

## Trends and Challenges in Service Design Methods

Xiaojun Ouyang<sup>1</sup>, Mohd Johari Mohd Yusof<sup>1\*</sup> and Thinagar  
Perumal<sup>2</sup>

<sup>1</sup>Department of Landscape Architecture, Faculty of Design and Architecture, Universiti Putra Malaysia, Malaysia, <sup>2</sup>Department of Computer Science, Faculty of Computer Science and Information Technology, Universiti Putra Malaysia, Malaysia  
Corresponding Author Email: m\_johari@upm.edu.my

**DOI Link:** <http://dx.doi.org/10.6007/IJARBS/v16-i5/28340>

**Published Date:** 31 May 2026

### Abstract

Service design has become increasingly important in addressing the growing complexity of contemporary socio-technical service ecosystems shaped by digital transformation, artificial intelligence, and multi-channel customer interactions. As service environments become more dynamic and user-centred, organisations require more integrated, sustainable, and participatory approaches to service innovation. However, existing service design methods remain fragmented, often focusing on isolated service requirements, specific stages of development, or single disciplinary perspectives. Consequently, there is limited understanding of how service design methodologies collectively evolve to address complex and interdisciplinary service environments. This study examines the trends and challenges of service design methods through a thematic analysis of 63 service design methods using the Zettelkasten (slip-box) organisation technique. The methods were integrated into a Sunburst Chart to visualise hierarchical relationships, process stages, and key methodological elements. Based on this analysis, a comprehensive service design process framework was developed to evaluate the evolution of service design methodologies. The findings indicate that service design methods are evolving towards more integrated, systemic, and holistic approaches. Nevertheless, major challenges remain in sustaining user engagement, eliciting implicit user requirements, supporting interdisciplinary co-creation, developing modular multi-interface systems, enabling automated value co-creation, and ensuring sustainability through iterative evaluation and long-term value-in-use. This study contributes a comprehensive analytical framework that supports the development of adaptive, sustainable, and human-centred service design methodologies for increasingly complex service environments.

**Keywords:** Service Design Methods, Codesign, Hierarchical Structure, Design Process, Key Elements, Trends & Challenges

**Introduction**

Service design has emerged as a critical approach for addressing the increasing complexity of contemporary service ecosystems shaped by digital transformation, artificial intelligence, multi-channel customer management, and evolving societal expectations (D. Y. Wang et al., 2022). Beyond improving organisational competitiveness, service design is increasingly recognised as a means of responding to broader social and economic challenges through human-centred innovation, participatory practices, and sustainable value creation. Service design supports principles and tools that enable comprehensive and collaborative exploration of the actors, resources, and activities involved in current and future service use (Karpen et al., 2017). By employing collaborative and interdisciplinary approaches to understand problems, generate solutions, and support implementation, service design seeks to enhance service experiences and foster social innovation. Consequently, service design is widely characterised as a creative, human-centred, co-creative, strategic, systemic, iterative, and sustainable approach to service innovation grounded in the development of new value propositions (Wetter-Edman et al., 2014; Patrício, Gustafsson, et al., 2018; Korper et al., 2020; Fisk et al., 2020; Vink et al., 2021; Chen & Chen, 2022; D. Y. Wang et al., 2022).

The increasing complexity of service environments (Patrício, de Pinho, et al., 2018), combined with rapid technological integration and the expansion of digital platforms (Schallehn et al., 2019), has transformed the nature of service systems and stakeholder relationships. Service design has therefore evolved from a traditional customer-centric perspective towards a broader human-centred and socio-technical orientation that emphasises multi-stakeholder engagement within complex value networks (Patrício, de Pinho, et al., 2018). This shift reflects the transition from Goods-Dominant Logic (G-D Logic) to Service-Dominant Logic (S-D Logic), progressing from the concept of “Design of Service” towards “Design for Service” (Vink et al., 2021). Rather than viewing services merely as intangible market offerings, contemporary service research increasingly conceptualises services as the basis of value co-creation among interconnected actors within service ecosystems (Kimbell, 2011).

These theoretical developments have substantially reshaped the foundations of service design. The focus of service design has expanded from isolated service encounters and touchpoints to broader multi-interface and multi-channel systems of value creation (Gummerus et al., 2021). Similarly, the purpose of service design has evolved from designing new service offerings towards collaboratively creating conditions that support value-in-use (Kimbell, 2011; Vink et al., 2021). The materiality of service design has also shifted from concentrating primarily on interfaces and touchpoints to recognising socio-material configurations in which services are understood as socially and materially embedded phenomena rather than purely intangible exchanges (Kimbell, 2011). In parallel, the role of participants has changed significantly. Earlier perspectives positioned organisations as the primary creators of value while customers acted mainly as recipients. Contemporary service design instead emphasises value co-creation among multiple stakeholders within extended networks involving customers, organisations, suppliers, and communities (Vargo & Lusch, 2004; Patrício, de Pinho, et al., 2018).

Furthermore, service design processes have evolved from linear new service development approaches towards more iterative, adaptive, and sustainable processes that recognise the dynamic nature of service ecosystems (Kimbell, 2011; Vink et al., 2021). Increasing attention

is now given to long-term value-in-use, service sustainability, continuous evaluation, and iterative improvement. These developments highlight the growing importance of addressing complex socio-technical interactions, interdisciplinary collaboration, and systemic interdependencies within service systems. However, despite these advances, service design processes within complex ecosystems remain insufficiently conceptualised and integrated (Vink et al., 2021).

Current developments in service design are closely connected to broader debates within the social sciences concerning participatory innovation, collaborative governance, sustainability transitions, digital transformation, and human-centred technology adoption. The increasing reliance on AI-enabled and data-driven service systems has transformed how organisations interact with users, raising important questions regarding user participation, inclusivity, technological acceptance, power distribution, and the sustainability of value creation. Service design increasingly operates within complex socio-technical systems where value emerges through interactions among multiple stakeholders rather than being produced solely by organisations. Consequently, service design research contributes not only to design and innovation studies but also to wider discussions surrounding digital society, platform ecosystems, co-creation, and socially sustainable development.

Although service design has developed rapidly across multiple disciplines and application domains, existing methods and tools remain fragmented and insufficiently integrated to address increasingly complex service environments comprehensively (D. Y. Wang et al., 2022). Many approaches focus on isolated service requirements, specific stages of development, or particular disciplinary perspectives. Existing methods often struggle to support closed-loop service processes that integrate user engagement, interdisciplinary co-creation, service delivery, evaluation, sustainability, and iterative improvement within a unified framework. Furthermore, while multidimensional approaches such as Multilevel Service Design (MSD) have attempted to address systemic complexity (Patrício et al., 2011), comprehensive and integrated methodological perspectives remain underdeveloped (Prestes Joly et al., 2019).

This fragmentation represents a significant research gap within contemporary service design research. Despite the growing complexity of socio-technical service ecosystems, limited studies have systematically analysed how service design methods collectively evolve to address challenges related to user engagement, implicit requirement elicitation, automation, sustainability, interdisciplinary collaboration, and long-term value creation. Consequently, there is a need for a comprehensive review and synthesis of service design methods to better understand their structural relationships, developmental trends, and methodological limitations (Vink et al., 2021).

In a prior study, a systematic literature review identified and compiled 63 service design methods to develop an inductive framework known as the MO Mapping Framework (Ouyang et al., 2025). Building upon this foundation, the present study thematically analyses and integrates these methods according to the proposed framework. Through visualising the hierarchical structures, process stages, and methodological elements of service design methods using a Sunburst Chart, this study seeks to reveal the underlying development logic, trends, and challenges of contemporary service design methodologies. The findings

contribute theoretically and methodologically to the understanding of integrated service design development and provide practical guidance for addressing increasingly complex and interdisciplinary service environments.

## METHODOLOGY

### *Introduction to MO Mapping Framework*

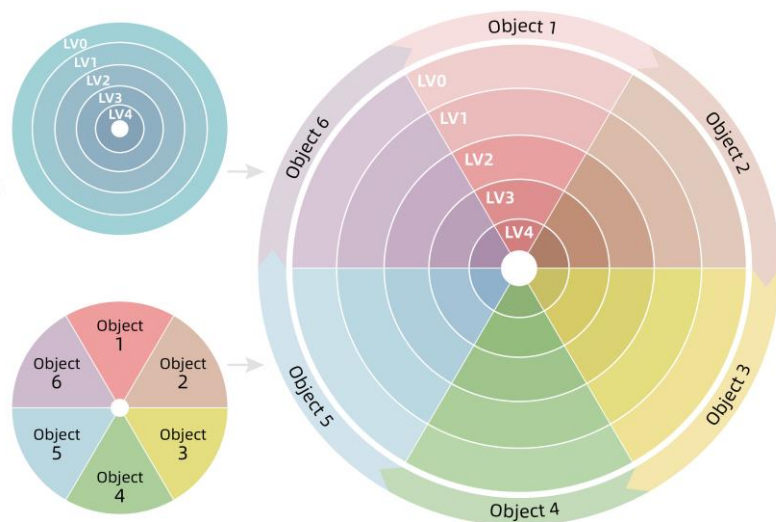
Based on our previous research (Ouyang et al., 2025), the building process of the MO Mapping Framework (see Figure 1) reveals the multifaceted complexity of service design methods, providing thematic clues related to their Modular perspectives and Objectives for inductive analysis. The sector structure maps the objectives of the methods, facilitating the study of method distribution in terms of processes, and aiding in constructing and evaluating service design processes. The annular structure depicts the modular hierarchy and combinatorial optimisation of methods, emphasising the trend towards integrated solutions. Building on this framework, 63 service design methods selected from the SLR were mapped onto a Sunburst Chart.

