

# Value cocreation in service ecosystems

## Investigating health care at the micro, meso, and macro levels

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### Abstract

**Purpose** – The purpose of this paper is to understand value cocreation in service ecosystems from a multilevel perspective, uncovering value cocreation factors and outcomes at the micro, meso, and macro levels.

**Design/methodology/approach** – A Grounded Theory approach based on semi-structured interviews is adopted. The sample design was defined to enable the ecosystem analysis at its different levels. At the macro level was the Portuguese Health Information ecosystem. Embedded meso level units of analysis comprised eight health care organizations. A total of 48 interviews with citizens and health care practitioners were conducted at the micro level.

**Findings** – Study results enable a detailed understanding of the nature and dynamics of value cocreation in service ecosystems from a multilevel perspective. First, value cocreation factors are identified (resource access, resource sharing, resource recombination, resource monitoring, and governance/institutions generation). These factors enable actors to integrate resources in multiple dynamic interactions to cocreate value outcomes, which involve both population well-being and ecosystem viability. Study results show that these value cocreation factors and outcomes differ across levels, but they are also embedded and interdependent.

**Practical implications** – The findings have important implications for organizations that are ecosystem actors (like the Portuguese Ministry of Health) for understanding synergies among value cocreation factors and outcomes at the different levels. This provides orientations to better integrate different actor roles, technology, and information while facilitating ecosystem coordination and co-evolution.

**Originality/value** – This study responds to the need for a multilevel understanding of value cocreation in service ecosystems. It also illuminates how keystone players in the ecosystem should manage their value propositions to promote resource integration for each actor, fostering resource density and ecosystem viability. It also bridges the high-level conceptual perspective of Service-Dominant logic with specific empirical findings in the very important context of health care.

**Keywords** Electronic health records, Service ecosystems, Value cocreation, Health care services, System levels

**Paper type** Research paper

### Introduction

Complex service systems with supplier networks interacting with customer networks are increasingly common (Gummesson, 2007). These interrelated value networks form service ecosystems, operating together through value cocreating interactions. Service-Dominant (S-D) logic focuses on the value cocreation process occurring in these dynamic environments that are central to the emergence and evolution of service ecosystems (Vargo and Lusch, 2016). A service ecosystem can be defined as a “relatively self-contained, self-adjusting system of



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resource-integrating actors connected by shared institutional logics and mutual value creation through service exchange” (Vargo and Akaka, 2012, p. 207).

An ecosystem perspective is essential for understanding the holistic dynamics of complex systems, which requires moving away from a firm-centered perspective to focusing on the whole context of a complex world (Gummesson, 2007). This perspective makes complex contexts such as healthcare more understandable by adopting systems-level thinking (Lusch and Spohrer, 2012).

The nature of the ecosystem is changed in every instance of resource integration, service provision, and value cocreation. Thus, the context for interaction and value cocreation outcomes also changes (Chandler and Vargo, 2011). As such, it is important to understand how resources are integrated at the various system levels (i.e. micro, meso, and macro), which shapes the unique social contexts enabling value cocreation (Edvardsson *et al.*, 2011; Chandler and Vargo, 2011). While these levels are different, they are interdependent within the whole system (Chandler and Vargo, 2011). Further research is needed on value cocreation in service ecosystems (Akaka *et al.*, 2012; Edvardsson *et al.*, 2012), especially how cocreation occurs at each level and is embedded in other levels (Chandler and Vargo, 2011). Deeper understanding of ecosystems requires exploring value cocreation at different levels of aggregation (Vargo and Lusch, 2016).

Service ecosystems are emerging in many markets. A well-known example is the Apple ecosystem, which is a complex network of actors (customers and app developers) that cocreate value in multiple levels on its platform. In health care, advanced information technologies (Dey *et al.*, 2013) have enabled the emergence of health ecosystems. Health care is a highly complex service that significantly impacts economies and quality of life (Berry and Bendapudi, 2007). Improving health care effectiveness, efficiency, and equity is therefore critical (Aday, 2004); and information technologies can play a significant role. Technology creates opportunities for service innovation, but it also increases the complexity of the service context (Ostrom *et al.*, 2015). This raises challenges for service managers that need to integrate people, technology, process, and information in their service systems (Maglio *et al.*, 2009).

Despite thorough conceptualizations of service ecosystems, further research is needed on the process of value cocreation (Payne *et al.*, 2008; Vargo *et al.*, 2008; Moeller *et al.*, 2013), especially the types of interaction and outcomes in service systems (Spohrer, 2011). Research on value cocreation in networks (Ostrom *et al.*, 2015) can also deepen the understanding of the systemic nature of resource integration and of how actor activities are coordinated and adapted to each other (McCull-Kennedy *et al.*, 2012).

Electronic health records (EHRs) provide a rich setting for studying service ecosystems. EHRs are digital repositories of patient data (ISO, 2004). The benefits received by each EHR actor (such as a citizen) depend on the EHR service provider but also on inputs from other actors, such as health care professionals and patients. In this context, the value the EHR creates for customers also depends on the way it supports value cocreating interactions among different actors in a complex value network (Pinho *et al.*, 2014). This calls for a deeper understanding of how value is cocreated at different levels of the ecosystem and how different levels influence and shape each other.

This study investigates how value is cocreated in service ecosystems from a multilevel perspective. First, drawing on S-D logic (Vargo and Lusch, 2016) it provides a detailed understanding of value cocreation factors and outcomes at the different ecosystem levels, showing how these different system levels are embedded within one another, and dynamically shape the ecosystem. Second, it contributes to research on value cocreation in the context of health care by offering an ecosystem approach for understanding the dynamics of multiple actor interactions. Overall, this qualitative study contributes to the development of middle range theories (Brodie Saren and Pels, 2011), bridging the high-level conceptual perspective of S-D logic with specific empirical findings in health care.

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The next section reviews literature on value cocreation and ecosystems within the S-D logic perspective. The second section describes the Grounded Theory methodology approach, including sample design, data collection, and analysis. The third section presents the findings of the qualitative study, offering a multilevel understanding of value cocreation factors and outcomes in service ecosystems. The fourth section discusses the results, research contributions, and managerial implications.

