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Enhancing value cocreation orientation in service innovation: a new service development and service design integrated process

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Integrating the prescriptive and linear approach of NSD with the non-linear approach of service design can enhance value cocreation orientation in service innovation. Then, the objectives of this study are to explore these complementarities, propose an integrated model that enhances value cocreation in service innovation, and evaluate this model. The methodology involved a systematic literature review, focus group, and brainstorming session to propose the model, followed by evaluation through three case studies and expert interviews. As results, the model's main feature is the development of each service prerequisite through the service design cycle, prescriptively incorporating customer input throughout the service innovation process. Expert interviews and model application indicated that the model achieved its objectives, as the development of each service element was based on a deep understanding of customer demands and their active participation, resulting in services with high potential for resource integration and value cocreation. After applying and evaluating the model, this study provides evidence that (i) hybrid waterfall-cyclic dynamic contributes to managing complexity in service innovation, while maintaining customer focus and creativity; (ii) recurring studies of customer needs in distinct service innovation phases, each focusing on a specific service element, contribute to enriching the understanding of such needs; (iii) active customer involvement in proposing and selecting each service prerequisites across service innovation phases tends to enhance resource integration and value cocreation; (iv) waterfall and cyclic hybrid approach for service innovation contributes to generating detailed service prerequisites specifications, leading to more effective implementation; and (v) customer-centered dynamics throughout the service innovation process contribute to promoting cross-departmental integration, embedding customer needs across the organization. This paper contributes to deepening the discussion on implementing value cocreation in service innovation.

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Introduction

Context. Service-Dominant Logic (SDL) is the contemporary marketing paradigm that approaches goods and services in an integrated manner, prioritizing benefits over the specific means employed to deliver them (Huarng et al. 2018). In SDL, a 'service' is the process in which the company (also called the service provider) and the customer interact in pursuit of mutual benefits through the application of specialized knowledge and skills (Vargo and Lusch 2004; Vargo and Lusch 2008). Moreover, this approach underscores the relational nature of value creation, emphasizing that value is cocreated by integrating the resources of both the company and the customer during the service execution (Gummesson and Grönroos 2012; Galvagno and Dalli 2014; Grönroos and Gummerus 2014). This value creation dynamic is referred to as 'value cocreation' cocreation' (Vargo and Lusch 2004; Ärleskog et al. 2021; Tregua et al. 2021).

To develop and offer a service enabled for value cocreation, companies must adopt a value cocreation perspective from the inception of service, that is, throughout the service innovation process (Mele et al. 2014; Huarng et al. 2018). Service innovation involves creating novel services tailored to market demands or specific operational contexts, aiming to enhance quality, efficiency, and customer experience (Biemans et al. 2016; Gustafsson et al. 2020; Kurtmollaiev and Pedersen 2022). From the SDL perspective, service innovation consists of new forms of value cocreation through innovative ways of integrating resources among involved actors (Lusch and Nambisan 2015). Examples of service innovation include new models of urban mobility, such as car-sharing, which offers users greater convenience and cost transparency, new forms of entertainment consumption like on-demand entertainment streaming, providing instant access to vast content libraries with personalized recommendations, and new forms of relationship with banks, such as mobile banking, enabling customers to manage their finances from anywhere, at any time, while reducing transaction times. In these examples, the true innovations are the new service models—car-sharing, on-demand entertainment streaming, and mobile banking - while technologies like apps and online platforms serve as mediating tools for service provision (Vargo and Lusch 2004; Vargo and Lusch 2008).

Service innovation process are development steps that aims to develop this new service (Droege et al. 2009; Biemans et al. 2016; Mendes et al. 2017). From an operational perspective, in a seminal conceptual paper, Edvardsson and Olsson (1996) proposed that service innovation process aims to develop the service elements (also referred to as service prerequisites) which collectively constitute the service, namely: 'Service Idea' (abstract service representation), 'Service Concept' (tangible and value-driven service presentation), and 'Service Delivery System' (service processes, human resources, and infrastructure). For Edvardsson and Olsson (1996), the service prerequisites are the key factors in defining service quality from the customer's perspective.

A value cocreation-oriented service innovation process involves aligning actions to create a new service in which the service provider's resources are capable of being integrated with the customer's resources during service execution (Helkkula et al. 2018; Lindhult et al. 2018; Cheng et al. 2023). In other words, the objective is to develop 'Service Idea', 'Service Concept', and 'Service Delivery System' elements in line with customer idiosyncrasies aiming for resource integration (Edvardsson and Olsson, 1996; Teixeira et al. 2016; Yu and Sangiorgi 2018). As service prerequisites are interdependent, the definition of the 'Service Idea' directly impacts the definition of the 'Service Concept', which in turn affects the definition of the 'Service Delivery System' elements. Therefore, meticulously developing each service prerequisite leads to a service with the potential for resource integration and value cocreation (Cheng et al. 2023).

Currently, service design is the service innovation approach that properly operationalizes the SDL and value cocreation perspectives by developing services tailored to customer idiosyncrasies (Wetter-Edman et al. 2014; Morelli et al. 2021). It employs human-centered and participatory design methods to deeply understand customer resources and, based on that, to develop service provider resources that can be integrated into them (Holmlid et al. 2017; Yu and Sangiorgi 2018). However, service design process presents some limitations, such as the lack of a defined scope (i.e., front-end, back-end or both of them) and clear design object (e.g., 'Service Idea,' 'Service Concept,' 'Service Delivery System,' or all of them) (Kimbell and Blomberg 2017; Yu 2017; Yu 2018). In reality, service design processes are better characterized as practical and adaptable frameworks, suitable for application at various scales and in diverse contexts (Yu 2018). Moreover, it follows the non-linear structure from agile development, entailing in a diffuse sequence of stages, making it challenging to conduct the process predictably (Stickdorn and Schneider 2011; Suetin et al. 2016; Rasheed et al. 2021). These factors may require tacit skills, making it difficult for non-designer employees to execute service design projects without the support of a design consultancy (Bailey 2013; Kirchberger and Tether 2017; Korpikoski 2023).

The solution for this issue can be the integration of service design with new service development (NSD) approach, which is an alternative approach to service innovation (Droege et al. 2009; Biemans et al. 2016; Mendes et al. 2017). On the one hand, NSD is criticized for its lack of customer-centricity and failure to tailor solutions to customer needs, stemming from its perspective of viewing services primarily as value-laden market offerings instead of a process in that the value is cocreated (Holmlid et al. 2017; Yu and Sangiorgi 2018). On the other hand, it offers a less tacit process compared to service design, following a linear stage-based process, inherited from the traditional project management approach, that provides greater predictability in execution (Crevani et al. 2011; Gemino et al. 2021; Agbejule and Lehtineva 2022). Moreover, NSD includes stages with well-defined scopes, explicitly addressing service prerequisites developed in each stage (Edvardsson and Olsson 1996; Yu 2017; Yu 2018). Finally, it encompasses the entire service development lifecycle, from ideation to implementation, which is not clearly defined in service design (Droege et al. 2009; Biemans et al. 2016; Mendes et al. 2017). Therefore, despite criticisms, NSD offers significant benefits, so it should not be disregarded in the construction of new service innovation models.

Considering this, integrating service design and NSD processes can result in a hybrid process that combines fuzzy/non-linear and stage-based/linear structures. In line with this, Patrício et al. (2018) stressed the importance of understanding the NSD and service design complementarities for enhanced service innovation. According to Yu (2017, 2018), this integration enhances service innovation by embedding customer-centricity and value cocreation into organizational practices while maintaining the stage-based dynamic necessary for operationalization. Yu and Sangiorgi (2018) suggested that integrating the SDL perspective into the rigid NSD process through service design can strengthen service innovation. Moreover, it can result in a process similar to the hybrid project management, combining traditional and agile approaches to handle complexity and uncertainty without sacrificing creativity (Gemino et al. 2021; Zasa et al. 2021; Reiff and Schlegel 2022). Therefore, literature shows that such integration can enhance value cocreation potential in services

while maintaining process control and efficiency (Holmlid et al. 2017; Hofmeister et al. 2022; Kurtmollaiev and Pedersen 2022).

Research problem and objective. However, literature has not extensively delved into the complementarities of NSD and service design that would enable the operationalization of the integration of these approaches into a unified process (Patrício et al. 2018; Hofmeister et al. 2022). Although the importance of exploring this topic is acknowledged, a notable research gap exists in terms of how to integrate these approaches to effectively leverage the strengths of both approaches (Yu 2017; Patrício et al. 2018). Therefore, it is necessary to understand the interconnection of the phases and stages of each approach, aiming to obtain an integrated model that has an enhanced value cocreation orientation (Yu 2018). Based on that, the following research question guides this research: '*What are complementarities between NSD and service design that can be leveraged to enhance value cocreation orientation in service innovation?*'.

Therefore, the main objective of this research is to develop an integrated model that combines NSD and service design process model to enhance value cocreation in service innovation. The specific objectives are to explicitly incorporate value cocreation orientation in the service innovation process through service design; develop a model that integrates the nonlinear structure of service design with the stage-based dynamics of NSD; and evaluate the proposed model. To develop the model, we conducted literature reviews, focus groups, and brainstorming sessions. The model was evaluated through application in three case studies and ten expert interviews. As the proposed model aims to result in a service with an enhanced potential for value cocreation by potentializing the integration of both service provider and customer resources, the evaluation criteria were: (i) in-depth understanding of customer resources idiosyncrasy, (ii) alignment of the service prerequisites proposition and selection with the customer resources idiosyncrasy, and (iii) integrated model efficiency. Based on this evaluation, considerations on the proposed model were made, and suggestions for improvements were also provided.

Contributions. This paper contributes to the discussion on how to implement the value cocreation perspective in the service innovation process, more specifically, how this can occur through the integration of service design with NSD, an ongoing topic in the service literature (Huarng et al. 2018; Patrício et al. 2018). Some studies have initiated such discussion, but there is still room for further advancements. Yu (2018) compared service design with NSD, concluding that the fundamental difference between them is that the former is orientated towards value cocreation and SDL while the later considers service as value-laden marketing and follows the Goods-Dominant Logic (GDL). Yu and Sangiorgi (2018), through extensive research on the topic (see, Yu (2016, 2017, 2018)), conducted 10 case studies in service design and demonstrated how service design practices can integrate with NSD for value cocreation-oriented service innovation, while also presenting an initial proposition of an integrated NSD and service design model. However, a comprehensive and operational model integrating service design and NSD to facilitate managerial decision-making is yet to be developed. In this regard, we advance previous literature by proposing an integrated model that operationalizes service design cycle of stages to sequentially develop each service prerequisite, reducing process complexity and fuzziness.

This paper is organized as follows. In Section "Theoretical background", we discuss the concept of value cocreation orientation in service innovation and its relation to the service design and NSD processes. In Section "Methodological procedures", we describe the methodological steps of the systematic literature review and focus groups that underpinned the proposed integrated model, as well as how it was evaluated through case studies and expert interviews. Section "Results" presents the first version of the integrated model, and the results obtained from its evaluation. Section "Discussion" discusses the results and presents an enhanced version of the model. Finally, in section 6, we present the conclusion, highlighting the theoretical and managerial implications, and suggestions for future research.

Theoretical background

Value cocreation orientation in service innovation. SDL provides a distinct definition for the term 'service' in contrast to the traditional definition originating from the service management community. SDL posits that service is the application of competences through intentional actions during the interaction between service providers and customers with the purpose of benefiting both parties (Vargo and Lusch 2004; Vargo and Lusch 2008). This benefit, referred to as 'value' by this theory, is influenced by social and contextual factors (Huarng et al. 2018). Therefore, value is not intrinsic to products or services but a result from the interaction between service providers and customers (Vargo and Lusch 2016). Consequently, value is always cocreated through a process of resource integration during service execution, where both the customer and the service provider combine assets, knowledge, and skills (Grönroos 2008; Lusch and Nambisan 2015).

To offer service with resource integration potential, value cocreation perspective should guide the service innovation process, influencing decisions at all stages (Lusch and Nambisan 2015; Huarng et al. 2018). Orienting service innovation towards value cocreation means making efforts to ensure that the innovation process results in a service where the resources of both the service provider and the customer have the potential to be integrated, consequently enabling value cocreation (Yu and Sangiorgi 2018). A service innovation process oriented towards value cocreation improves alignment with customers, strengthens relationships, and increases competitiveness (Kim et al. 2019; Gegužytė and Bagdonienė 2021; Yousaf et al. 2022).

The positive impacts of value cocreation oriented service innovation in practical cases have been widely recognized in the literature (Gustafsson et al. 2012). Brilliane et al. (2021) concluded that value cocreation in service innovation in tourism increased customer satisfaction. Islam et al. (2015) observed that, in academic libraries, this approach aligned services with users' needs and strengthened loyalty. Lin (2022) highlighted that, in painting creation enterprises, value cocreation was crucial for innovation, resulting in greater customer satisfaction and loyalty. Gegužytė and Bagdonienė (2021) identified that this orientation improved the understanding of customer needs and the quality of engineering services.

