

A Model of Antecedents for the Co-Creation of Value in Health Care: An Application of Structural Equation Modeling

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ABSTRACT

There is a lack of empirical studies to understand the creation of value in the context of health services. This research proposes a model with three antecedent variables (flexibility, responsiveness and co-innovation) and an outcome variable (co-creation) to be analyzed by the partial least square method (PLS). Four vignettes were built from the literature review, validated by experts, in order to capture the perceptions of respondents about the actions of the protagonists in scenarios on the value of co-creation in a health service. The assumptions of the model were tested empirically through a survey of 225 health professionals in São Paulo (nurses, nursing technicians and physiotherapists). The results support the hypotheses that flexibility is positively associated with the responsiveness and co-innovation. Also there was a positive association with the responsiveness co-innovation and co-creation. There was support for the positive association between co-innovation and co-creation, however, in that context, a direct association between flexibility and co-creation has not been verified. The research contributes to a better understanding of background variables that amplify the value co-creation capacity in health services.

Keywords: Antecedent variables. Value co-creation. Partial least square. Health services.

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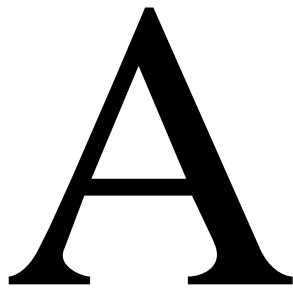
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1 INTRODUCTION



customer, under a traditional perspective, is seen as a passive recipient of the companies (PAYNE; STORBACKA; FROW, 2008). However, since the emergence of globalization and the spread of information through the internet, customers are increasingly taking an active and reflective role in today's society (UEDA et al., 2009). In addition, patients are increasingly taking a position to participate in decisions about their health, in an active and reflexive style (MCCOLLKENNEDY et al., 2013).

For purposes of this survey, the expression “customer of health services” will be used to replace the term patient.

Creating unique experiences of value for customers seems to be the goal that drives the market in the twenty-first century. Yet despite the recognition of the importance of customer experience by practitioners, the academic marketing literature investigating this topic has been limited and, in general, these publications tend to focus more on managerial actions and outcomes, than on the theories underlying the antecedents and consequences of customer experience (VERHOEF et al., 2012).

Businesses should direct a look at the environment beyond its borders to understand the customer experience and thus, achieve an innovative source of competitive advantage in the new economy (PRAHALAD; RAMASWAMY, 2004). However the literature that examines the mechanism of interaction between the constructs that permeate the customer experience of the healthcare service is still in the early stage (ZHANG; CHEN, 2008), including the Brazilian academic scene.

In Brazil, the academic literature on the co-creation of value is scarce and incipient. The first work dates back 2009, presented by Moraes and Manzini in the IV Meeting of Studies on Strategies of ANPAD. Only one in six studies published since then (CAMARINHA; COSTA; VIEIRA, 2013) explored the dynamics of value co-creation in the healthcare sector between the stakeholders of five health insurance companies in São Paulo.

With the rapid growth of online social networking for health, health care systems are experiencing an inescapable increase in complexity. Social networks composed of patients and their social circles can compete with, or complement, professional networks in assembling health-related information of value for improving health and health care. Patients are using social networking to access and contribute health information. Patient-doctor

encounters are now more permeable to influence from social networks and professional networks. Social networking has the potential to change patterns of health inequalities and access to health care, alter the stability of health care provision and lead to a reformulation of the role of health professionals (GRIFFITHS et al., 2012).

The customer experience construct is holistic in nature and involves the customer's cognitive, affective, emotional, social and physical responses to the retailer (MEYER; SCHWAGER, 2007). Patient satisfaction is a critical part of the quality outcomes of healthcare. The evaluation of overall quality of care, willingness to recommend and willingness to return are unique constructs; patient reactions (experiences) to different hospital care attributes (factors or dimensions) influence these dependent variables (OTANI, 2010).

On the other hand, health care workers' beliefs, attitudes, and behavior can have a major effect on patient participation to make decisions. One of the reasons for the rejection of the health professionals is the attitude in giving up the old traditional fatherhood standard on healthy assistance and change to the co-creation paradigm. There are other obstacles that may hinder the changing between the relation patients-healthcare staff archetypes, such as social rules that define a passive attitude to the patient and an organizational culture for not getting feedback from patients (LONGTIN et al., 2010).

The co-creation of value with the customer does not occur in a vacuum. On the contrary, the co-creation occurs within social systems in which a person can learn, adapt and make choices based on their perceptions on the construction of social reality. The construction of meaning (sense-making) implies social interactions as well as the identification of roles and positions of the actors within the social system (EDVARDSSON; TRONVOLL; GRUBER, 2011).

Prahalad and Ramaswamy (2004) described a shift of competences for a customer community network and a global network of talent outside the company domain.

The customer experience has become central to the company create value. The customer wants to define choices to reflect their perspectives on values. These changes in business environments and society were named co-creation of value - a process for developing systems, products or services through collaboration among costumers, managers, employees and other stakeholders (RAMASWAMY; GOUILLART, 2010).

In a broad perspective, this research focus on a set of contextual background and provisions which may facilitate or hinder the engagement of health professionals with the

change of paternalistic paradigm on customer support of health services to the archetype of an active and thoughtful customer, interested in co-creating values on the managed care about health.

Resuming the affirmative of Berry and Bendapudi (2007) that the customer archetype of the passive health services is dominant, and considering the gaps in literature on the implementation of practices that facilitate and increase the amount of co-creation processes (KARPEN; BOVE; LUKAS, 2012), this research questions:

What antecedent variables are associated with health professional's attitude regarding the experience of the value of co-creation in a health service?

The objective of this study is to test a theoretical model that relates antecedent variables for the co-creation of value in health services, limited to a geriatric service in São Paulo, in the first half of 2014.

This work does not intend to exhaust the particularities surrounding the value co-creation, but raise issues to instigate academic research on the topic in the health services. Its structure consists of four sections, including this introductory section. The next section is a literature review on the antecedent variables for the co-creation of value systems and presents the theoretical research model. The third section conceives the methodology used. The fourth section presents the main results, while the fifth section presenting the final considerations.

2 LITERATURE REVIEW

The concept of readiness has been applied in several studies in the academic literature and sets the state of one who is prepared to act quickly as the circumstantial needs. The concept of readiness becomes more difficult to apply when the focus of attention is directed to the organization level rather than the individual level. There are studies that direct the focus on people's readiness, business and technological resources, for example, organizational readiness factors. Research on the organizational level in readiness provide partial phenomenon explanations, so it is unlikely to be developed into a framework that unifies all readiness perspectives of a particular construct, for example, readiness for innovation (YEN et al., 2012).

