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Characteristics of Co-Design in the Context of Social Innovation

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Abstract. The purpose of this study is to explore the characteristics of co-design methods in the context of design for social innovation, to expand the application scope of co-design methods and enrich their connotations. Using Citespace literature quantitative analysis tool to construct knowledge maps and summarizes the research hotspots of co-design in domestic and foreign. Dividing social innovation into 4 contexts: Local Culture, Community Construction, Public Welfare care, and Public Service. The Nvivo text grounded coding tool is used to extract the theme characteristics of the 4 contexts and commonly used co-deign methods. Ten application characteristics of co-deign in different contexts of social innovation are obtained, which deepens the theoretical basis of co-deign methods and provides a reference for co-deign research in social innovation and other fields.

Keywords. Co-design, Design for Social innovation, Knowledge map, Coding analysis, Characteristics

1. Introduction

Collaboration is not a new topic. Collaborative behavior is a genetic attribute of all social animals, which has always accompanied human existence and continues to evolve with the development of social, economic, technological, political systems and other factors [1]. Entering the post-industrial era, open digital platforms have broken through the limitations of physical dimensions, providing individuals with opportunities to actively participate in the design and production process. Design, as an intrinsic driving force in this historical transition period, its collaboration and participation are constantly being explored and stimulated, gradually developing co-design theory. In recent years, design research on social issues has become richer, and many emerging design directions have emerged. Among them, Design for Social Innovation (DSD has received growing attention in the design field. Co-design, as the core design strategy of DSl, runs through its en-tire development process. Meanwhile, the DSI also provides a platform for co-design to explore new directions and becomes a source of power for promoting the development of co-design. Therefore, exploring the application characteristics of co-design methods in the context of DSI helps us better understand the connotation of co-design and enriches the application category and theoretical system of this method. Characteristics of co-design methods in the context of DSI helps us better understand the

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connotation of co-design and enriches the application category and theoretical system of this method.

2. Development of Co-design Theory

The concept of co-design originated in the Scandinavian region in the 1970s and rose in the field of computers. lnitially called participatory design, which has a strong political color. Then it developed rapidly in the fields of business and management. Prahala[2] and others proposed that in emerging economies, the co-creation experience of consumers becomes the basis of value. Since then, the boundaries of co-design have been continuously expanded. Sanders[3] proposed the concept of fuzzy front end' from the perspective of co-design tools and methods: allowing participants to participate in the early exploration stage of innovation activities, thereby influencing the design that has not yet appeared. Manzini[4] defined co-design from the perspective of DSI as: a vast and multifaceted social dialogue between individuals and collectives, where participants initiate design actions at various nodes of their social networks.

By combing through the development process of co-design, it can be found that the depth and breadth in co-design gradually deepen and expand with the changes in social development, and penetrate into various fields of society at present, becoming one of the important method to resolve social contradictions and promote social development.

3. Hotspots and Frontier Trends of Co-design methods in Design field

3.1. Hotspots of Co-design in Design field

This study uses academic papers related to co-design in two Chinese journals, *Packaging Engineering* and *ZhuangShi*, and three foreign journals, *Design Studies*, *Design Issues*, and *CoDesign*, over the past decade as data sources, resulting in 255 valid domestic sample documents and 269 valid foreign sample documents. Using the information visualization tool CiteSpace, a keyword co-occurrence map of domestic and foreign co-design research literature is generated, resulting in 7 clustering nodes domestically and 9 clustering nodes abroad, as shown in Figure 1. The nodes of the keyword co-occurrence network are summarized and integrated to extract 6 main research hotspots.

Cluster 1: Design education.including thinking and methods.scholars combine co-design with the education system, using workshop discussions, interdisciplinary cooperation, and other methods to stimulate students' initiative and creativity , fostering a sense of collaboration in practice[5]. Cluster 2: Service Design, including public services and service systems. Co-design appears in the form of co-creation in service encounters, establishing a service system based on the interaction and collaboration between service providers and recipients[6]. Cluster 3: Architectural Design, including community design and urban planning. Co-design was widely applied in the fields of architecture and planning at the end of the 20th century. The community has become the most focused object, based on a group of people with similar values and high interaction, to carry out the design of community facilities, spaces, and services[7]. Cluster 4:

Interaction Design, including user experience and smart homes. The co-design of interactive design is a systematic project, which includes collaboration between users and design team, collaboration among information technologies, people with interaction methods[8]. Cluster5: Collaborative Innovation, including design management and school-enterprise cooperation. As a design management model and strategy, co-design integrates and allocates advantageous resources between enterprises and teams to build an ecosystem of collaborative innovation and improve the efficiency and success of enterprise [9]. Cluster 6:Design for Social Innovation (DSD, including clusters such as culture, community, and rural areas, this direction pays attention to changes in lifestyle, using co-design to creatively combine existing social resources, services, and knowledge to create new social relationships or lifestyle[10].