To orient the service innovation toward value cocreation, the company has to embrace a customer-centric approach by understanding customer needs deeply, involving them actively in innovation process, and regularly testing services with them (Wetter-Edman et al. 2014; Holmlid et al. 2017; Yu and Sangiorgi 2018). Using SDL and the concept of value cocreation as an analytical lens, these actions have the following meaning. The deep understanding of customer idiosyncrasies involves a detailed analysis and understanding of customer resources. Active customer involvement in the innovation process aims for the collaborative development of service provider resources to maximize resource integration. Finally, testing the service with the customer is intended to verify effective resource integration

and make adjustments if necessary (Yu and Sangiorgi 2018). As an example, we can cite the project by the British government that culminated in the development of the Gov.uk platform (i.e., the vehicle for value cocreation) to facilitate access to public services. The *Government Digital Service* conducted interviews and ethnographic analyses to understand citizens' needs and resources' idiosyncrasies. Subsequently, they performed codesign sessions with public employees, design experts, and citizens to develop solutions (i.e., service provider resources). Finally, they developed and tested low and high-fidelity prototypes with citizens, culminating in the Gov.uk platform.

Literature has presented a significant progress in the last years about this topic. Several studies (e.g., Ordanini and Parasuraman (2011), Lusch and Nambisan (2015), Huarng et al. (2018)) contributed to understanding the SDL/value cocreation orientation in service innovation. Gustafsson et al. (1999) in a study predating the term value cocreation, examined how an airline company developed and redesigned services based on customer behavior during flights, emphasizing the importance of deeply understanding customer idiosyncrasies to develop services that meet their needs. Lindhult et al. (2018) explored how SDL impacts value creation in service innovation, especially in product-centric firms, identifying four value logics resulting from the service innovation process: product-based, service-based, virtual-based, and systemic-based. Skålén and Gummerus (2023) proposed a framework that conceptualizes service innovation as the creation of value cocreation practices. Korper et al. (2022) explored the importance of the 'meaning' in service innovation process, contending that 'meaning', driven by previous interactions, influences the resources interpretation by the customer and, consequently, the resource integration/value cocreation.

Despite the conceptual progress regarding the relation between value cocreation and service innovation, theoretical gaps remain to be explored. One of these gaps pertains to identifying service innovation approaches that most effectively foster value cocreation orientation (Gustafsson et al. 2020; Kurtmollaiev and Pedersen 2022). Although service design has presented practices in line with this perspective (see subsection "Service design: a value cocreation perspective in a non-linear and undefined scopeprocess"), there remains a gap in comprehending how each service design practice operationalizes value cocreation (Yu and Sangiorgi, 2018). This lack of understanding can be attributed to the scarcity of empirical studies that apply service design in practical contexts and analyze the results in light of the value cocreation perspective, resulting in a more theoretical than practical knowledge base (Vaz and Venkatesh 2022).

Service design: a value cocreation perspective in a non-linear and undefined scope process

Service design and its relation to SDL/value cocreation. Service design is a design thinking-based multidisciplinary approach for service innovation, developed by the design community, which presents the way designers develop services (Joly et al. 2019; Gustafsson et al. 2020). Based on human-centered design, participatory design, and agile approach, service design seeks to provide a useful, usable, and desirable service from the user's point of view; and to provide an effective service from the company's point of view (Stickdorn and Schneider 2011; Pearce et al. 2022).

The fundamental difference of service design when compared to other service innovation approaches is its efforts to develop a service that meets the customer's needs (Stickdorn and Schneider 2011). To this end, service design recognizes the importance of the deeply understanding of customers' idiosyncrasies before developing service elements (Polaine et al. 2013). Service design aims to achieve the alignment of all service elements with the customer's characteristics to ensure the satisfaction of their needs during interactions and service execution (Yu and Sangiorgi 2018). Because of this behavior, service design has a greater adoption by practitioners than other service innovation approaches (e.g. NSD) (Biemans et al. 2016; Mendes et al. 2017; Yu, 2018).

Service design is recognized to be in line with the SDL theory (Wetter-Edman et al. 2014; Morelli et al. 2021). Wetter-Edman et al. (2014) were pioneers in establishing a link between service design and value cocreation, emphasizing that the result of service design is a value cocreation system. This contribution influenced a series of subsequent studies, such as those by Holmlid et al. (2017) and Yu and Sangiorgi (2018). Morelli et al. (2021) also asserted that contemporary service design approach considers service as a process of cocreating value with customers, not just delivering value to them. Using SDL as a theoretical lens, it can be stated that service design seeks to develop a value cocreation-enabled service where the service provider's resources have the potential to be integrated with the customer's resources during the service execution (Holmlid et al. 2017). From the SDL point of view, service design operationalizes its principles based on (i) human-centered design, to deeply understand the customer resources idiosyncrasy; (ii) codesign, to develop company resources aiming at their integration with customer resources during service execution; and (iii) prototyping, to test resource integration during the service execution (Wetter-Edman et al. 2014; Holmlid et al. 2017; Stickdorn et al. 2017). Therefore, all service design activities are oriented by value cocreation perspective (Yu and Sangiorgi 2018; Korper et al. (2022)).

These service design principles are operationalized in a non-linear process inherited from the agile development approach (Stickdorn et al. 2017). This approach emphasizes that a project is more likely to succeed when adopting iterative dynamic of planning-execution-testing throughout the entire development lifecycle (Sutherland and Sutherland 2014; Sassa et al. 2023). The underlying reasoning is that it enables the elimination of non-value-adding activities (typical of linear waterfall models), and achieves the prompt fulfillment of customer requirements through direct testing of preliminary solutions (Findsrud 2020). This is a recognized successful approach as it prevents the occurrence of misinterpretations regarding the actual customer demand by testing preliminary versions of the developing solution directly with them (Sandstø and Reme-Ness 2021). Overkamp and Holmlid (2017) and Overkamp (2019) emphasized the importance of putting the service into practice and testing it before implementation to verify if value cocreation will indeed occur prior to service implementation and execution.

The non-linear and undefined scope process of service design. Nonetheless, service design process faces criticism. One of the criticisms is related to the ambiguity regarding the service innovation phase in which service design process should be operationalized (Yu 2017; Foglieni 2018; Yu 2018). Although companies tend to apply it just in the fuzzy-front end of the service innovation, the processes proposed in the literature (e.g., Design Council 2007; Meroni and Sangiorgi 2011; Stickdorn and Schneider 2011) do not explicitly restrict the application to this phase (Sangiorgi 2015; Almqvist 2017; Xiao et al. 2023). Patrício et al. (2018) indicated that there has been an increase in studies on service design across various service innovation stages; however, the focus of the majority of the studies remains on the fuzzy-front end. In line with this, Antons and Breidbach (2018) emphasized the importance of extending the application of service design from the front-end to the back-end, as such an extension would significantly enhance customer experiences and engagement. Wetter-Edman et al. (2014) e Yu and Sangiorgi

(2018) indicated that service design should be considered as an approach to service innovation aiming at enabling value cocreation, rather than just the application of methods and tools, therefore potentially providing contributions to various service innovation phases. Aligned with this, Yu (2018) indicates that service design processes are more accurately described as practical and adaptable frameworks, capable of being applied at various scales and in different contexts.

A consequence of the ambiguity regarding the service innovation phase where service design process should be operationalized is the challenge in identifying the design object of this process (Yu 2017; Vink and Koskela-Huotari 2021). In other words, it is not explicit whether service design process aims to develop the 'Service Idea,' 'Service Concept,' the 'Service Delivery System' or all of them, resulting in the suboptimal development of only parts of the service (Sangiorgi 2015; Kimbell and Blomberg 2017; Lim et al. 2018). The challenge in identifying the object of service design was highlighted by Kimbell (2011), who asserted that the process's exploratory approach to address vague service issues contributes to the complexity of defining the service design object (Kimbell and Blomberg 2017). Yu (2017) noted that the primary focus of service design stages is delineating activities rather than the service element, leading to challenges in identifying the design object for each stage. Wolstenholme (2016) asserted that its object can transition from specifying attributes to encompassing the entire service innovation process, which may challenge its definition. Yu (2018) suggested that since service design can be effectively utilized across different scales and diverse contexts, the design object will be defined by the project's specific objectives. Over time, various studies have proposed different design objects for service design process, for instance, service process (Xiaoyan 2022), service maps (Sun and Park 2017), organizational culture (Junginger 2015; Kurtmollaiev et al. 2018) and value constellations/service ecosystems (Zehrer 2009; Patrício et al. 2018).

Another point of criticism concerns the non-linear and flexible behavior of service design process, inherited from the agile development approach (Foglieni and Holmlid 2017; Stickdorn et al. 2017). Although literature acknowledges that this approach effectively addresses the volatile nature of service innovation (Biemans et al. 2016; Mendes et al. 2017; Yu 2018), it also underscores some challenges in its execution. Actually, the criticisms received are the same as those previously received by the agile approach due to its non-linearity and flexibility. In agile projects, frequent customer collaboration may lead to changing requirements, potentially causing scope creep and delays, while the need for self-organizing teams and decentralized decision-making can introduce risks and reduced controllability (Suetin et al. 2016; Rasheed et al. 2021). Due to that, transitioning to agile practices demands clarifying roles, training, coordination, effective communication and collaboration (Saeeda et al. 2020; Ferreira and Nobre 2022).

As shown above, although this non-linear and flexible behavior from the agile approach has advantages, it may introduce challenges in conducting service design process. Due to that, service design process becomes complex to be executed, requiring tacit knowledge to effectively deal with potential adversities that may arise during its execution (Wolstenholme 2016; Sayar 2019). Therefore, the support of a design consultancy in the execution of service design becomes a critical factor for its success (Kirchberger and Tether, 2017). Hong and Kim (2020) highlighted the critical role of design consultancies in ensuring the success of service design by utilizing specific skills from the field to overcome barriers during the project.

Therefore, restructuring service design process could be useful in making the actions of the process explicit, bringing more control to it, and democratizing its execution (Kirchberger and Tether 2017; Patrício et al. 2018; Hofmeister et al. 2022). In line with this, Wolstenholme (2016) emphasized the importance of a well-structured, well-documented, and transparent process with clear steps to enable non-designers to also engage in service design process. Similarly, Xiaoyan (2022) highlighted the importance of a purposeful and goal-oriented service design process with a clear focus on desired outcomes and objectives, enabling non-designers to effectively execute it. Such actions can advance the principles of democratic design theory, which aims to involve non-designers in the design process by simplifying the process (For further details, see Saward (2021)). Therefore, it is necessary to create a new structure for service design process in a way that clarifies the design object that is being addressed at each stage, enhancing its value cocreation orientation and reducing its inherent tacit characteristic (Kimbell and Blomberg 2017; Kirchberger and Tether 2017).

New service development: a value-laden perspective in a linear process with specific scope

NSD and its perspective that service is value-laden. NSD is the prescriptive and traditional approach for operationalizing service innovation (Menor et al. 2002; Yu 2017). Studies on NSD (e.g., Bushman and Cooper 1980; Shostack 1984; Johnson et al. 1986) initiated the academic concern about how to operationalize service innovation, serving as foundation for many contemporary studies on the subject (Menor et al. 2002; Biemans et al. 2016). It has been studied since the beginning of the 80's mainly by scholars from the operations management and marketing fields as an extension of the new product development (NPD) models (Mendes et al. 2017; Gustafsson et al. 2020; Kurtmollaiev and Pedersen, 2022). NSD is characterized by a linear development process composed by a sequence of phases and stages to create a new service through the explicit development of the service prerequisites (i.e., 'Service Idea', 'Service Concept', 'Service Delivery System') (Edvardsson and Olsson 1996; Edvardsson 1997; Yu 2017). According to Edvardsson (1997), the quality of a NSD can be measured based on the quality of the resulting service prerequisites. In contrast to service design process, that follows the agile approach, NSD process, in general, follows the traditional and waterfall project management dynamic (Yu and Sangiorgi 2018).

Service literature (e.g., Biemans et al. 2016; Holmlid et al. 2017; Yu and Sangiorgi 2018) criticizes NSD approach because it does not properly operationalize value cocreation perspective along the process. In fact, NSD perceives service as a discrete market offering, rather than a process in which resources are integrated, and value is cocreated (Holmlid et al. 2017). Therefore, literature considered that NSD follows the GDL instead of the SDL (Molinengo et al. 2021). NSD does not assume that the customer has a decisive role in the value creation process, considering the service as a value-laden market offering. This can be illustrated by the lack of NSD stages that deeply understand customer needs and by not actively involving the customer in the process (Gottfridsson 2012). Moreover, in general, NSD does not present cyclical stages of testing and adjustments of the service to adapt it to the customer's idiosyncrasies (Yu and Sangiorgi 2018). Consequently, NSD process tends to be supplier-centric and to have an 'inside-out' perspective, developing a service that was already predefined by the company (Holmlid et al. 2017). Because of these characteristics, it is rarely adopted by practitioners (Biemans et al. 2016; Yu 2018).