This research directs its focus to the readiness of frontline professionals (nurses, nursing technicians and physiotherapists) regarding the implementation of the value co-creation in hospital services.

Customer expectations for service can be analyzed, among other factors, by the employees' behavior. The ability of an employee to express and to identify a service depends on the extent of their knowledge about the service values in which it works and its ability to demonstrate these values in their beliefs and actions. It's important, therefore, for an organization to develop employees' attitudes and behaviors consistent with their values. The joint effort between the organization and its employees, from that perspective, implies a streamlined service experience with the promises of the organization and customer expectations (XIONG; KING; PIEHLER, 2013).

Within the hospitality industry, as well as in the health industry, the end service is co-created by customers and employees. Thus, the employee is a conduit for the establishment of relations between the customer and the organization. In fact, the employee's performance while performing the service provides immediate evidence to the customer about the organization and its brand. This has important implications on how customers will relate to the organization (XIONG; KING; PIEHLER, 2013).

The dominant logic service implies that service is the basis for understanding the co-creation of value with the customer, as it is not about tangible resources. The service provided through tangible resources emerges through skills representing primary inputs (operant resources) (VARGO; LUSCH, 2004).

The operands resources are those that undergo an action to create value (for example, an ultrasound machine), while the operative features are those that will act on the operands resources to create value (for example, knowledge of how to operate the ultrasound apparatus).

In a service network, some features will be transformed to generate value. These features, in the language of the logic of the dominant services, are called operand resources or competences (goods, natural resources, money etc.). Also, in the processing of operands resources a network of actors use external resources, called operant resources or capabilities (knowledge, skills, etc.) (VARGO; MAGLIO; AKAKA, 2008; CALLAWAY; DOBRZYKOWOSKI, 2009). The co-creation, then, can be defined as the extent to which a network of actors exchange expertise (goods, natural resources, money etc.) to develop the required skills (knowledge) (CHAKRABORTY; DOBRZYKOWSKI, [s.d.]; VARGO; LUSCH, 2004).

The customer integration in the co-creation of value requires frequent coordination because of the uncertainties and the heavy reliance on new information from customers. In this context, it emerges the need for flexibility, considering the changes in customer needs, the advances of technology and fierce competition for a position in the market (ZHANG et al., 2012). Flexibility is the ability of an organization to manage the uncertainties effectively in its operating environment (WANG; MASINI, 2009).

For the healthcare service customer, value means co-creating experience with the health professional, a treatment modality that takes into account their particular circumstances. Not merely the type of medication, the hospital itself, the sophistication of equipment for diagnosis or treatment, nor the professional expertise, etc. (PRAHALAD; RAMASWAMY, 2004).

Consider, for example, a couple who has a one-year-old child. Both work and leave the child in day care during working hours. The child falls ill and the parents take the child to the emergency service. The doctor diagnoses an infection in the middle ear and properly prescribes an antibiotic to be taken every 8 hours for 10 days. The family has no one to look after the child and the daycare is not able to administer the medication. Thus, a parent must be missing for 10 days on the job to administer the medication to the child. The doctor's solution, although technically correct, does not take into account the particular circumstances of the couple and its impact: 10 days of work leave for one of the parents.

In the value co-creation context, doctor and parents could choose together a treatment modality that best suits the couple's circumstances. This same infection for instance, could be treated with another type of antibiotic, given in a single dose. The child could return to day care the next day, and parents would not interrupt their work routine. Between these two treatment modalities, other possibilities arise, such as antibiotics once daily for three days or 12/12 hours for 07 days. In both solutions the child could receive antibiotics before and or after going to day care.

The flexibility creates a basis that supports the promises of better services, so that enables the organization to quick responses in capacity adjustments on the production line, the change of design and mass customization. In other words, the ability of service concerns the organization's ability to identify what customer value is as it interacts with the organization itself and also the ability to use the customer to identify new forms of value. Flexibility, in turn, is the ability that makes it possible to deliver the service promise, combining the

functional characteristics of the product or service to fulfill the customer's personal experience. Flexibility is positively associated with service capacity (ZHANG et al., 2011).

Service innovation is a set of practices to create value for stakeholders (customers, employees, shareholders, partners, communities, government, etc.) through improvements or new service proposals, service processes and models of business services (YEN et al., 2012).

There is a new paradigm to the innovation construct, co-innovation, which copes with new ideas and approaches from various sources, both internal and external, integrated into a platform for creating new organizational and shared values. The core of co-innovation includes engagement, co-creation and compelling experiences for the creation of value (LEE; OSLOM; TRIMI, 2012).

Based on the arguments above, the following hypothesis is proposed:

Hypothesis 1. Flexibility is associated directly and positively to co-innovation in health services.

Flexibility also helps to improve the delivery of products or services (ZHANG et al., 2012). In the value co-creation system, the organization becomes a hub (central and most important part of a place or activity) of value creation with great flexibility. Customizing prolonged times, in general, results from distortion of information and waste of resources (including waste of time). Flexibility accelerates the organization's response time to changes in customer demand, as well as modifying the design of operations and logistics (WIND; RANGASWAMAY, 2001).

The World Health Organization defines responsiveness as the extent to which health systems meet the legitimate expectations of users in relation to the non-medical aspects of health care (DARBY et al., 2000). The construct is related to user perception of how health services deliver the elements that are not directly related to health or disease, such as: agility to service (delays in care, waiting time to be served, frequency of delays, etc.); information and communication (easy to make complaints, easy to get information, etc.); and facilities (cleanliness and comfort sites) (ANDRADE; VAITSAN; FARIAS, 2010).

Flexibility can meet diverse customer demands. This enables the organization to the use of critical resources to produce exactly what the customer needs. Given that flexibility means rapid response to changes in customer demand, it requires rapid changes in product configuration and services, the volume of distribution in design changes. Flexibility provides

agility to the organization to provide exactly what the customer demands (ZHANG et al., 2011).

Therefore, the following hypothesis is proposed:

Hypothesis 2. Flexibility is associated directly and positively to the responsiveness of health services.

The customerization is a value co-creation engagement strategy with customers (WIND; RANGASWAMY, 2001). It brings together the mass customization and elicitation (process of obtaining information or someone's reaction) information on the individual customer demand during interactions with the organization (WIND; RANGASWAMY, 2001; PINE; PEPPERS; ROGGERS, 1995).