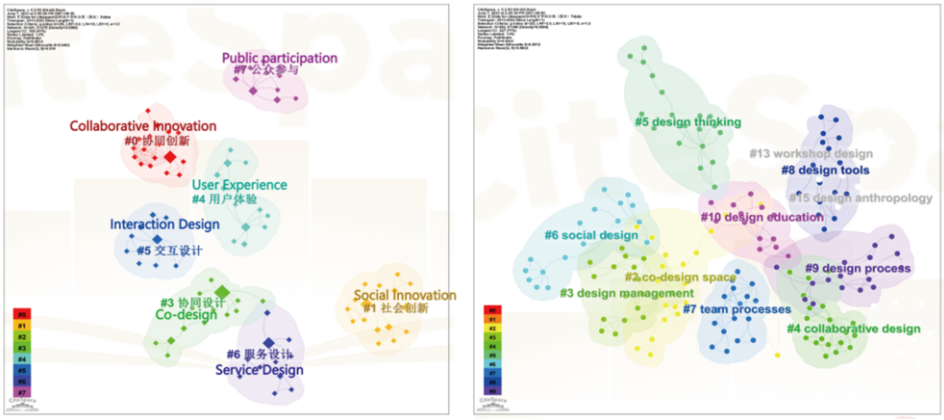

Figure 1. The cluster diagram of keywords in co-design research

Based on the content of the above clusters, there are two commonalities in the research of co-design at the theoretical level : (1) The coordination and integration features of co-design are reflected in different fields. (2) Most areas emphasise the cultivation of subjective initiative and collaborative consciousness for role participation. At the practical level, there are significant differences in the application of objects, tools of co-design in various fields. The form content is rich and diverse, and the relevance and commonality between various fields are not very clear.

3.2. Frontier Trends of Co-design in Design Field

Using Citespace's keyword outbreak detection and highly cited literature to explore the frontier trends of co-design research at domestic and foreign. DSI is a research direction that has been continuously erupting in co-design in recent years. The theme words revolve around rural areas, communities, intangible cultural heritage, service design, etc. Please refer to Table 1 for more information. Based on the political strategic background of Chinese poverty alleviation and people's livelihood construction, co-design has pro.posed innovative solutions to complex social problems such as rural revitalization and aging.

Table 1. Domestic co-design keyword outbreak and high-heat literature

Keywords	Strength	Time	Cited References	Citations	Time
Design for Social Innovation	2.82	2017-2022	Collaborative Design "Trigger" Revival of Traditional Community: Case Study on Design Research and Practice of "New Channel · HuaYaoHua" Project on Intangible Cultural Heritage	69	2016
Artificial Intelligence	2.10	2019-2020	Tacit Knowledge: The Microscopic Perspective of Design Innovation Research on Traditional Crafts	58	2015
Service Design	1.47	2013-2016	A Comparison Study on Art-driven Rural Construction Cases	54	2018

According to the results of foreign co-design keyword outbreaks, social design is a continuously erupting research direction. Around the themes of social innovation, public services, social change, etc. Please refer to Table 2 for more information. Based on the foundation of Western civil society and human subjective initiative, co-design aims to fundamentally change group behavior patterns and create a new social system and lifestyle. Both levels of DSI research are centered on co-design thinking, providing abroad practice platform for co-design research.

