

INNOSERV: Generalized scale for perceived service innovation

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Published Version

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Manohar, S., Paul, J. ORCID: <https://orcid.org/0000-0001-5062-8371>, Strong, C. and Mittal, A. ORCID: <https://orcid.org/0000-0002-1191-4620> (2023) INNOSERV: Generalized scale for perceived service innovation. Journal of Business Research, 160. 113723. ISSN 0148-2963 doi: 10.1016/j.jbusres.2023.113723 Available at <https://centaur.reading.ac.uk/111965/>

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To link to this article DOI: <http://dx.doi.org/10.1016/j.jbusres.2023.113723>

Publisher: Elsevier

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INNOSERV: Generalized scale for perceived service innovation[☆]

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ARTICLE INFO

Keywords:

INNOSERV

Service innovation

Synthesis approach

Scale development

Non-technology innovation

Integrated approach

ABSTRACT

Existing scales for Service Innovation focused mostly on technological newness in firms where the non-technological components were ignored. This study emphasizes the need for measures that could include both technological and non-technological constructs from customer perspective across a range of sectors. Mixed Method approach was adopted where qualitative techniques like in-depth interview, focus group discussion were used for item generation and purification followed by quantitative tests like PCA, EFA and path analysis to establish the item validation. A 22 items scale named INNOSERV with seven major typologies that measure service innovation was developed. Theoretically this study helps in emphasizing the importance of considering non-technological innovation to be viewed while measuring performance by the service industry. Managerially, the scale could be adopted by the service industry in understanding how their customers perceive or diffuse their innovation activity. For society, this scale organization understands that non-technological innovation also plays a major role in contributing to economic, social and environmental sustainability. This study highlights the need for exclusive approaches, theories and measurement tools which are essential to be defined in the service sector.

1. Introduction

Over the last three decades, services and service-related industries have made a major impact on global economies. The growth of the service sector is not only a result of the advancement in technology but also due to the need for change and higher customer expectations (Habel, Alavi, Schmitz, Schneider, & Wieseke, 2016; Hsieh & Yuan, 2019). Urbanization, lifestyle shifts, and increasing purchase power have created a demand for services that can provide better quality and comfort (Nair, 2018). Service sector managers are inevitably developing a focus on radical and incremental innovations across the sector (Myhren, Witell, Gustafsson, & Gebauer, 2018). Such innovations are seen predominantly in service sectors including home delivery through on-line apps in the food industry, online booking for travel and tourism, internet operated technological instruments to ameliorate the process of surgeries in the healthcare industry, and online learning and teaching systems in the education industry. However, there is no available scale

that allows managers and researchers to gain an in-depth understanding of their consumers' perception towards their service innovations. With millennial and generation Z customers, the expectation is typically not a service supporting a product, but services that complement both the functional and the emotional utility of the product (Hendriyani & Chan, 2018; Hur, Lee, & Choo, 2017; Leon, 2018). In the competitive environment, which allows for wider options, advancements in technology are being implemented on a day-to-day basis; therefore, retaining a customer is one of the major challenges for a firm for which rapid innovation is inevitable (Kyei & Bayoh, 2017; Tandon, 2022).

Although innovation as a concept was first emphasized by Schumpeter (1934), its significance was highlighted in the early 1970s, and even then, only as specific to product and manufacturing industries such as machinery, textiles, apparel, etc. (John & Snelson, 1988; Witell, Snyder, Gustafsson, Fombelle, & Kristensson, 2016). The concept of innovation in service or service innovation was seen only as a support element of product sales and therefore given minimal recognition or

[☆] INNOSERV: Perceived Service Innovation Scale. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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<https://doi.org/10.1016/j.jbusres.2023.113723>

Received 4 December 2022; Received in revised form 22 January 2023; Accepted 25 January 2023

Available online 25 February 2023

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importance at the initial production and product-based marketing strategy. This ideology was not prevalent until [Barras \(1986\)](#) presented a reverse product cycle (RPC) theory for service innovation, emphasizing the importance of its characteristics and how it differed from product innovation. A clear and well-accepted definition for service innovation was defined by [Van der Aa and Elfving \(2002\)](#), “service innovation encompasses ideas, practices, or objects which are new to the organization and the relevant environment that is to say to the reference groups of the potential innovator”.

A review of existing scales leads us to note that service innovation has been measured using a wide range of scales and approaches. Previous studies have followed: (a) radical and incremental innovation ([Coccia, 2017](#); [Hervas-Oliver, Sempere-Ripoll, Estelles-Miguel, & Rojas-Alvarado, 2019](#)) as dimensions (product perspective), (b) disruptive and sustaining innovation (market perspective) ([Enders, Jelassi, Koenig, & Hungenberg, 2006](#); [Hwang & Christensen, 2008](#); [Paap & Katz, 2004](#)) (c) adopted an assimilation approach where the scale contained two major dimensions - product and process innovation ([Aas & Pedersen, 2011](#); [Alpay, Bodur, Yilmaz, & Büyükbacı, 2012](#); [Castro, Montoro-Sanchez, & Ortiz-De-Urbina-Criado, 2011](#); [Tejada & Moreno, 2013](#)) (d) a one-dimensional scale with a dichotomous rating method e.g. [Santamaria, Nieto, and Miles \(2012\)](#) and [Vergori \(2013\)](#). Researchers have also applied the demarcation approach (exclusive for service and service based industries) and developed specific dimensions in their studies with relative items to measure the constructs ([Avlonitis, Papastathopoulou, & Gounaris, 2001](#); [Hertog, 2000](#); [Sidhu, Commandeur, & Volberda, 2007](#)).

An issue to be noted here is that the nature of service depends on many factors like customer wants, perceptions, expectations, satisfaction, and behavioral intentions that would change from one service encounter to another and few attempts have been made in previous studies to identify a unique scale that could measure innovation across sectors. [Ostrom \(2010\)](#) emphasized in their study that service innovation requires detailed conceptualization, techniques for adaptation and approaches that are different from product innovation. Similarly, [De Castro, Verde, Sáez, and López \(2010\)](#) noted that service and service-based companies are more inclined towards non-technological innovation compared to manufacturing companies which have a greater tendency towards technological innovation. However, based on the characteristics of services specifically perishability and inseparability where production and delivery are integrated to provide better customer experience thereby giving a thought to service marketing researchers in combining all related service attributes together for innovation and provide complete experience to customer.

The scale developed in this study is operationalized as perceived service innovation. The perceived scale is different from existing scales because it involves measuring customer judgment on service innovations from various typologies. Since existing scales are from the firm perspective ([Anning-Dorson, 2017](#); [Arshad, Wang, & Su, 2016](#); [Bustinza, Gomes, Vendrell-Herrero, & Baines, 2019](#); [Khan & Naeem, 2018](#)), it is difficult to estimate the customer's point of view on innovativeness. Decision-makers need to understand that it is customers who decide the life cycle of their innovation: the success or failure of any innovative idea is determined by customer acceptance and satisfaction ([Goldsmith & Hofacker, 1991](#)). Understanding the customer's wants (by customer orientation) is mandatory for the success of R&D departments, which have evolved many significant service concepts such as co-development and co-creation in the marketing domain. Certain companies commercialize the invention to become early movers, and certain others imitate it to be early adopters, however, ultimately customer satisfaction is the driving motive ([Mahmoud, Hinson, & Anim, 2018](#)).