The linear and specific scope process of NSD. Considering its process dynamic, NSD process presents advantages and

disadvantages. One of the main disadvantages is that the stage-based and linear nature of the process is not in line with the volatile dynamic required by the market for service innovation (Zomerdijk and Voss 2010; Yu and Sangiorgi 2018). Yu and Sangiorgi (2018) pointed out that the rigidity of NSD process does not meet the requirements of contemporary service innovation due to its product-oriented and provider-centric perspective. Kurtmollaiev and Pedersen (2022) suggested that NSD is a rigid process that involves linear phases and stages, being the lack of flexibility a main limitation to provide value cocreated services.

However, besides these disadvantages, the linear and stage-based structure of NSD, inherited from the traditional project management approach, provides advantages in terms of monitoring, control, and process predictability (Gemino et al. 2021; Agbejule and Lehtineva 2022). For Gemino et al. (2021), traditional project management and linear processes present well-defined and predictable planning practices, a clear understanding of objectives, a detailed project plan, and a focus on optimization and efficiency. According to Agbejule and Lehtineva (2022), it provides standardization in planning, scheduling, and control. Crespo-Santiago, de la Cruz Dávila-Cosme (2022) highlighted that the simplicity of waterfall models eases cost control and time management by breaking the project into manageable stages, ensuring timely completion. In line with this, Petersen et al. (2009) asserted that linear models allow stage progression, ensuring that each stage is completed before moving on to the next.

Moreover, NSD process stages explicitly cover the whole service innovation lifecycle (Droege et al. 2009; Yu and Sangiorgi 2014; Biemans et al. 2016) and have a specific scope, explicitly presenting the service prerequisite that is being developed in each stage (i.e., it is clear if each stage is developing the 'Service Idea', 'Service Concept' or 'Service Delivery System') (Edvardsson and Olsson 1996; Crevani et al. 2011; Yu 2017). In a systematic review of the NSD literature, Kitsios and Kamariotou (2020) highlighted that NSD process models proposed by researchers in recent decades encompass stages from idea generation to service launch. In a literature review paper, Yu (2017) emphasized that one of the key differences between NSD and service design processes models is that the former explicitly presents the object under development in each of its stages. Some examples of NSD processes that present these characteristics are Bushman and Cooper (1980), Scheuing and Johnson (1989), Edgett and Jones (1991), DIN (1998) and Johnson et al. (2000). Comparatively, service design does not present such completeness and does not explicitly present the service prerequisites along the process (Yu 2017; Patrício et al. 2018). Consequently, NSD is easier to understand as an organizational function than service design process and should not be neglected when proposing new models for service innovation (Yu 2017).

NSD versus service design: key characteristic comparison. In summary, a service innovation process centered on value cocreation is crucial for business success, as it increases the likelihood of integrating both company and customer resources (Lusch and Nambisan 2015; Huarng et al. 2018). Among service innovation approaches, service design is recognized for its emphasis on value cocreation, involving customers at every stage (Wetter-Edman et al. 2014; Holmlid et al. 2017; Yu and Sangiorgi 2018). Its iterative and non-linear process allows for continuous refinement and improvement, ensuring the service meets customer needs and promotes creative, user-centered service innovation (Stickdorn and Schneider 2011; Stickdorn et al. 2017). However, the non-linear nature and ambiguous service innovation scope of service design, which vary from project to project, make its management challenging. (Wolstenholme 2016; Kimbell and Blomberg 2017; Vink and Koskela-Huotari 2021). In contrast, NSD is a linear and sequential process with well-defined stages that provide predictability and control (Yu 2017; Agbejule and Lehtineva 2022). This approach facilitates clear progression through stages, aiding project management with a defined scope (Gemino et al. 2021).

From an organizational perspective, NSD appears to be more relevant for service innovation projects with a well-defined scope, prone to few changes, and with low levels of uncertainty, where the main concepts and functionalities are already established, and the project's purpose is to specify and operationally detail the service (Petersen et al. 2009; Crespo-Santiago, de la Cruz Dávila-Cosme 2022). Conversely, service design is more suitable for projects with flexible scopes and high levels of uncertainty, where the ideas, concepts, and functionalities are still being developed based on customers' specific needs (Wolstenholme 2016; Holmlid et al. 2017; Yu and Sangiorgi 2018). Given these characteristics, although service design can be applied throughout both the front-end and back-end of the service innovation process, it is often adopted in the front-end to define the service idea (Sangiorgi 2015; Almqvist 2017; Xiao et al. 2023). In contrast, NSD comprehensively covers the service innovation process, including the back-end by providing operational detailing and implementation of the service concept (Droege et al. 2009; Biemans et al. 2016).

Therefore, integrating service design with the linear characteristics and clear scope of NSD can further enhance its outcomes. Considering the strengths and weaknesses of both service design and NSD processes, studying their cross-contributions is highly relevant for leveraging the best aspects of both approaches (Patrício et al. 2018). Table 1 summarizes the characteristics of both NSD and service design approaches.

Methodological procedures

This article's method follows the procedures and steps used by other studies that also proposed and evaluated a model to solve theoretical and practical problems (e.g., Teixeira et al. 2016; Teixeira et al. 2019). To propose the NSD and service design integrated model, firstly, we performed a systematic literature review and content analysis to identify the most frequent NSD and service design process stages presented in the literature. Then, we conducted a focus group with experts and several meetings among the authors to identify the complementarities between NSD and service design that could be leveraged to enhance value cocreation orientation in service innovation and to propose the 'NSD and Service Design integrated process' model. Finally, the proposed model was evaluated by applying it to 3 cases and by discussing the results with 10 experts. These methodological stages are presented in Fig. 1.

'NSD and Service Design Integrated Process' proposition. Firstly, we conducted a systematic literature review, following the steps proposed by Denyer and Tranfield (2009), to collect NSD and service design process models proposed in both scientific and practical (grey) literature. Due to the broad base of indexed papers, we queried Scopus and Web of Science databases with the strings *("new service development" AND "process")* to retrieve NSD process models; and *("Service Design" AND "process")* for service design process models. In addition, we conducted searches in grey literature, that included relevant conferences (e.g., ServDes and Nordes) and books about the themes that were not covered by Scopus and Web of Science databases. Specifically to gather service design processes, we also explored service design consulting firms' websites, since, although this area has received wide practical attention and application, few articles aiming to propose

Table 1 NSD and Service Design characteristics.

	New service development	Service design	References
Origin	NPD	Design Process	Bushman and Cooper (1980); Shostack (1984); Johnson et al. (1986); Menor et al. (2002); Stickdorn and Schneider (2011); Biemans et al. (2016); Joly et al. (2019)
Position in service innovation theory	Traditional approach	Contemporary approach	Menor et al. (2002); Droege et al. (2009); Wetter-Edman et al. (2014); Holmlid et al. (2017); Yu and Sangiorgi (2018); Biemans et al. (2016); Mendes et al. (2017); Morelli et al. (2021)
Research community of proposition	Operations Management, Marketing and Service Operations community	Design community	Menor et al. (2002); Droege et al. (2009); Stickdorn and Schneider (2011); Biemans et al. (2016); Mendes et al. (2017); Gustafsson et al. (2020); Joly et al. (2019)
Theory	Embedded value in the marketing offering (goods-dominant logic)	Value is always cocreated (service-dominant logic)	Wetter-Edman et al. (2014); Holmlid et al. (2017); Yu and Sangiorgi (2018); Morelli et al. (2021); Molinengo et al. (2021); Korper et al. (2022)
Theoretical background	Consolidated	Not yet consolidated	Biemans et al. (2016); Mendes et al. (2017); Yu (2017) Yu (2018); Joly et al. (2019); Gustafsson et al. (2020); Kurtmollaiev and Pedersen (2022)
Practical acceptance	Rarely used	More commonly used by companies	Biemans et al. (2016); Mendes et al. (2017); Yu (2018); Stickdorn et al. (2017); Patrício et al. (2018)
Project Management Approach	Traditional Approach	Agile Approach	Stickdorn and Schneider (2011); Crevani et al. (2011); Suetin et al. (2016); Yu and Sangiorgi (2018); Rasheed et al. (2021); Gemino et al. (2021); Agbejule and Lehtineva (2022)
Process dynamic	Linear and sequential process	Iterative and non-linear process	Stickdorn and Schneider (2011); Crevani et al. (2011); Suetin et al. (2016); Rasheed et al. (2021); Gemino et al. (2021); Agbejule and Lehtineva (2022)
Area focus	Focused on phases and stages	Focused on way of thinking or mindsets	Biemans et al. (2016); Yu (2017) Yu (2018); Yu and Sangiorgi (2018); Kurtmollaiev and Pedersen (2022)
Development process scope	Tends to be used in the back-end, but not it is restricted to this phase	Tends to be used in fuzzy front-end, but it is not restricted to this phase	Droege et al. (2009); Clatworthy (2012); Wolstenholme (2016); Biemans et al. (2016); Yu (2017); Yu (2018); Antons and Breidbach (2018)
Characteristics of the development process stages	Focused on the development of the service prerequisites	Focused on the activities performed	Edvardsson and Olsson (1996); Edvardsson (1997); Yu (2017); Mendes et al. (2017); Kimbell and Blomberg (2017)

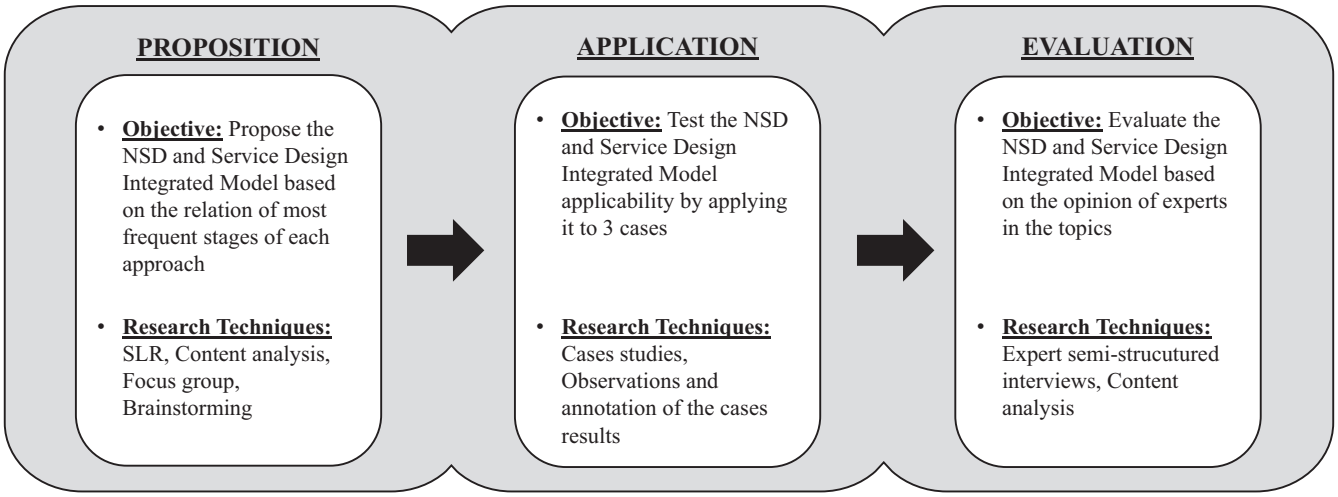

Fig. 1 Methodological procedure.

processes have been published in journals and conferences (Yu 2018; Luojus and Tossavainen 2019; Yoo et al. 2019). In areas with limited scientific publications, understanding phenomena directly in companies can be crucial (Nordin and Ravald, 2016; Schumacher, 2018) and this is especially relevant in the field of service design process models, where empirical knowledge has not been properly absorbed by scientific publications (Sangiorgi 2015).

Finally, we also followed a backwards snowballing technique to include papers that were cited in the references of the reviewed

papers (Jalali and Wohlin 2012). From the results retrieved, we selected those that explicitly presented NSD or service design process models. To evaluate the sample data, we used the 'Preferred Reporting Items for Systematic review and Meta-analysis' (PRISMA), as proposed by Moher et al. (2015). The final sample comprehends 46 NSD processes and 21 service design processes (see Supplementary Table S1 and Supplementary Table S2 online). The number of processes found is notably higher than other review papers (e.g., Johnson et al. 2000; Kitsios and Kamariotou 2020). NSD and service design process references and the stages retrieved on the systematic review can be found in the reference list.

Secondly, to identify the most incident stages of NSD and service design, we performed a content analysis adapting the stages proposed by Bardin (1977) and Elo and Kyngäs (2008). In a preliminary analysis, we confirmed that the processes retrieved are in line with the theoretical background, showing that the stages of NSD process explicitly present the service prerequisites in each stage (i.e., 'Service Idea', 'Service Concept' and 'Service Delivery System'), whereas the stages of service design process focus on the activities performed, so that it does not explicitly present the service prerequisite that is being addressed. Also, as presented in the theoretical background section, NSD models exhibit prescriptive characteristics, as they provide a clear and detailed sequence of steps for its execution, aiming at a specific outcome (Happe et al. 2009; den Hertog et al. 2010). In contrast, service design models have explanatory characteristics, demonstrating how the design practice can contribute to service innovation (Shmueli, 2010; Chen and Chen 2023). In other words, NSD outlines the '*what*' and service design the '*how*' of service innovation. It is important to emphasize that such characteristics are an initial evidence of complementarity between NSD and service design. Then, we inductively performed the coding process, so that the codes related to the theme at hand naturally emerged as the analysis progressed. We used the service prerequisites addressed in each stage of NSD process and the activities performed during each stage of service design process as the codes (see the first column of the Supplementary Table S1 and Supplementary Table S2 online).