Table 2. Foreign co-design keyword outbreak and citation outbreak

Keywords	Strength	Time	Cited References	Citations	Time
Social design	2.19	2020-2022	Institutioning: Participatory Design, Co-Design and the public realm	3.38	2020-2023
Design method	1.92	2021-2022	Design, when everybody designs: An introduction to design for social innovation	2.99	2018-2019
Design anthropology	1.71	2021-2022	Democratic design experiments: between parliament and laboratory	1.88	2018-2019

4. Characteristics of Co-design in the Context of Design for Social Innovation

4.1 The Relationship between Design for Social Innovation and Co-design

Looking at the development process of DSl, it can be divided into three stages: (1) From the 1970s to the 1980s, design was used to meet the survival needs of the underprivileged. Papaneck[11]proposed design for the disadvantaged". (2) From the 1990s to the early 21st century, design provided public services for the middle class. Bovaird[12] emphasized the necessity, importance, and good practical effects of the public as end-users participating in public services. (3) From the 2010s to the present, design builds collaborative relationships for social transformation. Mancini[13] proposed that DSI is an activity in the co-design process aimed at changing society.

With the widespread application of information and communication technology, the social structure has shifted from traditional hierarchical to interconnected distributed. Co-design has become the research foundation and core means of DSl. At the same time.

DSI a comprehensive discipline that includes sociology, natural sciences, management design, and other fields. The research of this discipline can promote the reshaping of social structure and lifestyle. Its values and methodology are universal, which can guide the development direction of various disciplines from the source, and then stimulate the leapfrog development of co-design method research in various fields.

At present, research and practice on co-design in the context of DSI show a situation of small sample size, large dispersion, mixed application scenarios, and multiple methods. It has not yet formed a unified, systematic application characteristics and theoretical system.

Therefor, this study adopts a case study method, using the DSI case collection, DESIS network projects and relevant literature as sample sources. A total of 101 social innovation cases are collected. Based on factors such as project completeness, representativeness, and richness, 40 social innovation cases were selected as the research foundation. The NVIVO text grounded coding software is used to count the 269 instances of collaborative design methods in social innovation cases. Similar design methods are sorted and integrated based on semantic similarity and type, resulting in a total of 20 design tools and methods.Please refer to Figure 2 for more information.

According to the research classification of DSI cases by the DESIS network and the research hotspot classification of DSI literature by Jiang Yuhao[14], can be divided into 4 main themes: Local Culture, Community Construction, Public Welfare, and Public Service. 10 cases are selected for each theme, and data such as background, roles, and project structure are extracted to summarize the characteristics of each theme. A cross-matrix analysis is conducted on the correlation between theme characteristics and 20 co-design methods. The correlations between co-design methods and different theme characteristics are explored. Further, the application characteristics of co-design methods in different DSI contexts are defined.