The remainder of this paper is structured as follows. Section two explains the review of literature for scale development process and the methodology adopted, Section three describes the context of the study, section four explains the results of the qualitative and quantitative approach adopted for generating, purifying and validating the perceived

service innovation scale. Finally, section five elucidates the discussion and conclusion of this study.

2. Literature review

2.1. Review protocol and procedure

The literature review focuses on the abstract-level construct i.e. service innovation based on content analysis ([Ding, 2019](#); [Mayring, 2003](#)). The review (See [Fig. 1](#)) followed these steps focusing on publications between 1980 and 2020: (a) material identification, (b) sorting the duplication, (c) inclusion and exclusion based on the criteria (d) classification of articles, (e) abstract reading, and (f) full content reading, following the protocols ([Paul & Barari, 2022](#); [Paul & Criado, 2020](#); [Paul, Lim, O'Cass, Hao, & Bresciani, 2021](#); [Tsiotsou, Koles, Paul, & Loureiro, 2022](#)).

A list of keywords was prepared following the review of papers on service innovation, through backward integration (noting the terms that appear multiple times in a set of review papers, such as service innovation, innovation, services, new product, process, facilitators and barriers for innovation, typologies, organization, innovation and performance, dimensions, new service development, scale development, measurements etc). Following [Paul et al. \(2021\)](#), the articles were predominantly collected through search engines including Web of Science, Scopus, Microsoft Academic, Google Scholar.

2.2. Scale development procedure

According to [DeVellis \(2012\)](#) and [Houts, Morlock, Blum, Edwards, and Wirth \(2018\)](#), theories, concepts, and approaches in a domain constitute the major source for scale development. Prior authors ([Dagger, Sweeney, & Johnson, 2007](#); [Padmavathy, Swapana, & Paul, 2019](#); [Paul, 2019](#)) noted that to develop a new construct, researchers have to focus primarily on understanding and gaining clarity on related theories and concepts. Furthermore, insights can be gained from subject experts and field experts by conducting group discussions and in-depth interviews that can give clarity on ideas about the construct from various dimensions. If a construct is unobserved and cannot be measured directly (intangibility - phenomena are not visible), multiple dimensions and relative item scales are needed to measure it ([DeVellis, 2012](#)). Similarly, [Comrey \(1988\)](#) stated that “multiple-choice item formats are more reliable, give more stable results, and produce better results.” [DeVaus \(1986\)](#) found that the ability of the scale to evaluate the complexity of a construct from different dimensions rather than using a single item or dichotomous scale may be misleading in the observation of the entire concept. This study followed the scale development procedure proposed in the marketing literature ([Churchill, 1979](#); [Clark & Watson, 1995](#); [DeVellis, 2012](#); [Kock, Josiassen, & Assaf, 2019](#); [Netemeyer, Burton, & Lichtenstein, 1995](#); [Padmavathy et al., 2019](#); [Papadas, Avlonitis, & Carrigan, 2017](#)). The scale development process adopted in this study is detailed as a graphical flowchart in [Fig. 2](#):

2.3. Conceptualization and operationalization of service innovation

The construct of innovation is well-conceptualized in existing literature where researchers have differentiated the construct from invention ([Witell et al., 2016](#)). The two major criteria that differentiate innovation from invention are (a) Ownership and (b) Commercialization ([Freddi & Salmon, 2019](#); [Lane & Flagg, 2010](#); [Sener, Hacıoglu, & Akdemir, 2017](#)). Irrespective of the type of firm, researchers have adopted the term innovation either in products (an offering in terms of service firms) or in the market. Researchers have further classified innovation as radical and incremental in products and disruptive and sustaining in the market ([Agrawal & Rahman, 2019](#); [Coccia, 2017](#); [Clauss, 2017](#)). Radical innovation refers to something that is offered to customers for the first time; on the other hand, incremental innovation

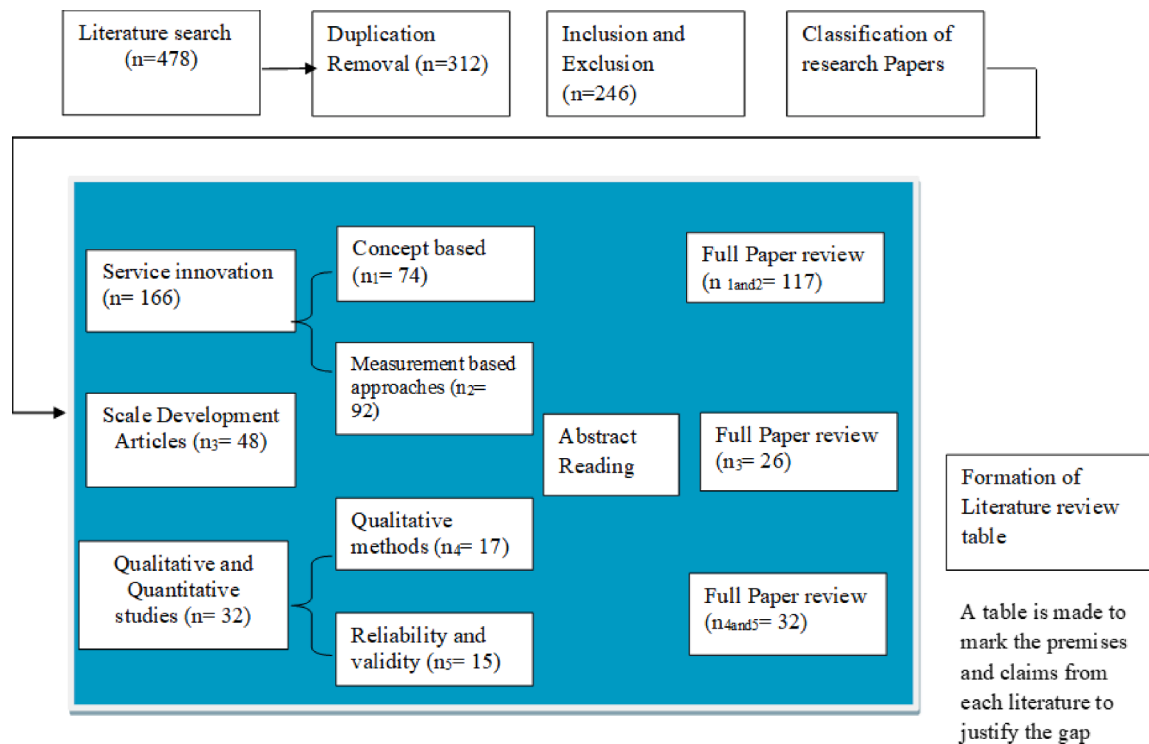


Fig. 1. Overview of the literature review process.

refers to improvements in existing products (Das, Verburg, Verbaeck, & Bonebakker, 2018; Kuokkanen, Uusitalo, & Koistinen, 2019). An idea that disrupts the market is a disruptive innovation and an idea with certain changes and modifications in an existing market is sustaining innovation. Two major points of clarity emerge from this review: (1) Innovation need not always be a completely new product; even an already existing product or service that is offered to the firm's customers for the first time is notably innovative, (2) innovation is an activity and a part of new product/service development that can be a part of any level of a product (core/expected/augmented).