## Literature review

### *Value cocreation*

The concept of value has been extensively studied in service literature, although value cocreation in complex multi-actor, network settings still needs deeper understanding (Ostrom *et al.*, 2015). Value cocreation is a central concept of S-D logic (Vargo and Lusch, 2008) and can be defined as “benefit realized from integration of resources through activities and interactions with collaborators in the customer network” (McColl-Kennedy *et al.*, 2012). From this perspective, resources do not have value *per se*. Value is cocreated by actors when resources are used and combined in different ways. In S-D logic, all social and economic actors are resource integrators, active participants in value cocreation, and connected together in embedded systems of service exchange (Chandler and Vargo, 2011). Because customers are intrinsically involved in the value cocreation process by performing a series of activities to achieve a desired outcome, they always cocreate value (Payne *et al.*, 2008; Vargo and Lusch, 2008). In this sense, actor collaboration is essential (Moeller *et al.*, 2013), as they interact to increase resource density, improve the set of resources available to them and increase the value created (Normann, 2001).

### *Value cocreation in service ecosystems*

A service ecosystem perspective brings new insights into value cocreation by focusing on multiple actors and their value cocreation interactions (Lusch and Vargo, 2014), the importance of interdependencies, adaptation, and evolution (Frow *et al.*, 2014). Service ecosystem perspectives contrast with the traditional focus on dyadic relationships between customers and service providers by emphasizing many-to-many interactions between multiple stakeholders (Gummesson, 2007). In S-D logic, service ecosystems are defined as a relatively self-contained, self-adjusting systems of actors connecting through shared norms and service exchange (Vargo and Akaka, 2012). S-D logic provides a foundation for characterizing service ecosystems as multiple actors in institutional contexts that interact directly and indirectly through value propositions and service exchange to cocreate value. The routine and adaptive interactions among actors are guided by institutions, which play a key role in the functioning of service ecosystems (Edvardsson *et al.*, 2014; Vargo and Lusch, 2016). Thus, in service ecosystems, value cocreation is influenced by actors’ ability to access, adapt, and integrate resources, which is deeply shaped by the social context (i.e. relationships and resources) (Akaka *et al.*, 2012; Edvardsson *et al.*, 2011; Pinho *et al.*, 2014).

From a service ecosystem perspective, value cocreation goes beyond the firm and customer dyad to a broader context where all participants (companies, customers, suppliers, employees, and other network partners) contribute to creating value for themselves and for others (Vargo *et al.*, 2008). In ecosystems, value can be defined as an improvement in system well-being and can be measured in terms of system adaptability (Vargo *et al.*, 2008; Payne *et al.*, 2008). The interactions between actors offer opportunities to facilitate value cocreation for and with each other (Grönroos, 2008), and the quality of interaction (i.e. trust and power) among actors is essential to value cocreation (Fyrberg and Jürjado, 2009).

Service ecosystems are dynamic and can simultaneously reconfigure themselves (Lusch and Vargo, 2014) because multiple actors engage in service exchange (Lusch and Nambisan, 2015). A dynamic approach to studying ecosystems is needed to understand their learning, adapting,

and evolving properties. Service ecosystems have a multilevel nature, from the micro to the meso and macro levels; and these levels are embedded in each other (Lusch and Vargo, 2014). At each level, various actors interact to cocreate value and form the social context where value is obtained (Chandler and Vargo, 2011). This requires analyzing the cocreation process at each ecosystem level (Chandler and Vargo, 2011).

More recently, Vargo and Lusch (2016) show that value cocreation involves resource integration with actors reciprocally providing services and cocreating value through holistic experiences in embedded and overlapping service ecosystems. These authors emphasize the role of institutions (rules, norms, meanings, symbols, practices) and institutional arrangements (interdependent assemblages of institutions), which govern service ecosystems. Institutions are a key driver of value cocreation interactions (Edvardsson *et al.*, 2014; Vargo and Akaka, 2012). Thus, institutional or social norms are important to facilitate a common environment for value cocreation for the different actors in the ecosystem. This is especially important at the macro level since it is characterized by shared norms, institutions, and rules, which then enable and constrain meso and micro level actors (Lusch and Vargo, 2014).

S-D logic provides a theoretical foundation for studying service ecosystems and value cocreation. However, further research is needed to understand value cocreation interactions and outcomes in service ecosystems (Akaka *et al.*, 2012; Edvardsson *et al.*, 2012) at various levels of aggregation (micro, meso, and macro) (Chandler and Vargo, 2011). This study deepens the understanding of value cocreation in service ecosystems from a multilevel perspective. Using a Grounded Theory approach, it provides a detailed analytical view of the micro, meso, and macro systems within the ecosystem. It allows zooming in on value cocreation factors and outcomes at each level and then zooming out to obtain a global view of the interplay and influences each level exerts on the others.

#### *Value cocreation in health care*

Health care and the role of technology in enhancing patient coproduction is a promising research area (Berry and Bendapudi, 2007), as the evolution of technology offers to develop new health services and improve well-being (Ostrom *et al.*, 2015). Still, few studies empirically explore the antecedents of patient value cocreation (Zhao *et al.*, 2015); and further work is needed to deepen the knowledge of value cocreation, considering all relevant actors in the network (Pinho *et al.*, 2014). Healthcare services should be viewed within customer service networks, including not only the customer-firm dyad but also other firms as well as public (e.g. community and governmental) and private (e.g. friends and family) sources (Brodie, Hollebeek, Jurić and Ilić, 2011).

Previous EHR research identified value cocreation factors and outcomes in health care networks (Pinho *et al.*, 2014). Value cocreation factors (i.e. availability, accessibility and reliability of information, and actors' collaboration and communication) show how actors cocreate value through resource integration, which result in value cocreation outcomes (i.e. broader healthcare coverage, better healthcare provision, cost and time savings, and health care decision support management). These authors show that information is a critical resource in healthcare and how EHR provides easier and faster access to it. Technology has the potential to empower patients (Mukherjee and McGinnis, 2007), since having access to more information leads to increased knowledge and more informed relationships with the physician (Camacho *et al.*, 2010). Also, e-healthcare services allow health professionals to more easily access information, facilitating interactions and the emergence of new relationships among them, increasing the flow of information in the system (Camacho *et al.*, 2010; Pinho *et al.*, 2014).

Collaboration and communication are essential value cocreation factors in health care (Pinho *et al.*, 2014). Patients are assuming a more active role in medical decisions, but not all patients and doctors are equally willing to do it (Camacho *et al.*, 2010). Communication contributes to improved inter-personal relationships, facilitating information sharing and

treatment-related decisions (Ong *et al.*, 1995). Thus, health care services need full collaboration between the different actors (health care professionals, patients, families, and the community) (Apesoa-Varano *et al.*, 2011). An emergent trend is new patient-driven health care services, such as health social networks, which increase information flow, collaboration, and patient choice (Swan, 2009). Citizens that enroll in these virtual communities can share experiences, information, and support, which can have positive impacts on their well-being (Mukherjee and McGinnis, 2007; Nambisan and Nambisan, 2009).

