transformation for sustainable communities and the study by Mitchell et al. [27] about sustainable travel solutions. In that regard, we recommend conducting more research in the field of co-creation for sustainable development to identify the most effective methodologies.

4.3.2. Methodologies for Co-Design

All 96 documents retrieved for the scoping review passed a screening process conducted by the authors. Moreover, each paper was read and analyzed to identify the research field, the specific context of an application, the stakeholders, and the components or steps of each methodology reported in the articles. Articles that did not include a clear specification of the steps followed were not included in this analysis. Such information is presented in the Appendix A as Table A2. A total of 26 out of the 96 articles describe or introduce phases related to co-design.

In summary, a considerable number of studies report co-designing methods or frameworks that address health or educational issues. Moreover, most of the papers dealing with hardware/software design do not present a specific outline of steps that involve the intervention of stakeholders; for this reason, some papers were left out of this analysis.

4.3.3. Additional Considerations about Co-Design and Co-Creation

The scoping review results show 32 methodologies for co-creation and 26 for co-design (see Appendix A, Tables A1 and A2). However, by analyzing the methodologies, the main conclusion that emerges is that the steps or stages of conducting a co-creation or co-design process are not yet clear. The steps or stages defined in the methodologies differ from the others, and there does not seem to be a clear consensus on that. A possible interpretation of this result suggests that the confusion between the concepts of co-design and co-creation [4] restricts the definition of clear methodological steps. Another interpretation might be that the field is still emerging, and the lack of research has not allowed us to reach a consensus on validated methodologies for these processes. It seems that each team establishes its own methodology depending on their needs. A common approach that appears in the methodologies for co-design and co-creation is the use of workshops as a strategy to involve final users in the design, development, or validation of a proposal or idea. Some methodologies for co-creation involve a co-evaluation approach that seems to be a key step in the co-creation process, and it would be important to provide feedback on the process. In the methodologies for co-designing, the generation of ideas appears as a relevant aspect. This is a natural step in the design process.

The methodologies reported in the papers analyzed are, in general, presented in a very succinct way, and consequently, a few details are provided for each methodology. The methodologies suggested by Wu et al. [28] and Trischler et al. [29] could be two of the most detailed methodologies among the papers analyzed. In this regard, we recommend that future research provide as many details as possible so that future researchers can adapt those methodologies or validate the existing methodologies in other contexts.

By analyzing the methodologies for co-creation, we can see that co-creation methodologies are basically extensions of co-design methodologies by adding steps that involve the co-production of the idea or product and its co-evaluation or co-validation.

Consumers are viewed as co-creators of value because they provide their experience in consuming products and services [30]. Moreover, Maciulien et al. [31] argue that a co-creation ecosystem should involve diverse actors, consistent and dynamic communication, shared vision and trust, feedback mechanisms, and intermediaries. Collaboration and participation (also referred to as the approach of participatory design) are key aspects of co-design and co-creation processes.

From the methodologies for co-design and co-creation, an iterative process is suggested in co-design and co-creation processes to improve artifacts, identify needs and problems, introduce new features and innovations, and allow customers (or final users) to participate to boost organizational competitiveness [32].

When working on designing or creating new products or services, the living labs are emerging as a strategy to involve multiple stakeholders in familiar contexts like day-to-day usage [33].

Participatory design or participatory research is a well-adopted strategy for working in co-design processes. According to Axelsson et al. [34], participatory design is part of the practices for user-centered design where there are multiple co-designers.

Overall, the scoping review results suggest that a future research direction would be to identify validated methodologies for co-design and co-creation and effective strategies to monitor those processes. A validated methodology should involve the phases, activities, tasks, stakeholders, and strategies to monitor and manage co-design and co-creation.

4.4. RQ4: What Are the Trend Topics in Co-Design/Co-Creation in Terms of Contents Analysis Based on Authors' Keywords?

Regarding co-design, there are studies dealing with topics such as hardware/software design, control systems, and design processes, among others. However, such studies do not consider the stakeholders to be an important element in the co-design process. Other topics about co-design highlighted in the studies have a more social focus related to health and educational issues.

In the case of co-creation, topics such as innovation, commerce, and consumer behavior are the most mentioned topics. Moreover, concepts such as value co-creation, collaboration, and co-production also appear as the most addressed topics in this bibliometric analysis.

The results also show that sustainability as a topic only appears in 2% of the publications in the field of co-creation. Consequently, a lack of research in the field of co-creation for sustainable development is evident, and therefore, more research should be conducted in this field in the future, taking into account that co-creation can be one of the best mechanisms by which to tackle challenges in sustainability [8].