#### **The Annular Structure: Module-Levels of Service Design Methods**

- LV0: General Methods Level
- LV1: Component Level (Micro Perspective)
- LV2: Module Level (Meso Perspective)
- LV3: Module Package Level (Macro Perspective)
- LV4: Interface Level

#### **The Sector Structure: Objects of Service Design Methods**

- Object1: Value Propositions
- Object2: Service Concepts
- Object3: Service System
- Object4: Service Encounters/Touchpoints
- Object5: Service Delivery/Implementation
- Object6: Service Sustainability



**Figure 1. The structure of MO Mapping Framework**

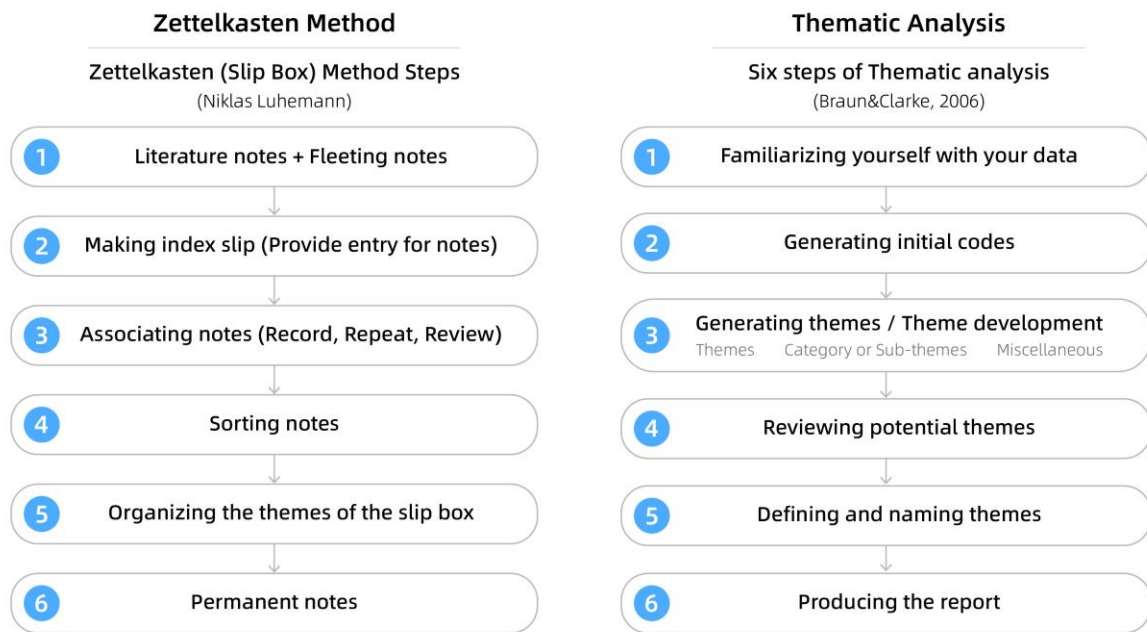
We analysed and matched the 63 methods using the Zettelkasten Method and Thematic Analysis, detailed below.

### *Zettelkasten Method (Slip Box)*

The Zettelkasten Method, developed by Niklas Luhmann, centres on recording one idea or topic per index card. These cards are stored without categorisation, allowing connections to be made between them. Each card captures an idea in the researcher's own words and includes necessary references, ensuring clarity and usability beyond the original context. Visual mapping helps link and expand ideas, enhancing memory retention and viewpoint generation. This method excels by organising knowledge through personal understanding. Each note is uniquely identified and sequentially numbered for related topics, allowing flexible insertion and cross-referencing. This approach supports both expansive (horizontal) and in-depth (vertical) exploration, facilitating continuous knowledge expansion and deepening.

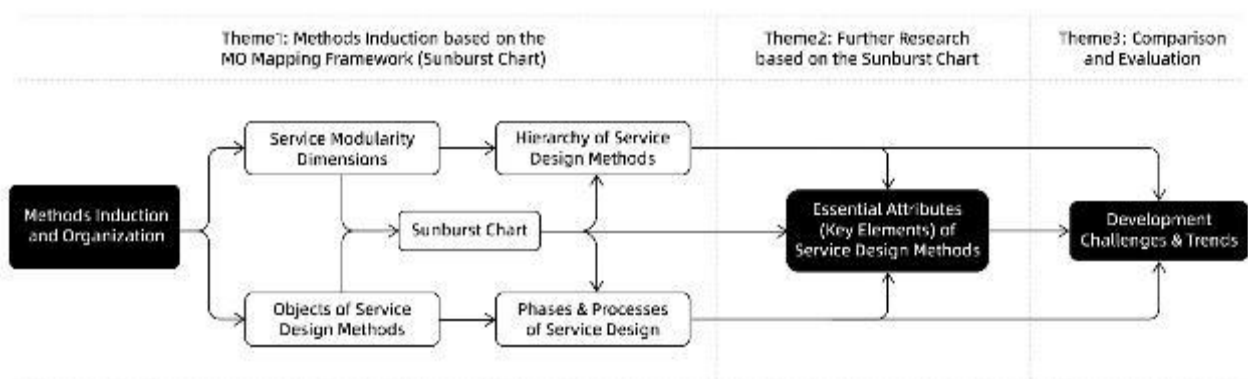
*Thematic Analysis*

Thematic analysis is a qualitative method for examining themes or concepts within texts, generating contextually relevant insights from subjective data (Braun & Clarke, 2006). Chosen for its flexibility and without imposing constraints from any specific theory, it effectively captures complex and varied phenomena. This method’s rich descriptions and strong interpretative power enhance data credibility and accuracy.



**Figure 2. Steps of Zettelkasten Method and Thematic Analysis.**

We conducted in-depth analyses of previous findings using the procedures outlined by these two methods (Figure 2). This led to an in-depth research flow organised around three main themes (see Figure 3). These themes involved coding the 63 methods, refining them, and conducting thematic analyses, revealing interconnected challenges and trends in the evolution of service design methods.



**Figure 3. Flow chart of the in-depth research**

Based on the MO Mapping Framework, we integrated 63 methods into the Sunburst chart to facilitate discussion and analysis of method hierarchies and design process phases. This process also identified key elements of the service design methods. Finally, we evaluated and compared the results from the first two steps to summarise developmental challenges and trends (i.e., whether they meet process and element requirements), achieving the research objectives. Subsequent sections will detail these findings.

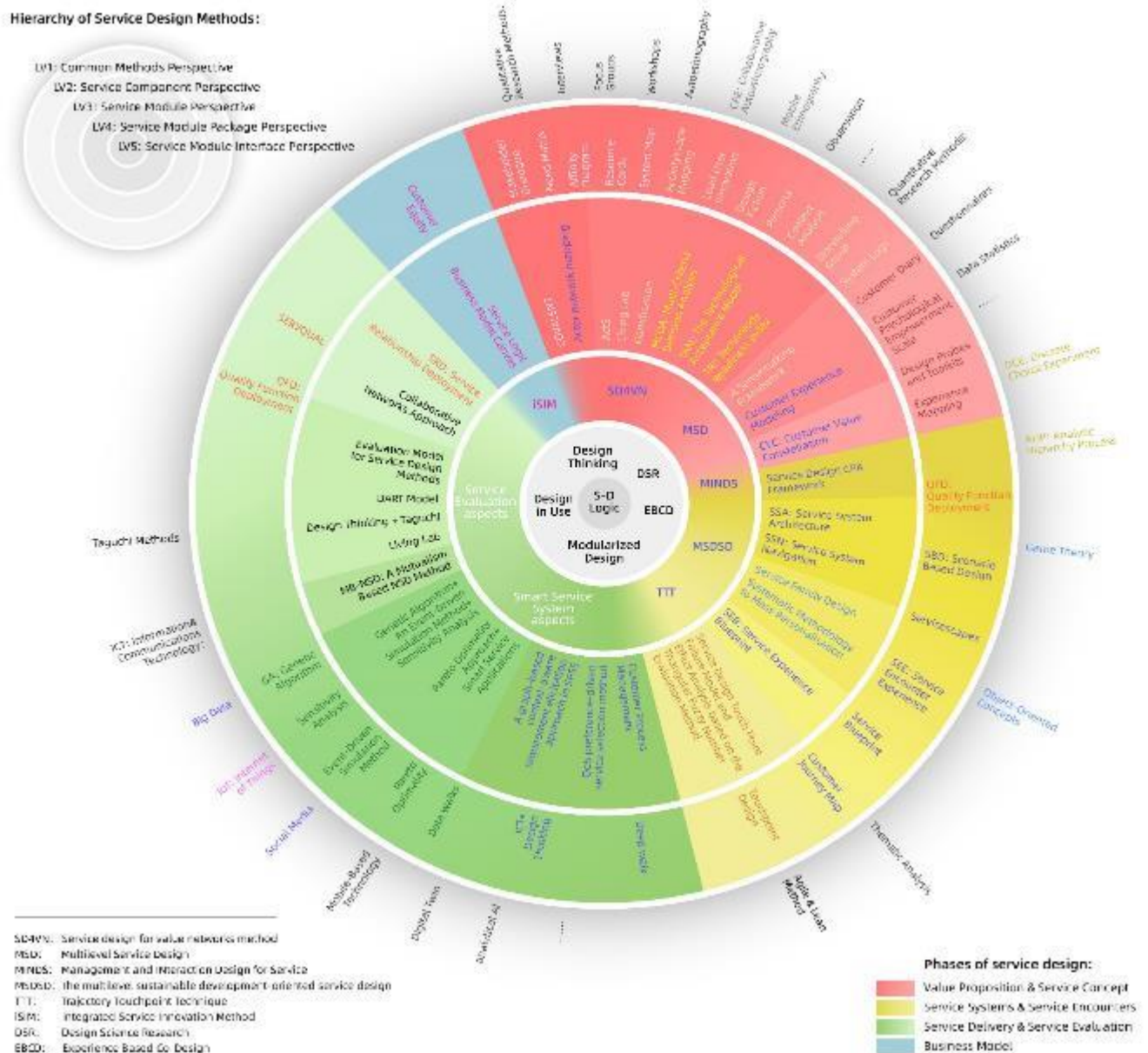
## **Findings**

### *Integration and Analysis of Sunburst Charts*

The sunburst chart structure (Figure 4) is divided into two main themes: the annular structures illustrate the structural hierarchy of methods. In contrast, the sector structures depict the process stages to which these methods belong.