Coombs and Miles (2000) categorized the extant literature into three different approaches: (i) Assimilation, (ii) Demarcation, and (iii) Synthesis. Assimilation approach studies (Alam, 2002; Griffin, 1997; Hughes & Wood, 2000) predominantly adopt the concepts, definitions, theories, and measurements from product innovation (technological aspects) believing that there is little difference between products and services. Other notable theories include Henderson and Clark's theory of architectural innovation (Henderson & Clark, 1990) and disruptive innovation theory (Christensen & Bower, 1996). However, these approaches are criticized by some schools of thought as service innovation cannot be considered the same as product innovation. These studies are classified under a demarcation approach, in which measurement tools focus only on service provisions (Barras, 1986; Gadrey, Gallouj, & Weinstein, 1995; Hipp & Grupp, 2005; Tether, 2005). According to the synthesis approach, theories of service innovation must be much broader, embracing both services and manufacturing. Therefore, to successfully measure service innovation, both technological aspects and non-technological aspects need to be considered (Janssen, Castaldi, & Alexiev, 2016; Manohar, Mittal, & Marwah, 2019).

Researchers generally consider innovation as an independent variable that can be manipulated to gain either financial or non-financial performances (Ganesan & Sridhar, 2016; Sridhar & Mehta, 2018). It has been theoretically and empirically proven in previous studies that frequent innovation over a period helps the firm in terms of profit, growth, market share (monetary benefit), reputation, satisfaction, and behavioral intention (non-monetary benefit).

The increasing popularity of the concept of innovation paved the way for inductive theories, approaches, and measurements in academic literature (Hsu, Liu, Tsou, & Chen, 2019; Yu, Wen, Jin, & Zhang, 2019). Researchers have not differentiated these aspects from each other when it comes to products and services. Studies related to pure service or abstract level of services adopted the product methodology thereby creating difficulties when it came to implementation. Atuahene-Gima (1996) in his research suggests that innovation in services is comparatively faster than that of the manufacturing industry and argued that the benefit of the product realized by the customer is lower than in the services industry. Also, DeBrentani and Cooper (1992) indicated that technology plays a lesser role in service innovation. Vargo and Morgan (2005) state that organizations, markets, and society are concerned primarily with the exchange of services which need to be equally valued along with the tangible components, leading them to propose the Service-Dominant logic (S-D logic). Due to the dominance of services in any economy, a call for a thorough and in-depth knowledge exclusively related to service concepts is required.

Theories such as reverse product cycle (Barras, 1986; Coombs & Miles, 2000; Drejer, 2004) and models such as the four-dimensional model (Hertog, 2000) have been validated by researchers in the service innovation domain; however, there still exists confusion on how to measure the latent construct. Existing literature (Hullova, Simms, Trott, & Laczko, 2019; Marzi, Dabić, Daim, & Garces, 2017) uses either an assimilation approach that only has product and process innovation as dimensions to measure service innovation or service innovation as a unidimensional construct with the dichotomous rating method, which is mostly from the firms' perspective. Therefore, this study adopts the synthesis approach in that both technological and non-technological aspects are captured in developing a generalized scale across sectors.

To move forward in the scale development process, the construct service innovation and its typologies are well-defined from the customer's perspective. Instead of developing new typologies, this study focuses on retaining the established typologies and map it onto technological and non-technological aspects to generate respective items. Authors including McMullan (2005), Walsh, Shiu, and Hassan (2014),

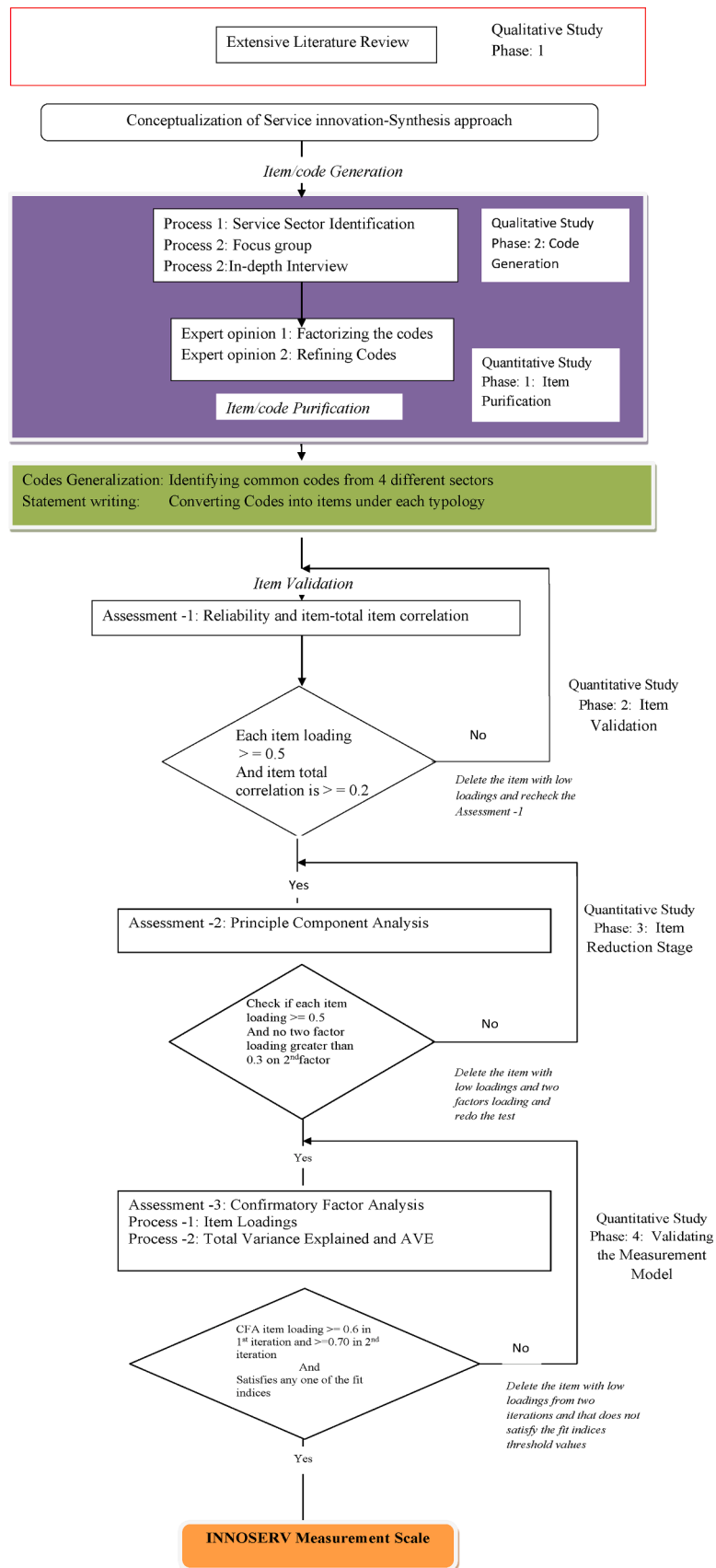


Fig 2. Scale Development Process.

and Velikova, Howell, and Dodd (2015) developed items for well-established dimensions of a construct. Following these works, this study reviewed literature that led to the identification of the five major typologies of service innovation, which are product, process, organization, strategic, and marketing innovation. Lovelock, Patterson, and Walker (2004) found that both product and process can be further classified as major product/process innovation, product/process line extension, and supplementary product/process innovation where these typologies are applicable for both the firm and customer perspectives (i. e. how customer perceive the innovation from a service firm) on the service firm.

Two major mappings were applied in this study: (1) Mapping the core customer wants with technology innovation and (2) Mapping the support system with non-technological innovation. Equal Importance is given to both technological and non-technological innovation as holistically.