Designing effective and efficient health care systems (whether a hospital, clinic, or entire country-level system) remains a challenge and needs an integrated approach that considers aspects such as patient complexities, systems efficiencies and costs, service provider roles, and technology's ability to support and deliver across innovative service platforms (Ostrom *et al.*, 2010). Effectiveness and efficiency are also critical in health care (Aday, 2004). In addition to health outcomes, effectiveness also includes economic impacts, quality of life, and well-being. On the other hand, efficiency evaluates the amount and combination of resources used to produce a certain health outcome.

Health services that are labor and skill intensive may result in performance variability across different health institutions (Berry and Bendapudi, 2007). Research suggests that health services coproduced within networks present the ability to outperform single health providers due to network facilitation of asset harmonization and standards definition (Hammerschmidt *et al.*, 2012). Ensuring cohesion in the network is important to enhance knowledge transfer, more collaboration, and learning to result in increased performance (Camacho *et al.*, 2010). One critical health care outcome is patient experience because it enables comparison of different healthcare service providers, facilitates patient health care decisions, enables monitoring health care delivery and patient experience standards, and helps health care organizations to assess their quality standards (LaVela and Gallan, 2014). Previous research identified potential effects of communicative physician behaviors on patient outcomes, namely satisfaction, compliance (adherence to treatment), recall and understanding of information, knowledge, coping, recovery, and quality of life/health status (Ong *et al.*, 1995). Also, it is important to ensure that customers (i.e. patients) adhere to the professionals guidance and advice or negative outcomes may arise (Seiders *et al.*, 2015). This requires understanding the role patients play with knowledge and skills in health care service development (Elg *et al.*, 2012; McColl-Kennedy *et al.*, 2012).

Cost efficiencies are critical to ensure health care system viability. Several studies suggest that the lack of adequate clinical information has a negative effect on costs and the quality of healthcare provision, which in turn compromises patient safety (Mukherjee and McGinnis, 2007). E-healthcare services may have considerable positive impact on the costs of health organizations (Chen *et al.*, 2014; Mukherjee and McGinnis, 2007; Pinho *et al.*, 2014). In addition, e-healthcare (especially EHR) saves time by enabling health professionals to focus on patient care (Mukherjee and McGinnis, 2007).

## Method

The study adopted a qualitative approach based on Grounded Theory (Charmaz, 2006; Strauss and Corbin, 1998) to gain an in-depth understanding of value cocreation in service ecosystems from a multilevel perspective. The Portuguese Health Information Ecosystem and the EHR were chosen as the empirical ground. National health information fits the definition of a complex ecosystem and provides a rich empirical context to study value cocreation. The EHR provided by the Portuguese Ministry of Health enables sharing health information among patients and health care practitioners through the patient and the health professional portals. As such, it enables value cocreation, not so much through dyadic interactions between the service provider and the patient, but mostly by enabling and facilitating resource integration and interactions among actors within the ecosystem.

Qualitative methodology provides insights that would be difficult to get otherwise and is suitable for investigating human interactions, meanings, and processes that underlie the phenomena (Gephart, 2004). In the context of network research, a case study is appropriate because it is important to analyze the context of the phenomena to understand its dynamics (Halinen and Törnroos, 2005). Thus, to enable the study of value cocreation at the different ecosystem levels, a case study approach was used to define the units of analysis (Yin, 2009). Following this approach, a case study with embedded units of analysis was used. The health information ecosystem and EHR represented the case study (macro level) with selected embedded health organization units (meso level), which in turn have embedded individual citizens and health care practitioners (micro level).

The Portuguese EHR (launched in 2012) is supported by the Portuguese *Plataforma de Dados de Saúde* that constitutes the national health record data sharing facility and uses interoperable technologies to link old and new existing applications. In 2014, the patient portal of the Portuguese EHR had one million users with 600 health care units using the professional portal. The portal was accessed more than 18,000 times daily (SPMS, 2014). The Portuguese EHR provided a rich empirical ground for studying value cocreation in a service ecosystem context. The health care ecosystem comprises individual actors (e.g. patients, their families, physicians, nurses, pharmacists), organizational actors (e.g. public and private hospitals, primary care units, regional health care administration, and software vendors), and national actors (e.g. Ministry of Health).

*Sample design*

The sample covered a diverse set of theoretically relevant organizations and actors to provide evidence on different perspectives of value cocreation at the micro, meso, and macro level (Corbin and Strauss, 2008). To ensure diversity (Eisenhardt, 1989), the sample covered both public and private health organizations, with different sizes, and in different geographic locations. Table I shows the sample design. The health information ecosystem and EHR represented the case study (macro level) with selected embedded health organization units (meso level), comprising eight organizations (three public hospitals, three private hospitals, and two primary care units). Embedded in the meso level is the micro level of individual citizens and health care practitioners. Thus, inside the hospitals several actors with different roles were interviewed, to cover actors that provide a national, organizational, and individual perspective. To obtain an organizational view, the sample included health care board members and managers (clinical directors, service managers, and information system (IS) managers). For the individual microlevel view, doctors, nurses, pharmacists, psychologists, nutritionists, social assistants, and citizens were interviewed. In the primary care units, the sample included members of the board, physicians, and nurses. In total, 48 interviews were conducted until data saturation was reached (Corbin and Strauss, 2008).

|  | Primary care | Public hospital | Private hospital | Citizens | Total |
|--|--------------|-----------------|------------------|----------|-------|
| Physicians                                   | 2            | 4               | 6                |          | 12    |
| Nurses                                       | 1            | 3               | 3                |          | 7     |
| Pharmacists                                  |              | 1               | 3                |          | 4     |
| Other health care professionals <sup>a</sup> |              | 4               | 3                |          | 7     |
| Health care board members                    | 1            | 3               | 3                |          | 7     |
| Health care service managers                 |              |                 | 2                |          | 2     |
| Health care IS managers                      |              | 2               | 3                |          | 5     |
| Total interviewees                           | 4            | 17              | 23               | 4        | 48    |
| Organizations                                | 2            | 3               | 3                |          | 8     |

**Table I.**  
Sample design

**Note:** <sup>a</sup>Psychologists, nutritionists and social assistants

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### *Data collection*

To address the research objectives, semi-structured interviews were undertaken by two authors. The interviews were conducted face-to-face on the health organization's premises and lasted 45 minutes on average. The interview protocol sought to understand how actors integrate, access, and adapt resources in their value cocreation activities within the health ecosystem. More specifically, the interview started by inviting participants to talk about their overall activities during a normal working day, their role in the organization, their goals, their direct and indirect interactions with other actors, and the information exchanged with other actors. The second part of the interview addressed the experience with using the EHR. This included the impact on their activities and interactions with others, the perceived and expected benefits, and how the EHR should evolve in the future.