From the service module perspective, the process reflects the development of comprehensive solutions, evolving from method components (micro-level dyadic interactions) to method modules (meso-level systemic interactions), and further to method module packages (macro-level multilayered perspectives). This aligns with research on service design trends, highlighting the shift towards integrated solutions to address complex service environments (Prestes Joly et al., 2019; Kwon et al., 2021).

From the process elements perspective, the sequence of service design objects (the issues addressed) maps the phased distribution of co-creative service design methods. Constructing service design process frameworks helps organise these methods and assess their performance. Simultaneously, organising service processes and their corresponding methods also responds to researchers' earlier expectations that within complex service systems, there remains a need for further conceptualisation of service design processes (Vink et al., 2021).



**Figure 4. Sunburst Chart: Structural hierarchy and process phases for service design methods**

**Annular Structure of Sunburst Chart: Hierarchical Relationships in Service Design Methods**

*Level 1: Common Methods Perspective*

Moon et al. (2011) discussed the sharing of strategic modules among services, including common modules, variant modules, and unique modules. Common modules, based on common functions within a service family, enable the sharing of these functions (Moon et al., 2011).

Building upon the concept of common modules, we categorise common functional methods for service design into the outer ring (shaded area) of the sunburst chart. This foundational level includes fundamental methodological approaches (qualitative, quantitative, mixed),

theories and concepts (e.g., game theory, object-oriented concepts), and technological architectures (e.g., ICT). This level can be seen as foundational methods shared across other levels and stages of service design, combined and applied at the service component level in subsequent stages.

This level of methods, applicable both within and beyond service design, offers multi-disciplinary solutions. For example, the Discrete Choice Experiment (DCE) is a quantitative method used to elicit user preferences for various elements. It is widely used in sociology, biostatistics, and marketing (Dehmel et al., 2021). DCE can be integrated into service design for enhanced design and testing. Similarly, the Analytic Hierarchy Process (AHP), from operations research, helps analyse systems by breaking problems into factors and calculating weights through pairwise comparisons. AHP is used in service design research, as demonstrated by Kwon et al. (2021), who developed an evaluation model using AHP. Additionally, methods like DCE and AHP are combined in Multi-criteria Decision Analysis (MCDA), which supports complex decision-making by providing critical information on customer preferences and relying on contextual participant data (Cahill et al., 2022).

### *Level 2: Service Component Perspective*

Methods at the service component level can be seen as fundamental granularity entities for executing different functions and stages of service design. These methods focus on the dyadic interactions between customers and organisations at a micro level. Unlike the common level, this level integrates service design thinking and applies it within service design.

In the red area of this level (see Figure 4), methods highlighted in light yellow facilitate dyadic interactions between enterprises and users. These methods explore user contexts to gain insights into preferences and value propositions. Whether the divergent, exploratory, or prospective Design Fiction (Park et al., 2022), Persona that archetype or fictitious user profile (Trischler et al., 2018), or Context Analysis that effectively extracts and models the tacit context which causes heterogeneity of the rationality among actors (Tsutsui et al., 2021), they are predominantly qualitative and involve user exploration surveys conducted through ethnography, interviews, focus groups, or workshops, which are applications of methods at the common level.

Simultaneously, the combined application of these component-level methods constitutes the red area of the service module level (e.g., ActS, Living Lab, Gamification and a Sensemaking Framework). For instance, ActS optimises Activityscape Mapping in data collection descriptions, amplifies the micro level, and captures activities related to achieving user expectations and goals (Gummerus et al., 2021), involving macro-level institutional, regulatory, and commonsense backgrounds, thereby classifying ActS under the module level.

### *Level 3: Service Module Perspective*

Modules are logical groupings of components that can provide variants and substitutes with similar functionalities (Prakash, 2021). Design methods at the service module level inherit this characteristic by optimising and combining component-level methods. This level also reflects value creation within meso-level service networks and addresses systems involving participants and technologies by services. This perspective demands that design methods focus on facilitating system value co-creation (Gummerus et al., 2021).

The yellow area includes SSA (Service System Architecture), SSN (Service System Navigation), and SEB (Service Experience Blueprint), which support service system and encounter design. SSA and SSN provide structural and navigational views of service systems, while SEB maps participant actions in service encounters, covering both frontstage and backstage elements (Patrício et al., 2011). These methods, part of the MSD (Multi-level Service Design), which belong to the next level (module pack level), optimise and integrate part methods from the service component level, such as Service Encounter Experience, Service Blueprint, Customer Journey Map, and Touchpoint Design.

Furthermore, this level constitutes the mainstream granularity entities of service design methods, with clear functional divisions among them. Thus, the Sunburst Chart visually depicts relatively distinct boundaries between method combinations, which reinforces the description of service design objects and aids in the construction of the service design process framework. Further comparative discussions will be provided in the following sections.

#### *Level 4: Service Module Package Perspective*

Service module packages are considered the smallest building blocks, composed of a group of modules, which in this study are reflected by being used to construct the comprehensive methods. At the module package level, these methods integrate multidimensional and cross-process aspects, not only combining and optimising methods across multiple levels but also encompassing multiple stages of service processes. These innovative multidimensional service design methods, utilising ubiquitous technology networks and multi-channel systems, have replaced dyadic encounters, responding to the complexity of modern services (Sudbury-Riley et al., 2020).

Some studies advocate for a multidimensional perspective in service design and have made significant contributions in this area (Sudbury-Riley et al., 2020). The already established multidimensional integrated service design methods primarily revolve around complementing and optimising the MSD method, contributing to the systematic and unified development of service innovation. The Sunburst Chart shows that methods like MSD span across both the red and yellow areas, integrating service design at different levels (stages) — from the strategic level of user experience and service concepts, organisational level of service systems, to the interface level of service encounters (Chen & Chen, 2022). MSD and similar methods merge interdisciplinary contributions, driving trends in service design thinking and emphasising value and experience within and across service hierarchies (Vargo & Lusch, 2008; Patrício, Gustafsson, et al., 2018; Sudbury-Riley, Hunter-Jones, Al-Abdin, et al., 2020).

The MSD method is the first to address the multi-tiered collaborative creation of services, integrating analysis of service design and innovation across strategic (service concept), organisational (service system), and interface (service encounter) levels (Patrício et al., 2011). The MSD method, informed by customer experience research, uses the Customer Value Constellation (CVC) model for service concept design, the SSA and SSN models for service system development, and the SEB model for designing customer-service interface interactions (service encounters). The MINDS method employs design science research methods to integrate management (coordinating interfaces and backend support processes) and interaction design (customer interactions with technology) into the MSD method,

improving upon it (Grenha Teixeira et al., 2017). The SD4VN method strengthens and complements MSD by extending its comprehensive approach to include exploration (understanding the interconnections among different participants in the value network) and ideation (transforming this understanding into service concepts and service architectures within the value network) stages (Patrício, de Pinho, et al., 2018), with a focus on constructing user value networks. The TTT method builds upon previous multidimensional, multi-level methods of service value creation by delving deeper into customers' life experiences and adopting a socio-material configuration perspective. TTT does not depend on specific issues, eliminating biases and differences in questioning methods within qualitative approaches (Sudbury-Riley et al., 2020). The MSDSD method shifts the focus of service research from the customer to a perspective that considers both customer needs and ecological needs, leading the MSD towards sustainability in its multiple dimensions. Sustainable services aim for long-term satisfaction of customer needs, emphasising the perspective of "value in use" (Chen & Chen, 2022). The iSIM method aims to design innovative services and business models concurrently. Building upon MSD, the iSIM method introduces early stages such as Service Strategy Design (defining the market business logic of the enterprise), and later stages, including Service Architecture Design (defining modular and standardised interfaces) and Monetisation Design (comprehensively formulating the business model). While considering co-creation of value between users and enterprises, it emphasises the sustainability of service provision from the enterprise's perspective, particularly in terms of business model considerations (Chew, 2016).

An interesting contrast arises between the "Service Experience Design" stage in the iSIM method and the "Service Encounter Design" stage in the MSD method. Both aim to enhance service interactions but use different terminology. Patrício et al. (2011) argue that while organisations cannot design customer experiences directly, they can design service systems to support them, labelling this stage as Service Encounter Design (the interface where users interact with service providers). We align with this viewpoint, suggesting that customer experiences result from both the service content (product functionality and outcomes) and the delivery mode (usage process, environment, and emotional components) (Patrício et al., 2008). Service experiences are shaped not just by providers but also by users' individual traits and social contexts (Kemppainen & Uusitalo, 2022). Thus, service design should emphasise two stages: evaluating value propositions and gathering requirements during design, and analysing user experiences during service delivery. This viewpoint helps us construct service design processes and analyse and summarise corresponding method sets.

In summary, these multidimensional and multi-level service value co-creation methods are leading the current field of service design research, responding to the trend towards comprehensive and integrated perspectives in service design methods. As researchers have noted, there is a need for a method that can formulate a broad and comprehensive strategy through multidimensional approaches (Kwon et al., 2021). However, from the Sunburst Chart, existing methods primarily integrate dimensions and processes from value proposition creation, service encounter design and business model development. They fall short of offering comprehensive guidance that covers all stages of service design in a closed loop. Key phases such as service delivery, evaluation, and iterative development—critical for the development of smart service systems, automated value creation, user experience analysis during service in use, reciprocal networks, and evaluation of existing services to promote

sustainable service iterations—remain un-integrated. The characteristics and necessity of these stages will be elaborated upon in subsequent sections.

#### *Level 5: Service Module Interface Perspective*

Interfaces manage interactions between components, mixing and matching components to provide integrated, holistic and functional service packages (Prakash, 2021). The service design methods at the module interface level can be seen as tools for correlating method sets, serving as the logical basis and principles for method integration. Constructing and optimising service design methods based on these underlying logical approaches or theories makes it possible to have anchor points in organising and analysing the complex and diverse set of service design methods. Prestes Joly et al. (2019) identified several interface-level methods, including systemic and participatory design, experience design, and design thinking, for coordinating resource integration in service design projects. This study similarly identified guiding methods such as Design Thinking, DSR (Design Science Research), EBCD (Experience-Based Design), Modularised Design, Design in Use, and S-D Logic, as shown in the central part of the Sunburst Chart.