5. Future Research Directions

The most important gap to address in the field is the definition of validated methodologies for co-design and co-creation. The definition of these methodologies should include a clear description of roles or stakeholders, phases, activities, and tasks, including a detailed description of mechanisms for monitoring and managing these processes. We encourage future researchers to provide as many details as possible for the methodologies applied in the studies conducted with co-design and co-creation so that other researchers can replicate the methodologies in order to pave the way for defining a common methodology.

Regarding the areas of application, only 2% of the studies reviewed are directly related to the field of sustainable development. In that regard, future research should be conducted on how co-design and co-creation can contribute to sustainable development. In particular, future research can explore how co-creation can be one of the mechanisms to address some issues defined in the SDG 17.

Other research directions might include using artificial intelligence in co-creation and co-design for different purposes, such as generating ideas, management, or monitoring. Moreover, co-creation methodologies are encouraged in other fields that remain underexplored or have not involved vulnerable or marginalized user groups such as migrants. One of the topics that deserves more attention is the definition of methodologies for co-creating virtual reality storytelling environments.

Since the field of co-design and co-creation is an emerging field, we recommend regularly conducting other bibliometric analyses and systematic reviews to better understand the current landscape of research in the field and identify trends and research gaps that other researchers can address.

6. Conclusions and Limitations

The bibliometric analysis reported in this study shows the main trend topics in the co-design and co-creation fields and the publication behavior from 1993 to now. The lists of the top 20 contributing authors and the top 20 cited authors can be used by students and early-career researchers to identify the most prominent authors in the field for future research. Moreover, the results show that the trend topics in the field of co-design are machine learning, optimization, hardware/software co-design, and issues in the field of health, such as cancer. Regarding co-creation, the trend topics are product/service/brand co-creation, social media, customers, innovation, value co-creation, knowledge generation, artificial intelligence, living labs, and virtual reality. Other researchers and stakeholders can use the results of the bibliometric analysis in the research process to decide on the key topics to focus on in future research projects. Moreover, policymakers can identify key topics to create funding opportunities for future research projects.

To identify the main methodologies or frameworks, a scoping review was conducted for both fields of co-design and co-creation. As a result, 26 co-design methodologies and 32 co-creation methodologies were identified and presented in terms of phases, stages, or steps. However, there is no consensus about steps for co-design and co-creation, but there are key components such as working closely with stakeholders, keeping in mind the final user or objective public, establishing sharing spaces (i.e., workshops), disseminating results, generating specific artifacts (physical or digital resources), etc. To the best of our knowledge, this is the first study that summarizes the methodologies for co-design and

co-creation defined in the literature. In that regard, practitioners and stakeholders can have a compendium of methodologies at hand that have been defined and applied in different disciplines, and this is a starting point for the definition of a common methodology for co-design and co-creation.

The results of the scoping review suggest a lack of research in the field of co-creation methodologies for sustainable development. In that regard, a future research direction could be to define and validate methodologies for value co-creation for sustainable development. Innovation and the co-creation of innovation are key to addressing the challenges of sustainability [35].

This bibliometric and scoping review opens up the agenda for working in the co-design and co-creation of experiences, ideas, products, or services that involve the use of a controlled process through different stages as well as the support with novelty technologies and strategies such as artificial intelligence, immersive technologies, living labs, participatory design, and workshops.

The bibliometric analysis and the scoping review presented in this study have some limitations. On the one hand, the timeframe was restricted to papers published until May 2023, so the results might have missed papers published after this date. On the other hand, the scoping review results might be biased due to the research bias introduced in some of the studies reviewed. In that regard, the results of this study should be interpreted with caution. Moreover, we only considered journal papers in the scoping review, but some conference papers might contain insights into new methodologies. Regarding the bibliometric analysis, some papers less related to the topic might have been included in the analysis, and therefore, the results might be biased.

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Data Availability Statement: The datasets used in this review are publicly available in the following repository: https://osf.io/frupg/?view_only=ed77ea95d1ce444fb38362b1329df577 (accessed on 28 November 2023).

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Table A1. Methodologies for co-creation reported in the scientific literature.

N°	Reference	Research Field	Specific Context of Application	About the Stakeholders	Components/Steps
1	[36]	Planning process	Gamified urban planning. The co-creation process is applied based on a proposed planning solution	Experts (planners, architects, engineers, etc.) Non-experts (mayor, city council, district governor, etc.)	Step 1: To interact and explore the game environment. Step 2: To discuss the elements involved in the solution's workflow. Step 3: To discuss and evaluate the proposed solution. Step 4: To propose changes or alternative solutions.