Core Mapping is an approach in which the new technology is introduced by the firm to fulfill the customer's core product needs. New technology must be based on the customer's needs and current trends in the industry that firms can understand through co-creation, co-development, and customer-orientation methods. As customers are the end-users of the product, the firm must frequently introduce new technology-based products and processes. Product is the tangible element that satisfies both functional and emotional benefits as sought by the target customer; the process is how technology is used to deliver the product/concept to the end customer (Cho & Linderman, 2020; Taques, López, Basso, & Areal, 2021). Customers expect value-based products and successful firms must offer products with benefits that exceed (monetary, time, effort, and psychic costs). Customers evaluate the innovative ability of a firm on frequent pioneering ideas emerging strategies, the following four typologies are framed around the measurement of the perceived service innovation under the core-mapping approach. The conceptual definition for each typology is given in Table 1. The core product and process help in understanding/measuring the ability of the firm in mapping with the customer's basic and expected product/service needs.

Support Mapping is carried out between the non-technological innovation from the firms that support the core functionality of the product with the customer's expectation, particularly in the expected and augmented level of a product. Since service is a combination of several activities at every level, customers expect new ideas or an innovative approach to support the core benefit. For example, if we consider a student who has decided to invest in an education programme from a university: here, the core service innovation is knowledge transfer, whereas the way of teaching would be a process innovation such as online lectures and seminars. In this situation, technology plays a major role, but this factor alone does not make a customer choose the university. There needed a support system facilitating the core needs which predominantly are non-technological: for example, providing a good and clean environment, additional facilities such as the library,

transportation, accommodation, student support, and tie-ups with national and international organizations, fee payment policies, etc. In this study, three non-technological typologies are identified from the existing literature to measure the latent construct service innovation. The conceptual definitions for each typology are given in Table 2:

Based on the typologies proposed to measure the overall construct, this study defines Service Innovation as *any new offering introduced or adopted by a firm, manifests itself in novel process of delivering the offerings, any changes within the organization functions or in strategic decisions and in marketing approaches leading it to retain its customers or attract new customers, thereby gaining competitive advantage.*

2.4. Context

Four service industries were selected from Lovelock et al. (2004) classification. We segregated the service industries based on the action (intangible or tangible) and the type of receiver (Possession or person) which were placed in each quadrant. Following this, one industry from each cell was selected:

- (a) Service directed at Intangible Assets = Banking
- (b) Service directed at People's Minds = Education
- (c) Service Directed at Physical Possession = Retailing
- (d) Service Directed at People's Bodies = Healthcare

The fact that traditional business models have been replaced with outsourcing, automation, and digitalization has caused a rapid increase in the acceptance of services by consumers. Recent innovations in services help customers adapt to new lifestyles, comfort, socialization, advancement, motivation, and self-concept. Companies could also recognize how bringing innovation in service offerings and marketing strategies will help in the growth of business performance. According to Lazzari (2019), the demand for new services is predominant in middle-class and upper-income families. Rapid urbanization, advancement in technology, ready acceptance/less resistance towards new ideas from millennial customers, risk-taking abilities of firms, and relaxation of rules and regulation from the government are also the major reasons for frequent product/service innovations from industries (Cooke and Wills, 1999).

The digital world has paved the way for the growth of all industries with disruptive ideas. Whether it is UBER or Lyft or Ola in taxi (cab) services, or Zomato, Swiggy or Uber Eats in online food ordering connecting restaurants and customers, the service has come to the doorstep of every consumer. Measuring the customer evaluation of service innovation from service firms would benefit both academic and managerial decision-makers in understanding how customers perceive innovative services and how they value such services for each industry from different dimensions. The increase in income in all levels of the population pyramid has enhanced the necessity of banking services for all individuals in both urban and rural areas. In India, for instance, certain policies of the government, where the government directly makes transfers to individual bank accounts, have resulted in drastic increases

Table 1
Core Mapping (Technology-based) Service Innovation Typologies.

Typology	Conceptual Definition
Core Product Innovation	"New core service for markets that have not been previously defined. These core services usually include both new service characteristics and radical new concepts. or) Introducing new concepts that are completely new to the firm's customers." Lovelock et al., (2004)
Peripheral product Innovation	"Adding benefits to existing services, either for new or existing customers" Taques et al., 2021
Core Process Innovation	"improving the way a company produces a product or service" Cho & Linderman, 2020
Peripheral process Innovation	"Less innovative than process innovation but often represents distinctive new ways of delivering existing services to either offer more convenience and different experience for existing customers or attract new customers." Lovelock et al., (2004)

Table 2
Support Mapping (Non-Technology based) Service Innovation Typologies.

Typology	Conceptual Definition
Organization Innovation	"Changes introduced in planning, employment, leadership, control, facilities, which are either purchased externally or generated internally, being affirmed the contribution by organizational members" Tang, 2017).
Strategic Innovation	"Strategic innovation revolves around three key elements. a fundamental re-conceptualization of the business model, reshaping existing markets, and substantial value improvements for customers" Gebauer, Worch, & Truffer, 2012)
Marketing Innovation	"Significant changes in promotion, pricing and distribution" Taques et al., 2021)

in the opening of new bank accounts. There is an intense competition among banks in gaining new, and retaining, existing customers, leading to a drastic growth in offering value-added services in this sector. Digitized payments have created a revolution where credit cards, debit cards, online payments, and mobile transfers have increased the usage of banking services. Although banks are under financial regulatory environment of the country where it is located at, there are certain restriction and permissions to be taken to come-up with radical innovation compared to other sectors however, the incremental innovations in banking sector have shown a sizable increase in offerings compared to any other service industry, and hence the banking sector is considered as one of the contexts in this study.

The higher education system plays a major role in a nation's development by teaching specialized skills and knowledge; around 13 percent of the Indian population aged 18–23 years old are targeted in this segment. There are three levels of higher education segmentation-Graduate, Post-graduate, and Doctoral. Higher education in the country trains students creatively and intellectually in mathematics, social sciences, engineering, medicine, arts and humanities (liberal arts), law, agriculture, communication, etc., disciplines that are well accepted in the international job market (CareRatings, 2018). With a significant amount of government initiatives, support from parents, interest from students in various fields, and the thirst for learning new concepts, the Indian higher education sector plays a major role in the overall performance of the service industry.

The retail industry is one of the major industries that have significantly been transformed in recent years especially in developing countries such as India. The buying behavior of Indian customers, e-commerce, and mall culture have played a significant role in shaping this unorganized sector into an established and credible one, an important achievement given the large consumer market in India. India is considered the fifth largest destination for retail space in the world where the sector contributes to 10 percent of the country's GDP and 8 percent of total employment. Indian retail consumption is expected to reach US\$ 3,600 billion in 2020. The consumer market is expected to increase by 60 percent in total by the year 2020; many factors were identified as a reason for this strong increase such as the growth of e-commerce, technology advancement, changes in lifestyle, growth of real estates and 'third place' experience (Deloitte, 2019).

Compared to other services, healthcare services remain one of the necessities in human life; due to an increase in new infectious diseases (e.g., COVID-19) and lifestyle diseases (e.g., mental health issues), as well as expanding access to health insurance, this sector has gained importance in every-one's life. Compared to public healthcare services, private service providers play a major role, accounting for almost 74 percent of India's total healthcare expenditure (IBEF, 2019). New technologies, telemedicine, safety equipment, and affordable medicine cost have allowed every individual to get health care facilities as a necessity. Both the government of India and private hospitals are focused on improving the awareness level of the citizens on health-related issues, making healthcare one of the major industries in which customers are expecting and evaluating the level of service innovation. The enduring COVID-19 pandemic has disrupted global healthcare systems and prompted governments to invest and focus on constructing labs for testing kits and vaccines, opening testing centers in malls and airports (which remain closed due to the COVID-19 lockdown), remote patient engagement systems such as virtual rehabilitation centers, chatbox, etc. (Kumar, 2020).