An organization able to elicit information about the customer's needs and specific preferences, during the customization of the service, get detailed feedback to deliver better products and services to a customer individually. It brings great advantages over competitors (PINE; PEPPERS; ROGGERS, 1995).

The service capacity in customerization can be measured by the ability to provide customized services for the co-creation of value with the customer. An organization may engage the customer in a number of diverse co-creation activities (ZHANG; CHEN, 2008). The more the organization emphasizes customer interactions, the more communication is developed between them. The organization gets, then, more information about customer needs and preferences and therefore is able to provide exactly what the customer desires, making it difficult customer evasion to competitors (PINE; PEPPERS; ROGGERS, 1995). The emphasis on co-creation activities is associated positively with service capacity and the customerization capacity (ZHANG; CHEN, 2008).

Flexibility is a primary capacity in the co-creation of value systems to build other capacities, among them the service capacity and the delivery capability. Organizations must necessarily be flexible to suit the diversity of costumers and their different demands (ZHANG et al., 2011) and thus co-create value.

Consequently, considering the previous literature, the hypothesis is proposed as follows:

Hypothesis 3. The flexibility is associated directly and positively to value co-creation in health services.

The responsiveness of the service aims to preserve user's time, regarded as one of the most valuable resources and whose perception of waiting time often overshadows the real time. The flexibility of a company strongly binds with high levels of responsiveness. An organizational culture committed to learning favors the development of flexibility and, therefore, results in high levels of responsiveness of the service. For a company to be able to adapt and respond to changes in the environment and customer needs, it must become flexible to change its planning (THEOHARAKIS; HOOLEY, 2003). The co-innovation becomes more effective when combined with flexibility and responsiveness (LEE; OSLOM; TRIMI, 2012). The greatest demand for service responsiveness expresses the commitment of the service provider for its customer relationship (THEOHARAKIS; HOOLEY, 2003).

Consequently, the following assumptions are proposed:

Hypothesis 4. The responsiveness is associated directly and positively to co-innovation in health services.

Hypothesis 5. The responsiveness is associated directly and positively to value co-creation in health services.

The strategic direction for innovation in services concerns the degree to which an organization directs its business strategy for innovation in services. The first dimension of this construct involves the strategic investment, as demonstrated by the extent to which the organization strategically directs the focus to innovation in services and allocates investments to execute planning. The second dimension involves risk tolerance, i.e., how an organization is willing to tolerate actual or potential losses on their investments while introducing innovation in services (YEN et al., 2012).

Customers simply do not accept a recommendation from the service provider based solely on the expectations of utility, i.e., cost and benefit. Rational customer considers the likelihood that the recommendation is successful, i.e., that it suits the intended use. So in addition to pay attention to customers needs, it is also important to understand their preferences. The decision rests with a trade-off between risk and utilities, distinguished between old and new customers (CHIU; LUENG; LAM, 2009).

The service is the fundamental basis for the exchange (VARGO; LUSCH, 2004) and may represent a competitive advantage for an organization, which places innovation as basic and strategic element. The readiness for service innovation characterizes the readiness of the organization (or person) to adopt innovation based on evaluation of its acceptance contexts.

Organizations tend to accept innovation in services if the changes are perceived as necessary and if they are able to perform the change (YEN et al., 2012).

The traditional organization develops a set of strategic plans to produce products or services and "push them" to stakeholders. In the co-creation value process, however, the organization works in cooperation with stakeholders, especially customers. They know what they want and how products or services should be modified to create new values for themselves (LEE; OSLOM; TRIMI, 2012). The fundamental principle of co-creation is the engagement of people to create, together, unique experiences of value (RAMASWAMY; GOUILLART, 2010), which is at the heart of co-innovation (LEE; OSLOM; TRIMI, 2012).

Therefore, with the foundations laid in the review of previous literature, the hypothesis following is envisioned:

Hypothesis 6. Co-innovation is associated directly and positively to value co-creation in health services.

From the review previous literature and assumptions about the object of study it was developed the structural model in Figure 1.

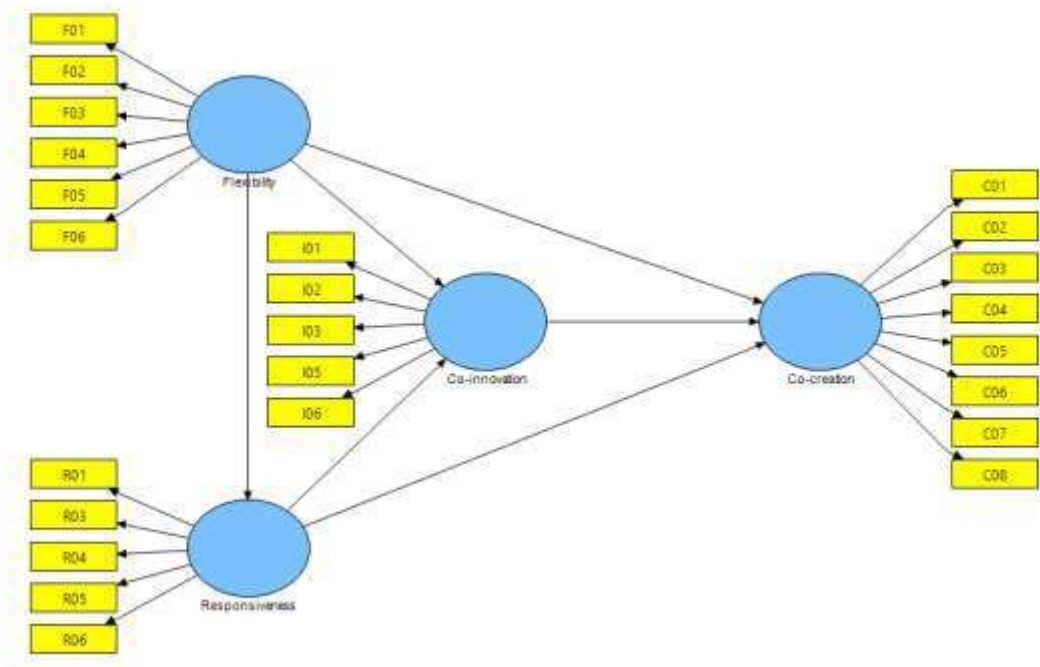


Figure 1 - Theoretical model of research

3 METHODOLOGY

This research implemented a questionnaire to a sample of healthcare professionals (nurses, physiotherapists and nursing technicians) in a geriatric service in São Paulo, in order to test a theoretical model that lists three antecedent variables (flexibility, responsiveness and co-innovation) for the co-creation of value in health services. Furthermore, the three chosen categories represent professionals who provide more interaction and interaction time with customers in healthcare services.