### *Data analysis*

All interviews were literally transcribed and analyzed using NVivo 10 software. Data analysis followed a Grounded Theory approach (Charmaz, 2006; Corbin and Strauss, 2008) to uncover value cocreation factors and outcomes at the different levels of the healthcare ecosystem and to understand the interactions among levels. However, a more contemporary approach to the Grounded Theory was followed. Instead of a purely inductive method, an abductive method was adopted (Dubois and Gadde, 2002; Richardson and Kramer, 2006; Charmaz, 2006), involving inferences that are not totally free of the researcher's previous knowledge and experience.

A preliminary literature review was performed at the beginning of the research and as the process of data analysis evolved, further literature review was undertaken to compare and relate the emergent results with previous research. The process of analysis involved two authors that iteratively compared, discussed, and refined the emergent results. This has the advantage to confront different perspectives and increase confidence in the results (Eisenhardt, 1989). This process also ensured theoretical validity (Maxwell, 1992) by assuring that the emergent results are coherent with data. As new findings were uncovered in data analysis, more data were gathered to confirm the theoretical interpretations and data were re-examined, refined, and compared with the literature. Thus, theory was built during both data collection and analysis. In an iterative process, relevant patterns identified in preliminary data analysis guided subsequent data collection (Charmaz, 2006). The goal was to use the theoretical concepts as guides to compare the empirical results of a case (Yin, 2009); and, by using abductive logic, let theory emerge from data (Richardson and Kramer, 2006).

The first phase of data analysis started with an open coding process for actors' resource integration, activities, and interactions. By comparing data with the literature, items that describe the broad value cocreation factors and outcomes at the three levels of analysis were addressed. S-D logic (Vargo and Lusch, 2016) and previous research (Pinho *et al.*, 2014) provided the general framework for the next phase from a multilevel ecosystem perspective. This process allowed refining and categorizing the value cocreation factors and outcomes at each level and the relationships between them. In the third phase, theoretical coding (Charmaz, 2006) was used to specify the emergent relationships between the conceptual categories and subcategories previously identified, thus helping to draw theoretical inferences. In this process, drawing on categories identified in the literature, empirical data were organized under the broader theoretical categories of value cocreation factors and outcomes. The system level analysis enabled understanding the dynamism and interplay among levels and strengthened the empirical evidence.

## **Results**

Study results enabled better understanding of the nature and dynamics of value cocreation processes in service ecosystems from a multilevel perspective. More specifically, results

identified: value cocreation factors and outcomes at the micro, meso, and macro levels. Additionally, the results showed how those levels are embedded and interdependent, thus influencing and shaping each other.

*A multilevel understanding of value cocreation in service ecosystems*

Data analysis revealed different levels of value cocreation in the ecosystem, showing its dynamic nature and multiple exchanges occurring within its different systems. Chandler and Vargo's (2011) three-level conceptualization of context (micro, meso, and macro) was used to analyze healthcare service ecosystem in three levels. The micro level comprises the individual actors such as health professionals, patients, and family. At this level, service-for-service exchange occurs directly and reciprocally between actors in dyads. The meso level consists of public and private hospitals, primary care units, and health support organizations. At this level, actors connect directly or indirectly to serve one another and cocreate value. Macro level actors include government, the ministry of health, and other organizations with responsibilities for defining national health policies. At this level, the context is an ecosystem where multiple simultaneous service-for-service exchanges occur.

The smaller service systems such as families, primary care units, and hospitals are embedded in a larger healthcare ecosystem. Also, the interactions and exchanges at each level (e.g. between doctors and patients) and among levels (e.g. information sharing among hospitals and the Ministry of Health) shape and enable the emergence of the ecosystem in an ongoing process of value cocreation.

Based on this analysis, study results enabled multilevel identification of value cocreation factors and outcomes, as presented in Figure 1. Value cocreation factors are service dimensions that facilitate and enable resource integration between each actor and the EHR and, therefore, contribute to value cocreation (Pinho *et al.*, 2014). Value cocreation factors at each level were aggregated in broader dimensions. Three dimensions are common to the three levels: resource access, resource sharing, and resource recombination.