#### *The Most Effective Problem Discovery Method - Design Thinking & Service Design:*

Service design adheres to the principles of design thinking: an iterative process of exploration, ideation, reflection, and implementation, supported by various methods and tools (Grenha Teixeira et al., 2019). Design thinking focuses on understanding user needs, reframing problems, and developing innovative solutions. It is essential for collaborative and interdisciplinary service innovation, knowledge management, optimal decision-making, and sustainable innovation (Yu & Sangiorgi, 2018). This approach emphasises empathy, balances utility with emotion, and utilises divergent and convergent thinking to uncover problems and provide strategic insights for service design. Service design thinking adapts design thinking methods to understand service ecosystems and improve user experience, while applying these insights to service development (Korper et al., 2020; Luca & Ulyannikova, 2020).

Methods that rely on and embody design thinking include service blueprints, customer journeys, empathy design, and personas. Service quality is a prerequisite for customer satisfaction and organisational performance, with service design thinking enhancing perceived service quality and customer satisfaction (Andreassen et al., 2016).

#### *Methods for Research Utility - DSR and Service Design*

Design Science Research (DSR), originating in information systems, is a goal-oriented, creative problem-solving paradigm. It enhances understanding of organisational phenomena by creating and evaluating artefacts such as models and methods to address problems. DSR achieves two goals: generating scientific knowledge and solving real-world issues (Hevner et al., 2004). While design thinking emphasises the service experience itself, DSR focuses on practical solutions derived from this experience, ensuring that conceptual models have empirical utility. DSR aims for research utility by developing new models and methods and advancing service design and research through iterative conceptualisation and validation (Grenha Teixeira et al., 2017; Sudbury-Riley et al., 2020).

Examples of service design methods developed using DSR include MSD (Patrício et al., 2011), MINDS (Grenha Teixeira et al., 2017), SD4VN (Patrício, de Pinho, et al., 2018), and TTT (Sudbury-Riley et al., 2020), among others.

#### *Collecting Experiences and Codesigning - EBCD and Service Design:*

Codesigning experiential services with users enhances value creation and creates memorable experiences. Successful service development requires a deep understanding of user needs through active user involvement. Codesign emphasises designing with people, not just for them (Visser et al., 2005). While designing for people focuses on reflecting users' perceptions in service solutions, designing with people involves them as co-creators, recognising them as "experts of their own experience." Thus, codesign, a human-centred and participatory approach — designing for and with people — to create balanced solutions that enhance service quality (Fisk et al., 2020).

Building on this foundation, Experience-Based Codesign (EBCD) fosters effective collaboration between service providers and users by focusing on life experiences to identify improvement areas (Bowen et al., 2013). EBCD involves two key phases: experience gathering and codesigning (Green et al., 2020). Participants reflect on their experiences and collaborate to implement changes. Both service design and EBCD are user-centred system design approaches, but EBCD emphasises codesign more strongly (Ramos et al., 2022).

#### *Modular Theory of Platform Thinking - Modular Design and Service Design*

Systematic service development employs modular design, integrating modular theory from platform thinking (Chew, 2016). Service modularisation is characterised by knowledge reconfigurability and interface integration (Zheng et al., 2021), decomposing systems into modular components managed by different teams with standardised interfaces (Chew, 2016). This approach increases the reusability and flexibility of design components, thereby lowering development costs and shortening delivery cycles. Standardised interfaces facilitate the integration of components, support multi-disciplinary collaboration, and minimise iterative design (Chew, 2016). Factors such as professional autonomy, technical comprehensiveness, clear task division, and efficient information flow drive modular service delivery (Prakash, 2021). Modular approaches have proven effective in addressing Product-Service System (PSS) design challenges, where PSS combines tangible products with intangible services, with service design representing the latter (Yenilmez & Bagli, 2020). We argue that while PSS focuses on product-led product services and service design on service-led service products, both share a theoretical and methodological intersection (S-D Logic), reflecting common principles and methods.

We found that modular design methods are predominantly applied during the design stages of service systems and encounters. Key methods include Service Family Design (Moon et al., 2011), Service Experience Blueprint (Patrício et al., 2008), Systematic Methodology for Mass Personalisation (Hsiao et al., 2015), and iSIM (Chew, 2016), etc.

#### *Long-term Customer Satisfaction - In-Use Design and Service Design*

Customer experience, shaped by user interactions with suppliers, determines the value of use (Patrício et al., 2011). Value is thus created through usage (Lim et al., 2019). Value co-creation is central to service design, with Codesign and in-use design as key methods (Akasaka et al.,

2020). Codesign involves users and designers collaboratively planning service value before delivery, while in-use design focuses on value creation and service improvement during usage. Sustainable services emphasise the "value-in-use" perspective (Chen & Chen, 2022). Ensuring long-term user satisfaction and adapting to changes in user experience are crucial for service sustainability. Moreover, information technology can aid designers in gathering user behavioural data for experience analysis, enhancing in-use design methods.

In-use service design methods include Customer Process Management (Lim et al., 2019), quality of service Preference-driven Service Selection (Kang et al., 2016), and Graph-based Context-aware Requirement Elicitation Approach in PSS (Z. Wang et al., 2021), etc.

**Theory and Practice Integration: Service-Dominant Logic and Service Design:** Co-creation is a prerequisite for value creation; value co-creation has been conceptualised as service-dominant logic (S-D Logic) (Malakhatka et al., 2021). Positioned centrally in the sunburst chart, S-D Logic provides a foundational framework for theorising service science, emphasising user-centered design (Vargo & Lusch, 2008). It posits that users are always co-creators of value, which is interactive and uniquely phenomenologically determined by the user (Tung & Yuan, 2011). The emergence of S-D Logic shifts the focus of service innovation from output to customer value, impacting the design, development, delivery, and perception of services (Sudbury-Riley et al., 2020). It enhances the theoretical understanding of value creation through resource integration, where all participants, resources, and support mechanisms within service ecosystems interact to generate value (Rejikummar et al., 2022).

S-D Logic lacks practical processes and technologies for organisations to gather phenomenological insights into value creation and configure resources to enhance these opportunities. Service design complements S-D Logic by offering theoretical support and practical tools for implementing value co-creation (Sudbury-Riley et al., 2020).

#### *Sector Structure of the Sunburst Chart: Process Stages of Service Design*

The shift from "Design of service" to "Design for service" has broadened the service design process, focusing more on understanding and supporting customer experiences across various service system levels (Patrício et al., 2011). "Design for service" underscores the sustainability of service design and reflects the transition from Goods-Dominant (G-D) to Service-Dominant (S-D) logic (Vargo & Lusch, 2004). This evolution has advanced service design methodologies and enhanced the understanding of customer value determinants (Sudbury-Riley et al., 2020). Nonetheless, within complex service systems, these service design processes still require further conceptualisation (Vink et al., 2021).

The service design process involves collecting and transforming insights into design objects, processes, and systems (Wetter-Edman et al., 2014). It integrates perspectives through a creative, iterative process: exploration (understanding user goals and experiences), ideation (envisioning new service futures), prototyping (developing and testing prototypes), and implementation (deploying solutions) (Grenha Teixeira et al., 2019; Chen & Chen, 2022; Solem et al., 2022). This process aligns with the Double Diamond Model (DDM), which includes divergent and convergent thinking stages (Nusir et al., 2021; Park et al., 2022). The Double Diamond and IDEO 3I represent two mainstream service design processes. D.Y. Wang et al. (2022) propose a three-diamond model incorporating Problem Distillation, Service

System Design, and Sustainable Development as critical stages for innovation from inception to implementation.

*Aligning the Service Design Process with New Service Development:*

New Service Development (NSD) and service design are closely linked in service management. NSD involves creating and launching new services, while service design focuses on crafting customer experiences. Service design, as part of NSD, facilitates value creation by aligning new services with user needs and expectations (Tung & Yuan, 2011; Yu & Sangiorgi, 2018).

Yu and Sangiorgi (2018) proposed a multidimensional NSD model showing how service design enhances the NSD process, guiding NSD toward a customer-centric logic. This model includes stages of Exploration, Design, Analysis, Development, Implementation, and Evaluation, with Exploration and Evaluation extending traditional NSD processes. Exploration generates user value insights, while evaluation integrates implementation and exploration, supporting iterative development and service improvement. These processes ensure NSD becomes a continuous, user-centric value creation process. From this perspective, the service design process should correspond to the new service development process.

Building on the summarised viewpoints and the sunburst chart, we developed a framework for the service design process (see Figure 5). This model integrates the human-centred new service development process (Yu & Sangiorgi, 2018) and the three-diamond model (D. Y. Wang et al., 2022).

**Diamond 1** (Red area of sunburst chart):

Phase 1: Value proposition acquisition and analysis of service users (divergence);

Phase 2: Designing service concepts with user needs and value propositions (convergence);

**Diamond 2** (Yellow area of sunburst chart):

Phase 3: Developing a modular, systematic multi-channel service system (Divergence);

Phase 4: Designing service encounters based on system interfaces and processes (Convergence);

**Diamond 3** (Green area of sunburst chart):

Phase 5: Service implementation and delivery, emphasising user data collection in service use and collaborative network building among stakeholders to achieve automated and dynamic capabilities for value creation (Divergence);

Phase 6: Evaluating services, considering network relationships between new and existing services to facilitate service iteration (Convergence).

The third diamond enhances service sustainability through long-term user relationships, feedback collection, and refinement of design based on evolving needs.

Additionally, the design and development of service business models span the entire three-diamond process, ensuring the monetisation and business benefits of services, which is another manifestation of service sustainability (Blue area of sunburst chart).