In the description of development of learning processes of care and co-creation with customers in the health services, Elg et al. (2012) identified some platforms with greater probability of successful interactions and engagement for the value co-creation experience, for example the process of care of the gastroenterology service. In this service, it is common the emergence of chronic diseases that require multiple interactions of customers of health services with various health professionals and other non-medical services. So, these environments are auspicious to customerization and, by extension, to co-creation of value.

There is an analogy between the platforms described by Elg et al. (2012) and a geriatric service. The elderly population experiences chronic health problems such as hypertension, diabetes, cancer, depression, degenerative diseases of the central nervous system, ischemic strokes, etc. These processes are highly complex and require a well-coordinated cooperation network for proper management of these conditions, health promotion and a better quality of life.

A total of 350 questionnaires were distributed to a sample of health professionals. The selection of respondents was made by convenience sampling in work shifts (morning, afternoon, evening), in intensive care units, medical clinic, surgical clinic and emergency room. Access to respondents was made by personal contact, once, during the interval between the customer services.

The data from this study were analyzed by SmartPLS 2.0 M3 software (RINGLE; WENDE; WILL, 2005) to test the model proposed by the method partial least square (PLS). The approach with PLS was chosen because this is an exploratory research, particularly in the context where there is a shortage of theories (CHIN, 2010) about the value of co-creation history in health services (ELG et al., 2012). The PLS approach is considered a "soft modeling" as it does not require robust assumptions regarding the distribution of the data, the size of the sample and the measurement scale (CHIN, 2010). On the other hand, this implies less-assuming statistical properties for the estimates. For example, it is known that the

coefficients can be biased if the sample is not of consistent size. The PLS is better directed to predictive models than for statistical precision models of the estimations (VINZI et al., 2010).

The determination of the PLS algorithm and software for analysis included:

- a) Algorithm for treatment of missing data: replacement by the middle;
- b) Weighting scheme: path weighting scheme;
- c) Metric data: rate 0 and variance 1;
- d) Interruption criterion between interactions: 0.00001;
- e) Starting weight: use of a uniform value of 1 for the initial value for each weight or load factor;
- f) Maximum interactions: 300;
- g) Bootstrapping settings: 5000 samples.

The PLS approach to ESM, like other statistical methods, requires appropriate choices which, if not made properly, can generate results, interpretations and incorrect conclusions. Some articles have been published recently in order to provide recommendations for the correct use of ESM, including the approach to PLS (PREARO; GOUVÊA; ROMERO, 2011; BIDO et al., 2012; HAIR JUNIOR et al., 2012a, 2014a, 2014b; PENG; LAI, 2012; HAIR JUNIOR; RINGLE; SARSTEDT, 2013).

This research looked upon the recommendations suggested in the literature for the proper use of the PLS method. The requirements for the application of the method met the guidelines of Bido et al. (2012) and Hair Junior, Ringle & Sarstedt (2013). The analysis followed the recommendations of Hair Junior et al. (2014a).

Four hypothetical vignettes (scenarios) were textualized by one of the authors: a medical expert in quality services. A thorough review of the literature on co-creation of value looked on the content of vignettes to describe a real context of services in healthcare, and which information could be easily recognized by other experts.

A scenario is a story that presents a hypothetical situation that demands an action or judgment of the informants (WASON; COX apud WASON; POLONSKY; HYMAN, 2002). Also a vignette is a brief description of a person or of a social situation that contains precise details of what is believed to be the most important factors for the informant to make a

decision or make a judgment (ALEXANDER; BECKER apud WASON; POLONSKY; HYMAN, 2002).

The scenarios represent situations that concern the assessment of the information outside of the actual use, retrospectively or in anticipation (EDVARDSSON et al., 2012) of frontline staff (nurses, physiotherapists, nursing technicians). For each scenario there is a set of statements (items) in which the respondent was asked to indicate their degree of approval or disapproval of each statement in the scenario.

Table 1 describes the construct flexibility with their respective items, the proposed scenario to describe it, and the version presented to the frontline staff. Tables 2-4 describe the constructs co-innovation, responsiveness and co-creation with their associated items, as well as a brief presentation of the concepts.

	Construct	Brief description
F	Flexibility	Flexibility is the ability of an organization to manage the uncertainties effectively in its operating environment (WANG; MASINI, 2009).
	Construct items	Brief description
F1	Volume	Temporary moving within a system to adjust to variations in demand for services.
F2	Reactivity	Rapidity with which the system performs the change to adjust to variations in demand for services.
F3	Expansion	The ease with which the system introduces a new service demand.
F4	Communication	Ability to distribute and share information within the system.
F5	Routing	Ability to use alternative routes for delivery of services.
F6	Function	Ability of people to realize new operations.
Vignette 1	<p>Scenario 01 - . Mrs. Sonia Alves , 66, is hospitalized a week ago for the treatment of stroke . During the physical therapy service, the sister of Ms . Sonia Alves said to the sister who had a migraine attack. The physical therapist told the nurse the sector. The nurse reported it to the medical unit . Soon after, the doctor came to see her sister Mrs . Sonia Alves and has prescribed a medication . The central pharmacy provided the medication for the sister of Ms . Sonia Alves and it was administered by the nursing technician. After a while , the doctor returned to the bedroom to see if the sister of Ms . Sonia Alves was painless . An administrative assistant came to the room and provided the invoice issued for payment of services rendered. The sister of Mrs . Sonia Alves was delighted with the experience.</p>	
	Version presented to the frontline staff	
V1EF1	The change in routine inpatient unit staff (physiotherapist, doctor, nurse, pharmacist, nursing technician and administrative assistant) was a good response to the complication happened to his sister Mrs. Sonia Alves and the image of the service.	
V2EF2	The speed with which the inpatient unit staff responded to the complication was very important for the sister of Mrs. Sonia Alves had a good experience and kept a good image of the service.	
V3EF3	The sister of Mrs. Sonia Alves was visiting her sister. The alignment between the professionals was important to the ease with which the team met this complication.	
V4EF4	The physiotherapist heard a necessity sister of Mrs. Sonia Alves. He reported this to the nurse, who informed the doctor. A decision was taken and communicated to the pharmacy, to the nursing technician and administrative assistant. This communication skills was important for the complications were well settled .	
V5EF5	The complications of this service changes the routine inpatient unit. Small adjustments in the routine allows the sister of Ms. Sonia Alves can be met in the inpatient unit, in addition to other locations such as outpatient or emergency room.	
V6EF6	The unit staff have well-defined functions in relation to inpatients. But it can also be an alternative to meet this complication, as well as other professionals in the clinic or emergency room.	