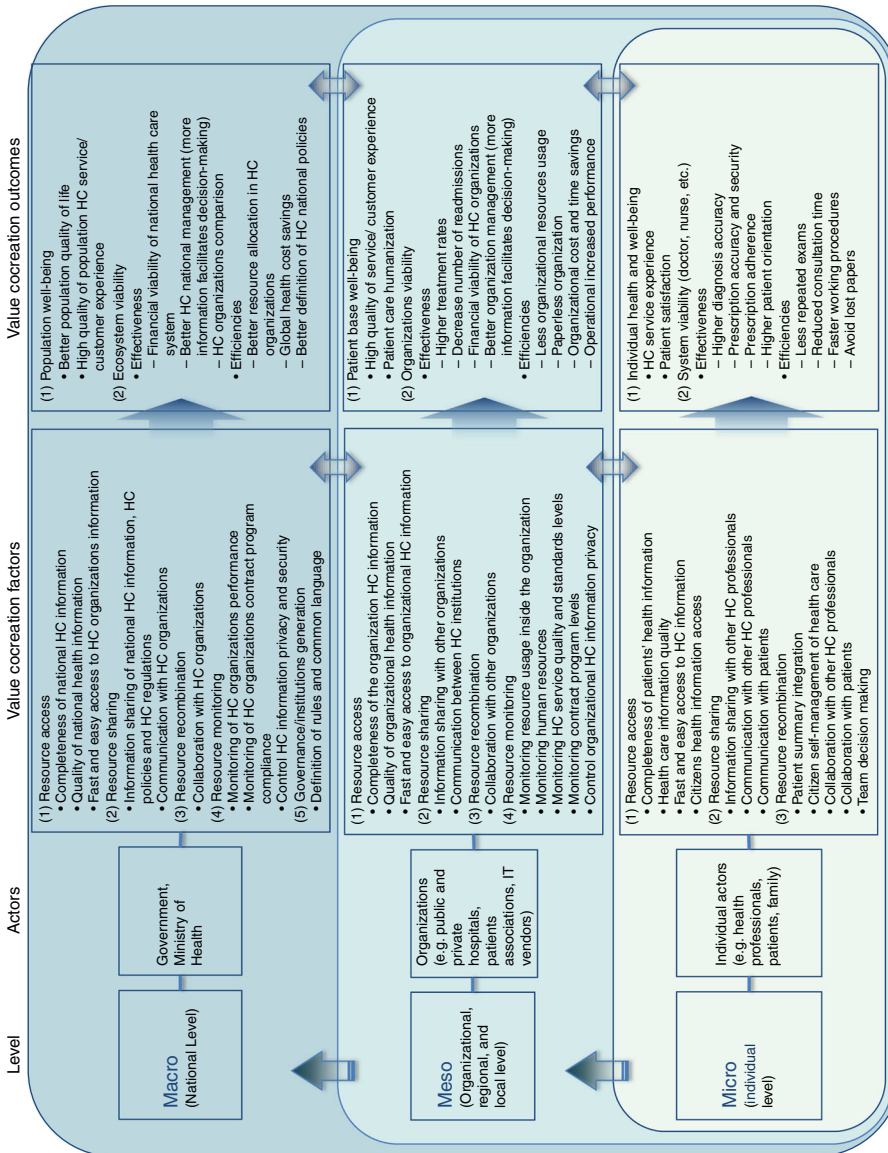
*Resource access.* Through the EHR, actors in the ecosystem are able to use new resources they would otherwise not access, increasing resource density. Results showed how the EHR fosters resource access at the three levels by enabling the different actors faster access to information (e.g. health care, managerial, organizational) and providing a complete view of health care information.

*Resource sharing.* Through the EHR, multiple actors in the ecosystem can use the same resources, leading to increased efficiency. Digital communication growth increases the ability to disperse digital resources by separating information from any physical form (Normann, 2001; Lusch *et al.*, 2010), enabling seamless communication processes.

*Resource recombination.* Through the EHR, actors are able to integrate existing and new resources in new ways. They use resources, adapt them, recombine them with their own (e.g. skills, knowledge) and other actor resources (e.g. patient own information, other professionals skills, other organizations services), and produce more resources (e.g. patient summary). This process leads to higher resource density, meaning that resources are combined to achieve the best possible value (Normann, 2001; Lusch and Vargo, 2014). This resource recombination is done through collaborative and cooperative processes (Lusch and Vargo, 2014; Edvardsson *et al.*, 2014; Vargo and Lusch, 2016), where actors make new uses of existing resources.

Two other value cocreation factors emerged as relevant at higher levels. Resource monitoring emerged at the meso and macro levels where organizations self-monitor their health indicators and performance and governments exert control. For system viability, it is necessary to control output quality and overall complement quantity (Wareham *et al.*, 2014). For example, at the meso level, it is important to control organizational resource usage and health care service provision. At the macro level, a broader perspective is necessary to control the availability and quality of health care supply across the ecosystem.





**Figure 1.** Value cocreation factors and outcomes at the micro, meso, and macro levels

At the macro level, a critical value cocreation factor is governance/institutions generation that comprises rules and common language definition. Governance can be defined as a “shared system of rules” (Spohrer *et al.*, 2012) and institutions are its essential foundations (Vargo and Lusch, 2016). Governance shapes the whole service ecosystem downward, influencing the lower levels and thus greatly impacting its viability.

Resources are dynamic, since they are constantly being combined and integrated, and value cocreation factors depend on actors’ own actions and the actions of other actors (Pinho *et al.*, 2014). Value cocreation factors therefore lead to value cocreation outcomes, generating benefits to the actors and ecosystem. Based on data analysis, value cocreation outcomes were aggregated in two broader dimensions: individual, organizational, and national well-being and system viability. The overall ecosystem objective is well-being, which is embedded in the purpose and nature of the ecosystem. However, system viability, that is its sustainability, must be assured. Well-being is important at the individual, the organizational, and national levels (Anderson *et al.*, 2013). Importantly, health care effectiveness and efficiency are critical outcomes to ensure ecosystem viability.

The next section presents study results describing the identified value cocreation factors and outcomes at the micro, meso, and macro level of the ecosystem, as well as the interconnections between the levels. Based on the qualitative results and literature review, value cocreation factors are defined as enablers and antecedents of value cocreation outcomes. These factors are interdependent, influencing each other both within each level and between other levels.

#### *Value cocreation factors at the micro, meso, and macro levels*

*Value cocreation factors at the micro level.* Value cocreation factors at the micro level enable dyadic interactions through which individual actors (e.g. health professionals, patients, family) integrate resources to cocreate value with other actors supported by the EHR. These factors comprise resource access, resource sharing, and resource recombination.

Resource access includes the completeness of patients’ health information, fast and easy access to health information, and citizens’ health information access. Information is a critical resource for all actors. However, to enable effective integration, information should be accessible whenever needed:

[Through the EHR] we have detailed information related to medicine prescriptions, exams performed; we have a lot of information, which is extremely useful (Hospital clinical director).

As pointed out by a nurse “when a patient arrives at the emergency room, knowing the patient’s condition, both social and clinical, is extremely important for all health care professionals involved.” Importantly, information must be accessible, available, organized, reliable, secure, and customized to specific actors’ needs. An IS manager emphasized that “we want to adapt information to the needs of each health care specialty, so it is not so general, but instead is customized.” Citizens may also access and manage their own health information through the EHR. This is important for professionals that use it to make better-informed decisions, as expressed in the following example:

The patient portal brings a lot of benefits, because patients, by their own initiative, insert some information, feeding the system; and, when they contact a health unit, we already have some knowledge about them (Hospital service manager).

Resource sharing among actors in the ecosystem is an important value cocreation factor and several actors pointed out how the EHR facilitated communication both with other health professionals and with patients or families. For example:

We have to try to understand the patient side, do some research, know what is happening with the patient. We talk a lot among ourselves inside the hospital, but sometimes it is not so easy with other hospitals (Psychologist).