3. Methodology

3.1. Code generation and purification

We follow the scale development protocols including the major item generation techniques that are seen in the well-established scales (Gupta, Aggarwal, Gupta, & Arora, 2022; Hinkin, 1995; Padmavathy

et al., 2019), focus group discussions (Cook, Kerr, & Moore, 2002; Parasuraman, Zeithaml, & Malhotra, 2005), depth interviews (Arya, Paul, & Sethi, 2022; Den Hertog & De Jong, 2007) and experts' opinions (Hardesty & Bearden, 2004; Hudak et al., 1996).

3.2. Focus group discussions

According to Zeithaml, Parasuraman, and Malhotra (2002), Dagger et al. (2007) and Bräuer, Plösch, Saft, and Körner (2018), the majority of scale development studies rely on focus group discussion for item generation. Wong (2008) noted that focus group discussion is a qualitative methodology where a small number of related participants are assembled and allowed to discuss a specific topic within a stipulated period. The researcher acts as a moderator and conducts the discussion, which is recorded and evaluated for future development. To generate the initial items pool, the researchers organized two focus group discussions for each sector and totally 8 discussions for this study (as suggested by King, Gunton, Freebairn, Coutts, & Webb, 2000; Chan, 2001; Manohar & Kapur, 2019).

The non-probability purposive sampling technique was adopted to select customers who only frequently visit the place of service delivery for focus group discussions. Generally, purposive sampling needs to be used for qualitative research because there is a need for discussion about the construct from various dimensions, and the customer needs a good experience of the service offered by the firm (Palinkas et al., 2015).

Since the scale is perceived service innovation, the sample unit were the customers of these service sectors such as students pursuing final year in graduation and post-graduation studies, customers who visit banks at least once a month, customers who visit retail stores at least once a week and patients using the hospital services (public/private) frequently for the previous calendar month. Geographically, the study areas were the southern Indian cities Bangalore, Chennai, and Vellore.

Prior studies (Charmaz, 2006; Creswell, 1998) have suggested that the time frame, number of participants in the focus group, and number of discussions to be conducted for qualitative study are difficult to determine as they vary from one study to another. The general rule of thumb is the saturation limit; when the moderator feels that no new information can be generated from the discussion, the discussion can be concluded.

There were 84 customers participated and discussed based on the semi-structured questionnaire. It was identified that most of the existing literature (King et al., 2000; Parasuraman et al., 2005) used two focus group discussions to identify grounded information about the construct. Under each focus group, the number of participants varied from 9 to 12, the sample size for each group was based on the availability of frequent users, which satisfied the minimum threshold limit for focus group discussions stated in earlier literature (Carlsen & Glenton, 2011; Chan, 2001).

The questions (Engagement, Exploration, and Exit) in the semi-structured questionnaire are formulated based on the research problem where the target audience is taken through "soft laddering techniques" (a process adopted by the moderator to elicit the association of the discussed topic from the audience's cognitive structure). Special permission was obtained from three colleges in Vellore, Bangalore, and Chennai to use their discussion rooms as the venue for conducting the focus group sessions.

Kitzinger (1995) noted that in general, a focus group must satisfy three major conditions: (a) minimum age difference of the participants in a single discussion, (b) no gender discrimination, and (c) no power discrimination (equal cadre or levels). Sample selection for this study is presented in Table 3.

During the discussion, the moderator found that customers gave more information on both product and process innovation followed by marketing, organization, and strategic innovation. The transcription process was done by the moderator, converting voice into words. The total number of codes generated during focus groups for the higher

Table 3

Focus Group Discussion Sample description.

Industry	Sample Frame	Sample unit	Sample Area	Sample size	Iterations/discussions	Duration	Age and Gender
Education	Students	Higher education in management/engineering/arts and science	Chennai and Bangalore	12 and 11 students each	2	Video Recording ranging from 64 min to 96 min	Classified as Youngsters, middle-age and elders.
Banking	Customers	Private/Public sector customers	Vellore and Chennai	9 customers each	2		No discrimination in gender, participants were selected based on availability and interest
Retail	Customers	Customer who have visited and made a purchase from organized retail stores	Chennai and Bangalore	11 and 12 customers each	2		
Health care	Patients/Caretakers	Private/Public multispecialty hospitals	Vellore and Chennai	10 patients/caretakers each	2		

education industry was $n = 161$, banking $n = 205$, retail sector $n = 174$, healthcare sector $n = 126$ (where $n =$ number of codes).

3.3. Triangulation process through in-depth interview

The concept of triangulation is widely discussed and highly recommended by seminal literature and helps in mitigating any researcher bias (Denzin, 2017; Fusch, Fusch, & Ness, 2018). In this study, to validate the codes derived from the focus group discussion, the authors have implemented an in-depth interview method, approaching the industry perspective to gain an understanding of consumers' perceived notion of innovation.

According to Duncan and Morgan (1994), although focus group discussions yield detailed information, it is critical to conduct in-depth interviews to understand the topic chosen. The new codes that evolved in in-depth interviews are added to the list of codes generated, numerous qualitative approach studies have combined the codes generated by two different methodologies (Duncan & Morgan, 1994; Michell, 1999; Eysenbach & Köhler, 2002; Shaw, Grehan, Shiu, Hassan, & Thomson, 2005).

The in-depth study method also adopted the procedure of soft laddering where experienced field experts were chosen with a minimum of 10 years of experience in that specific industry. Two middle-level managers and one top-level decision-maker from each industry were shortlisted based on their depth of knowledge and availability, Table 4 details the sampling procedure for in-depth interviews.

The interviews were voice recorded and the moderator laddered the questions related to typologies of service innovation where no specific time limit was given for each typology; the interview moved from one typology to another and ended completely when the moderator experienced the occurrence of saturation. It was noted that most of the codes generated in both the methods were similar, which resulted in 124 codes for Education, 119 for Banking, 155 for Retail and 108 for Healthcare. Removing duplicates, the final set of codes received after the item generation steps were- Education: 90, Banking: 99, Retail: 123, Healthcare: 104.

Table 4

Details on In-depth Interview.

Industry	sample	Demographic Details				Procedure
		Age	Gender	Area	Position	
zEducation	3	Age ranging	No gender discrimination.	Major cities in the southern part of India namely Chennai, Bangalore, Puducherry, and Vellore.	Decision-makers at the strategic level and implementers at the operational level.	Soft laddering, no time-bound, semi-structured interview, saturation limit. Voice recording, thick transcriptions, identifying codes.
Banking	3	a) 30–40 as young	Selected on interest, availability, and minimum of 10 years of experience in the industry			
Retail	3	b) 41–50 as middle age				
Health care	3	c) 50 and above as elder				

3.4. Experts' opinion: Item purification

According to Richins and Dawson (1992), removing the irrelevant items is necessary to arrive at a manageable set of items for the constructs. Hardesty and Bearden (2004) use of experts' opinion in scale development improved the face validity of the measures. It would be appropriate to remove those codes that are irrelevant to the context through experts' suggestions rather than to take all items to the validation test for two major reasons: (1) dimension reduction is not possible at the validation stage and (2) respondents feel that the data collection instrument is too large to answer which leads to response/non-response error. The addition or removal of items can be done based on experts' suggestions (Hudak et al., 1996).