Table 1 - Description of the construct flexibility, their associated items and textualization vignette that contextualizes it.

Construct		Brief description
I	Co-innovation	Any new idea or approach that is applied essentially in different ways to create value for an organization and its stakeholders: customers, suppliers, partners, communities, government, etc. (LEE; OSLOM; TRIMI, 2012).
Construct items		Brief description
I1	Services	Meetings with clients to identify new services , evaluate quality of services, etc.
I2	Risks	Involvement of customers in the development process.
I3	Architecture	Extent to which customers use electronic tools such as scheduling and online support, etc.
I4	Value	Allowing the customer to make choices, customize services and track the status of choices.
I5	Customer base	Provision of various alternative channels of services for integrating unique service to the customer.
I6	Business model	Forming partnerships between staff and client to the involvement of new innovation processes.

Table 2 - Brief description of the co-innovation construct and associated items

Construct		Brief description
R	Responsiveness	User perception of how health services deliver the elements that are not directly related to health or disease (ANDRADE; VAITSAN; FARIAS, 2010).
Construct items		Brief description
R1	Dignity	Respect for customer privacy during the clinical treatment OU Exam Achievement.
R2	Confidentiality	Conversations that protect client confidentiality.
R3	Autonomy	Informed consent from the patient before performing examinations and / or treatments.
R4	Immediate attention	Ease of access to information.
R5	Tangible aspects	Comfort and clearance.
R6	Access to support social networking	Possibility of family can take care of the customer's personal needs.
R7	Choice of service provider	Possibility of the client to consult experts.

Table 3 - Brief description of the responsiveness construct and associated items

Construct		Brief description
C	Co-creation	The customer value co-creation is a benefit realized from the integration of resources through activities and interactions with employees in the network of customer services (MCCOLLI-KENNEDY et al., 2013).
Construct items		Brief description
C1	Cooperation	Following the instructions of staff (doctor, nutritionist, physical therapist, etc.) by the customer.
C2	Cataloging information	Notes the daily activities, project activities, etc.
C3	Complementation of complementary therapies	Exercise, yoga, meditation, diet , psychotherapy, acupuncture, spiritual healing, etc.
C4	Learning set	Active search and share information on new sources (internet, newspapers, etc.).
C5	Changes in lifestyle	Changes in work routines, social, vacation, etc.
C6	Connectivity	Construction and maintenance of social networking relationships, virtual communities, etc.
C7	Co-production	Choice of professionals who care for you, choices of examinations and treatments, etc.
C8	Brain stimulation workshops	Dance workshops, memory, mourning, rescue of self-esteem, etc.

Table 4 - Brief description of the co-creation construct and associated items

The final questionnaire, consisting of four vignettes and 27 items was pre-tested with 10 representatives of the population of interest to verify the adequacy of the proposed model, after validation by experts (4 doctors, 3 nurses and 3 physiotherapists). There were no indicated changes in the vignettes structures and its questions. The full survey is available upon request to the authors.

The participation of the respondents was voluntary, anonymous, free of coercion, force and requirements. There were no conflicts of interest surrounding this research. There was no relationship between the experts and respondents, nor direct links between the respondents and the authors.

4 ANALYSIS AND DISCUSSION OF RESULTS

From a total of 350 questionnaires distributed by personal contact, 322 were returned (92%). Of the returned questionnaires, 225 (69.88%) were considered valid for analysis. All questionnaires with a number of items unanswered (missing data) above 10% were excluded from the analysis (4.35% of the returned questionnaires). Surveys in healthcare have been the subject of interest among researchers to improve the rate and response time. Klein et al. (2010) had a return rate of 49% and a ratio of 9% of unanswered items, in a national survey in the United States in healthcare.

Also, questionnaires confirmation bias (26.4% of the returned questionnaires), in which the respondents chose the same response in more than 70% of the items were excluded from analysis, despite the recommendation of the European Social Survey Education Net (2014) by the exclusion of questionnaires with confirmation bias above 75%.

The sample size recommended by the G * Power 3.1.7 (BUCHNER et al., 2013) contained at least 119 valid respondents, considering the parameters: number of predictor variables (flexibility, responsiveness, co-innovation), the size of the effect (average effect of 0.15), the significance level $\alpha = 0.05$ the power of the sample $1-\beta = 0.8$ (COHEN, 1988).

The average age of respondents was 36 (7) years, average training time of 9 (5) years, average working hours in geriatric service 4 (3) years. Most respondents were female (74.65%). Regarding training, 55.19% are nursing technicians, nurses 24.06% and 17.02% physiotherapists.

The Anderson-Darling, Ryan-Joiner and Kolmogorov-Smirnov tests did not confirm a normal distribution of data. Indicators showed coefficients of variation between 16.70% to 40.95%, which suggests differences of opinions among respondents.

4.1 STRUCTURAL EQUATION MODELING (SEM)

The estimation of a model provides empirical measures of relations between indicators and constructs (model of measurement), and the relations of the constructs to one another (structural model). Empirical measures make it possible to compare the model set theory and the reality represented by the sample data.

4.2 EVALUATION OF THE MEASUREMENT MODEL

The evaluation of the reflective measurement model includes the individual reliability indicator and the average variance extracted (AVE) to evaluate the convergent validity; the Fornell-Larcker criterion and factor loadings of indicators to assess the discriminant validity; and reliability made to assess the internal consistency.

Convergent validity is the extent to which the items are theoretically interrelated. For reflective models the following indicators are considered for convergent validity: a) loading factor $\lambda > 0.7$ and statistically significant with $\alpha = 0.05$ (CHIN, 1998; FORNELL; LARCKER, 1981). Items with λ between 0.4 and 0.7 can be considered to remain in an exploratory model (HAIR JUNIOR et al., 2014); b) average variance extracted (AVE) $> 50\%$ (CHIN, 1998; FORNELL; LARCKER, 1981; HAIR JUNIOR et al., 2014).

A variable of responsiveness construct (R02) showed no convergent validity, with $\lambda = 0.351$. The R07 variables ($\lambda = 0.648$) and the I04 co-innovation construct ($\lambda = 0.549$) affected the discriminant validity of the model. After the exclusion of these three variables, the adjusted model was run, and was assured both the convergent validity, as the discriminant validity of the model.