Furthermore, we identified the NSD and service design stages that repeated throughout the sets of processes and merged them based on the prerequisites' similarity (for NSD process) or based on the activities performed (for service design process). Finally, to facilitate the relationship among stages, we created two process archetypes, one for NSD and another for service design, composed of the most incident stages along the retrieved process models (see Fig. 2). An archetype represents the essential characteristics shared by many service innovation process models, serving as a generic model for understanding this process (Helkkula et al. 2018). Archetype-based research is proved to be highly valuable in understanding the characteristics and patterns of service innovation, being employed in various other service innovation papers (e.g., Leminem et al. 2017; Helkkula et al. 2018; Frey et al. 2019; Jovanovic et al. 2022; Megaro et al. 2023). It is important to emphasize that the NSD and service design archetypes presented in this paper do not aim to mimic the most popular models of NSD (e.g., Cowell 1988; Scheuing and Johnson 1989; Ramaswamy 1996; Bitran and Pedrosa 1998) and service design (e.g., Design Council 2007; Meroni and Sangiorgi 2011; Stickdorn and Schneider 2011), but rather to represent the models already published in the literature thus far. The archetypes presented in Fig. 2 clarify the characteristics highlighted in the theoretical background section. NSD follows a linear dynamic, while service design adopts a cyclical dynamic, evidencing the prescriptive nature of NSD and the explanatory nature of service design. This further highlights the complementarity of both approaches.

Finally, we merged both model archetypes' stages to develop the integrated process to enhance the value cocreation orientation, considering the complementarities between NSD and service design process. To that end, we conducted an exploratory focus group with experts on service innovation, NSD, and service design (3 Ph.D. students and 4 scholars) during an open session of a service management conference. During the focus group, both the NSD and service design archetypes were presented to the participants, and they were inquired regarding their perceptions on how the complementarities between them could be related and integrated to enhance value cocreation orientation. Then, the authors analyzed the data gathered on the focus group through brainstorming sessions among authors. During the brainstorming sessions, we compiled the data in a relationship matrix where the NSD archetype's stages were displayed in the matrix's lines and the service design archetype's stages were displayed in the columns, following the stages of Zhu et al. (2007).

We aimed to understand how the activities performed in each service design stage potentially contributed to developing each service prerequisites from each NSD stage, to leverage these complementarities for an integrated process with an enhanced value cocreation. We performed three meetings to analyze the results. Only the 'strong' and 'moderate' relations between NSD and service design stages were considered to develop the proposed process model. During these meetings, three preliminary models were constructed. After evaluating these model proposals, a fourth model was developed, incorporating the best features from the other three. This final model is the one utilized in this study as the 'NSD and Service Design Integrated Process' model. The criterion for model selection was customer-centric focus and, consequently, value cocreation orientation.

'NSD and Service Design Integrated Process' evaluation. Finally, in the third stage, the proposed integrated process was evaluated based on the criteria: (i) in-depth understanding of customer resources idiosyncrasy, (ii) alignment of the service prerequisites proposition and selection with the customer resources idiosyncrasy, and (iii) integrated model efficiency. To that end, firstly, we applied the proposed integrated process model in 3 case studies to test its applicability and the value cocreation orientation enhancement. These case studies were of projects aiming to develop innovative services, namely: a service to facilitate students' transportation to their campus, a service to decrease college students' dropout rates, and a service to increase the number of trips taken by customers of a tourism agency. Each case was executed by a dedicated team of consultants under the researchers' supervision. Initially, consultants and researchers developed plans, specifying the service design methods for each phase. During project execution, workshops were conducted to apply these methods, while researchers observed to gather insights. Data collection included unstructured field notes, meeting recordings, and analysis of the service innovation reports. Details about the specific contexts of each case are presented in Table 2.

These cases were selected based on several criteria to ensure a comprehensive and relevant evaluation of the proposed model: availability for data collection, theme relevance, diversity of contexts and potential for innovation. Availability was important because research needed to have longitudinal access to the case to follow the model's application, whereas theme relevance was determined based on how important and impactful the demand was for society and the economy as a whole. Transportation, education, and tourism are three major themes in service economy and vary in complexity, target audience and revenue. We achieved diversity of contexts by applying the model in

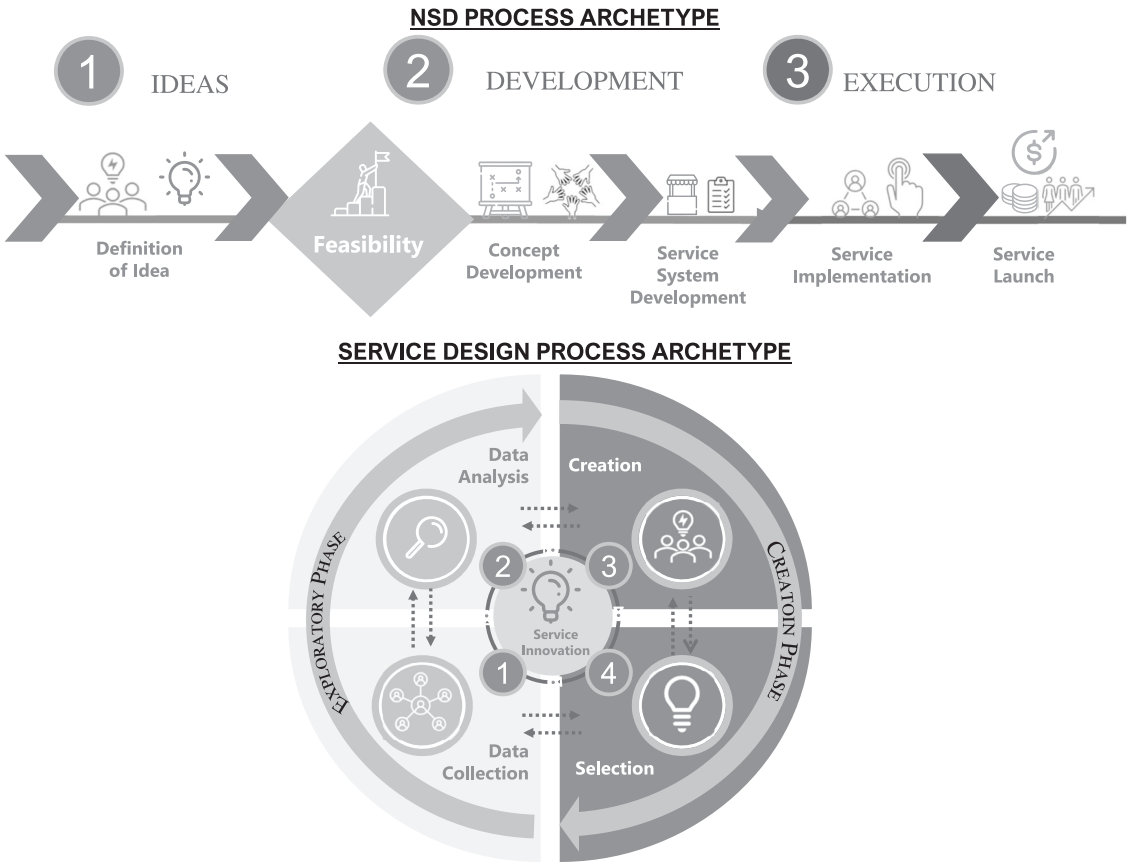

Fig. 2 NSD and service design process model archetypes.

different service sectors, which was important to provide evidence of the potential generalization of the results. Finally, we prioritized projects with high potential for innovation to highlight the model's capability in fostering novel solutions or significantly improving existing services. The student transportation sector is advancing in accessibility and sustainability, the education sector is adopting innovative strategies to reduce dropout rates, and the tourism industry is increasing personalized customer experiences and sustainable practices.

As a final stage, we performed interviews with 10 experts in the NSD and service design topics to evaluate the value cocreation orientation enhancement of the proposed model (as presented in Table 3). During this stage, we presented the 'NSD and Service Design Integrated Process' model and the results of the case studies. The questions aimed to evaluate the model in the aforementioned criteria, asking for a comparative analysis among the proposed integrated process and NSD and service design original processes. The interviews lasted between 60 and 150 min. The scholars interviewed are from the top Brazilian universities and have long-time experience on either NSD or service design. As for the consultants, they work for the top 3 design agencies in Brazil. The interviewees came from different backgrounds, ranging from design, industrial engineering, knowledge management sociology, and business administration, and all of them hold MSc or PhD degrees in their respective fields.

We analyzed the qualitative data collected in the interviews following the content analysis technique proposed by Bardin (1977) and Elo and Kyngäs (2008). We read and scrutinized the answers by examining the similar aspects presented in them. Then, we coded the experts' answers based on the aforementioned evaluation criteria to analyze how the integrated process performed. So, we employed deductive coding, where the evaluation criteria were used as pre-defined codes to text excerpts. Finally, we analyzed and discussed the results; and we proposed some improvements to the proposed model based on the experts' evaluation.

Validity and reliability. As addressed in the previous sections, multiple steps were conducted to ensure *validity* and *reliability* throughout the study. We addressed *validity* through several means. Firstly, to develop the final model, we reviewed 67 models previously published in specialized literature, namely 46 NSD and 21 service design models to identify the most frequent process stages of each approach. This ensured that the major contributions in both academic and grey literature were considered, since previous literature review studies about the topics retrieved a shorter number of processes (e.g., Johnson et al. 2000; Kitsios and Kamariotou 2020). Secondly, the integrated NSD and service design process was developed with practitioners and academic experts from the related topics by conducting focus group. Subsequently, we tested the applicability of the proposed model in 3 case studies in different contexts, providing evidence for its potential generalization. Afterwards, an additional group of professionals and academic experts in NSD and service design evaluated the model and its application outcomes through interviews, focusing on its efficacy and efficiency without restricting their conclusions to specific service contexts, thereby aiming to generalize the results. Finally, the analysis of data collected from both scholars and practitioners offered insights and adjustments to refine the proposed model.

Finally, for *reliability*, we conducted a systematic literature review (Denyer and Tranfield 2009), followed by a snowballing technique (Jalali and Wohlin 2012), to retrieve NSD and service design process models. We also used a structured well-defined

Table 2 Cases description.

Case	Guiding question	Target Audience	Sector	Demand origin	Application period	Research techniques
Case 1	*How to facilitate college students' transportation to their campus?*	College students	Transportation	University wanted to improve and facilitate students' transportation from their houses or dorms to campus in a safe and optimized manner.	From September 2021 to February 2022	Brainstorm meetings, interviews, observation, desk research, field notes
Case 2	*How to decrease college student's dropout rate?*	College students	Education	College dropout is a major problem and the monetary and societal costs associated with it are very high. The demand aimed to understand what leads to student dropout and develop a novel service to try and reduce dropout rates	From October 2021 to April 2022	Brainstorm meetings, interviews, observation, desk research, field notes
Case 3	*How to increase the number of travels customers make yearly?*	Customers of a tourism agency	Tourism	Tourism is a big part of the economy. The demand for this service was to increase the number of trips customers make to help a tourism agency grow	From January 2022 to May 2022	Brainstorm meetings, interviews, observation, field notes

coding technique to analyze the content of each model, following Bardin (1977) and Elo and Kyngäs (2008). This avoided possible biases, especially while analyzing service design models from consulting firms, as the codes ensured an equivalent analysis of NSD processes and service design processes due to the standardization of the analysis method. To integrate both models, the focus group was performed using a pre-defined script created by the authors. Besides that, all the data gathered during the focus group were discussed and compiled in a relationship matrix between NSD and service design process stages, based on Zhu et al. (2007). To evaluate the proposed integrated model, we applied it in 3 cases with different characteristics and we performed interviews with 10 experts using the same group of questions, based on predefined model evaluation criteria, along with the interviews to avoid bias. Lastly, the interviews were also analyzed using the content analysis proposed by Bardin (1977) and Elo and Kyngäs (2008).

Results

'NSD and Service Design Integrated Process' proposition. Before relating the NSD and service design stages and obtaining the integrated model, it is important to highlight the particularities of each process approach, as this will impact the role of each stage in the integrated model. On the one hand, service design has broad and unstructured user demands as a starting point under which several customer studies are conducted in the 'Data Collection' and 'Data Analysis' stages to transform user data into user insights. Afterwards, solutions are created, through creativity and codesign, in the 'Creation' stage; and the best solution is selected through prototype testing in the 'Selection' stage. On the other hand, NSD process has the company's strategic planning as input, being focused on detailing and implementing the 'Service Idea' already defined by the strategy.