Two levels of expert opinion were sought where the first level helped in dimension reduction and the second level helped in item confirmation. For both surveys, the experts (Table 5 above) were from five different continents. The questionnaire (that included the operational definition of the construct, typologies in columns, and codes in rows) was conducted through mail, space was provided for inclusion, exclusion, and addition of new codes for the experts. The shortlisted experts were both academicians and industry practitioners.

Table 6 illustrates how the codes were placed by experts from each industry after two levels. The table also clarifies the number of codes under each typology after the purification stage. The final set of codes obtained for each typology after two levels of expert opinion surveys are verified by the authors to find the commonality among the codes within the specific dimension. This is done to confirm that there is no code added to the repetition of the existing codes by the experts.

3.5. Scale generalization

The next step followed the generalized service innovation scale to find the code commonality among four industries and convert the code into items Allen, Kilgus, Burns, and Hodgson (2019), following the existing generalization procedure seen in prior studies (Parasuraman, Zeithaml, & Berry, 1988; SERVQUAL) and statement writing technique (Clark & Watson, 1995; Padmavathy et al., 2019; Alagarsamy, Mehroli,

Table 5
Expert's Details.

Industry	Expert Opinion 1	Expert opinion 2
Higher Education	1. Professor A University in the USA)	1. Professor A university in the USA)
	2. President A Business School in Bangalore, India)	2. Professor Medical college in Vellore, India)
	3. Executive Director, A University- Chennai, India)	3.Professor Indian Institute of Technology, India)
	4. Professor only suggestions received) Business School in Belgium)	
Banking	1. Professor Private Institute, Rwanda)	1. Vice President, Private Bank - India)
	2. General Manager Nationalized Bank - India)	2. Divisional Manager, Nationalized Bank - India)
	3. Zonal Manager, South Nationalized bank- India)	3. Branch Manager Private bank- South Australia)
Retailing	1. Professor Management Institute - India)	1. Area Head XXX Hypermarkets Australia)
	2. Store Manager chain of garments store - India)	2. Head – Office Depot, Private Retail ltd- India)
	3. Store Manager chain of Mobile stores - India)	3 Store manager, Chain of a supermarket –India)
Health care	1. Professor Medical College - India)	Dean, Private Hospital, India
	2. Associate Professor Medical College - UK	Quality control Head, Private hospital, India
	3. Associate Professor Medical College – India	Administration head, Private Hospital, South Africa

& Paul, 2022). According to Clark and Watson (1995), the language must be simple, straightforward, and appropriate for the reading level of the target audience, and special care needs to be taken to remove double-barreled items.

The study followed the Delphi technique, giving codes to respective subject experts and the authors moderated the entire event. The items were finalized after 3 iterations and each typology was handled exclusively. The procedure is explained below as a flow chart (Fig. 3).

The total number of items after generalization was 41. Though negative (reverse) statements signify the validity of the scale, the inclusion of those statements was not considered in this study to reduce response bias (authors believed that in general, the respondents' cognitive response would be towards positive statements).

Table 6
Expert Opinion Survey based Codes under each typology after level 1 and 2.

Service Innovation Typologies	Higher Education		Banking		Retailing		Health Care	
	Level 1	Level 2	Level 1	Level 2	Level 1	Level 2	Level 1	Level 2
Core Product Innovation	4	6	9	12	8	7	12	10
Peripheral Product Innovation	16	10	11	7	9	7	11	9
Core Process Innovation	8	9	6	9	9	10	16	14
Peripheral Process Innovation	17	17	25	24	16	15	14	14
Organization Innovation	23	21	21	15	27	27	18	18
Strategic Innovation	11	11	15	11	21	22	13	13
Marketing Innovation	8	7	12	9	18	18	10	8
Total	87	81	99	87	108	106	94	86

3.6. Item validation

The validity part of the study is done through different stages, initially the items had undergone the expert opinion survey to justify content/face validity, later the construct validity was defended based on the existing literature review as the typologies and definition were taken from previous service innovation literatures. To prove the convergent validity and discriminant validity the study adopted both Principal Component analysis (PCA) and Confirmatory Factor Analysis (CFA). Two different sets of customers were approached for performing PCA and CFA. For PCA new set of samples in higher education sector and for CFA in travel and tourism sector.

In the higher education sector 250 questionnaires were distributed among students of which 223 were received and after the process of cleaning 209 student's opinions were taken for analysis. The results on reliability and PCA analysis help to understand the process of removing items that showed poor correlation with sum of other items and those items that were with poor loadings and the items with two factors loading.

On checking the internal consistency (Table 7) the values varied from 0.721 to 0.830. According to Nunnally (1978), an alpha of 0.7 or higher is considered as a sign of satisfactory internal consistency thereby all the items with the respective typology have high correlation and no items were removed at this stage (Bentler, 2009; Cronbach & Meehl, 1955).

Through PCA, the study used factor loading scores, total variance explained scores to estimate the convergent validity of each construct. Those items with loadings lesser than 0.7 in a single construct and items not contributing to the overall variance explained are removed from the study (Table 8). The minimum threshold for total variance explained is > 50 %. The test for convergence helped in item removal. The final scale with 22 items satisfied the validity for convergence.

It was noted that all the typology recorded the TVE value above the cutoff value TVE > 0.50. The final 22 items scale received from PCA was taken to the next stage of CFA, a new questionnaire was prepared in the context of the travel and tourism sector. In total 350 questionnaires were distributed among the respondents who were frequently using the website or mobile application of the service providers such as MakeMyTrip, Yatra, Goibibo, etc. in India. After cleaning and removing unfilled questionnaires finally 308 samples were taken into consideration for item validation.

3.7. Establishing the dimensionality of service innovation through CFA

Through CFA, to test the measurement model two layers of constructs are considered abstract level and concrete level. The first layers contain the concrete level typologies/ Lower Order Constructs and the second layer the service innovation itself, which is a Higher Order Construct (Anderson et al., 1987). According to Hair et al. (2011) higher order model helps in reducing the structural model and specifically for formative constructs the higher order model helps in eliminating the collinearity issues. In this study the direction of causality for higher order models is formative because it is perceived that the seven typologies represent service innovation and the items measuring the

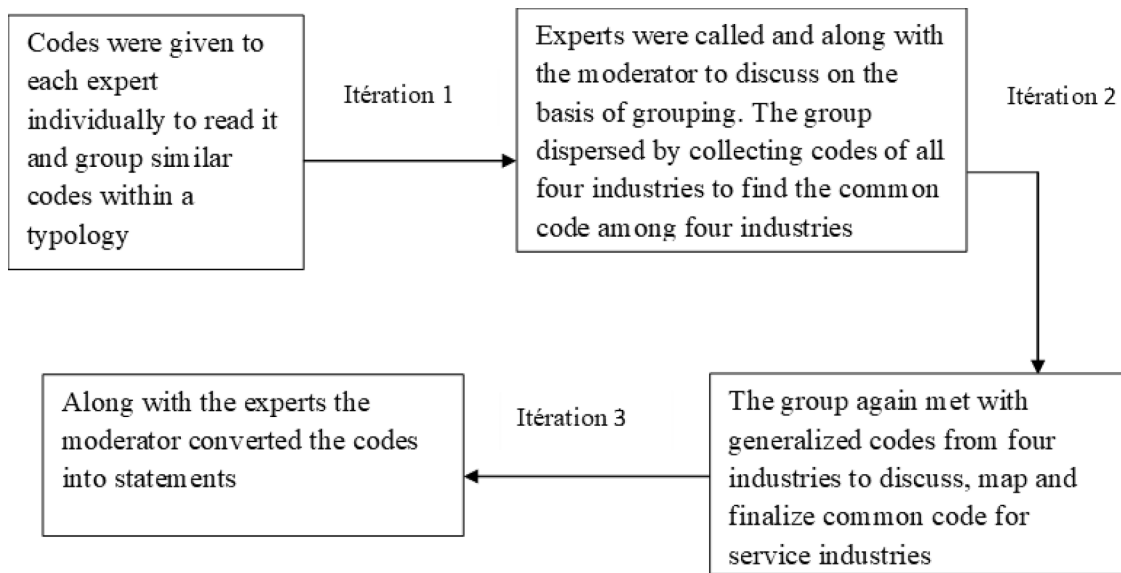


Fig. 3. Scale Generalization Procedure.