A detailed look at the items that were excluded from the model (R02, I04, R07) and those with factor loadings below 0.7 that remained in the model (C07, C04, I02) (Table 5) allows you to speculate on the resistance of health professionals in share information and existing knowledge on a network, as well as transactions between actors.

Code	Item	Description	Factor loading	P-Value	Status
R2	Confidentiality	Conversations that protect client confidentiality	0,3510	0,001	Excluded from the model
14	Value	Allowing the customer to make choices, configure or customize your products or services and track the status of your choices	0,5490	0,000	
R7	Choice of service provider	Customer possibility to consult experts	0,6480	0,000	
C7	Co-production	Choice of professionals who care for you, involvement in decisions on diagnostic methods and modes of treatment , local treatment , etc.	0,6723	0,000	Remained in the model
C4	Learning set	Active search for information from other sources (internet , newspapers, magazines , etc.) and share with others (doctors, nurses, family, etc.)	0,6803	0,000	
12	Risks	Customer involvement in the development process	0,6891	0,000	

Table 5 - Items with a loading factor below 0.705

A critical input for the knowledge renewal, identified as a key source for the competitive advantage of an organization, is the willingness of people to participate and transmit an amount of knowledge (BALLANTYNE; VAREY, 2009). Access to information allows an accurate view, relevant, transparent and timely (DAVENPORT; GLASER, 2002) to the customers about the service, allowing them to take an active role as the value is being created. Access to information supports the co-creation of value (CHAKRABORTY; DOBRZYKOWISKI, 2013).

Regarding the convergent validity three indicators followed λ between 0.672 and 0.689. The other indicators showed λ between 0.717 and 0.893. All factor loadings were significant ($p < 0.01$). The constructs presented AVE between 0.587 and 0.653; composite reliability (Rho Dillon-Goldstein) between 0.876 and 0.923 and Cronbach's Alpha between 0.815 and 0.904. The values of composite reliability and Cronbach's Alpha must be between 0.7 and 0.95 (HAIR JUNIOR et al., 2014).

The discriminant validity refers to the ability of a measure not be modified by processes not related to the object of the questionnaire. In other words, it examines whether the items of a construct are related to items of other construct.

One way to assess the discriminant validity, with reflective models, is by calculating square root of the average variance extracted (AVE). The square root of AVE is greater than the correlations between other constructs, it means there is discriminant validity (CHIN, 1998; FORNELL; LARCKER, 1981; HAIR JUNIOR et al., 2014). This can be observed in table 6, wherein it is apparent that correlations between constructs are lower than those of the square root of AVE, that is, the constructs are correlated, however, are different from each other.

Table 6 - Discriminant Validity at the Level of Constructs

Latent Variable	Co-creation	Co-innovation	Flexibility	Responsiveness
Cocreation	0,7765			
Co-innovation	0,6104	0,7595		
Flexibility	0,3039	0,4470	0,8086	
Responsiveness	0,6683	0,5174	0,2590	0,7663

Note: the figures in bold on the diagonal, are the values of the square root of AVE. The other values correspond to the correlations between the latent variables.

Criterion: the values of the correlations between the latent variables must be lower than the values of the square root of AVE.

The discriminant validity at the level of items implies that the loading factor of construct item should be greater than the items from the other constructs, both horizontally, as vertically. Identifying major loading factors that exceed the λ of the other item indicates discriminant validity problems (HAIR JUNIOR et al., 2014). The discriminant validity of the items was also ensured at the level of indicators, so that only the R07 and I04 indicators were eliminated from the measurement model as they did not have high loads on their constructs and low in others, as previously explained.

4.3 EVALUATION OF THE STRUCTURAL MODEL

The evaluation of the structural model allows checking how well the empirical data support the theoretical model and, thus it allows the theoretical model to be confirmed or not by empirical data.

The first step in the analysis of the structural model involves the assessment of problems related to collinearity, since estimating the structural coefficients is based on ordinary least squares regressions of each endogenous variable in relation to their corresponding predecessors constructs. Thus, as in a regular multiple regression, structural coefficients can be biased if the estimation involves significant levels of collinearity among the predictors constructs (HAIR JUNIOR et al., 2012; PENG; LAI, 2012; HAIR JUNIOR; RINGLE; SARSTEDT, 2013; HAIR JUNIOR et al., 2014; HAIR JUNIOR et al., 2014b).

The evaluation of multicollinearity is done in general by means of tolerance or VIF (variance inflation factor). If collinearity level is very high, as indicated by a lower tolerance than 0.2 or greater than 5 VIF, one must consider the removal of the template construct. The evaluation of collinearity on SEM with PLS is carried out analogously to the evaluation of training models. In the first stage, an exogenous variable is considered as the dependent variable and then runs in the regression model with other constructs (HAIR JUNIOR et al., 2012; PENG; LAI, 2012; HAIR JUNIOR; RINGLE; SARSTEDT, 2013; HAIR JUNIOR et

al., 2014; HAIR JUNIOR et al., 2014b). The values of the VIF constructs ranged between 1,075 and 1,597, which means that multicollinearity problems in this research were not identified.

The approach of SEM with PLS fits the model to sample data to get the best parameter estimation by maximizing the variance explained by the endogenous latent variable. Instead of applying the model adjustments measures (goodness-of-fit), the structural model with PLS is evaluated based on heuristic criterion that are determined by the predictive ability of the model. Therefore, it is assumed the premise that the model was correctly specified and is assessed in terms of how well it is able to predict endogenous construct(s). The essential criteria for assessing the structural model with PLS are the significance of structural factors, the level of R² values, the f² effect size, predictive relevance Q² and q² effect size (HAIR JUNIOR et al., 2012; PENG; LAI, 2012; HAIR JUNIOR; RINGLE; SARSTEDT, 2013; HAIR JUNIOR et al., 2014; HAIR JUNIOR et al., 2014b).

Table 7 shows the average value of 54.3% R² model, in addition to the hypotheses that were tested and the results were recorded. The results in Table 7 indicate that the model shows R² valid because they are higher than recommended, i.e., should be greater than 20% (HAIR JUNIOR et al., 2014b).