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At the micro level, individual actors engage in collaborative and cooperative interactions when they engage in resource recombination, which is enhanced by the EHR. Health professionals integrate their own resources (e.g. skills, information) with other resources (e.g. existent patient information) and produce new resources (e.g. patient diagnosis). For example, this enables producing a patient summary with all relevant updated patient health information. Collaboration is another important factor mentioned by health professionals. A pharmacist said that with the EHR “we now interact much more with doctors and nurses. We manage the medicine database internally so we are able to facilitate prescriptions and register the right prescription, thus avoiding many medicine errors.” Also, “team work is essential” because different medical specialties may be needed to provide health care.

*Value cocreation factors at the meso level.* In this study, value cocreation factors at the meso level were analyzed considering the perspective of the health care organizations, such as hospitals and primary care units. Resource access at the meso level included health and organizational information aggregation and fast and easy access to organizational health information, as expressed in the next examples:

The EHR is a source of management information for me (Hospital service manager).

We need management information, knowing how we are performing in each activity and how we can improve. Information about production, quality standards, costs, and also about diseases, like which diseases occurred, how many patients we are taking care of (Hospital board member).

Resource sharing at the meso level enables good flow of information and communication among different organizations and with the regional health administration. Organizations share information “with the ministry, regional health government, other hospitals, or other institutions.” The EHR facilitates communication. As stated by a psychologist, “We work with some private health care organizations, and it would be easier to exchange information using the EHR.” Citizens may go to different health institutions depending on the health problem, thus health information should be shared among institutions. A nurse pointed out, “If a patient is referred to primary care, if he comes back, we need to know what happened to him after he left.” Information sharing concerning medical exams “to avoid repeating them” is also critical.

Resource recombination among organizations is related to facilitation of collaboration and cooperation between different organizations. Organizations collaborate in several ways, for instance in “developing information systems that are common to different organizations,” “regular contacts with regional administration, which helps dealing with some health situations” or using existent health information, which enables delivering better health services. For instance, “in the winter season [when there are health care demand peaks] we always keep close contact to help us referring patients.” Importantly, actors recognize that they can integrate new and existent resources recombining and reconfiguring them in new ways.

Resource monitoring is essential for organizations to control what and how resources are being used, health information security and privacy, service quality levels, health care delivery standards, and how well contract programs with Ministry of Health are being fulfilled. This is especially important to actors with management activities in the organization:

It is important to have access to management information, i.e., to know how we are performing at each activity, the production process, quality indicators, and satisfaction (Hospital board member).

*Value cocreation factors at the macro level.* Value cocreation factors at the macro level are related to resource access, resource sharing, resource recombination, resource monitoring, and governance/institutions generation. Resource access is related to completeness of aggregated

national health care information, fast and easy access to health care organizations information, and improved quality of national health care information. The Ministry of Health needs to monitor health care delivery to ensure population access and good health care services. Thus, accessing reliable, on time information is critical:

To provide information about compliance with the contract program, we have to have access to information about how production is running, because we have obligations with the ministry that regulates us (Hospital clinical director).

Resource sharing is facilitated by the EHR, by enabling the dissemination of national health information and legislation from central administration to health organizations, as shown in the following example:

We receive the orientations to elaborate the strategic plan for the next years, which are very clear about the level of financing, activity growing, and so forth (Hospital board member).

Resource recombination mediated through the EHR enables closer collaboration between organizations and the Ministry of Health, which is important to defining the national health strategy. As a hospital board member said, "We have monthly meetings with the fifteen large hospitals, where, based on a set of indicators, the national strategy is defined." Another example shows the importance of collaboration:

Our hospital collaborates in everything that the Ministry of Health asks! The definition of health guidelines should be done in collaboration with hospitals. That would be very good! (Hospital board member).

Resource monitoring is critical at the macro level; and the EHR and other ISs facilitate it by providing financial, production, and clinical information. Health organizations have "systems with clinical information, which enables monitoring many aspects of the organization, and statistical data that reflect the activity." Clinical information includes "complaint management, patient's satisfaction, infection control, fall rates, ulcers control, and so on." The aggregation of this information at the macro level is important for the Ministry of Health to assess and monitor the performance of the overall health ecosystem, such as the level of health care services provided. As an actor pointed out:

The Ministry of Health must control and penalize organizations that do not comply with the rules (Hospital IS Director).

Study results highlighted that governance/institutions generation is a critical value cocreation factor for ecosystem viability that only emerged at the macro level. This factor includes the definition of a strategic vision, rules, and common language. Several actors pointed out that:

The government should establish the guidelines for health care information systems so the different information systems can communicate with each other (Hospital clinical director).

The Government Health Information Agency should be the regulator, should define standards, procedures, and rules; and then control! (Hospital IS Director).

The value cocreation factors uncovered at each level act as enablers and antecedents of value cocreation outcomes described in the next section.

#### *Value cocreation outcomes at the micro, meso, and macro levels*

Data analysis enabled identifying value cocreation outcomes at the different levels and their aggregation in two broader dimensions: well-being and system viability. Higher quality of health care services is ultimately the desired outcome at all levels and is facilitated through the EHR. However, ensuring ecosystem viability through both effectiveness and efficiency

is also critical for it to be sustainable. This is particularly important in national health care as improving health and well-being requires careful integration of existing ecosystem resources. As such, trade-offs between these outcomes must be balanced. These outcomes are dependent on actors' own actions (e.g. inserting information in the EHR) as well as the actions of others at the various levels (e.g. willingness to collaborate and communicate).

*Value cocreation outcomes at the micro level.* At the micro level, the value cocreation outcomes directly benefit individual actors. Interviewees highlighted individual health and well-being as an important outcome of the EHR, such as good service experience and higher quality of care. Value cocreation factors enable health care professionals to access and share information as well as to collaborate with each other, resulting in outcomes such as better service to citizens and higher patient satisfaction. This is highlighted in the following comment:

The EHR allows substantial gains in terms of quality of care, first for the patient, because it allows us to know the clinical situation, the medication, previous surgeries, allergies, and previous exams [...]. This is especially important when the patient is not able to provide that information, such as in an emergency when the patient is not conscious (Hospital clinical director).

System viability has two major components: effectiveness and efficiency. Through the EHR, effectiveness is improved because it enables higher diagnosis and prescription accuracy and security, which result in more successful treatment. The EHR facilitates patient follow-up by enabling health professionals to know how well a treatment worked, if patients followed medicine prescriptions and treatments, and if they missed consultations. For example:

Now, if patients don't show up to medical appointments, if they are considered patients with a high level of risk, we must notify the colleagues who are following that patient to let them know what is happening (Psychologist).