*Service Design Segmentation Process and Key Elements of Design Methods*

We conducted a further analysis of the service module level methods and presented them in tables. (see Appendix). This analysis aims to clarify the functional distribution of method sets and their associated processes, given the clear structural relationships and boundaries at this level. It also aids in identifying key elements and challenges in service design methods, facilitating summaries and evaluations of their developmental trends.

*Diamond 1: Value Proposition Acquisition and Service Concept Design, focusing on high user engagement in value creation and context awareness*

The initial stage of service design involves identifying stakeholders' desires and needs to define service concepts (Rejikumar et al., 2022). Understanding value propositions is crucial for grasping customer engagement and co-creation motivations (Korper et al., 2020). Value propositions encompass both user experiences and corporate strategies. A contextual and holistic view of user experiences helps companies develop propositions that better align with user values (Yu & Sangiorgi, 2018). Corporate value propositions reflect the alignment of service strategies with customer values, necessitating a comprehensive reevaluation of business models across strategic dimensions of new services and products (Chew, 2016).

The concept of service is a crucial driver of service design decisions, representing the benefits and value delivered to customers (Patrício et al., 2011). It highlights a company's value proposition as a network of core and supplementary service products (Grenha Teixeira et al., 2017). The MSD method frames the service concept as the company's positioning within the Customer Value Constellation (CVC), suggesting that service concept design should prioritise the company's value proposition while considering its broader context within the value network (Patrício et al., 2011).

Further analysis of the first diamond process methodology identified key segmented processes: 1. Exploring the value network of participants; 2. Capturing user preferences, value propositions, customer experience, and service strategies; 3. Constructing and visualising frameworks for customer requirements, experiences, and strategies; and 4. Designing service concepts. These processes and methods emphasise considerations within the service design process, ensuring smooth transitions and supporting the development of design proposals. They highlight three essential elements of service design methods: value creation, high stakeholder involvement, and awareness of user context.

*Diamond 2: Service System and Service Encounter Design, focusing on multi-interface modularisation of systems and incorporates socio-material configurations*

The service system coordinates personnel, processes, technical support, and resources to support service concepts and ensure seamless customer experiences (Patrício et al., 2011; Grenha Teixeira et al., 2017). The iSIM method underscores the need for modular service architecture design (Chew, 2016). This approach systematises service design and innovation using modular principles, establishing a unified language and metrics for modularisation to enhance service agility. iSIM places this phase after the service system and encounter design. We categorise service architecture design within the service system design stage, as service systems are multi-channel and multi-level. Modularising and standardising components at this stage improves their independence and reusability, enhancing service delivery efficiency. Service encounters are defined as touchpoints (Patrício et al., 2011) and interaction moments (Grenha Teixeira et al., 2017) between customers and companies, occurring across multiple service interfaces, both online and offline. The goal of service encounter design is to shape the user's service experience by defining interaction settings, processes, and participant roles (Kimbell & Blomberg, 2017). It also integrates socio-material configurations (Sudbury-Riley et al., 2020) to facilitate service delivery. Technological advancements may introduce new roles for both employees and customers, reducing the need for physical co-location (Bolton et al., 2018) and expanding service interaction scenarios. Additionally, Agent-Based Simulation

(ABS) technology (Drăgoicea et al., 2015) can simulate these encounters to predict potential service delivery situations.

Table analysis identifies the segmented processes of this stage as follows: 5. Understanding organisational conditions that support service design and facilitating related design activities; 6. Designing service systems; 7. Achieving modularity/mass customisation of systems; 8. Designing service encounters; and 9. Evaluating service encounter touchpoints and predicting risks before service delivery.

Facilitating service design involves using the CPA framework to understand organisational capabilities, interactive practices, and individual abilities, guiding the implementation of service design strategies (Karpen et al., 2017). Risk prediction before service delivery relies on analysing touchpoint failure modes. Analysing failures and preventive measures is more cost-effective than addressing failures post-occurrence. Failure mode analysis thus reduces delivery risks and enhances service reliability (W. Wang et al., 2022).

Overall, the key elements of this stage include modular design of multi-interface service systems, incorporating socio-material configurations in the encounter design stage, and preparing adequately for the next phase.

*Diamond 3: Service Delivery and Evaluation Phase emphasises the automation and sustainability of service design*

Service design aims to systematise and standardise service innovation while automating value creation to enhance productivity and customer satisfaction (Tung & Yuan, 2011). Information technology is crucial for this process, as it collects and analyses customer data to identify needs and preferences, enabling personalised services via digital platforms. Additionally, IT supports automated service delivery, reducing costs and improving efficiency (Hsiao et al., 2015).

Tung and Yuan (2011) proposed the Mutualism-Based New Service Development Method (MBNSD), which enhances service productivity and satisfaction by establishing mutual relationships, constructing Collaborative Service Systems (CSS), and promoting automated value co-creation. Additionally, artificial intelligence (AI) is transforming service innovation. Huang and Rust (2018) predicted that automation technologies will increasingly replace tasks requiring mechanical, analytical, intuitive, and even empathetic abilities. Analytical AI, which processes and learns from data to solve problems, represents a more advanced stage in intelligent automation skills (Huang & Rust, 2018), ideal for enhancing service automation and personalisation (Flavián et al., 2022).

The sustainability of services highlights "value in use," emphasising shared and dynamic problem-solving (Chen & Chen, 2022). Service design should address two aspects of value creation: during the development of customer-involved value propositions and throughout the service experience (value in use) (Chen & Chen, 2022). Consequently, the service delivery phase must focus on users' value experiences during service use to support quality assessment, optimisation, improvement, and sustainable iteration of services.

Service design enhances iteration and sustainability through the development of service networks and evaluation. The process involves iterative cycles and collaborative practices to

ensure value creation (Korper et al., 2020). Based on understanding customer needs and prototyping services, the efficiency of service design is tested and evaluated to finalise services (Rejikumar et al., 2022). The segmented processes refined in the third Diamond Flow include: 10. Collecting customer data in use through ICT; 11. Simulating and predicting service encounters in the service delivery phase with smart service systems; 12. Constructing Collaborative Service Systems and facilitating the automation of value creation; 13. Service Evaluation; and 14. Establishing service networks to promote service iteration. The extracted method elements revolve around service automation and sustainable iteration. As mentioned earlier, comprehensive multidimensional approaches have not yet emerged in this process stage. Future research should therefore delve deeper into this stage to respond to researchers' direction towards comprehensive methodological developments in service design.

#### *Designing Business Models as Another Manifestation of Sustainable Service Design*

One aspect of service innovation is the innovation of business models (Korper et al., 2020). Business models have evolved from transactional to relationship-based models, emphasising the importance of establishing relationships with customers in new business models (Garcia-Magro & Soriano-Pinar, 2019). Enterprises co-create value with customers through their business logic (Vargo & Lusch, 2004) and receive returns. The iSIM method is a comprehensive design approach that focuses on the commercialisation of service innovation. It emphasises that a company's service strategy can be understood as a choice of business model, integrating this choice throughout the entire service design phase to co-create value with users and ultimately achieve a sustainable service business model (Chew, 2016).

Additionally, customer equity—representing the total lifetime value customers provide—is crucial for evaluating business model returns and overall success (Hao & Chon, 2022). Emphasising customer equity supports the development of sustainable and profitable business models. In summary, integrating business models into service design ensures sustainable returns and fosters long-lasting value creation with customers, reflecting the sustainability of service design.

#### **Challenge & Trends in Service Design Methodology**

##### *Service Design Lacks a More Complete and Integrated Method*

Service design is a multi-disciplinary field, but its contributions often cater to specific disciplinary perspectives and lack a comprehensive approach to support new value propositions fully (Prestes Joly et al., 2019). Traditional development methods tend to focus on business model innovation rather than the service delivery implementation process, neglecting evaluation and feedback, which diminishes real-world efficiency. Furthermore, traditional service design methods, often studied within single application domains, vary in perspectives, stages, and tools, and have not yet achieved a closed-loop design that includes delivery and evaluation phases. This variation leads to confusion in the industry regarding which methods and processes to adopt. Companies seeking to innovate through service-oriented design face diverse demands, highlighting the urgent need for a comprehensive approach to service design from a convergent perspective (Kwon et al., 2021). Despite efforts to compare design methods with critical elements of service process frameworks, challenges remain in addressing various process stages and key elements. However, these challenges

offer opportunities for advancing service design to better address complex needs and issues better.

#### *How to get Users Engaged and Maintain a High Engagement Level*

Traditional qualitative methods often suffer from stakeholder subjective biases in capturing user needs (Ojasalo & Ojasalo, 2018; Sudbury-Riley et al., 2020; Rejikumar et al., 2022). Methods like Customer Process Management (CPM) and ActS aim to capture customer process characteristics (CPC) and daily contextual backgrounds, providing data on digital traces of human activities or system operations that reflect authentic user behaviours and environments, minimising subjective bias (Lim et al., 2019). However, a new challenge arises: how to actively involve users in such co-creation activities and sustain long-term high engagement. Research indicates that engagement motivation determines users' willingness to participate in co-creation behaviours (Neghina et al., 2017), viewing motivation and goals as the starting point for a series of activities (Gummerus et al., 2021). That successful co-creation depends on communication, connection, and understanding (Neghina et al., 2015). Methods such as COVALENT and gamification emphasise encouraging reciprocal user involvement (Pahk et al., 2018), but offer limited insights into fostering deep motivation and sustained engagement. While these studies highlight factors influencing user participation in co-creation, systematic methods for guiding and enhancing user involvement remain underdeveloped.

#### *Symbolic Participation and Lack of Participant Diversity*

Service co-creation often occurs in environments controlled by organisations, which manage discussion topics, participation modes, and decision-making processes. This can result in symbolic participation, where users have limited influence on outcomes. Additionally, a lack of participant diversity is common. Social media could mitigate this issue by improving communication efficiency and fostering diverse connections. However, relying solely on social media may not fully address symbolic participation issues, as it might sacrifice depth for breadth. Organisations also face challenges in balancing control over communications with increased transparency (Walsh et al., 2021).