As can be seen in the Fig. 2, although service design is more commonly used in the front-office of innovation, it is primarily a way of thinking and working that can be applied at various scales and phases of the service innovation process. Then, the design object may change based on the project's specific objective. When the objective is the development of the entire service, service design generally develops the 'Service Idea', 'Service Concept', and 'Service Delivery System' in a mixed way. Moreover, although the 'Implementation' stage is presented in several service design processes, its execution is not further specified in literature.

Considering these characteristics, in the focus group and brainstorming sessions, relations among the NSD and service design stages were based on the potential contribution of each service design process activity to the development of each NSD process service prerequisites. In this way, we aimed to understand which service prerequisites could have their development oriented towards the value cocreation through service design. Moreover, we filled a relationship matrix with the intensity level of these contributions[1] (Fig. 3). Only the contributions assessed as 'strong' and 'moderate' were used to the proposed 'NSD and Service Design Integrated Process'.

The reasoning for the stages relation is presented as follows[2]. We concluded that the three service prerequisites (i.e., 'Service Idea', 'Service Concept', and 'Service Delivery System') could be developed with value cocreation orientation by applying service design cycle of stages (*Data Collection*, *Data Analysis*, *Creation* and *Selection*) to develop each of them.

Furthermore, we defined the relations among the service design cycle of stages with the **Definition of Idea** as 'strong', because service design is more commonly applied to develop the 'Service Idea', then its cycle of stages can be applied without modifications from its original execution. On the other hand, we attribute the

Table 3 Description of the experts that evaluated the integrated model.

Expert	Area of expertise	Professional focus	Academic background	Years of experience
Expert A	Service Design	Scholar and Service Design Consultant	MSc in Design	13 years
Expert B	Service Design	Scholar	PhD in Design	15 years
Expert C	Service Design	Scholar and Service Design Consultant	MSc in Design	7 years
Expert D	NSD	Scholar	PhD in Industrial Engineering	14 years
Expert E	Service Design	Scholar	PhD in Design	14 years
Expert F	NSD	Scholar	PhD in Industrial Engineering	16 years
Expert G	NSD	Scholar	PhD in Sociology	23 years
Expert H	NSD	Scholar	PhD Business Administration	13 years
Expert I	Service Design	Scholar and Service Innovation Consultant	PhD in Engineering and Knowledge Management	12 years
Expert J	Service Design	Scholar	PhD in Industrial Engineering	21 years

relations among the service design cycle of stages with the **Concept Development** and **Service Delivery System Development** as 'moderate', because the service design cycle of stages has potential to contribute to the definition of these prerequisites, but it is not so commonly applied in these phases. Therefore, adaptations should be made for proper execution. The reasoning is that service design is not traditionally used to develop the 'Service Concept' and 'Service Delivery System' explicitly, as these prerequisites require technical definitions and then are defined in a diffuse way in service design process execution, during the tests in prototypes to select the ideas. Finally, the focus group pointed that *Data Collection* and *Data Analysis* could also contribute to evaluate the service market performance after the **Service Launch**, but we concluded that it is more of a Marketing activity than a service design activity. Hence, such relation was classified as 'weak'.

In sum, service design cycle of stages could be applied along the service innovation process to define and specify each of the service prerequisites. Figure 4 presents the integrated model proposed. The model highlights how service design cycle of stages can sequentially develop each NSD explicit service prerequisites. The aim of the integrated model is to apply service design principles (e.g., human-centered design, codesign, visualizations, and prototyping) and tools (e.g., contextual interviews, ethnography, customer journey map, and role playing) to develop each of the service prerequisites in order to result in a service with potential for value cocreation. Therefore, in each phase of the process, the object of the service design cycle of stages is a different service prerequisite: in the first phase, the object is the 'Service Idea'; in the second phase, it is the 'Service Concept'; and, in the third phase, it is the 'Service Delivery System'.

Moreover, each service prerequisite defined in the previous phase is the input to the next phase and so on. The reasoning is that each service prerequisite is defined by the value cocreation lens based on a (i) human-centered design tools in the *Data Collection* and *Data Analysis* stages to deeply understand the customer demand and resources that inform the service prerequisite development; (ii) codesign and creativity tools in the *Creation* stage to propose several service prerequisite alternatives with some potential for value cocreation; and (iii) prototyping tools in the *Selection* stage to select (among them) the service prerequisite alternative with best potential for value cocreation. For example, in the **Definition of Idea**, the output is the 'Service Idea' that best suits the customer's basic needs; in the **Concept Development**, the output is 'Service Concept' configuration that best suits to the 'Service Idea' previously defined; and in the **Service Delivery System Development**, the output is the 'Service Delivery System' elements that best suits the 'Service Concept' previously defined. In other words, as presented in subsection 3.1, NSD contributes to specify the '*what*' (i.e., service prerequisites) while service design contributes to specify the '*how*' (i.e., activities) in the integrated process[3]. In this sense, service design is being applied sequentially way along the service development lifecycle, orienting the development of each service prerequisite by value cocreation perspective. In the Table 4, we present a description of each integrated process stage.

Proposed model application. The NSD and Service Design integrated model was applied to 3 cases to test the value cocreation orientation enhancement. As the **Service Implementation** and **Service Launch** phases were not in the scope of the case projects, we applied the proposed model up to the **Service Delivery System Development** phase. In each case, the application was carried out by a team of consultants and supervised by the researchers. In cases 1 and 2, the client company was a university. In case 3, the client was a travel agency. During the applications, researchers took field notes. Later, the researchers presented these field notes to specialists so that they could evaluate and propose improvements to the integrated process (see subsection 4.3). In Table 5, we present an overview description of each case. The results produced by each case are presented in Supplementary Fig. S3 online.

In general, the project teams of the 3 cases evaluated the application of the Integrated Process as positive. The application team pointed out that the proposed process had a less tacit characteristic than the original service design process as it makes the design object of each stage clearer. Considering the model evaluation criterion (i) in-depth understanding of customer resources idiosyncrasy, the application team pointed out that the process dynamics allowed for a deeper understanding of the customer needs, as several points of contact were made with the customer throughout the process. The *Data Collection* and *Data Analysis* stages, which focus on studying customer demands, occurred throughout **Definition of Idea, Concept Development** and **Service Delivery System Development** phases. Several tools were iteratively used in these stages to achieve the in-depth understanding of customer resources, such as: interviews, desk research, qualitative/quantitative questionnaires, and so on.

To make sure we understood customer resource idiosyncrasies, for each phase, we performed role play sections where the consultants impersonated the potential customers. Furthermore, since there was a different service prerequisite as the focus in each phase, the *Data Collection* tools could be customized for the characteristics of each prerequisite (e.g., the interview questions of the 3 cases were customized for each service prerequisite characteristics under development). The progressive study of customer needs throughout the phases resulted in an enhanced comprehension of customer resource idiosyncrasies. In essence, as the consultants progressed through the process phases, they gained a deeper understanding of customer needs, generating a snowball effect. This emphasized how the linear and sequential approach from NSD and the cyclical approach from service

◉: Strong contribution
○: Moderate contribution
Δ: Weak contribution

Service Design Archetype				NSD Archetype: Stage 1 Definition of Idea — *Stage Output: Generation of ideas and best idea selected*	Stage 2 Feasibility — *Stage Output: Response about the feasibility and whether the project must be continued*	Stage 3 Concept development — *Stage Output: Service concept defined*	Stage 4 Service delivery system development — *Stage Output: Service delivery system defined*	Stage 5 Service implementation — *Stage Output: Service implemented*	Stage 6 Service launch — *Stage Output: Service launched*
	Stage 1	**Data collection**	*Stage Activity Performed: Collecting users and stakeholders' data*	◉		○	○		Δ
	Stage 2	**Data analysis**	*Stage Activity Performed: Analyzing data collected in the previous stage*	◉		○	○		Δ
	Stage 3	**Creation**	*Stage Activity Performed: Generating solutions oriented to the needs of users and stakeholders*	◉		○	○		
	Stage 4	**Selection**	*Stage Activity Performed: Selecting the solution that best meets the needs of users and stakeholders*	◉		○	○		

Fig. 3 Relationship matrix of the Service Design archetype activities and the expected output from the NSD archetype.

design complemented each other, leveraging the understanding of customer demands, which is essential for the development of a service enabled for value cocreation.

Considering the model evaluation criterion (ii) alignment of the service prerequisites proposition and selection with the customer resources idiosyncrasy, the application team provided positive feedback for the *Creation* and *Selection* stages. These stages presented a hybrid characteristic of creativity with technical analysis, especially in the **Concept Development** and **Service Delivery System Development** phases. This allowed the application team to obtain 'out of the box' service execution elements. To achieve the alignment of the service prerequisites proposition and selection with the customer resources idiosyncrasy we used several tools, such as: creativity brainstorming sessions, morphological matrix, pugh matrix, among others. We evaluated the developed 'Service Ideas', 'Service Concepts' and 'Service Delivery System' elements in a role play sections again due to the difficulty of accessing a significant number of customers to test. The progressive and interdependent definition of 'Service Ideas,' 'Service Concepts,' and 'Service Delivery System' elements resulted in service prerequisites aligned with each other and tailored to customer idiosyncrasies. Again, a snowball effect was observed, as each service prerequisite was defined based on the preceding one. This dynamic enhanced the alignment of the defined service prerequisites with the customer idiosyncrasies. It also emphasized how the linear and sequential

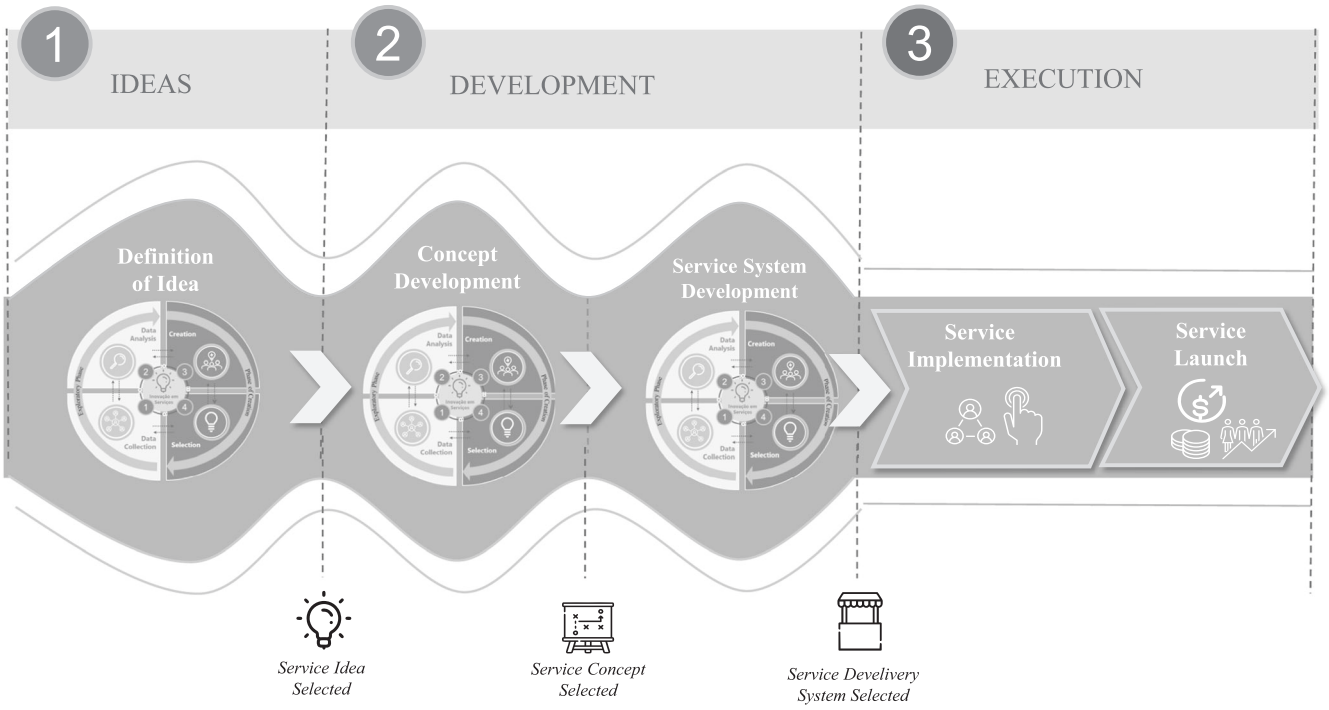

Fig. 4 'NSD and Service Design Integrated Process' model.

Table 4 'NSD and Service Design Integrated Process' Model stages description.