Table A1. Cont.

N°	Reference	Research Field	Specific Context of Application	About the Stakeholders	Components/Steps
2	[37]	Marketing	The product storytelling process	Suppliers, employees, and consumers	Co-creation based on the DART model (Dialogue, Access, Risk-Benefits, Transparency)
3	[38]	Scientific publications	Co-creation of plain language summaries with the intended audience	14 experts in patient engagement or in plain language summaries	Step 1: Rationale and scope. Step 2: Identify your target audience. Step 3: Consider the dissemination channels. Step 4: Identify your key stakeholders for co-creation. Step 5: Write. Step 6: Disseminate. Step 7: Track dissemination and measure success.
4	[39]	Public services	Co-creation in integrated public services	Service users and service providers	Step 1: Design Step 2: Delivery Step 3: Evaluation
5	[28]	Social innovation design	Modeling a co-creation design approach for intergenerational community development in a public square in a Shanghai community	Research team, stakeholders, and community participants. Moreover, 30 residents took their role as community participants	Steps of the co-creation method: Step 0: Establish trust relationships. Input Step 1: Find society topic. Step 2: Discovery needs. Step 3: Building shared vision. Output Step 4: Proof of concept and iteration. Step 5: Collaborative implementation. Step 6: Action co-building. Step 7: Ongoing operations. Step 8: Future vision. Step 9: Co-proposal. Co-creation workshop Step 1: Warm-up and icebreaker. Step 2: Community public impression. Step 3: Public area of co-creation. Step 4: Common assessment.
6	[40]	Aquaculture fish	Generation of 112 aquaculture fish product ideas.	36 participants consumers from Germany, France, and Spain	Step 1: A warm-up debate. Step 2: Generating new product ideas. Step 3: To score acceptance of new ideas. Step 4: Complementary activities. Step 5: A general discussion for a deeper understanding.
7	[41]	Resilient healthcare	To promote resilient healthcare through co-creation	20 stakeholder participants (5 kin representatives, 10 oncology nurses, and 5 physicians)	Step 1: Identify potential areas of co-creation. Step 2: Identify improvement areas and methods for involvement. Step 3: Preparation and individual learning from research and giving feedback. Step 4: Meeting in a collaborative learning forum and co-create consensus.
8	[42]	Quality in the daily workflow of hospitals	Improvement in the quality of the daily workflow in hospitals	33 healthcare stakeholders (12 board members, 6 policymakers, 3 representatives of patient associations, 4 representatives of hospital organizations, and 8 healthcare scientists)	Step 1: Planning. Step 2: Control. Step 3: Improvement. Step 4: Leadership. Step 5: Culture. Step 6: Context.

Table A1. Cont.

N°	Reference	Research Field	Specific Context of Application	About the Stakeholders	Components/Steps
9	[43]	Computer game development	Use of digital stories in a co-creation process as a way of participatory design for the research and design of a computer game	14 students (autistic young people), 8 staff members, 4 technology representatives, and a doctoral researcher	A spiral mode in which the first step is plan, then act and after the following iteration, there should be a reflection process. Step 1: Plan (activities, resources, support). Step 2: Act (design, develop, test, evaluate). Step 3: Reflect.
10	[44]	Research	Definition of guidelines for research integrity	Researchers, research institutions, funders, and journals	Step 1: Preparation. Step 2: Sensitization. Step 3: Workshop exercises. Step 4: Analysis.
11	[45]	Teaching	Research-inspired teaching framework	14 co-creators (students, educators, and self-identified facilitators of "Research Inspired Teaching")	Three workshops: Co-define; Co-design; Co-refine.
12	[32]	Value co-creation with customers	Customer-service relationship	Co-creation may involve many stakeholders and many customers and communities	Co-creation context Customer Organizational Technological Environment Forms of co-creation Co-conception of ideas Co-design Co-research Co-marketing Feedback loop Co-conception for competition
13	[46]	Research	The research forum as a methodological framework that enables co-creation in the social sciences field	Called as co-researchers	Domains for co-creation in citizen social science: Participation Transdisciplinary Reflexivity Impact
14	[47]	Entrepreneurship	Use of ICT for supporting entrepreneurial activity	60 participants	Participants worked to build together, generating ideas, and polishing those ideas in a co-creation process divided into two parts: 1. Identifying critical parts of the creation of an entrepreneurial project. 2. Developing two proposals to overcome the identified critical parts.
15	[48]	Medium-sized businesses	Human resources management	Managers, representatives from the unions, key persons identified in the process, working agency, business health representatives, financiers, and researchers	DART method by Ramaswamy: Dialog; Access; Risk; Transparency.
16	[49]	Tourism	User engagement for defining the optimal conditions for tourism	Local stakeholders, experts, and users	Co-creation workshop: Step 0. Selection of cases. Step 1. Identification of flows. Step 2. Recognition of optimal conditions. Step 3. Identification of adaptive actions. Step 4. Transformation of the data obtained.
17	[33]	Energy services	Co-creation in the design of energy services	End-users and experts from the building industry, energy industry, and service design	Co-creation in a living lab context: Step 1: Strategic. Step 2: Design. Step 3: Solution.