#### *The Importance of Research on Requirement Elicitation (RE) for Implicit and Usage Stage Requirements*

In terms of the phases of requirements elicitation, existing studies on requirements elicitation predominantly focus on the early design stages, often neglecting the usage stages (Z. Wang et al., 2021). Traditional techniques such as surveys, interviews, and focus groups are time-consuming and better suited for early design, while usage stages demand dynamic, timely feedback from service organisations (Bolton et al., 2018; Yu & Sangiorgi, 2018). In terms of the types of requirements elicitation, research mainly addresses explicit (e.g., user requests) or well-defined requirements (e.g., order quantities), frequently overlooking implicit requirements. These are needs users have not explicitly communicated or may not even recognise, hidden in their behaviours and contexts. In fact, many users are not clear about what they truly desire. For instance, before the advent of the iPhone, consumers were unaware that a phone could satisfy their comprehensive interests and implicit needs to such an extent. Identifying implicit requirements can significantly enhance service quality, customer satisfaction, and lead to innovative products, thereby improving organisational market competitiveness.

Customer Process Management (CPM) captures users' needs from their daily behavioural and service usage processes, but often overlooks implicit needs. With the digitisation of physical products, ICT and IoT-based digital twin technologies collect extensive, diverse datasets that provide digital traces of human activities or system operations, reflecting authentic customer behaviours and environments without cognitive transfer or bias, helping to identify hidden requirements during the usage phase. Building on this, Wang et al. (2021) proposed a graph-based context-aware requirement elicitation (RE) method that extracts implicit user needs within specific contexts, triggering relevant product or service components (Z. Wang et al., 2021). However, this method, initially applied to product-centric smart product service systems, faces challenges when integrated with service design approaches that emphasise service-dominant logic.

*Cross-border co-creation of service design methods is still challenging, and codesign methods lack clarity/are still under development.*

In collaborative innovation, diversity among actors can cause conflicts and uncertainties due to differing rationales (Tsutsui et al., 2021). Participants need to understand each other's backgrounds and rationales. Professional design methods, such as empathic techniques, may be inaccessible to non-designers, complicating co-creation. Additionally, methods involving computer engineering or other fields, like smart service systems, require a common language for effective multi-disciplinary collaboration. Consequently, achieving empathy in multi-disciplinary design processes remains largely unexplored (Wetter-Edman et al., 2014).

Tsutsui et al. (2021) introduced a contextual analysis method that blends exploratory investigation—capturing participants' experiences and contexts—with codesign, which provides frameworks and tools for integrating resources among participants. This method is effective in the initial stages of collaborative innovation, aiding in understanding participants' rationales and fostering empathy, thus improving codesign efficiency (Tsutsui et al., 2021). However, it does not yet cover the entire spectrum of service creation stages, such as delivery testing and evaluation. Future research should refine these stages and incorporate additional multi-disciplinary methods to enhance cross-disciplinary value co-creation.

Service design is an emerging field across various industries; its methods are still under development and continually being applied in service-related domains (Patrício et al., 2011; Lee et al., 2021). Services are complex, variable, and concurrent. Service design addresses service issues through more creative and collaborative design methods, aiming to apply a series of processes to all components (people, objects, spaces, interactions) that customers experience while using a service, as well as paths (procedures, interactions, systems) used for customer-centric contextual inquiries and capturing stakeholders' latent needs (Lee et al., 2021). However, due to the various applications of codesign and the ongoing refinement of integrated methods, there remains conceptual confusion in the literature (e.g., differing interpretations of service encounters and service experiences in methods like iSIM and MSD), lacking clarity on the practical implications of codesign methods.

*Automation value co-creation needs to take into account user acceptance of the technology.*

Information technology facilitates automated service delivery, reducing costs and enhancing efficiency (Hsiao et al., 2015). However, integrating technology into services poses challenges; there is a need for comprehensive deployment of technology while achieving

seamless customer experiences (Grenha Teixeira et al., 2017). Users may encounter barriers during technology-enabled service usage, feeling disconnected, frustrated, alienated, or isolated rather than immersed in a positive customer experience. When interactions and relationships are central to value propositions, organisations need to balance the efficiency of digital technologies with effective customer engagement (Bolton et al., 2018). Individual responses to technology vary widely, potentially eliciting positive or negative emotions (Flavián et al., 2022). Methods such as the Technology Acceptance Model (TAM) and the Technology Readiness Index (TRI) help capture these responses, providing support for technology-enabled service design solutions. TAM provides a framework for understanding consumer acceptance of technology-based products and services (Baron et al., 2006; Flavián et al., 2022), while TRI assesses consumers' psychological readiness for technology, differing from TAM's focus on motivation (Flavián et al., 2022).

However, these models have limitations in capturing nuances of the service application environment; merely assessing technology acceptance is insufficient and fails to adequately reflect the extent of consumer acceptance during co-creation of technological value in use (Baron et al., 2006). Baron et al. (2006) conducted a further review of TAM, re-examining the structure of usage behaviour within the context of technology-based service practices. They proposed a creation model based on TAM and user behaviour to explain, understand, and predict the behaviours of users in information systems and technology contexts. Therefore, it is necessary for future research to further scrutinise user usage behaviour in technology-based service practices, as these services largely depend on user creativity (Baron et al., 2006).

*Need to pay attention to the sustainability of value creation in service design*

**Meeting long-term user needs and focusing on value in use:**

From the user perspective, value is perceived phenomenologically, shaped by individual social and cultural backgrounds, and evolves with changing dynamics (Vink et al., 2021). This means users' perceptions of value undergo subjective changes over time. From the organisational perspective, user experience and value creation can be assessed through innovation, knowledge transfer, and sustainability (Malakhatka et al., 2021). Value co-creation forms the foundation of sustainable development (Ruiz-Alba et al., 2019), and customer-centric approaches help organisations establish long-term capabilities for supporting user value creation (Yu & Sangiorgi, 2018). Organisations must focus on relationship marketing to establish and maintain mutually satisfying relationships with users and address their long-term needs (Garcia-Magro & Soriano-Pinar, 2019). Sustainable services also emphasise "value in use" (Chen & Chen, 2022), aiming to meet customer needs sustainably and create value across multiple dimensions, beyond the traditional service-for-money exchange (Vargo & Lusch, 2004).

The earlier discussion on sustainable service design methods, such as MSDSD, highlighted that sustainability must encompass the entire service design process, including service delivery and evaluation stages. This introduces new challenges for service design, necessitating the integration of comprehensive methods to capture value in use and address users' long-term needs.

*Need to support enduring change and focus on the close loop and iteration of the service design process*

Implementing new services often sparks controversy. Despite successful prototypes, new concepts are often shelved or lose their original intent over time due to traditional practices (Vink et al., 2021). Many failed projects highlight the need to adapt service design methods to avoid naive solutions and support enduring change. Service design must address the complexities of dynamic multi-stakeholder interactions and interdependencies within complex service systems (Vink et al., 2021).

This study supports the view that the service design process is not yet closed-looped, requiring targeted method selection and adaptation for effective implementation. Therefore, there is a need to develop more comprehensive multi-level service design methods that integrate service data and insights from delivery and evaluation stages, forming a closed-loop system and fostering iterative development.

*The sustainability of business models, focusing on customer equity*

Customer Equity is a crucial aspect of Return on Investment (ROI), representing the lifetime value of all customers to a business - a discounted net present value of contributions a business expects to receive over a customer's lifetime. It serves as an overall parameter for evaluating business success. Focusing on customer equity helps to build a comprehensive, sustainable and profitable business model; it is also an effective tool to increase customer satisfaction and loyalty (Hao & Chon, 2022). Furthermore, applying service design thinking can differentiate organisations from competitors and create sustainable competitive advantages (Rau et al., 2017). Hao & Chon (2022) integrated service design thinking into a service evaluation framework that incorporates customer equity theory, suggesting that improving customer experience and delight boosts customer equity, service satisfaction, and trust. In summary, more service design research methods can focus on customer equity to ensure the sustainability of service business models.

**Conclusion**

Service research is entering an era of intelligence and servitisation, where technological trends drive multi-interface services and multi-channel customer management. The growing complexity of service environments due to diverse user demands has led to rapid evolution in service design methods. However, these methods often address localised needs and struggle to resolve all issues comprehensively. This has led to a shift towards integrated system methods in service design (Prestes Joly et al., 2019). Thus, understanding the current status and trends in the comprehensive development of service design methods is essential to address the increasingly complex service environment.

In this study, 63 selected service design methods were slip-box organised and thematically analysed by means of SLR. The collated module perspectives that support the hierarchical analysis of service design methods and the service design objects that support the construction of service design processes are merged into a sunburst chart, and further analysis was conducted from both the visualised hierarchy and process perspectives to derive the key elements of service design methods. By comparing these elements with the Rising Sun diagram, the study concluded with a summary and assessment of the development challenges and trends in service design methods.

Modern service design demands interdisciplinary, integrated methods and tools to address evolving challenges. Research on integrated service design methods has not yet formed a closed-loop process and still faces various challenges: The service design approach needs to start with the premise of engaging users in value creation activities, ensuring diversity and high levels of user participation, and avoiding tokenistic participation. Combined with a contextualised perception of the user, focus on accessing the implicit and in-use user needs. Next, service design methods must foster empathy to understand the rationality of cross-disciplinary co-creation and ensure the clarity of collaborative design. Providing modular solutions facilitates the co-creation of value with customers in multi-interface services. Furthermore, automated value creation enhances service delivery efficiency but requires consideration of user acceptance of technology. Finally, achieving sustainability in service design entails focusing on value in use and meeting long-term user needs, emphasising closed-loop processes and iteration to support lasting change, and prioritising customer equity to foster sustainable business models.

In conclusion, systematic, integrated and comprehensive is the trend in the development of service design methodology nowadays, and if it is to cope with the complex service environment, its development challenges are bound to be complicated and diverse. Nevertheless, if these challenges can be addressed, the service design methodology will be more complete and powerful.