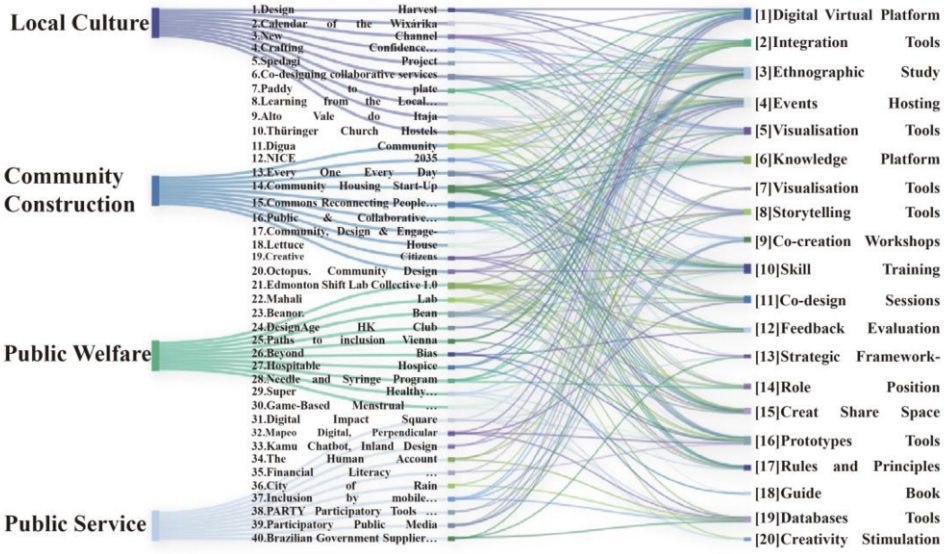

Figure 2. The design cases and co-design methods of 4 types of DSI

4.2. Characteristics of Co-design in Local Culture DSI Context

Local culture DSI cases often use traditional technology as resources to revitalize and revive traditional communities through co-design methods[15]. By encoding and analyzing cases 1-10, 3 high-frequency features of local culture cases are obtained: (1) Localization. Localization is based on the mutual integration between local cultural resources and non-local design teams, and carries out design practice activities. There are 8 types of main co-design methods, including participatory video, ethnographic study , storytelling, etc. (2) Activation. Activation. Activation combines professional design skills with local skills in an innovative way to enhance their value.There are 7 types of main co-design methods, including knowledge platform, skill training, co-creation workshop, etc. (3) Industrialization. Industrialization aims at introducing more local and non-local forces to promote the construction of a collaborative innovation network and achieve multi-party benefits[16]. There are 5 types of main co-design methods, including strategic framework, digital virtual platform, guide book, etc.

According to the correlation between the 3 local cultural context characteristics of "Localization", "Activation", "Industrialization" and the 20 co-design methods, 3 application characteristics of co-design methods can be derived: (1) Localization endows co-design methods with Experientiality: In the context of localization, co-design methods aim to integrate into the local culture, establish various participation channels, and experience and feel local culture from all aspects, helping designers discover problems from a local internal perspective. (2) Activation endows co-design methods with Interactivity: In the context of activation, the co-design method aims for knowledge exchange. It establishes an intercommunicating and integrating “knowledge community” between designers and local culture holders through forms such as visualization, gamification, and contextualization[17]. This promotes the innovative combination of design skills and local knowledge, stimulating the vitality of local resources.(3)Industrialization endows co-design methods with Dissemination: In the context of industrialization, co-design methods aim to promote projects. They employ strategies such as branding, commercialization, and digitization to absorb resources from multiple parties including local communities, universities, enterprises, and governments. They also replicate various sub-projects for external dissemination to achieve overall project scale enhancement. Please refer to Figure 3 for more information.

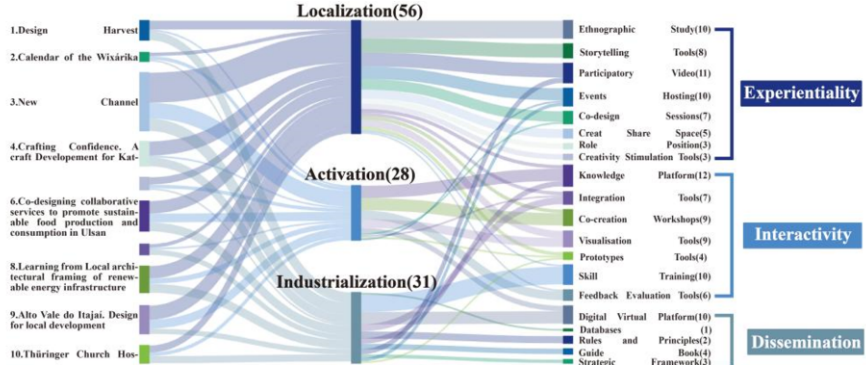

Figure 3. The correlation between local cultural and co-design methods

4.3. Characteristics of Co-design in Community Construction DSI Context

Community construction DSI cases often take urban communities as research objects, support community self-governance activities through co-design methods, and carry out community updates from aspects such as space, management, and services. By encoding and analyzing cases 10-20, 2 high-frequency features of community construction cases are obtained: (1) Sharing. Sharing aims to democratically collect individualized needs within the community. Through co-construction and co-creation, a solution for community resource sharing is coordinated and integrated, which address the complexity of community needs and the difficulty for government resources to cover comprehensively.There are 7 types of main co-design methods, including create share space, events hosting, integration tools, etc. (2) Self-governing. Self-governing aims to enhance the cohesion and self-organizational management capabilities of the community, form a structured organizational model, and achieve long-term sustainable operation of the community[18]. There are 10 types of main co-design methods, including rules and principles, skill training, feedback evaluation tools, etc.

According to the correlation between the 2 community construction context characteristics of "Sharing", "Self-governing" and the 20 co-design methods, 2 application characteristics of co-design methods can be derived: (1) Sharing endows co-design methods with Integrality:In the context of sharing, the co-design methods aim to meet diverse needs. Using idea cards, analogy cards, voting choices, and other methods to fairly screen and integrate a large number of ideas and creativity. It converges and focuses on a unified direction, and through joint deliberation, optimizes the best solution. (2) Self-governing endows co-design methods with Directionality: In the context of Self-governing, the co-design methods aim to cultivate the autonomous capabilities of community participants. Designers guide residents to independently formulate rules and regulations, agree on role division, and through regular seminars, community activities, service platforms, and other methods, help residents gradually break away from dependence on external teams and form a dynamic, flexible self-organizing management structure. Please refer to Figure 4 for more information.