Table 7 - Evaluation of the Structural Model

	<i>Hypothesis</i>	<i>Result</i>	<i>Structural coefficient</i>	<i>Standard Error (STERR)</i>	<i>T Statistics</i>	<i>95% confidence intervals</i>	<i>P-Value</i>	<i>R²</i>
Co-innovation -> Co-creation	H6	Validated	0,3520	0,0638	5,5160	[0,2269;0,4771]	0,0000	
Flexibility -> Co-creation	H3	Not validadet	0,0220	0,0537	0,4100	[-0,083;0,1272]	0,6819	54,3%
Responsiveness -> Co-creation	H5	Validadet	0,4810	0,0583	8,2500	[0,3667;0,5953]	0,0000	
Responsiveness -> Co-innovation	H4	Validadet	0,4300	0,0887	4,8480	[0,2562;0,6038]	0,0000	37,3%
Flexibility -> Co-innovation	H1	Validadet	0,3360	0,0671	5,0080	[0,2045;0,4675]	0,0000	
Flexibility -> Responsiveness	H2	Validadet	0,2590	0,0828	3,1290	[0,0968;0,4212]	0,0018	6,7%

Acceptable values of R² depend on the complexity of the model and the research area. In research areas on consumer behavior, e.g., R² values from 0.2 are considered high. Researchers studying the satisfaction or customer loyalty expect R² values above 0.75. In general, research in marketing considers the R² values as weak (0.25), moderate (0.50) or robust (0.75) (HAIR JUNIOR et al., 2014b).

Besides the evaluation of R^2 values of all endogenous latent variables, it is also important, for management purposes, to understand the changes that occur in R^2 when a specific exogenous variable is omitted from the model. Thus, it is possible to check whether an explanatory variable has a great influence on the dependent variable. This measure is known as the f^2 effect size (Cohen effect size) (HAIR JUNIOR et al., 2014). The criteria for evaluation are f^2 0.02 (little effect), 0.15 (moderate effect) and 0.35 (major effect) of exogenous variables on the endogenous variables (COHEN, 1988). The results can be seen in Table 8.

Table 8 - Cohen Effect Size (f^2) of the Constructs

Constructs	R^2 included	R^2 excluded	f^2	
			(Cohen effect size)	Rating
Co-creation	0,542			
Co-inovation		0,453	0,163	Moderate
Responsiveness		0,376	0,266	Moderate
Co-innovation	0,373			
Responsiveness		0,201	0,215	Moderate
Flexibility		0,266	0,146	Moderate
Responsiveness	0,066			
Flexibility		0,000	0,066	Low

Another criterion for assessing the accuracy of the estimate is the value of Q^2 Stone-Geisser. This measure is an indicator of the predictive relevance of the model, i.e., the PLS shows relevance when the model strictly predicts data of the indicators in reflective models of endogenous latent variables. In the structural model, values higher than zero indicate predictive relevance of a given construct for the template. Q^2 can be calculated by two different approaches: cross-validated redundancy, which includes estimates of both the structural model and the measurement model and the cross-validated communality approach, which does not include the information of the structural model. It is recommend that the first approach includes elements of both models (HAIR JUNIOR et al., 2012; PENG; LAI, 2012; HAIR JUNIOR; RINGLE; SARSTEDT, 2013; HAIR JUNIOR et al., 2014; HAIR JUNIOR et al., 2014b).

The Q^2 values were performed by blindfolding procedure and represent a measure of how well the structural model can predict the observed values originally. All values are higher than zero, which indicates that the constructs are relevant to the predictive model.

Also, as with the f^2 effect size approach to assessing the R^2 values, it is possible to verify the relative impact of predictive relevance by measuring the q^2 effect size. The

interpretation is also similar: values 0.02 and 0.15 and 0.35 indicate that exogenous latent variable has a small, moderate or large predictive relevance for a particular endogenous variable (HAIR JUNIOR et al., 2014). The results can be seen in Table 9.

Table 9 - q^2 Effect Size

Construct	q^2 included	q^2 excluded	q^2 effect size	Rating
Co-creation	0,310			
Co-innovation		0,248	0,082	Low
Responsiveness		0,214	0,122	Moderate
Co-innovation	0,213			
Responsiveness		0,112	0,114	Moderate
Flexibility		0,154	0,070	Low
Responsiveness	0,036			
Flexibility		0,587	-1,334	No effect

4.4 THEORETICAL IMPLICATIONS

The analysis of the empirical measures makes it possible to compare the theoretical model and the reality represented by the sample of employees of geriatrics service, as there was convergent and discriminant validity of the measurement model. Also, the empirical data (moderate R^2 , structural coefficient with p -value <0.05 ; f^2 moderate size of the constructs effect; predictive relevance of the model confirmed by Q^2 above zero, and the impact of the predictive relevance q^2 from low to moderate between the constructs) support the proposed theoretical model, except for direct positive association between the constructs flexibility and co-creation.

This research explored a model on three antecedent variables experience of co-creation of value in a health facility in the city of São Paulo. The results suggest that the flexibility is a significant predictor variable for co-innovation and responsiveness. Likewise, responsiveness and co-innovation are associated positively to the experience of co-creation of value. Moreover, the responsiveness is also associated positively to co-innovation variable.

The f^2 effect size of flexibility on co-innovation (hypothesis 1), in this study, was 0.146 (moderate effect, COHEN, 1988), with statistical significance (p value = 0.000). Studies with reflective indicators are mainly intended to test theories. Despite the statistical confirmation of positive association between flexibility and co-innovation, this provides only limited insight because it indicates that the association is highly possible, in addition, a significance test depends on the number of observations. Therefore, the effect size that flexibility has on co-

innovation provides richer information and provides support to the literature on the relationship between the two constructs.

The f^2 effect size of flexibility on the responsiveness (hypothesis 2), in this study, was 0.066 (small to moderate effect, COHEN, 1988). Brazil has a responsiveness index lower relative than other countries, an average of 5.16 (0.9) on a scale of 0 to 10 (DE SILVA; VALENTINE, 2000). The assumptions with reflective indicators indicate that they are interchangeable representations of latent variable. Consequently, research of this nature only demonstrates the effects of the constructs and do not indicate how to operationalize them (ALBERS, 2010).

However, in contrast with the results that the capacity of a service is associated positively with their customerization capacity (ability to offer customized services during the co-creation of value) and that flexibility is associated positively to delivery capacity (ZHANG et al., 2011), the f^2 effect size of flexibility on co-creation (hypothesis 3) in this research did not have statistical significance (R^2 of 0.007 and p value of 0.6819).