Table A1. Cont.

N°	Reference	Research Field	Specific Context of Application	About the Stakeholders	Components/Steps
18	[50]	Architecture	Co-creating public spaces as an action-research project	20 participants: Architecture students, researchers, and technicians from the CMC	Step 1. Approximation. Step 2. Recognizing. Step 3. Ideation. Step 4. Prototyping.
19	[51]	Science	Science-based co-creation	Researchers	Step 1: Decision engagement. Step 2: Inputs by actors. Step 3: Managing co-creation.
20	[52]	Public governance	Co-created governance solutions	Non-government actors, such as service users, voluntary groups and organizations, and private stakeholders, etc.	Components: Theories; Public value management; Public innovation; Collaborative governance; Governance network theory; Strategic management; Digital era governance.
21	[26]	Sustainability	Urban transformation for sustainable communities and environments	Residents, parents, representatives of the administration, local stakeholders	Looper method (using a living lab): Step 1: Problem identification. Step 2: Co-design. Step 3: Action and feedback.
22	[53]	Education and health	Co-creation of healthy environments in universities	30 participants (students, services personnel, teachers, administrative staff, researchers)	Step 1: Participation action for selecting ideas. Step 2: Prototyping in teams. Step 3: Evaluation and methodological design.
23	[54]	Sports	Co-creation of a green sports event brand	Managers Sponsors City is also considered a stakeholder	Step 1: Event strategy. Step 2: Event experience. Step 3: Event brand development. Step 4: Event evaluation.
24	[55]	Responsive research innovation	A co-creation course for university students	Experts in the domain from academia Experts in the domain of technology End-users Public and private sectors	Course based on the Kolb's model. Students interact with experts and end-users. Step 1: Active experimentation (doing). Step 2: Concrete experience (feeling). Step 3: Reflective observation (watching). Step 4: Abstract conceptualization (thinking).
25	[56]	Tourism	Value co-creation in service enterprises for tourism	Shareholders, venture capitalists, customers, suppliers	Step 1: Value conceptualization. Step 2: Value actors. Step 3: Creation platforms. Step 4: Resource planning. Step 5: Learning. Step 6: Value co-creation. Step 7: Co-created value.
26	[57]	Public health	Evaluation of participatory methodologies. identify a key set of principles and recommendations for co-creating public health interventions	A combination of service providers and end-users	Iterative co-creation process: Step 0. Planning. Step 1. Conducting. Step 2. Reflecting. Step 3. Evaluating.
27	[58]	Health	Co-creation of a patient workbook	14 participants	Step 1: Review and synthesize the evidence. Step 2: Individual reflection and small group brainstorming. Step 3: Achieving group consensus. Step 4: Clustering ideas. Step 5: Naming, ordering the clusters. Step 6: Naming the resource.

Table A1. Cont.