Phase	Stage	Description
Definition of Idea	Data Collection	Gather data about the needs and idiosyncrasies of the company's target customer. *P.S.: In general, this step starts with a problem question to be solved.*
	Data Analysis	Analyze the previously gathered data to identify insights about the customers. *P.s.: This is the stage to deepen the knowledge of the initial problem of the project.*
	Creation	Propose several service ideas to solve the problem, aligned to the target audience's needs and idiosyncrasies.
	Selection	Choose the service idea that best meets the customers' needs and that is best suited to their idiosyncrasies.
Concept Development	Data Collection	Gather data from the customer target audience to understand demands strictly about the previously defined service idea.
	Data Analysis	Analyze the gathered data to identify customers insights about the configuration of the previously defined service idea.
	Creation	Create alternatives configuration for the previously defined service idea, aligned to the previously identified demands.
	Selection	Choose the service configuration that best meets the customers' needs and is best suited to their idiosyncrasies. *P.S.: The service configuration chosen is the Service Concept.*
Solution Delivery System Development	Data Collection	Gather data from the customer target audience to understand demands strictly about the previously defined service concept. *P.S.: In this moment, the main focus is the service usability.*
	Data Analysis	Analyze the data collected to identify customers insights about the service delivery system configuration that will execute the previously defined service concept.
	Creation	Create alternative configurations for the service delivery system elements *P.s: In general, the service delivery elements are 'human resources', 'material resources' and 'facilities'.*
	Selection	Choose the service delivery system elements configuration that best meets the customers' needs and is best suited to their idiosyncrasies.
Service Implementation		Make acquisitions and hirings to the service delivery system in order to allow its execution.
Service Launch		Launch the service to the market and collect customer perceptions.

approach from NSD and the cyclical approach from service design synergistically complemented each other, enhancing the value cocreation orientation in service innovation.

Despite the positive points presented above, the case applications provided insights into the decline in efficiency in the final phases of the proposed model, impacting criterion (iii) integrated model efficiency. It was observed that as the process advanced, it became increasingly difficult to collect new relevant data in the *Data Collection* stages. This characteristic was observed in the **Concept Development** and, mainly, in the **Service Delivery System Development** phases, where many repetitive data appeared in the interviews. Consequently, it was difficult to obtain new relevant insights in the *Data Analysis* stage of these phases. As shown in Table 5, in the 3 cases, it was not possible to further refine the persona in the *Data Analysis* stage of the **Service Delivery System Development** phase. Another issue

Table 5 Case application description.

		CASE 1: 'HOW TO FACILITATE COLLEGE STUDENTS' TRANSPORTATION TO THEIR CAMPUS?'	CASE 2: 'HOW TO DECREASE COLLEGE STUDENT'S DROPOUT RATE?'	CASE 3: 'HOW TO INCREASE THE NUMBER OF TRAVELS CUSTOMERS MAKE YEARLY?'
PHASE 1: Definition of Idea	*Data Collection*	Interviews with university students about transport difficulties to their campus.	Desk research on the dropout rate of Brazilian colleges and interviews with university students to collect data about their dropping out reasons.	Interviews with the target audience, asking: '*What makes the customer want to travel?*' and '*What makes the customer NOT want to travel?*'
	Data Analysis	Data organization by similarity to identify insights, which supported the university student persona creation.	Quantitative data and qualitative data organization by similarity to identify insights. Persona creation of a university student that dropped out of a course.	Data organization by similarity to identify insights. The application team concluded that the company has two target audiences (young and old people). Then, two Personas were created, one for each audience.
	Creation	Desk research on existing college transport services, which inspired a brainstorming for service ideas. The ideas raised were drafted to facilitate the communication and to stimulate creativity.	Brainstorming to raise service ideas. The ideas raised were drafted to facilitate the communication and to stimulate creativity.	Brainstorming to raise service ideas. The ideas raised were drafted to facilitate the communication and to stimulate creativity.
	Selection	Ideas evaluation based on 'Desirability', 'Technical Viability', and 'Financial Viability' criteria. The team chose the service idea **'App that arranges rides among students'**.	Ideas evaluation based on 'Desirability', 'Technical Viability', and 'Financial Viability' criteria. The team chose the service idea **'Workshops aimed at professional experience'**.	Ideas evaluation based on: 'Desirability', 'Technical Viability', 'Financial Viability', and 'Market Potential'. The project team selected the service idea **'Travel to a surprise destination**'.
PHASE 2: Concept Development	*Data Collection*	Interviews with university students to identify their specific demands about the app.	Interviews with university students and professors to identify their specific demands for the workshops.	Interviews with people representing both personas to identify their specific demands about the '**Travel...**'.
	Data Analysis	Data organization by similarity to identify insights, which supported the university student persona refinement.	Data organization by similarity to identify insights. Based on this, the persona was changed from a university student to a high school student.	Data organization by similarity to identify insights about both target audiences. Based on this, both personas were refined.
	Creation	Brainstorming and morphological matrix to create alternative concept configurations for the app.	Brainstorming and morphological matrix to create alternative concept configurations for the workshops.	Brainstorming and morphological matrix to create alternative concept configurations for the '**Travel...**'.
	Selection	App concepts' evaluation based on same criteria from the previous phase. The Project team drafted the service concept chosen.	Workshop concepts evaluation based on same criteria from the previous phase.	'**Travel...**' concepts evaluation based on same criteria from the previous phase. *Ps.: Discussion among project team complemented the selected concept configuration.*

Table 5 (continued)

		CASE 1: 'HOW TO FACILITATE COLLEGE STUDENTS' TRANSPORTATION TO THEIR CAMPUS?'	CASE 2: 'HOW TO DECREASE COLLEGE STUDENT'S DROPOUT RATE?'	CASE 3: 'HOW TO INCREASE THE NUMBER OF TRAVELS CUSTOMERS MAKE YEARLY?'
PHASE 3: Service System Development	*Data Collection*	Interviews with university students to collect usability demands for the selected concept of the app.	Interviews with high school students to collect what they want to experience in the workshops selected concept.	Interviews to understand critical factors during '**Travel**...' concept experience.
	Data Analysis	Data organization by similarity to identify insights. *Ps.: due to few insights obtained, the persona did not change.*	Data organization based on similarity to identify insights. *Ps.: due to few insights obtained, the persona did not change.*	Data organization based on similarity to identify insights. *Ps.: due to few insights obtained, the persona did not change.*
	Creation	Morphological matrix to create alternatives elements of the service delivery system.	*'Creation'* and *'Selection'* were simultaneously accomplished. The team used a Morphological matrix to create alternatives for the human resources and then evaluated regarding the same criteria from the previous phases. *Ps.: The other system elements were defined by the teams without applying these criteria.*	Morphological matrix to create service delivery system's elements alternatives.
	Selection	Service delivery system alternatives evaluation using the same criteria as in the previous phases.		Service delivery system alternatives evaluation using the same criteria as in the previous phases.

observed is that, during the **Concept Development** phase, 'Service Delivery System' elements were involuntarily identified, although they should only be identified in the next stage (i.e., **Service Delivery System Development** phase). This may point out that, although the proposed process aims to carry out the service design cycle of stages sequentially for each service prerequisite, inherently, one service prerequisite can appear when another service prerequisite is under development. All these observations were registered in field notes and supported the proposal of a second version of the model, aimed at overcoming this decline in efficiency (see Section "Discussion").

After the applications, all field notes were gathered and served as the basis for a discussion among the researchers. By observing the cases, the complementarities between NSD and service design that enhance value cocreation orientation in service innovation became evident. On the one hand, service design contributes by presenting a customer-centric perspective in order to result in a service able for value cocreation. The various points of contact with the customers in all cases illustrate this. On the other hand, NSD provides a linear structure to the inherently non-linear service design by defining a specific design object for each phase: in the first phase, the service design stages focus on developing the 'Service Idea'; in the second phase, they focus on the 'Service Concept'; and, in the third phase, the 'Service Delivery System'.

Consequently, as the service prerequisites are interdependent, applying the service design cycle of stages to define each of them results in a snowball effect. As the 'Service Concept' is defined based on the 'Service Idea,' and the 'Service Delivery System' is defined based on the 'Service Concept,' if all these service prerequisites are developed in a customer-centric way, the resources that constitute the 'Service Delivery System' will have a greater potential for integration with customer resources. Therefore, the integration of the linearity from NSD with the nonlinear customer-centric focus of service design results in a process with a greater potential to yield a service enabled for value cocreation. In other words, these complementarities can be leveraged to enhance the value cocreation orientation in service innovation.

The integrated process characteristics aforementioned can be illustrated in the cases as follows. In each of the cases, consultants started with a general question to be answered in the **Definition of Ideas** phase, which became more specific as the model progressed to the **Concept Development** and **Service Delivery System Development** phases. For example, in Case 1, the consultants initiated the service innovation project, in the **Definition of Idea** phase, aiming to understand how to facilitate student transportation to campus, defining the 'App that organizes rides among students' as the 'Service Idea'. Then, in the **Concept Development** phase, the consultants aimed to understand what app features students would like. Finally, in the **Service Delivery System Development** phase, the consultants aimed to comprehend how the interface should be and what functionalities the app should have, considering the app features previously defined.

Integrated process evaluation by experts. As mentioned in Section "Methodological procedures", we interviewed 10 experts to evaluate the proposed integrated model. We present their evaluation and improvement suggestions in each topic of this section. We divided this section into six topics. The first three topics present the positive aspects of the proposed model. The following three topics present the points to be improved in the model. Experts' evaluation indicated a good performance of the model mainly in relation to criteria (i) in-depth understanding of customer resources idiosyncrasy and (ii) alignment of

the service prerequisites proposition and selection with the customer resources idiosyncrasy. However, experts pointed opportunities for improvement mainly regarding the (iii) integrated model efficiency.

Expert positive evaluation for the proposed model

Increased understanding depth of customer needs: Regarding the criterion (i) in-depth understanding of customer resources idiosyncrasy, the experts pointed out that the Integrated process model results in a deeper understanding of customer needs, as the study about the customer (performed in the *Data Collection* and *Data Analysis* stages), occurs throughout various process phases. According to Expert G, the integrated process model presents the 'voice of the customer' in many its phases, from the conceptual to technical phases: *"…the main positive point in the model is that the customer is involved in several phases… not only in the idea phase, but also in the detailing of the service…"* (Expert G).

Additionally, Expert B emphasized the fact that the model allows customizing human-centered design techniques to the characteristics of each service prerequisites. Consequently, different customer need dimensions can be reached, which are not achieved in service design traditional processes. For example, in the **Definition of Idea** phase, techniques can be used to understand more general customer demands, while, in the **Concept Development** and **Service Delivery System Development** phases, techniques that aim to understand more specific needs to operationalize the already defined idea can be used: "*The model allows for a change in the way people participate in each of its stages to maximize the contribution that the customer provides…"* (Expert B).

Greater possibility of generating a service suited to customer needs: According to the experts, customers' deep understanding reached with the proposed model increases the possibilities to achieve a service that properly addresses customers' needs at each phase. It results in positive evaluation regarding the criterion (ii) alignment of the service prerequisites proposition and selection with the customer resources idiosyncrasy. According to Expert H, the greater understanding of the customer's characteristics results in a better basis for proposing proper service characteristics: "*…the model allows for more customer understanding possibilities, resulting in more potential to achieve the right marketing offering*" (Expert H).

For Expert G, using the service design cycle of stages to define each service prerequisite allows the company to deepen service details. Therefore, the fact that the model allows a series of alternatives to be proposed for each service element in the *Creation* stage, and that, later, the best alternative is chosen, results in a greater model refinement when comparing the proposed model to NSD and service design traditional models. So, the possibility of generating a service that, in fact, meets the customer's needs is increased, as evidenced in Expert G's sentence:"*…the customer will have the opportunity to interfere in various service… this is the great differential of the proposed model…all the details of the service will be developed from the customer's perspective."*

The process can contribute to a qualified service implementation by detailing the specifications: The proposed process contemplates an extended analysis to achieve the best service to the user idiosyncrasy. According to expert B, this extended analysis can produce detailed specifications about the service that can be useful to **Service Implementation** activities. For Expert H, as the process presupposes many user understanding activities along each service prerequisite, the risk to implement a service that does not meet the user need is low: *"This process reduces risks as it adds these stages within a clear framework of service innovation… thus, it is possible to move forward with more confidence towards implementation…"* (Expert H).

Experts' improvement propositions for the proposed model

User understanding and insights should be reused along the process: User understanding is enriched along the process. So, the data about users collected in the **Definition of Idea** can be reused in the next phases (i.e., **Concept Development** and **Service Delivery System Development** phases). For Expert A, as the process progresses, firms should collect and analyze just incremental new customer data about the prerequisites focused on that phase to obtain specific insights. All the improvement opportunities for the proposed model are related to the (iii) integrated model efficiency criterion, in experts' perception. For example, Expert A argued that: "*A large data collection in the service idea phase could be performed to produce input to the later phases*" (Expert A).