#### **Declaration of Competing Interest**

The authors declare that there are no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### **References**

- Asakawa, F., Yasuoka, M., Nakatani, M., Kimura, A., & Ihara, M. (2020). Patterns for living lab practice: Describing key know-how to promote service cocreation with users. *International Journal of Automation Technology*, 14(5), 769–778. <https://doi.org/10/gsfzcn>
- Andreassen, T. W., Kristensson, P., Lervik-Olsen, L., Parasuraman, A., McColl-Kennedy, J. R., Edvardsson, B., & Colurcio, M. (2016). Linking service design to value creation and service research. *JOURNAL OF SERVICE MANAGEMENT*, 27(1), 21–29. <https://doi.org/10.1108/JOSM-04-2015-0123>
- Bagheri, S., Kusters, R. J., & Trienekens, J. J. M. (2019). Customer knowledge transfer challenges in cocreation value network: Toward a reference model. *INTERNATIONAL JOURNAL OF INFORMATION MANAGEMENT*, 47, 198–214. <https://doi.org/10/grfgh8>
- Baron, S., Patterson, A., & Harris, K. (2006). Beyond technology acceptance: Understanding consumer practice. *International Journal of Service Industry Management*, 17(2), 111–135. <https://doi.org/10.1108/09564230610656962>
- Bolton, R. N., McColl-Kennedy, J. R., Cheung, L., Gallan, A., Orsingher, C., Witell, L., & Zaki, M. (2018). Customer experience challenges: Bringing together digital, physical and social realms. *Journal of Service Management*, 29(5), 776–808. <https://doi.org/10/gfrfzh>
- Bowen, S., McSeveny, K., Lockley, E., Wolstenholme, D., Cobb, M., & Dearden, A. (2013). How was it for you? Experiences of participatory design in the UK health service. *CoDesign*, 9(4), 230–246. <https://doi.org/10.1080/15710882.2013.846384>

- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Brocklehurst, P. R., McKenna, G., Schimmel, M., Kossioni, A., Jerković-Ćosić, K., Hayes, M., da Mata, C., & Müller, F. (2018). How do we incorporate patient views into the design of healthcare services for older people: A discussion paper. *BMC Oral Health*, 18(1). <https://doi.org/10/gg8c7p>
- Cahill, P. T., Reitzel, M., Anaby, D. R., Camden, C., Phoenix, M., Romoff, S., & Campbell, W. N. (2022). Supporting rehabilitation stakeholders in making service delivery decisions: A rapid review of multi-criteria decision analysis methods. *Disability and Rehabilitation*. <https://doi.org/10/gsfzbx>
- Chen, Y. A., & Chen, C. L. (2022). Case study of sustainable service design in the hospitality industry. *Chinese Management Studies*, 16(1), 162–196. <https://doi.org/10/gsfzcv>
- Chew, E. K. (2016). iSIM: An integrated design method for commercialising service innovation. *Information Systems Frontiers*, 18(3), 457–478. <https://doi.org/10/f8q66m>
- Dehmel, N., Ran, Y., Osborne, M., Verschoor, A., Lambe, F., Balungira, J., Tabacco, G. A., Pérez-Viana, B., Widmark, E., & Holmlid, S. (2021). Combining service design and discrete choice experiments for intervention design: An application to weather index insurance. *MethodsX*, 8. <https://doi.org/10/gm8cdx>
- Drăgoicea, M., Falcão E Cunha, J., Pătrașcu, M., Dragoicea, M., Cunha, J. F. E., Patrascu, M., Drăgoicea, M., Falcão E Cunha, J., & Pătrașcu, M. (2015). Self-organising socio-technical description in service systems for supporting smart user decisions in public transport. *EXPERT SYSTEMS WITH APPLICATIONS*, 42(17–18), 6329–6341. <https://doi.org/10/gsfzcc>
- Fisk, R. P., Alkire, L. A., Anderson, L., Bowen, D. E., Gruber, T., Ostrom, A. L., & Patricio, L. (2020). Elevating the human experience (HX) through service research collaborations: Introducing ServCollab. *JOURNAL OF SERVICE MANAGEMENT*, 31(4), 615–635. <https://doi.org/10/gsfzbx>
- Flavián, C., Pérez-Rueda, A., Belanche, D., & Casaló, L. V. (2022). Intention to use analytical artificial intelligence (AI) in services – the effect of technology readiness and awareness. *Journal of Service Management*, 33(2), 293–320. <https://doi.org/10/gnmks6>
- Garcia-Magro, C., & Soriano-Pinar, I. (2019). Design of services in servitized firms: Gamification as an adequate tool. *JOURNAL OF BUSINESS & INDUSTRIAL MARKETING*, 35(3), 575–585. <https://doi.org/10.1108/JBIM-12-2018-0413>
- Green, T., Bonner, A., Teleni, L., Bradford, N., Purtell, L., Douglas, C., Yates, P., MacAndrew, M., Dao, H. Y., & Chan, R. J. (2020). Use and reporting of experience-based codesign studies in the healthcare setting: A systematic review. *BMJ QUALITY & SAFETY*, 29(1), 64–76. <https://doi.org/10.1136/bmjqs-2019-009570>
- Grenha Teixeira, J., Patrício, L., Huang, K.-H., Fisk, R. P., Nóbrega, L., & Constantine, L. (2017). The MINDS Method: Integrating Management and Interaction Design Perspectives for Service Design. *Journal of Service Research*, 20(3), 240–258. <https://doi.org/10.1177/1094670516680033>
- Grenha Teixeira, J., Pinho, N. F. D., Patrício, L., Teixeira, J. G., de Pinho, N. F., Patricio, L., Grenha Teixeira, J., Pinho, N. F. D., & Patrício, L. (2019). Bringing service design to the development of health information systems: The case of the Portuguese national electronic health record. *International Journal of Medical Informatics*, 132. <https://doi.org/10.1016/j.ijmedinf.2019.08.002>

- Gummerus, J., Mickelsson, J., Trischler, J., Harkonen, T., & Gronroos, C. (2021). ActS - Service design based on human activity sets. *JOURNAL OF SERVICE MANAGEMENT*, 32(6), 28–54. <https://doi.org/10.1108/JOSM-09-2019-0275>
- Hao, F., & Chon, K. K. S. (2022). Contactless service in hospitality: Bridging customer equity, experience, delight, satisfaction, and trust. *INTERNATIONAL JOURNAL OF CONTEMPORARY HOSPITALITY MANAGEMENT*, 34(1), 113–134. <https://doi.org/10/gsfzcx>
- Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). *Design Science in Information Systems Research*.
- Hsiao, W.-B., Chiu, M.-C., Chu, C.-Y., & Chen, W.-F. (2015). A systematic service design methodology to achieve mass personalisation. *International Journal of Agile Systems and Management*, 8(3–4), 243–263. <https://doi.org/10/gsfzcd>
- Huang, M.-H., & Rust, R. T. (2018). Artificial Intelligence in Service. *Journal of Service Research*, 21(2), 155–172. <https://doi.org/10.1177/1094670517752459>
- Kang, G., Tang, M., Liu, J., Liu, X. F., & Cao, B. (2016). Diversifying web service recommendation results via exploring service usage history. *IEEE Transactions on Services Computing*, 9(4), 566–579. <https://doi.org/10/f873vt>
- Karpen, I. O., Gemser, G., & Calabretta, G. (2017). A multi-level consideration of service design conditions Towards a portfolio of organisational capabilities, interactive practices and individual abilities. *JOURNAL OF SERVICE THEORY AND PRACTICE*, 27(2), 384–407. <https://doi.org/10/gsfzbp>
- Kemppainen, T., & Uusitalo, O. (2022). Introducing a sensemaking perspective to the service experience. *JOURNAL OF SERVICE THEORY AND PRACTICE*, 32(2), 283–301. <https://doi.org/10.1108/JSTP-02-2021-0030>
- Kimbell, L. (2011). *Designing for Service as One Way of Designing Services*.
- Kimbell, L., & Blomberg, J. (2017). *The object of service design*. <https://doi.org/10.5040/9781474250160.ch-006>
- Korper, A. K., Patricio, L., Holmlid, S., & Witell, L. (2020). Service design as an innovation approach in technology startups: A longitudinal multiple case study. *CREATIVITY AND INNOVATION MANAGEMENT*, 29(2), 303–323. <https://doi.org/10/gh8nf6>
- Kwon, H.-I., Baek, B.-H., Jeon, Y.-S., Kim, Y.-L., & Jung, H.-B. (2021). Key factors of service design methodology for manufacturing servitisation. *Cogent Business & Management*, 8(1). <https://doi.org/10/gp5rtx>
- Lee, S., Oh, H. Y., & Choi, J. (2021). Service design management and organisational innovation performance. *Sustainability (Switzerland)*, 13(1), 1–18. <https://doi.org/10/gsfzb9>
- Lim, C., Kim, M. J., Kim, K. H., Kim, K. J., & Maglio, P. (2019). Customer process management A framework for using customer-related data to create customer value. *JOURNAL OF SERVICE MANAGEMENT*, 30(1), 105–131. <https://doi.org/10.1108/JOSM-02-2017-0031>
- Luca, E. J., & Ulyannikova, Y. (2020). Towards a User-Centred Systematic Review Service: The Transformative Power of Service Design Thinking. *JOURNAL OF THE AUSTRALIAN LIBRARY AND INFORMATION ASSOCIATION*, 69(3), 357–374. <https://doi.org/10/gsfzb5>
- Malakhatka, E., Sopjani, L., & Lundqvist, P. (2021). Co-creating service concepts for the built environment based on the end-user's daily activities analysis: Kth live-in-lab explorative case study. *Sustainability (Switzerland)*, 13(4), 1–22. <https://doi.org/10/gjpsnv>
- Moon, S. K., Shu, J., Simpson, T. W., & Kumara, S. R. T. (2011). A module-based service model for mass customisation: Service family design. *IIE TRANSACTIONS*, 43(3), 153–163. <https://doi.org/10.1080/07408171003705383>