N°	Reference	Research Field	Specific Context of Application	About the Stakeholders	Components/Steps
28	[59]	Education	Co-creation of a serious game	Researchers and teachers	Step 1: Diagnostic. Step 2: Action planification. Step 3: Action. Step 4: Evaluation. Step 4: Specifications.
29	[43]	Learning technologies and educational needs	Co-creation of digital stories for children with autism	Academic staff Students	Step 1: Development of the ingredients for the digital stories. Step 2: Co-creation of the digital stories. Step 3: Analysis and conceptualization of the videos as digital stories, and digital stories as evidence.
30	[60]	Innovation	Framework for creating innovation in the Triple Helix	Academics Practitioners Government Shareholders Other stakeholders	Step 1: Actors' resources. Step 2: Value proposition. Step 3: Interaction and resource integration. Step 4: Modified resources.
31	[61]	Semantic web in healthcare	Ontology co-creation	Residential Hospital healthcare	Step 1: Composing a stakeholder group. Step 2: Observations at institutionalized settings of care. Step 3: Workshop type 1: Introducing ontologies. Step 4: Workshop type 2: Scenario role-play. Step 5: Workshop type 3: Decision-making. Step 6: Workshop type 4: Concept evaluation. Step 7: Workshop type 5: Embodied system use.
32	[62]	Behavioral sciences	Social marketing	Multiple case studies (students, obese people, students, teachers, defense personnel)	Step 1: Co-create. Step 1.1: Stakeholder orientation. Step 1.2: Competition. Step 1.3: Theory. Step 1.4: Segmentation. Step 2: Build—marketing mix. Step 3: Engage.

Table A2. Methodologies for co-design reported in the scientific literature.

N°	Reference	Research Field	Specific Context of Application	About the Stakeholders	Components/Steps
1	[63]	Health	Co-design of patient information sheets	Key providers Consumers	Step 1: Content. Step 2: Communication of content. Step 3: Design. Step 4: Delivery and access. Step 5: Usability. Step 6: Engagement.
2	[64]	Cooperation and co-design	Design of a cooperative digital solution	Researcher Designers Domain experts	Step 1: Start: Building insight and generating statement representations. Step 2: Move: Horizontal groups and the "move" to design ideas. Step 3: Land: Vertical groups and implementing design ideas in a prototype.
3	[65]	Community-based participatory research	Design of social resources for immigrants using co-design methods	Immigrants Researchers	Step 1: First co-design workshop. Step 2: Second co-design workshop. Step 3: Consultations with key stakeholders. Step 4: Final co-design workshop.

Table A2. Cont.

N°	Reference	Research Field	Specific Context of Application	About the Stakeholders	Components/Steps
4	[66]	Learning and augmented reality	Co-design of augmented reality games	Leader Designers Developers Researchers Teachers Students	Step 1: Training. Step 2: Iterative design (ideating, designing, and developing). Step 3: Evaluation.
5	[67]	Health	Co-design framework for building coalition in cancer control	Stakeholders involved in the development or delivery of cancer control care, research, and/or policy	Step 1: Engagement. Step 2: Discovery. Step 3: Unification. Step 4: Action.
6	[68]	Health	Co-design of a virtual health intervention	Patients Clinicians	Step 1: Defining challenges and empathizing. Step 2: Ideating solutions (patients only). Step 3: Individualized virtual onboarding (patients only). Step 4: Virtual prototyping (patients only). Step 5: Further ranking. Step 6: Engineering work (ongoing). Step 6: Engineering work (ongoing). Step 7: Testing.
7	[69]	Health	Developing a mobile app for older adults using co-design	Older adults Caregivers Care providers	Step 1: Consulting stakeholders, after a scoping review. Step 2: App development and co-designing with older adults. Step 3: Field-testing with older adults. Step 4: Reflecting on lessons learned.
8	[70]	Health	Co-design of services with young people with mental health problems	Young people Staff Researchers	Step 1: Setting up the project. Step 2: Gathering staff experiences. Step 3: Gathering the experiences of service users. Step 4: Bringing participants together in a co-design event. Step 5: Organizing small groups in which staff and service users. Step 6: Holding an end-of-project celebration event.
9	[71]	Health	Co-design of a cancer exercises toolkit	25 exercise professionals	Step 1: needs identification and co-design. Interview. Participants' screening. Workshop 1 and 2 (capture and understand experience). Workshop 3 (challenges and opportunities). Workshop 4 (improve experience). Step 2: Pilot evaluation.
10	[72]	Health	Co-design of a framework for remote control cancer care	Patient Caregiver Community	Step 1: Identify. Step 2: Discover. Step 3: Define. Step 4: Ideate. Step 5: Refine. Step 6: Implement. Step 7: Test.
11	[73]	Cultural heritage	Co-design across cultures	Local people Urban designers Students of design Markers Consumers Providers Researchers	Step 1: Introducing/starting. Step 2: Following/inheriting. Step 3: Changing/transferring. Step 4: Concluding/combining.

Table A2. Cont.