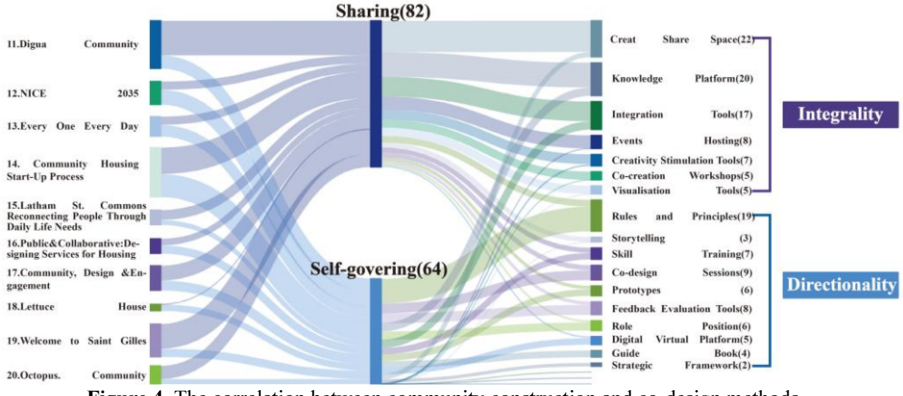

Figure 4. The correlation between community construction and co-design methods

4.4 Characteristics of Co-design in Public Welfare DSI Context

Public welfare DSI cases often take disadvantaged groups as research objects. Through the co-design method, they are transformed from passive recipients of social welfare into

active participants, in order to form an equal and mutually beneficial service model[19]. By encoding and analyzing cases 21-30, 3 high-frequency features of community construction cases are obtained: (1) Humanization. Humanization aims to address the special psychological or physiological needs of disadvantaged groups. It establishes a trust relationship with these groups through empathetic, indirect, and inclusive forms of interaction. There are 6 types of main co-design methods, including storytelling, visualisation tools, events hosting,etc. (2) Equalization. Equalization aims to uncover the potential subject capabilities of disadvantaged groups, provide them with a platform and carrier for realization, and construct a service model of equal and mutually beneficial relationships[20]. There are 7 types of main co-design methods, including skill training, role position, rules and principles, etc. (3) Popularization. Popularization focuses on the reach of disadvantaged groups to the outside world, constructs a platform for the public to interact with them, and promotes the public's cognitive transformation towards disadvantaged groups.There are 7 types of main co-design methods, including digital virtual platform, guide book, prototypes, etc.

According to the correlation between the 3 community construction context characteristics of "Humanization", "Equalization","Popularization"and the 20 co-design methods, 3 application characteristics of co-design methods can be derived: (1) Humanization endows co-design methods with Perceptivity. In the context of humanization, the co-design methods aim at communication and understanding. In a shared scenario and through collaborative interaction, it enhances the trust of vulnerable groups in the outside world. This helps designers indirectly perceive and understand the characteristics and needs. (2) Equalization endows co-design methods with Empowerment. In the context of equalization, the co-design methods aim to unearth strengths and cultivate abilities. Through cooperative forms such as reward mechanisms and educational interactions, it stimulates the inherent potential of vulnerable groups. Moreover, it enhances the use value through design interventions, achieving self-creation of welfare. (3) Popularization endows co-design methods with Inspiration. In the context of popularization, the co-design method aims to call for dissemination. It strengthens the sense of public welfare experience and connection through online and offline interactive platforms. With the help of the social attributes of the government, public welfare organizations, celebrities, it propagates and attracts the attention and participation of the general public[21].