Study results showed that health care practitioners are frequently overloaded and recognize the need to carefully use resources. Efficiency at the micro level is important to avoid wasting resources (e.g. "avoiding unnecessary exams repetition"). The EHR also enables time efficiencies, such as shorter consultation times and faster work procedures. Another important outcome from accessing health information on the EHR is reduced time spent on processing paperwork and the possible loss of documents. As stated below:

[The EHR enables] fast and efficient processes because we do not waste time on getting papers and sending them. The prescription shows up as soon as the doctor validates it (Pharmacist).

*Value cocreation outcomes at the meso level.* Data analysis revealed the value cocreation outcomes obtained from an organizational perspective. At the meso level, the well-being of the organization's patients was considered crucial for hospital board members, comprising "high quality health service," "health care excellence" and "patient care humanization." At the organizational level, high quality of care is an important goal, and is also important for building a strong reputation among citizens, health care professionals, and the Ministry of Health.

On the other hand, healthcare organizations need to ensure viability by assuring effectiveness and efficiency. Effectiveness at the meso level is related to achieving the desired organizational results. First, the EHR enables delivering better health care due to higher successful treatment rates and decreased numbers of readmissions. Second, EHR enables better-informed management decisions based on aggregated data on resource usage, thereby increasing financial viability. As shown in the following comment:

I see the [EHR] platform as a means that helps us better manage hospital capacity (Hospital board member).

Attaining health organizational objectives while efficiently using resources is crucial for health care organizations, which are usually faced with resource constraints. Health care

professionals with management responsibilities, such as hospital board members and clinical directors, highlighted this outcome the most. Cost efficiencies from avoiding duplication of exams or medical procedures are very important outcomes for health care organizations because of their huge financial impacts. The use of ISs was considered critical to ensure efficient use of resources, for example, paper dematerialization, resulting in cost and time savings:

Having information on digital support helps save a lot of resources: financial, human, material, and others! (Hospital board member).

*Value cocreation outcomes at the macro level.* At the macro level, the value cocreation outcomes are viewed from a national perspective. Population well-being at the macro level is a critical outcome for ensuring citizens' quality of life and a healthier population. The implementation of a national EHR is considered fundamental to this outcome and has been considered a flagship project by the Portuguese Ministry of Health. The EHR is considered a structural project that puts the citizen at the center of the health care system, enabling citizens to play a more active role in managing their health care and enabling health care practitioners to access, share, and recombine integrated patient information. For example, one actor emphasized that:

The EHR is essential; something we wanted a long time ago; and, when well implemented, will allow considerable health care gains at the national level (Hospital clinical director).

The Ministry of Health should foster health care ecosystem viability through effectiveness and efficiency, which is facilitated by the EHR. Effectiveness at the macro level results in financial viability of the national health care system, improved national health care service decision support, and comparability of health care organizations. This is facilitated by the EHR because it enables aggregation of national health data, which is critical for informed decision making:

The regulator [Ministry of Health] has advantages in having information, aggregated at national level, thus one EHR advantage is having crosswise information, enabling a comprehensive view of national health care (Hospital clinical director).

The EHR has powerful potential to enable efficient use of resources within the ecosystem. "The EHR is a tool to help better manage hospital facilities. If the EHR provides information about health costs and is available to everyone, people will realize the difficulties and how much the National Health Service costs," said a hospital administrator. The EHR and other health ISs promote efficient resource usage (e.g. money, human, materials, facilities) and better definition of health care national policies. For example:

Having on time information represents a huge time saving in decision-making. We can have much more combined actions across health care organizations; and we can have better planning for public hospitals, with higher productivity and better overall resource usage (Hospital IS manager).

In summary, as stated by the Minister of Health when referring to the National Health System said, "The EHR enables efficiency gains, waste reduction, continuous improvement of quality of health care, auditing, renovation, and innovation" (Macedo, 2014).

#### *Interplay between the micro, meso, and macro levels*

Study results showed that the health care ecosystem levels (macro, meso, and micro) are intertwined as multiple actors (governmental, organizational, and individual) engage in dynamic, simultaneous, and interdependent interactions in their resource integration process to cocreate value. These findings corroborate previous research stating that the understanding of value cocreation implies an interplay between micro, meso, and macro perspectives (Chandler and Vargo, 2011), and that value propositions offered within each level and among the levels influence and shape them (Frow *et al.*, 2014). Also, results

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show that relationships between organizations are important sources of resources (Kandampully, 2002; Rusanen *et al.*, 2014) contributing to ecosystem overall value.

Due to the dynamic nature of ecosystems, four simultaneous influences occur within and across levels. First, since resource integration by actors at each level is dynamic and constantly occurring, the value cocreation factors occur simultaneously and interchangeably while influencing each other. For example, actors access information in the EHR, use and share it with others, and produce new information, thus increasing resource density:

I can know the patients' problems, know patients' health evolution, and know the activities the nurses performed to respond to patients' needs, which is valuable (Hospital nurse).

Second, value cocreation factors contribute to value cocreation outcomes at each level. For instance, patients' well-being depends on the availability of previous health information (e.g. patient summaries, exam results) that would help the current practitioner provide care. This information can be inserted by previous practitioners in the different organizations on behalf of the patient they may have treated. The patient can also insert and manage his or her health care information; and, thereby, feel more empowered to participate in treatment decisions with the health care professional. Furthermore, health professionals involved in the treatment decision may communicate and collaborate while providing better care and higher satisfaction for the patient's health care experience. Several actors, as evidenced in the next quote, mentioned these benefits:

The EHR, as a tool, is very positive, with a huge potential, not only in terms of cost reduction, but also celerity in treating a patient and the impacts that might originate for all (Hospital board member).

Third, value cocreation outcomes are not independent and mutually influence each other within the service system levels. For example, inside each health organization, health professionals attempt to be effective and efficient in the use of resources when performing their activities, which in turn results in patients' better diagnosis and care. This leads to improved health and well-being for patients, as shown by the examples:

The EHR can help us provide better health care and improve financial efficiency. People don't have any idea of the unnecessary duplication of exams that we have to do because we do not have access to the system (Hospital clinical director).