Table 7
Internal consistency of each typology.

Typologies	Cronbach's alpha before Validation
Product Innovation	0.731
Peripheral Product Innovation	0.795
Process Innovation	0.713
Peripheral Process Innovation	0.749
Organization Innovation	0.830
Strategic Innovation	0.722
Marketing Innovation	0.721

typologies are generated by inquisition customers by defining each typology and it is reflective. Overall, the measurement model in this study is *reflective formative measurement* model.

The one-dimensionality can also be confirmed through model fitness where the measurement model is said to be fit if any one of the fit indices of (a) Absolute fit measures (b) Incremental fit measures (c) parsimonious fit measures is above the threshold value. The fit indices results using the LISREL software tool is given in Table 9 below.

For absolute measure, initially, the value of Chi square (χ^2) = 1931.04 and df (degrees of freedom) = 798 is compared and the chi-square value is within three times the df and hence it is an acceptable fit. Secondly, the RMSEA value is 0.064, which is lower than the

threshold value of 0.07 and hence the model is “good fit”. Thirdly, the GFI = 0.91 which is >0.90 thereby the model shows a good fit. Finally, the obtained value of RMR = 0.074 and SRMR = 0.066 is within the threshold (values ≤ 0.08 for RMR and SRMR) specified by Hu and Bentler (1995), Schermelleh-Engel et al (2003) and Jarvis et al (2003). Thus, the result indicates that the measurement model is fit with respect to the absolute fit index.

The incremental fit index is verified where the value of CFI = 0.97 which is equal to the threshold value of 0.97 thereby proving absolute fit. The value of NFI = 0.94 is greater than the threshold limit of 0.90 to prove it is an acceptable fit and TLI = 0.97 is equal to the cutoff value of 0.97 indicating the absolute fit. All the three fit indices in this study related to measures developed for typologies of service innovation were accepted to prove that the overall model is fit with incremental fit index.

For the Parsimonious fit index, AGFI (0.89) which is greater than cutoff value 0.85, PNFI (0.86 is closer to 1.00) and normed chi-square (2.42 where the value is between 2 and 5) was accepted to indicate that the model is good fit. Finally, the reliability, convergent validity and discriminant validity was checked to justify the final scales were reliable and cleared the validate test.

This study once again ensures reliability of the measurement scale through internal consistency and validity through convergent (AVE) and Discriminant (Discriminant Scores). From Table 10 the obtained values

Table 8
PCA Results for each typology.

Typologies	Total No of Items	No of the Items deleted less than 0.7 loadings)	No of Items Retained	Total variance explained	Deleted Items
Product Innovation	2	0	2	73%	0
Peripheral Product Innovation	5	2	3	74.64%	4 and 5
Process Innovation	6	3	3	70.24	1,2 and 3
Peripheral Process Innovation	8	4	4	60.82%	1,2,7 and 8
Organization Innovation	10	6	4	65.59%	1,2,5,6,7,8
Strategic Innovation	6	2	4	52.21%	2,4
Marketing Innovation	4	2	2	92.80%	1,2
Total Items	41	19	22		

Table 9
Fit indices for measurement model.

Fit indices		Banking	Overall acceptance
Absolute fit measures	Chi square χ^2	1931.04	Accepted fit
	Df	798	
	RMSEA	0.064	Good fit
	GFI	0.91	Good Fit
	RMR	0.074	Accepted Fit
	SRMR	0.066	Accepted Fit
Incremental fit measures	CFI	0.97	Absolute fit
	NFI	0.94	Accepted fit
	NNFI/ TLI	0.97	Good fit
Parsimonious fit measures	AGFI	0.89	Accepted
	PNFI	0.86	Accepted fit
	χ^2 / df	2.42	Good fit

satisfy the minimum threshold (Alpha ≥ 0.7) and AVE score > 0.50 for basic research.

The discriminant value is calculated by taking the square root of AVE and the discriminant validity is ensured if the discriminant value is more than the value obtained through correlation between the latent variable based on [Fornell and Larcker \(1981\)](#) method.

From the above [Table 11](#) we can note that the discriminant value for all typologies is greater than the correlation of the respective typology with all other typologies ensuring that the items within the typology are discriminant in measuring unrelated constructs.

3.8. Final scale items

The survey instrument ([Table 12](#)) is developed to measure Service Innovation in the service industry, “AAA” of each statement can be replaced with any service firm which you frequently engage and transact with: *for example*, if it is an educational institution, then read “AAA” as “my university/college”; if it is retail then read as “this retailer”; and if it is a bank, then read as “my bank”.

4. Discussion and conclusion

Instrument design is one of the major components of an empirical research project. A reliable and valid instrument helps the researcher to accurately measure the unobserved construct and generalize the results. Many researchers adopt an existing scale to measure the concept and context of their study, creating a significant necessity for scale development studies because the opinions of the respondents cannot be directly measured. There needs to be a precise stimulus question that can capture the appropriate opinion clearly without any kind of measurement error. The measurement tool also plays a major role in moving from a qualitative to a quantitative study. Although existing studies have developed measurement scales for every respective concept in their domain, the common or unique scale is still questionable because of numerous reasons, including socio-economic, operationalization of the construct, emerging latent variables, etc.

Although theories and approaches propose specific scales to measure service innovation, measuring the unobserved construct remains a problem. Existing scales are industry-specific, uni-dimensional, and more inclined towards manufacturing industries, a fact that motivated

Table 10
Establishing Reliability and Convergent validity through AVE.

AVE after deleting)	Cronbach's alpha after deletion of items
0.73	0.746
0.74	0.830
0.68	0.785
0.6	0.774
0.65	0.823
0.52	0.702
0.92	0.922

this study to develop a unique measurement tool. [DeVaus \(1986\)](#) indicated that a scale must be able to measure a concept in multiple dimensions and indicators which helps in evaluating the complexity of the concept. Similarly, [Green, Adams, and Turner \(1988\)](#) noted that a multi-dimensional scale accurately measures a concept, the similarities, and differences. This study developed a process to be followed for scale development adapting existing scale development literature, contributing new item generation, purification, and generalization.