The contribution of codesign activities decreases as the process progresses: The experts pointed out that the codesign with users becomes less contributive as the process progresses, since it becomes focused more on technical service prerequisites. Users generally do not have technical knowledge, which decreases their codesign potential contribution in the later phases. Therefore, as the process progresses, based on the inputs previously provided by the customer, the company's personnel should predominantly execute the stages. Therefore, model efficiency can be negatively affected if customer active participation is not properly managed, which affects (iii) integrated model efficiency, as stated by Expert E: "*… too much user involvement, depending on the phase, can also be problematic. Because, as users do not understand the technical details of development, they may not contribute and still perceive it as a waste of time."*

The execution order of the process's phases should not be rigid: Although the proposed process model has an expected order of execution, it should be possible to return to any previous phases to adjust or refine prerequisites that were already defined. For example, if the designer identified that the defined 'Service Idea' is not the best to the customer idiosyncrasy during the **Concept Development** phase, it should be possible to return to the **Definition of Idea** phase to reidentify the best 'Service Idea'. As the user understanding improves throughout the process, it is possible that some insights obtained in one phase can influence the decision made in the previous phases. A wrong dynamic of driving the process, not allowing necessary loops throughout the process, can result in problems of efficiency and effectiveness of the process. Then, this expert's perceptions of improvement can impact all the three evaluation criteria. This required process flexibility was illustrated by Expert I: "*… in a service design method, you can't run the stages in a completely linear way… if you put rigidity into the design, it's no longer design; you're turning this into just a management process."*

Discussion

General characteristics of the proposed integrated model. The premise of value cocreation is that a firm cannot deliver value per se, as value is defined by the customer during use (Vargo and Lusch, 2004; Grönroos, 2006). To achieve value cocreation, service provider resources must be capable of being integrated with the customer resources. Based on this, the present paper proposes that there is a greater possibility of obtaining a service enabled for value cocreation if each service prerequisite is developed considering customer demands. To this end, this paper proposes the

'NSD and Service Design Integrated Process' model that combines the flexibility and value cocreation orientation of service design with the sequential and linear structure of NSD. This resulted in a model where the service design process is applied prescriptively, with its cycle of stages executed sequentially, where each phase addresses a specific design object.

It is important to highlight that, although service design process models can be applied at various stages of the service innovation process with different objectives and design objects, literature has yet to present a structured, linear, and prescriptive approach for their application (Kimbell and Blomberg, 2017; Yu, 2017). The service design process models proposed so far serve more as practical and flexible guides, applicable across multiple scales and contexts (Yu, 2018). The present article aims to fill this gap by integrating service design process into NSD process, where NSD provides the dynamics and frame within which service design is integrated. Thus, the resulting integrated process provides a structured and prescriptive approach for applying service design within the phases of NSD process models, systematizing its application.

The integrated model contribution to enhance value cocreation orientation in service innovation. The proposed integrated model presents several contributions to enhance value cocreation in service innovation. These contributions include combining flexibility and predictability for process execution, achieving a deep understanding of customer demands and resource characteristics, and creatively and iteratively developing service elements that enhance resource integration and value cocreation. Additionally, the model provides detailed service specifications, serving as a guide for implementation. In Table 6, we present a summary of the research findings and their implications, which were obtained after applying the integrated model and conducting expert evaluations. These points are discussed in detail in the subsequent paragraphs.

The integrated process shares similarities with hybrid project management, positioned as an intermediary between traditional and agile methodologies (Papadakis and Tsironis 2020; Zasa et al. 2021; Reiff and Schlegel 2022). Hybrid project management combines the benefits of both approaches, incorporating the flexibility of agile methods with the predictability and clarity of goals found in traditional approaches (Gemino et al. 2021; Agbejule and Lehtineva 2022). Thus, the proposed integrated process contributes to enable managers to better control complexity without compromising the customer focus and creativity that are essential for innovation (Papadakis and Tsironis 2020; Zasa et al. 2021; Reiff and Schlegel 2022). Complexity is handled by developing service prerequisites in specific phases, while customer focus and creativity are fostered through cyclical stages of customer understanding, creative proposition of solutions, and testing with customers. By sequentially detailing each service element, the integrated process presents a snowball effect, therefore enhancing the potential for resource integration and value cocreation.

To obtain a service capable of value cocreation, it is first necessary to deeply understand customer demands. Service design provides this input due to its human-centered design tools (Vargo and Lusch 2008; Holmlid et al. 2017; Yu and Sangiorgi 2018). In our proposed model, customer understanding is obtained by gradually repeating the *Data Collection* and *Data Analysis* stages throughout each phase of the NSD. In this way, the understanding of customer demands is continuously accumulated and enriched, creating a snowball effect. Korper et al. (2022) state that for resource integration and value cocreation to occur, it is essential to deeply understand the phenomenological context (personal experiences) and institutional context (social and organizational settings) of the customer, allowing the proposal of a service that holds true 'meaning' for them. The iterations of the *Data Collection* and *Data Analysis* to inform the development of each service prerequisite further deepen this understanding, supporting the creation of a service with greater "meaning" and potential for value cocreation. They achieve this if appropriate adaptations are made to the human-centered design tools to the characteristics of the prerequisite under development. Therefore, the proposed integrated model potentially achieves a great depth of customer understanding – in response to the evaluation criterion (i) in-depth understanding of customer resources idiosyncrasy.

Service design, informed by the deep understanding of customer demands, develops the service through creative and participatory design, along with service testing to verify resource integration and value cocreation (Polaine et al. 2013; Stickdorn et al. 2017; Joly et al. 2019). In each phase of the proposed integrated process, after executing the *Data Collection* and *Data Analysis* stages, the service prerequisites are defined and developed in the *Creation* and *Selection* stages. In *Creation*, our integrated model systematically applies creativity and actively engages the customer in codesign to develop each service prerequisite, including the operational elements of the 'Service Concept' and 'Service Delivery System'. In *Selection*, prototypes are developed suitable for the characteristics of each service prerequisite and tested to select those that best meet customer needs. This sequential approach introduces more prescriptive characteristics to the service design process by delineating and sequentially developing specific design objects (i.e., service prerequisites), a dynamic not explicitly addressed in the literature (Kimbell 2011; Sangiorgi 2015; Kimbell and Blomberg 2017). Although service design can be applied at various scales, in both front and back-end, meticulous development of each service prerequisite through active customer participation increases the likelihood of a service better suited for value cocreation, as customers can tailor each element to their needs. Thus, these characteristics of the integrated process address the evaluation criterion (ii) alignment of the service prerequisites proposition and selection with customer resource idiosyncrasies. It is important to highlight that a necessary consideration when applying the proposed integrated model is that customer participation should be conducted with parsimony in back-end phases, as these phases focus on technical aspects beyond the customer's knowledge.

Another recognized service design limitation is the lack of service implementation guidance (Yu 2017). As our model presents the operationalization of several stages for each prerequisite development, its result can be a series of specifications, which can be useful to ensure a more effective implementation (Yu 2017, 2018). In addition, our process presupposes that many company departments be involved in the human-centered dynamics as it develops service elements that require different expertise (e.g., a 'Service Idea' needs marketing skills and a 'Service Delivery System' needs technical skills). Therefore, it is possible to engage the customer's needs with great capillarity within the company. In Table 7, we compare NSD and service design processes with the 'NSD and Service Design Integrated Process', emphasizing how the complementarities of both processes led to the integrated process.

Although the proposed integrated model presents the aforementioned advantages, some aspects must be taken care of during its execution. First, knowledge about the customer should be reused throughout the phases. Discarding already gathered customer insights when moving to the next phase results in unnecessary efforts in the *Data Collection* and *Data Analysis* stages. With the reuse of customer knowledge throughout the process, these stages can be performed incrementally to increase

Table 6 Findings and its implications.

Findings	Rationale	Implications	
		Methods/Tool	Application Dynamics
Hybrid processes (integrating waterfall and cyclic dynamics) contribute to more effective complexity management in service innovation, without compromising focus on customer needs and creativity.	A specific characteristic of service innovation is that it involves the interconnected development of the 'Service Idea,' 'Service Concept,' and 'Service Delivery System'. The linearity between phases in a hybrid model allows for clear identification of the element being developed at each stage, providing greater control in managing the process.	A hybrid approach between traditional and agile methodologies in project management should be adopted.	Balancing the cyclical and linear dynamics of the process to prevent it from becoming overly complex or rigid.
Studying customer needs for each service element in distinct phases contributes to enhances understanding of both the phenomenological and institutional contexts, as well as a more comprehensive insight into these needs.	By dedicating each phase of the model to analyzing customer demands for a specific service component, a snowball effect is created, where the understanding of customer needs progressively deepens through cumulative customer interactions.	Human-centered design tools should be adapted to the characteristics of the developing service prerequisite.	Knowledge about customer demands obtained in the initial phases of the process should be reused in the final phases. Moreover, when necessary, it is essential to revisit earlier stages of the process to conduct new studies on customer demands.
Active customer involvement in proposing and selecting alternatives for each service prerequisite, carried out in distinct phases, tends to lead to a service with an enhanced resource integration and value cocreation.	By enabling active customer participation and the use of creativity across multiple phases of the development process, from the conceptual elements to the operational ones, this approach significantly contributes to enhance the potential for delivering a service more closely tailored to customer needs.	Techniques of co-design and creativity should be adapted to the characteristics of the developing service prerequisite. Furthermore, low-fidelity prototypes should be utilized for service idea selection, medium-fidelity for service concept, and high-fidelity for service delivery system elements.	Active customer participation should be employed with parsimony during the 'Service Concept' and 'Service Delivery System' development phases, as they often delve into technical aspects beyond the customer's expertise.
Waterfall and cyclic hybrid approach tends to generate a higher level of detail for each service prerequisite, contributing to more effective service implementation.	By delineating the operationalization of multiple stages for developing each prerequisite, the meticulous design process within each phase can generate a more refined set of specifications, potentially leading to an effective service implementation.	Detailed reports of the outputs obtained throughout the process should be utilized.	The knowledge acquired during the developmental phases of the process should be carried forward into the service implementation phase.
Customer-centered dynamics across various phases of service innovation, from more conceptual phases to operational ones, can promote cross-departmental integration, embedding customer needs throughout the organization.	As the development of each service element requires diverse expertise, multiple departments engage in human-centered dynamics, which can lead to better alignment with customer needs. For instance, crafting a 'Service Idea' necessitates marketing skills, whereas designing a 'Service Delivery System' calls for technical proficiency.	Techniques that facilitate discussions among various sectors of the company should be adopted (such as customer journey maps, for example).	Employment of multifunctional and multisectoral groups throughout the process should be adopted.

(iii) integrated model efficiency. A final important aspect is that, although the integrated process proposes a sequential phases execution, some phase return loops for prerequisites redefinitions is possible. This means that prerequisite redefinitions can be performed as the process progresses and user understanding is enriched. Considering these aspects, we proposed a second and enhanced version for the integrated model, contemplating the improvement opportunities identified during the model evaluation in Fig. 5.

As a final consideration, the model proposed in this paper contributes to the debates on integrating service design with NSD to implement value cocreation orientation in service innovation. Yu (2016), Holmlid et al. (2017), Yu (2017), Yu (2018) and Yu and Sangiorgi (2018) are some examples of studies that have discussed this topic, reflecting a collective effort to advance the field. In comparison, the model proposed by Yu and Sangiorgi (2018) adopts a broader circular approach, without explicitly detailing the stages of NSD and service design nor explicitly presenting the development of each service prerequisite. Conversely, the model proposed in the present paper offers a more detailed and operational view of the value cocreation orientation, integrating the cycle of service design within the linear dynamics of NSD to develop each service prerequisite.

Thus, we conclude that both models are valid and complementary. Using a service design consultancy as example, the model proposed by Yu and Sangiorgi (2018) can be used to present the project phases to client companies during the sale of the consultancy project, while our proposed model can guide the project execution.

Conclusion

Service innovation literature is still looking for a model that results in a service enabled for value cocreation. Service design is

Table 7 Comparison between traditional NSD and Service Design processes with the 'NSD and Service Design Integrated Process'.