- Neghina, C., Bloemer, J., Van Birgelen, M., & Caniëls, M. C. J. (2017). Consumer motives and willingness to co-create in professional and generic services. *Journal of Service Management*, 28(1), 157–181. <https://doi.org/10.1108/JOSM-12-2015-0404>
- Neghina, C., Caniëls, M. C. J., Bloemer, J. M. M., & Van Birgelen, M. J. H. (2015). Value co-creation in service interactions: Dimensions and antecedents. *Marketing Theory*, 15(2), 221–242. <https://doi.org/10.1177/1470593114552580>
- Nusir, M., Tariq, U., & Ahanger, T. A. (2021). Engaging Diverse Stakeholders in Interdisciplinary Codesign Project for Better Service Design. *Journal of Cases on Information Technology*, 23(4). <https://doi.org/10.4018/JCIT.296253>
- Ojasalo, J., & Ojasalo, K. (2018). Service Logic Business Model Canvas. *Journal of Research in Marketing and Entrepreneurship*, 20(1), 70–98. <https://doi.org/10/gf8mmk>
- Ouyang, X., Mohd Yusof, M. J., & Perumal, T. (2025). Structuring service design methods: The MO Mapping Framework. *The Design Journal*, 28(6), 1132–1156. <https://doi.org/10.1080/14606925.2025.2567940>
- Pahk, Y., Self, J., & Baek, J. S. (2018). COVALENT, a method for codesigning value exchange in community-centred design. *CoDesign*, 14(4), 275–292. <https://doi.org/10/gsfzck>
- Park, E. S., Kim, S., Song, H., Kim, D., Seo, J. H., He, Y., Lee, H., & Lee, H.-K. (2022). Design Fiction as a Convergence and Divergence Tool in the Design Thinking Process: Developing Smart Communication Service for Childcare. *Archives of Design Research*, 35(2), 87–98. <https://doi.org/10/gsfzbg>
- Patricio, L., de Pinho, N. F., Teixeira, J. G., & Fisk, R. P. (2018). Service Design for Value Networks: Enabling Value Co-creation Interactions in Healthcare. *SERVICE SCIENCE*, 10(1), 76–97. <https://doi.org/10/gd5xpd>
- Patrício, L., Fisk, R. P., & Falcão E Cunha, J. (2008). Designing Multi-Interface Service Experiences: The Service Experience Blueprint. *Journal of Service Research*, 10(4), 318–334. <https://doi.org/10.1177/1094670508314264>
- Patrício, L., Fisk, R. P., Falcão E Cunha, J., & Constantine, L. (2011). Multi-level Service Design: From Customer Value Constellation to Service Experience Blueprinting. *Journal of Service Research*, 14(2), 180–200. <https://doi.org/10.1177/1094670511401901>
- Patricio, L., Gustafsson, A., & Fisk, R. (2018). Upframing Service Design and Innovation for Research Impact. *JOURNAL OF SERVICE RESEARCH*, 21(1), 3–16. <https://doi.org/10/gc2djz>
- Prakash, G. (2021). Exploring enablers of modularity in healthcare service delivery. *TQM Journal*. <https://doi.org/10/gsfzbc>
- Prestes Joly, M., Teixeira, J. G., Patrício, L., Sangiorgi, D., Joly, M. P., Teixeira, J. G., Patricio, L., & Sangiorgi, D. (2019). Leveraging service design as a multi-disciplinary approach to service innovation. *Journal of Service Management*, 30(6), 681–715. <https://doi.org/10.1108/JOSM-07-2017-0178>
- Ramos, M., Forcellini, F. A., Ferreira, M. G. G., Bowen, S., & Wright, P. C. (2022). Cyclical experience-based design: A proposal for engaging stakeholders in a co-creative model for primary health care service design. *International Journal of Health Planning and Management*, 37(1), 486–503. <https://doi.org/10/gsfzcc>
- Rau, C., Zbiek, A., & Jonas, J. M. (2017). Creating Competitive Advantage from Services: A Design Thinking Case Study from the Commodities Industry Service design thinking can provide the tools to help companies design value propositions that meet customer needs and sustain competitive advantage. *Research Technology Management*, 60(3), 48–56. <https://doi.org/10/gfgnbq>

- Rejikumar, G., Aswathy, A.-A., Jose, A., & Sonia, M. (2022). A collaborative application of design thinking and Taguchi approach in restaurant service design for food wellbeing. *Journal of Service Theory and Practice*, 32(2), 199–231. <https://doi.org/10.1108/JSTP-12-2020-0284>
- Ruiz-Alba, J. L., Soares, A., Rodríguez-Molina, M. A., & Frías-Jamilena, D. M. (2019). Servitisation strategies from customers' perspective: The moderating role of cocreation. *Journal of Business and Industrial Marketing*, 34(3), 628–642. <https://doi.org/10.1108/JBIM-02-2017-0028>
- Schallehn, H., Seuring, S., Strähle, J., & Freise, M. (2019). Defining the antecedents of experiencecocreation as applied to alternative consumption models. *Journal of Service Management*, 30(2), 209–251. <https://doi.org/10.1108/JOSM-12-2017-0353>
- Solem, B. A. A., Kohtamäki, M., Parida, V., & Brekke, T. (2022). Untangling service design routines for digital servitisation: Empirical insights of smart PSS in maritime industry. *Journal of Manufacturing Technology Management*, 33(4), 717–740. <https://doi.org/10.1108/JMTM-10-2020-0429>
- Sudbury-Riley, L., Hunter-Jones, P., Al-Abdin, A., Lewin, D., & Naraine, M. V. (2020). The Trajectory Touchpoint Technique: A Deep Dive Methodology for Service Innovation. *Journal of Service Research*, 23(2), 229–251. <https://doi.org/10.1177/1094670519894642>
- Trischler, J., Zehrer, A., & Westman, J. (2018). A designerly way of analysing the customer experience. *Journal of Services Marketing*, 32(7), 805–819. <https://doi.org/10.1108/JSM-04-2017-0138>
- Tsutsui, Y., Mitake, Y., Hosono, S., Nemoto, Y., Sholihah, M., & Shimomura, Y. (2021). A context analysis method for empathy in co-creative innovation. *Journal of Advanced Mechanical Design, Systems and Manufacturing*, 15(2). <https://doi.org/10/gsfzct>
- Tung, W. F., & Yuan, S. T. (2011). Constructing Collaborative Service Systems: A Mutualism-Based NSD Method. *IEEE TRANSACTIONS ON SYSTEMS MAN AND CYBERNETICS PART C-APPLICATIONS AND REVIEWS*, 41(3), 316–332. <https://doi.org/10.1109/TSMCC.2010.2091125>
- Vargo, S. L., & Lusch, R. F. (2004). Evolving to a New Dominant Logic for Marketing. *Journal of Marketing*, 68(1), 1–17. <https://doi.org/10.1509/jmkg.68.1.1.24036>
- Vargo, S. L., & Lusch, R. F. (2008). Service-dominant logic: Continuing the evolution. *Journal of the Academy of Marketing Science*, 36(1), 1–10. <https://doi.org/10.1007/s11747-007-0069-6>
- Vink, J., Koskela-Huotari, K., Tronvoll, B., Edvardsson, B., & Wetter-Edman, K. (2021). Service Ecosystem Design: Propositions, Process Model, and Future Research Agenda. *JOURNAL OF SERVICE RESEARCH*, 24(2), 168–186. <https://doi.org/10/ghtz2r>
- Visser, F. S., Stappers, P. J., Van Der Lugt, R., & Sanders, E. B.-N. (2005). Contextmapping: Experiences from practice. *CoDesign*, 1(2), 119–149. <https://doi.org/10.1080/15710880500135987>
- Walsh, L., Hyett, N., Howley, J., Juniper, N., Li, C., MacLeod-Smith, B., Rodier, S., & Hill, S. J. (2021). The risks and benefits of using social media to engage consumers in service design and quality improvement in Australian public hospitals: Findings from an interview study of key stakeholders. *BMC Health Services Research*, 21(1). <https://doi.org/10.1186/s12913-021-06927-x>

- Wang, D. Y., Hsieh, W. A., Chen, S. Y., & Tang, H. H. (2022). The Complexities of Transport Service Design for Visually Impaired People: Lessons from a Bus Commuting Service. *INTERNATIONAL JOURNAL OF DESIGN*, 16(1), 55–73. <https://doi.org/10/gsfzbj>
- Wang, W., Song, J., Chen, J., Wei, T., & Ning, J. (2022). Service design touch point failure model and effect analysis based on the triangular fuzzy number evaluation method. *International Journal on Interactive Design and Manufacturing*, 16(2), 517–530. <https://doi.org/10/gsfzc2>
- Wang, Z., Chen, C.-H., Zheng, P., Li, X., & Khoo, L. P. (2021). A graph-based context-aware requirement elicitation approach in smart product-service systems. *International Journal of Production Research*, 59(2), 635–651. <https://doi.org/10/gnfdxd>
- Wetter-Edman, K., Sangiorgi, D., Edvardsson, B., Holmlid, S., Gronroos, C., & Mattelmäki, T. (2014). Design for ValueCocreation: Exploring Synergies Between Design for Service and Service Logic. *SERVICE SCIENCE*, 6(2), 106–121. <https://doi.org/10.1287/serv.2014.0068>
- Yenilmez, F., & Bagli, H. H. (2020). Changing Paradigms, Subjects, and Approaches in Industrial Design Studio Education in Turkey. *JOURNAL OF QUALITATIVE RESEARCH IN EDUCATION-EGITIMDE NITEL ARASTIRMALAR DERGISI*, 8(2), 754–775. <https://doi.org/10/gsfzb6>
- Yu, E., & Sangiorgi, D. (2018). Service Design as an Approach to Implement the Value Co-creation Perspective in New Service Development. *JOURNAL OF SERVICE RESEARCH*, 21(1), 40–58. <https://doi.org/10/ggfmws>
- Zheng, C., Wang, Z., Qin, X., Eynard, B., Hehenberger, P., Li, J., Bai, J., & Zhang, Y. (2021). Integrated design for product–service systems: A focus on multi-disciplinary interface. *International Journal of Production Research*, 59(19), 5884–5902. <https://doi.org/10/gsfzbx>