N°	Reference	Research Field	Specific Context of Application	About the Stakeholders	Components/Steps
12	[34]	Robotics	Social robot co-design	Domain experts Co-designers	Step 1: Problem space. Step 2: Design guidelines. Step 3: Solution space.
13	[74]	Health	Co-design of a web-based portal for cardiac rehabilitation	Consumer Researcher Product developer Clinician	Step 1: Workshop design. Step 2: Workshop satisfaction. Step 3: Workshop analysis of the themes.
14	[75]	Games and education	Framework for the co-design of narrative digital game-based learning	Educators Game developers Co-designers	Step 1: Preparation. Step 2: Co-design. Step 3: Co-specification. Step 4: Development.
15	[76]	Urban landscape	Co-design of urban landscape	Architects Urban landscape designers Engineers Process managers	Collaborative levels: Collaborative; Participative; Consultive; Informative; Stages. Step 1: Research. Step 2: Analysis. Step 3: Projection. Step 4: Selection.
16	[77]	Urban landscape	Framework for co-design urban planning	Citizens and other stakeholders	Step 1: Interest and power matrix of actors. Step 2: Exercise booklets for experience registration. Step 3: Sports experience and conditions matrix. Step 4: Online post-its board in the co-design workshop. Step 5: Live sketching in the park and site architectural plans. Step 6: Live collective sketching of spatial layout. Step 7: Diagrams, plans, and renders. Step 8: Sketching in social media visuals. Step 9: Sketching in details and sections. Step 10: Work in progress in social media. Step 11: Plans and renders. Step 12: Photographs in a report. Step 13: Sketches in a printed architectural layout. Step 14: Sketching in sections and details.
17	[78]	Health	Co-design with Aboriginal community members	Government and non-government service providers Clinicians Managers Coordinators Support services	Step 1: Look and listen. Step 2: Think and reflect. Step 3: Collaborate, consult, and plan. Step 4: Take action.
18	[79]	Health	Co-design of a psycho-social service for caregivers	Caregivers Local stakeholders	Step 1: Foundation of the service concept. Step 2: Co-design workshops. Step 3: Piloting and preliminary assessment.
19	[80]	Health	Co-design of healthcare user engagement	Patients Patients' partners Caregivers Clinicians Healthcare decision-makers	Pre-design Step 1: Contextual inquiry. Step 2: Preparation and training. Co-design Step 3: Framing the issue. Step 4: Generative design. Step 5: Sharing ideas. Post-design Step 6: Data analysis. Step 7: Requirements translation.

Table A2. Cont.

N°	Reference	Research Field	Specific Context of Application	About the Stakeholders	Components/Steps
20	[81]	Health	Co-design of expert caregiving interventions	9 expert caregivers Informal caregivers Professional stakeholders	Step 1: One workshop for recruit participants. Step 2: Establishment of a steering group. Step 3: Establishment of a reference group. Step 4: Planning and co-designing the intervention. Step 5: Discussion and planning after the training course. Step 6: Co-designing procedures for organizing volunteering opportunities. Step 7: Co-designing volunteering opportunities.
21	[82]	Health	Co-design of a framework for youth mental health	Elders Young people Service staff	Step 1: Engagement. Step 2: Preparation for working together and co-design workshops. Step 3: Clients at headspace center sites. Step 4: Community assessment.
22	[83]	Education	Co-design of an intervention for inclusion of children in schools	Research team Specialist additional support for learning teachers Classroom teachers Specialist therapists Managers of education and health services Psychologists Medical doctors Parents/carers	Step 1: Gathering feedback on proposals for change. Step 2: Theoretical framework development. Step 3: Developing pencil and paper tools. Step 4: Developing a design specification and building new manual. Step 5: Naturalistic implementation for new materials.
23	[84]	Health	Human-centered design in the prevention of diabetes in adolescents	Adolescents Parents Professionals	Step 1: Adolescents—patients session 1. Step 2: Adolescents—patients session 2. Step 3: School-based adolescent session. Step 4: Professionals session.
24	[27]	Sustainability	Co-design of sustainable travel solutions	Participants Researchers Travel experts	Step 1: Problem and context setting. Step 2: Storytelling. Step 3: Problem understanding. Step 4: Idea generation.
25	[85]	Behavior	Co-design of methods for connecting generations	Children Older adults	Step 1: Pre-design preparation. Step 2: Flexible co-design activities. Step 3: Distributed collaboration. Step 4: Return to co-located design activities.
26	[29]	Management and public management	Public service design projects	Researchers with backgrounds in service design, marketing, psychology, and social innovation	Step 1: Resourcing. Step 2: Planning. Step 3: Recruiting. Step 4: Sensitizing. Step 5: Facilitating. Step 6: Reflecting. Step 7: Building for change.

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