		New Service Development	Service Design	NSD and Service Design Integrated Process
Process Characteristics	**Project Management Approach**	Traditional Approach	Agile Approach	Hybrid Approach
	Process dynamic	Linear; sequential process	Iterative; non-linear process	Progresses linearly between phases and is executed cyclically within the phase.
	Development process scope	Typically used in the back-end, but it is not limited to this phase	Typically used in the fuzzy front-end, but it is not limited to this phase	Back-end and Fuzzy front-end
	Design object	Explicitly presents service prerequisites as a design object	Does not explicitly present a design object, which varies by project scope	Each service prerequisite being cyclically developed, however the process progresses sequentially among them.
Value Cocreation Orientation Activities	**Understanding the idiosyncrasies of customer resources**	Does not study in-depth the idiosyncrasies of customer resources	Studies in-depth the idiosyncrasies of customer resources	Understands in-depth the needs of each service element, therefore deepening the understanding of the idiosyncrasies of customer resources
	Development of company resources	Develops resources with an inside-out perspective, not recognizing the need for resource integration	Develops resources with an outside-in perspective, recognizing the need for resource integration	Develops each service element with an outside-in perspective, increasing the potential for resource integration
	Resource integration test	Does not conduct a service test to verify if the resources are effectively integrated	Conducts service tests to assess resource integration	Conducts tests to assess the suitability of each service element to customers' needs, ensuring more effective resource integration
	Guidance for the implementation of a value cocreation-enabled service	Both do not properly guide the implementation to ensure the deployment of a value cocreation-enabled service		Specifies in detail each service element, reducing the risks of implementing a service with low resource integration/value cocreation potential

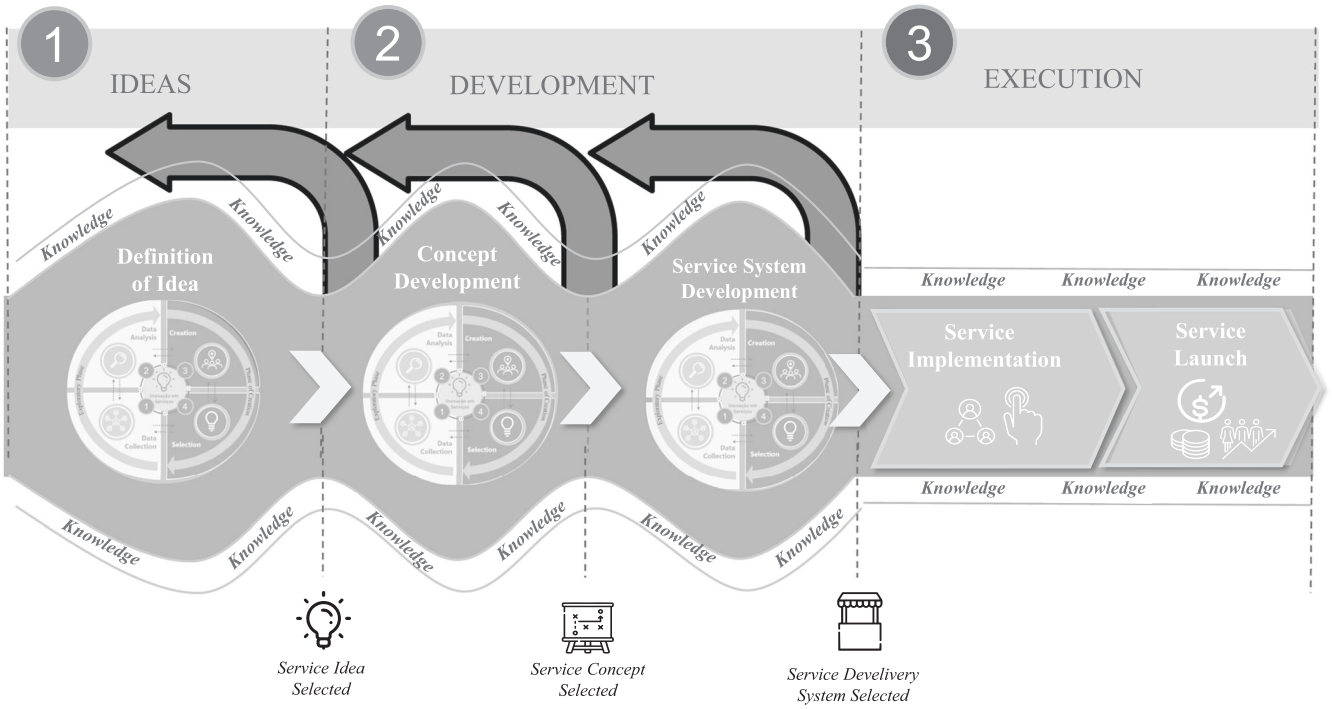

Fig. 5 'NSD and Service Design Integrated Process' model enhanced version.

the service innovation approach that is recognized by being oriented towards value cocreation. However, such an approach has some limitations, such as the non-linear dynamic of its processes. Furthermore, service design does not make it explicit what is the design object of its process, having the possibility of being applied in various scopes of the service innovation process. On the other hand, although NSD does not have value cocreation as one of its premises, it is a prescriptive process with less tacit characteristics than service design, explicitly outlining the service prerequisites being developed at each stage. Based on this context, our paper proposes an alternative approach to service innovation based on the integration of service design and NSD in order to enhance value cocreation orientation by leveraging the best of both approaches.

The resulting integrated model proposes that each service prerequisite should be developed following a service design cycle of stages *Data Collection*, *Data Analysis*, *Creation* and *Selection*. Therefore, the prescriptive linear dynamic of NSD, coupled with its explicit consideration of service prerequisites as design objects, synergistically complements the non-linear dynamic and the emphasis on activities (rather than the emphasis on service prerequisites) of service design. Hence, these complementarities can be leveraged to achieve a service innovation process with an enhanced value cocreation orientation compared to traditional NSD or service design. The proposed integrated process model presents proper characteristics to generate a service enabled to value cocreation as it is oriented by the customer's demands throughout different service innovation phases, directing the development of each service prerequisite. In addition, we emphasize that the model's scope extends beyond defining the 'Service Idea'. It also encompasses the development of operational elements of the service (e.g., 'Service Concept' and 'Service Delivery System' elements), creating multiple alternatives and selecting the one that best meets customer demand. As a result, this approach amplifies the incorporation of the customer's voice in the service innovation process.

The findings of this paper respond to the call for efforts in understanding the relationship between NSD and service design, aiming for the integration of both approaches, made by Patrício et al. (2018). Additionally, it is in line with the research of Holmlid et al. (2017), emphasizing the fundamental difference between NSD and service design, highlighting that the latter is oriented towards value cocreation. Moreover, this article complements the studies by Yu (2017) and Yu (2018), who compared NSD with service design, and the study by Kurtmollaiev and Pedersen (2022), who reviewed various approaches to service innovation (including NSD and service design). However, these three studies did not present a model that integrated both approaches in an operational manner. Finally, our study advances the work of Yu and Sangiorgi (2018), who developed an integrated model of NSD and service design based on case studies of service design consultancies, but did not clearly present the characteristics of each approach.

Theoretical implications. As theoretical implications, we present an alternative way to orientate the service innovation process to value cocreation, using this perspective to guide the sequential development of each service prerequisite. Therefore, the proposed model presents how customer orientation can define both the conceptual and, mainly, operational service elements, in which customers generally do not have a direct influence. In addition, our work shows how NSD can enhance the results of service design by providing a prescriptive linear dynamic to its value cocreation orientation. In our paper, we propose a process that gradually develops the service elements through the service design cycle of stages, aiming to enhance the resources integration and, consequently, value cocreation. Such an approach represents an innovative contribution to the service innovation literature.

Managerial implications. As managerial implications, our integrated process contributes to businesses, improving their service innovation strategies by integrating customer feedback more effectively throughout the development process, resulting in a more comprehensive and effective service offering. This leads to a

better alignment with customer needs, which can represent a significant competitive advantage in the marketplace.

Moreover, our model reduces the uncertainty and complexity typically associated with the application of service design for service innovation. This allows companies to systematically implement service innovation projects with clear guidelines, which can improve operational efficiency.

Additionally, by reducing service innovation complexity, the proposed integrated process becomes accessible for non-design professionals to execute. This means that a company without service designers on staff can still develop a service design project, as the process prescriptively presents clear phases, decreasing the tacit nature of the process and making it less complex.

Finally, from the perspective of design consultancies, this process ensures clear communication of the design object throughout the development process. This transparency allows the client company to understand how the service innovation project will be conducted. By clearly outlining the project stages, the consultancy provides the client with greater control over the service design project.

Future research propositions. Despite the theoretical and practical contributions, several future research can be undertaken to extend the findings. To advance the theoretical landscape in the field of service innovation, we recommend developing new service innovation process models that integrate different approaches from those used in this paper (e.g., service engineering, lean startup, lean development, and open innovation). A comprehensive review and comparative analysis of the idiosyncrasies of these approaches is suggested. Additionally, we recommend comparing the results obtained with those models with the proposed integrated model presented in this paper. The studies conducted by Biemans et al. (2016), Mendes et al. (2017) and Kurtmollaiev and Pedersen (2022) are recommended as valuable starting points to underpin such research.

Considering the evolution of the integrated model proposed in this paper, we recommend implementing the **Service Implementation** and **Service Launch** phases, which were unexplored in this study, to verify whether the dynamics of the previous phases positively impacted service implementation and launch. Additionally, future research could conduct other applications of the model using human-centered and codesign tools different from those utilized in this study. Also, the integrated model could be applied in different contexts from those applied in this paper, such as healthcare, financial, and entertainment, therefore, testing its robustness.

We also recommend a more in-depth investigation into how the proposed integrated model can be more easily executed by non-designers compared to the original service design process. In this regard, we suggest applying the democratic design theory as an analytical lens, which emphasizes the democratization of design execution, making it more accessible for individuals without prior design knowledge and skills to actively participate in the process. Literature argues that the main benefit of the democratic design is a greater likelihood of meeting the needs of the general population. Saward (2021) can be a relevant starting point for the development of this future research.

Furthermore, we recommend executing the service developed as a result of our integrated process and verify its actual potential for value cocreation when in contact with the customer. This assessment should be compared with services developed solely through traditional NSD or service design approaches. Such a study is an alternative way to test if our proposed integrated model has a greater potential to develop a value cocreation-enabled service compared to traditional approaches.

Finally, this research focused only on the integration of phases and stages of NSD and service design process models, not explicitly addressing how the tools from these approaches could be integrated. Performing a low-level proposition for the 'NSD and Service Design Integrated Process', identifying how tools from both approaches could complement each other, would be an interesting work to continue this research.

Data availability

The dataset from the interviews conducted during the study is available in the Figshare repository, https://doi.org/10.6084/m9.figshare.25655931. The Supplementary Information Files present the systematic literature review results, which include studies proposing process models for NSD and service design along with their respective stages, as well as the results of the case studies.

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Notes

1 We classified the relation with 'strong', 'moderate', 'weak' and 'none'. We classified as 'strong' when the Service Design activity strongly contributes to orientate the NSD service prerequisite development to the value cocreation, without any adaptation in how to perform these activities; we classified as 'moderate' when the Service Design activity potentially contributes to the NSD service prerequisite development, but its execution needs adaptations from its original execution; we classified as 'weak' when the Service Design activities weakly contributes to the service prerequisite development; we classified as 'none' when there is no contribution of the Service Design activities.

2 Hereafter, we will name the stages coming from NSD (Definition of Idea, Concept Development, Service Delivery System Development, Service Implementation, and Service Launch) as 'phases' and present them in **bold** letters. Stages coming from Service Design (Data Collection, Data Analysis, Creation, and Selection) as 'stages' and present them in *italics* letters.

3 As can been seen in the Figure 4, we adjusted some stages from the archetypes to fit both processes. The NSD stage 'Feasibility' was suppressed because it was incorporated throughout the several times when the Service Design 'Selection' stage is performed.

4 The CNS Resolution n° 510/2016, which establishes ethical guidelines for research in the Humanities and Social Sciences, can be accessed at: https://www.gov.br/conselho-nacional-de-saude/pt-br/acesso-a-informacao/legislacao/resolucoes/2016/resolucao-no-510.pdf/view.

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Author Contributions

The first author led the data collection, including case studies and interviews, and conducted the initial analysis of the results. The other authors actively contributed to the data analysis and provided critical and in-depth interpretations of the findings. All authors participated in methodological discussions throughout the study and collaborated in developing the conceptual framework. All authors were actively involved in writing the manuscript, jointly reviewed the text, and approved the final submitted version.

Competing interests

The authors declare no competing interests.

Ethical approval

This study adhered to Brazilian research ethics regulations, as established by the National Health Council (CNS) in **Resolution CNS n° 510/2016**, which governs research in the Humanities and Social Sciences[4]. According to **Article 1, Sole Paragraph, Item VII**, research that aims to deepen the theoretical understanding of situations arising spontaneously and contingently in professional practice, provided no identifiable data is disclosed, is exempt from ethics committee review. This provision aligns with the focus of our study on the development and evaluation of a theoretical model for service innovation. The study involved no invasive procedures, sensitive personal data, or engagement with vulnerable populations. All data collected were strictly technical and professional, addressing organizational practices without disclosing any identifiable information. Participants were assured that all data would be treated with strict confidentiality and anonymity, and they were informed of their right to withdraw from the research at any time. Consequently, complete anonymity was guaranteed throughout the research process. Additionally, the study adhered to the principles of the **Declaration of Helsinki**, which emphasize the importance of balancing risks and benefits in ethical research practices (**Paragraphs 16, 17, and 23**). As the research posed no physical or psychological risks to participants and prioritized their privacy, anonymity, and voluntary participation, it qualifies as minimal-risk research. Based on these considerations and in full compliance with applicable regulations and ethical principles, formal ethics committee review was not required by the university and the Brazilian government instances.

Informed consent

Informed consent was obtained from all participants in this study. Focus group participants were informed about the research objectives and assured of anonymity, providing oral consent before participation. Case study consultants were briefed on the study's context and objectives, with anonymity guaranteed and oral consent provided. Interviewed specialists were informed of the study's purpose, data usage, and anonymity assurance, with explicit consent recorded during each interview. Participants were assured their contributions would be used solely for research purposes, with no identifiable risks or incentives involved, ensuring compliance with ethical standards.

Additional information

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