The innovations in product/process (technology innovation) have shifted the services industry to an advanced level especially in collaboration with various other service providers in India, which existing studies termed as multichannel marketing: for example, in the hospitality industry, ordering of foods using online applications such as Zomato, Swiggy, and Uber Eats where the customer can directly pay the bill through remote bank transactions ([Kampani & Jhamb, 2021](#)). Similarly, Bookmyshow, Ticketmaster, and Ticketnew applications allow customers to book movies and theater tickets using online payment platforms. Such applications are prevalent not only in technological innovations but also in non-technological innovations such as organization innovation (free customer support, expert advice, preferred seat booking, ordering food and snacks in advance), strategic innovation (collaboration with organizations to bulk booking during new movies releases, bringing advance technologies such as 5D theater surroundings), and marketing innovations (recommending upcoming movies to customers based on previously demonstrated preferences, using digital platforms to promote, special offers and discounts and guerrilla marketing techniques). Similar types of innovations can be observed in services such as the retail industry: for example, e-commerce players such as Amazon, Flipkart, and Myntra have utilized technology and optimized the purchase process, leading to enhanced buyer experiences. Service innovation has played a major role in non-technology contexts including improvements in atmospherics, servicescape, ideal product assortments, creating virtual or physical stores, and so on.

Innovation has played a huge role irrespective of the service sector. Examples include new ventures such as Urban Clap for tangible services and OYO and AirBnB for accommodation bookings. Most industries are trying to attract new customers or retain existing customers by bringing either disruptive or sustaining innovations into the market or radical/incremental innovations concerning services/products. As marketing continues to shift from traditional to progressive, it relies on customer relationships, consumer communities, and customer lifetime values. The government of India with the help of “Aadhaar” (Unique Identification Authority of India), made the opening of bank accounts much easier and enhanced usability, however innovation in the banking sector is unavoidable given that post-millennial customers are keen to engage with organizations that frequently develop innovative strategies, loyalty towards service providers is diminishing drastically, thereby commanding “Innovate or Perish – I have someone else to provide better service” ([Ganesan & Sridhar, 2014](#)), the rapid growth and popularity of the online bank Monzo demonstrates this. The outcome of this study supports the proposition that those who innovate earn a good reputation which leads to word of mouth recommendations to others in the community. Earlier studies in the marketing domain primarily focused only on technology innovation (assimilation approach), the results of this study indicate that the service sector needs to adopt both technology and non-technology innovation (synthesis approach).

There are several implications of this study in terms of both theoretical and managerial contributions. Existing service innovation literature offers a generalized, multi-dimensional scale that can measure the unobserved construct in any service industry from concrete to pure services. The usage of this scale would enable researchers to prove conceptual theories empirically. The newly developed scale is unique as the authors add the service sector to test the effect of innovation from the customer perspective. The uniqueness of this scale is that technological innovations and opinions on non-technological innovation are measured. Researchers who work on testing the financial and non-

Table 11
Establishing Discriminant validity Table.

	Product Innovation	Peripheral Product Innovation	Process Innovation	Peripheral Process Innovation	Organization Innovation	Strategic Innovation	Marketing Innovation
Product Innovation	0.85						
Peripheral Product Innovation	0.52	0.86					
Process Innovation	0.39	0.59	0.82				
Peripheral Process Innovation	0.46	0.62	0.64	0.77			
Organization Innovation	0.53	0.71	0.67	0.55	0.81		
Strategic Innovation	0.34	0.45	0.32	0.50	0.49	0.72	
Marketing Innovation	0.22	0.30	0.26	0.25	0.31	0.44	0.96

Table 12
Perceived Service Innovation Scale.

Item Code	Core Service-Product Innovation
CPI1	AAA introduces new services
CPI2	AAA continuously introduces technology-based new service products/offerings
Item Code	Peripheral Service- Product Innovation
PPI1	AAA always offer value-added services with its main services
PPI2	AAA develops its existing services with new features
PPI3	AAA modifies its existing service from time to time
Item Code	Core Process Innovation
CPsI1	AAA introduces technologies for self-services
CPsI2	AAA constantly provides an online interface for accessing its services
CPsI3	AAA shares service related information using new approaches
Item Code	Peripheral Service-Process Innovation
PPsI1	AAA provides new experience by improving its service demonstration facilities
PPsI2	AAA continuously bring new features in its self-service technologies
PPsI3	AAA continuously upgrades its self-service technologies
PPsI4	AAA improves the procedure for service delivery
Item Code	Organization Innovation
OI1	AAA makes its customers comfortable during the service delivery process
OI2	AAA enhances its security with advanced systems
OI3	AAA opens refreshment centers within its premises
OI14	AAA is unique in providing entertainment during service purchase
Item Code	Strategic Innovation
SI1	AAA encourages customer participation in developing its services
SI2	AAA takes initiative to provide after-sales services/ follow up services
SI3	AAA is accredited by national and international bodies for quality improvements
SI4	AAA continuously engages in CSR corporate social responsibility) activities
Item Code	Marketing Innovation
MI1	AAA promotes its service differently
MI2	AAA reaches me through multiple channels like websites, stores, mail order, mobile etc.

Note: the abbreviations are CPI – Core Product Innovation, PPI – Peripheral Product Innovation, CPsI – Core Process Innovation, PPsI – Peripheral Process Innovation, OI – Organization Innovation, SI – Strategic Innovation, MI - Marketing Innovation.

financial performance of service firms must incorporate service innovation as one of the major driving factors for market performance and competitive advantage. The multiple typologies enhance the accuracy of locating the appropriate concepts to be focused on building the overall latent construct. The process of scale development provides future scope for the researchers to develop such scales in their domain. The scale could be developed for further testing and validation in various other service sectors such as the hospitality, legal, and transportation industries where such studies are limited.

The unique nature of this scale is that it could specifically measure

both technological innovation and non-technological innovation typology wise. The scale is further developed considering each industry from one quadrant classification provided by Lovelock (1983) and hence the scale is wide applicable across different nature of services be it concrete or pure.

One of the future scopes is to test for nomological validity. The future researchers can adopt the scale and test the effectiveness on outcome performance. This helps in estimating the predictive nature of the structural model as this study estimated only the measurement model. The process adopted in the development and validation of perceived

innovation scale is in line with existing well-established scales like SERVQUAL and its predictive ability can be justified in building structural models.

For managers, the scale is a tool to understand customer needs and expectations. This scale can be either incorporated during the service co-development process or examined during the post-purchase behavior estimation process. The multidimensional latent variable measurement scale is most appropriate and helpful for managers to estimate customers' perceptions of their new services to help in building long-term relations, brand, reputation, and satisfaction. As Lovelock (1983) classified for service firms, both extremely tangible and intangible services, and regardless of whether the service is for the people or their possessions, this scale would estimate every attribute (technological/ non-technological) from the customer's perspective and give the managerial decision-makers an overall progress indicator to compare with their competitors.

To conclude, we developed a new generalized measurement tool for service innovation from customers' perspective that will assist service firms in understanding how customers evaluate innovation in terms of technological as well as non-technological aspects. The study adopted standard scale development procedures which generated new items and purified using qualitative techniques. The new seven typologies with 41 items scale contribute to both researcher and managerial decision making across service sectors to include the estimation of the latent variable, which was not available in earlier literature in this domain. Existing theoretical models in service innovation can also be empirically estimated using this scale, therefore contributing substantially to services industries literature.

CRedit authorship contribution statement

Sridhar Manohar: Investigation, Formal analysis, Data curation, Conceptualization. **Justin Paul:** Writing – original draft, Supervision, Formal analysis, Conceptualization. **Carolyn Strong:** Writing – review and editing, Visualization, Supervision. **Amit Mittal:** Conceptualization, Validation, Methodology.

Declaration of Competing Interest

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

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Further reading

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