Unlike other hypotheses, the construct flexibility did not prove to be a significant predictor variable for the experience of co-creation of value in the same context. Changes in customer demand are faster in co-creation system than a traditional system. The flexibility means a rapid response to changes in customer demand, which requires rapid changes in the services configuration (ZHANG et al., 2011). The lack of support for this hypothesis, in this context, despite the evidence to suggest a positive association between flexibility and co-creation in other areas of knowledge, needs further studies to understand the phenomenon in health care.

Also, in contrast to the literature, the flexibility has not taken a primary position to amplify the capabilities of responsiveness and co-innovation to co-creation of value, since structural coefficients between the flexibility and capabilities of responsiveness and co-innovation have relatively lower values than other structural coefficients (table 7). Some researches suggest that improving the flexibility of services is developed after the consolidation of quality, delivery within service (trust) and cost efficiency (WANG; MASINI, 2009). Companies in Japan, for example, evolved the flexibility of capacity after they have reached a prerequisite quality level, reliability and cost efficiency (DE MEYER et al., 1989). These variables were not explored in this research.

The operationalization of flexibility can become difficult to implement because it involves dealing with people power, individual freedom or quality of life (SCHNEEWEIS; SVHEIDER, 1999). The flexibility of the people is a valuable ability for an organization, but there are few empirical studies in this area (BHATTACHARYA; GIBSON; DOTY, 2014).

However there is a great asymmetry of power between those who provide health services and their customers. This asymmetry limits individual freedom, or group of customers in the health services (BADCOTT, 2005), which may make it difficult to flexibility operationalization (SCHNEEWEIS; SVHEIDER, 1999).

The lack of support for the hypothesis 3 in this context may be associated with little flexibility of human resource practices. The extent to which these practices interfere with the flexibility in the health services needs further research, with formative indicators for better guidance on the development of this operational capability.

Many restrictions related to the flexibility of human resources in Brazil have legal support intending to protect customers from damage (BADCOTT, 2005). One example is the institution of the medical act, which limits the actions of diagnosis and treatment by other health professionals such as nurses and physical therapists. An opportunity for research therefore involves the extent to which these practices that limit the action of these professionals, affect the relationship between the flexibility and constructs co-creation of value.

The study of Auh et al. (2007) on the extent of applicability and the responsibility of co-production (customer participation in the creation of the product / service, does not involve the use of experience) assigned to the customer in two high-contact services (finance service and medical service) provided support for the study variables for the tax office, but there was no positive association between the variables for the medical service.

This research investigated the positioning of the three professional categories that interact longer with health care customers (nursing technicians, nurses and physiotherapists). These professionals have little power and control over health care customer when compared to doctors. This reflects the practices of human resources in the health services, whose power of information centers on the figure of the doctor.

Regarding the responsiveness in the context of this research, the values of their structural coefficients with co-innovation and co-creation are higher compared to other structural factors. This suggests a sequence between responsiveness and co-innovation to

construct a cumulative capacity strategy for co-creation of value. This is a two-way prescriptive model, i.e. both in bottom-up sequence, and the development of a primary capacity towards the capacities of the higher levels, as the top-down direction, to analyze the associations among these constructs (ZHANG et al., 2011).

The autonomy and choice of professional caregiver scores were particularly low compared to other countries in a survey conducted by the World Health Organization (WHO) on the responsiveness (DE SILVA; VALLETNINE, 2000). The excluded items from the model as well as those with loading factors below 0.7 are consistent with the survey of the WHO (Table 5). So it emerges the importance of developing policies for engagement of health professionals in integration and interaction processes with their customers so that the implementation of a strategy based on value co-creation can be successful.

However, regarding the success factors, the hypotheses do not give support to identify indicators which must be triggered, since they reflect their respective constructs. The hypotheses only indicate a possible positive association between the constructs. For the management of health operations, it is relevant to know the level of impact of various drivers for a successful implementation of a targeted strategy for the co-creation of value.

The proposed model with the four constructs (flexibility, responsiveness, co-innovation and co-creation) seems appropriate to the context of geriatric services, as there was support ($p < 0.01$) for the confirmation of hypotheses, except H3. The choice of process of care for the implementation of engagement platforms (RAMASWAMY; GOUILLART, 2010) should have great potential of co-creation (ELG et al., 2012). The geriatric services include chronic disease care, with high potential for co-creation of value, like the gastroenterology service.

5 FINAL CONSIDERATIONS

This research explored the application of structural equation modeling with PLS (partial least square) to analyze background variables associated with co-creation of value in a geriatric service in Sao Paulo.

In contrast to the literature, in such applied context, the results did not support the hypothesis that H3 flexibility is associated directly and positively to the co-creation of value. Also, the flexibility was not as a primary variable for the development of others, but joined indirectly to the changing responsiveness and co-innovation (hypotheses H1 and H2) for amplifying the co-creation construct. In addition, the other hypotheses (H4, H5 and H6) are consistent in this research with the literature review.

New researches to investigate the relationship between these results and the level of development that is the organization about the minimum level of quality, reliability and cost efficiency are necessary for a better understanding of the phenomenon. It is also important to investigate how the flexibility component of human resources practices in health organizations, joins the positioning flexibility as primary ability to amplify other capabilities that enhance the co-creation of value.

The development of operative resources and the repositioning resources operands can follow a prescriptive model whose focus could be directed to a primary operating feature. This amplifies a sequence of one resource to other ones. For example, the flexibility (primary resource) amplifies the secondary responsiveness and co-innovation resources. This model might capture an association between cumulative and lasting capabilities to support an environment of experiences for the co-creation of value. Dynamic surveys, of longitudinal character, albeit in difficult operational approach, can provide or not to support this proposition.

The reality of health services is quite complex, so there is the need for new theories that add new exploratory variables to distinguish the effects of various exogenous and endogenous variables on the value of co-creation experience to the customer. Exploring training models to identify the antecedents operating flexibility, responsiveness and co-innovation can bring relevant information to guide policies and administrative practices.

The relaxation of the parsimony criterion in order to allow more complete models to describe the amount of co-creation environment in the health services enables the inclusion and exclusion of variables to create different models. Among these variables, consequent variables can be explored, such as treatment adherence, satisfaction with the service, loyalty to service and others identified in the literature.

The presence of heterogeneity can distort the results of the structural equation modeling. However, the phenomenon has not been investigated in this research, which represents a limitation, so that additional studies to identify subgroups in the health services that impact in different ways on the co-creation of value are important for the management of operations.

The research did not explore the possibility of mutual dependency between the constructs co-innovation and co-creation, which represents an opportunity for future studies.

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