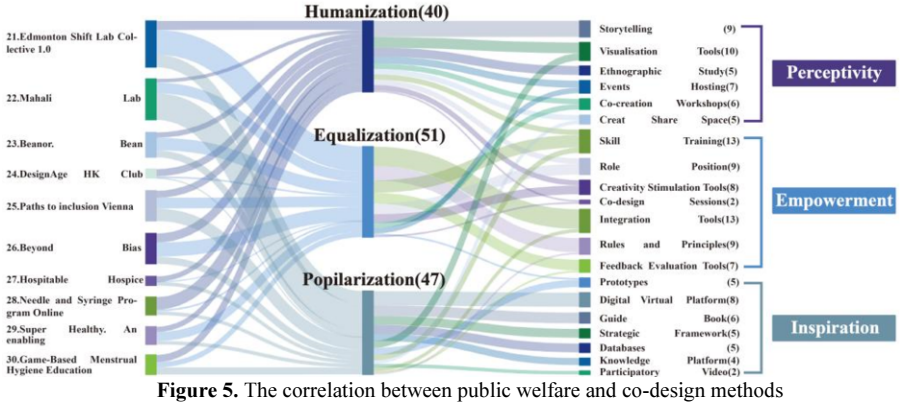

Figure 5. The correlation between public welfare and co-design methods

4.5 Characteristics of Co-design in Public Service DSI Context

Public service DSI cases are often initiated in a top-down manner, with co-design methods mainly intervening from the strategic and decision-making levels, providing timely, fair and effective social services for the public. By encoding and analyzing cases 31-40, 2 high-frequency features of community construction cases are obtained: (1) Networking. Networking aims to design and build a flexible, open, and comprehensive distributed network structure to cover a large area of the public. There are 9 types of main co-design methods, including strategic framework, rules and principles, databases, etc. (2) Diversifying. Diversifying aims to attract the government, the public, experts, news media,enterprises and institutions, social organizations, and other social subjects to participate in, consult and make decisions on public affairs together, so as to achieve continuous and healthy development of the relationship between the government and the public.and realize good governance of the society by the government[22]. There are 8 types of main co-design methods, including , digital virtual platform, knowledge platform, events hosting,etc.

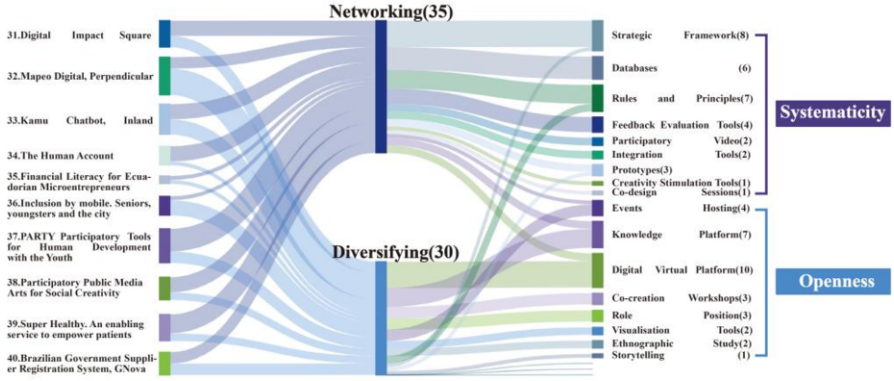

Figure 6. The correlation between public service and co-design methods

According to the correlation between the 2 community construction context characteristics of "Networking", "Diversification"and the 20 co-design methods, 2 application characteristics of co-design methods can be derived: (1) Networking endows co-design methods with Systematicity. In the context of networking, co-design methods aim to coordinate planning, through creative resource reorganization and global framework formulation, to expand the overall scale of the system and service range. (2) Diversifying endows co-design methods with openness. In a context of diversifying, co-design methods aim to expand and be compatible, using digital tools to promote the establishment of an open consultation platform for democratic dialogue. Through organizational patterns, they integrate and coordinate into a dynamic, balanced collective collaboration mechanism to achieve effective expression of individual will.

5. Conclusion

This study is based on the characteristics of four thematic contexts of DSl, using NVIVO text grounded coding software to analyze the application features of co-design in DSl cases, and summarizes 10 application features of co-design in the context of DSl: experientiality, interactivity, dissemination, integrality, directionality, perceptivity,

empowerment, inspiration, systematicity and openness. It helps people to understand the research characteristics of co-design in the context of DSI from a more intuitive and systematic perspective in practice and methodology, and provides a systematic collaborative theoretical method for the discipline of DSI. These characteristics and research methods obtained above have certain universality and replicability, which expands the application category of co-design methods. It promotes the connection and communication between co-design and various disciplines, deepens the theoretical basis of co-design methods.

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