Fourth, the ecosystem is composed of multiple embedded systems, which mutually influence each other and contribute to resource integration and higher resource density. Because levels are embedded, the impact is both upward and downward, that is from micro to meso and to macro and the reverse. At the micro level, the quality of health care provided to each patient impacts a health organization's overall service quality, which in turn impacts the population's quality of life. Also, the health information inserted in the EHR by individual actors (e.g. health professionals, patients) is used by organizations at the meso level and is quite valuable for assessing service quality levels, decision making, and better resource allocation. The meso level is nested in a broader macro level, and this health information is essential at the macro level for improving system efficiency, effectiveness, and definition of national health policies, which has a downward influence on the other levels. Furthermore, macro level decisions regarding institutions, operational rules, and common language are critical for ecosystem survival because they bind the micro and meso actors' value cocreation activities. The interplay between levels is shown in the following example:

We need a 10-year strategic vision with data, statistics; this will allow us to invest in the right areas, the right pathologies to have a global vision with the health platform. This is important for our staff to know how to better use resources to provide good care to our patients and for our hospital health care service (Hospital board member).

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The EHR is a powerful resource that enables and facilitates the multiple interactions between actors in the different levels, as emphasized by all actors. The EHR allows actors to combine their own resources with the resources from other actors (individual and organizational), which increases resource density and creates value for the whole ecosystem. Also, as the results showed, the micro, meso, and macro levels are deeply interconnected while influencing and shaping each other.

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### Discussion

This health care investigation sought to broaden the comprehension of the relationships among actors for value cocreation in service ecosystems (Akaka *et al.*, 2012; Edvardsson *et al.*, 2012). This advances the understanding of value cocreation at each ecosystem level, as embedded in other levels (Chandler and Vargo, 2011), namely the types of interaction and outcomes (Spohrer, 2011). This study contributes an empirically grounded, in-depth understanding of how value is cocreated at the service ecosystem micro, meso, and macro levels. More specifically, it contributes to research on value cocreation in the context of health care by offering an ecosystem approach for understanding the dynamics of multiple actors' interactions. Furthermore, the paper presents a detailed view grounded in S-D logic of the conceptual domain of value cocreation in service ecosystems by identifying broader dimensions of value cocreation factors and outcomes. As such, this paper also contributes to the development of middle range theories (Brodie Saren and Pels, 2011), bridging the S-D logic high-level conceptual perspective with empirical findings in a specific context. This study suggests that the understanding of value cocreation in a service ecosystem should be seen from a multilevel perspective. This implies disaggregating the system levels to enable detailing and simplifying value cocreation among actors, although it is important to comprehend that levels are intertwined thus influencing and shaping each other. In this sense, this paper extends previous conceptual research (Chandler and Vargo, 2011; Lusch and Vargo, 2014) by providing an empirical study for understanding the nature and dynamics of value cocreation in service ecosystems from a multilevel perspective.

The findings enabled identifying broader dimensions of value cocreation factors and outcomes at the various ecosystems levels and enhanced understanding of the interrelationships between levels. Five value cocreation factors emerged: resource access, resource sharing, resource recombination, resource monitoring, and governance/institutions generation. The first three occur at all levels, the fourth at the meso and macro levels, and the last one only at the highest macro level. Resource access, resource sharing, and resource recombination enable actors at each level to access resources, configure, and combine them in multiple direct and indirect dynamic interactions while generating new resources that benefit themselves and others in different levels of the ecosystem, thus increasing resource density. At the meso and macro levels, resource monitoring enables organization's self-monitoring and government monitoring of health care service delivery and health care organizations. At the macro level, the governance/institutions generation value cocreation factor is critical for the overall ecosystem viability, as it comprises common language, shared norms, and rules definition. Institutions are established at the macro level but strongly influence and shape the meso and micro levels value cocreation activities. Therefore, the study results corroborate and empirically show the importance of institutions that have recently been highlighted within service ecosystems (Vargo and Lusch, 2016). Furthermore, overlapping individual and collective institutions (e.g. social norms) (Edvardsson *et al.*, 2011) influence interactions and value cocreation (Akaka *et al.*, 2013).

These value cocreation factors contribute to value cocreation outcomes (well-being and system viability), representing actor benefits at each level of the service ecosystem. Technology (e.g. the EHR) facilitates the process of value cocreation, which in turn generates these outcomes. This is in line with previous research showing that technology



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platforms facilitate resource liquefaction and foster resource integration by enabling efficient and effective service exchange (Lusch and Nambisan, 2015).

The disaggregation of the ecosystem levels allows analytical exploration of each system level. However, it is important to acknowledge the interrelationships and influences across levels. The interplay between levels was evident in data analysis; the deeply interconnected levels influence and shape each other as multiple actors (national, organizational, and individual) engage in dynamic, simultaneous, interdependent interactions in their resources integration process to cocreate value. This is in line with previous research stating that the understanding of value cocreation implies an interplay between micro, meso, and macro perspectives (Chandler and Vargo, 2011) and that value propositions offered within each level and among the levels influences and shapes them (Frow *et al.*, 2014).

The interplay between levels occurs in several ways. Within each level, value cocreation factors and outcomes influence each other; and, importantly, value cocreation factors enable and contribute to the value cocreation outcomes. Also, the levels mutually influence each other, contributing to resource integration, fostering resource density, and ecosystem viability and well-being. This influence is evident from micro to meso and macro and from macro downwards to meso and micro.

Thus, this study enables a better understanding of service ecosystems such as health care by showing the need for a multilayer analytical approach that goes beyond dyadic analysis. The analysis of interactions within and across levels provides valuable insights for ecosystems managers. Previous research has explored the conceptual domain of resource integration and value cocreation in service ecosystems, but empirical studies showing how this is done are scarce. As such, this study contributes a detailed analysis empirically explicating the value cocreation process.

#### *Managerial and research implications*

This study has important implications for ecosystem service managers at each level since they provide a multilevel understanding of value cocreation. Results are especially important to keystone players, such as the Ministry of Health, since they help integrate different actors' roles, information, and technology while facilitating ecosystem coordination and co-evolution. The study helps service managers address the challenges of managing ecosystems since they integrate people, technology, process, and information (Maglio *et al.*, 2009). Understanding how EHR affects the whole ecosystem and the different actors involved (health care organizations, health professionals, and information technology companies) is important. Service researchers and managers can zoom in to comprehend and facilitate value cocreation factors at each level and zoom out for a broader view of how each ecosystem level influences and shapes the others. Study results can be used to analyze resource integration at each level and to facilitate value cocreation. Also, service providers need to understand interactions and resource integration between actors within and across levels and how they can be fostered. Importantly, not all actors integrate resources in the same way. For example, the degree of information sharing and collaboration between various health care institutions is different and not all citizens choose to enter their health information in the patient portal. Service managers should acknowledge the important role customers play in service exchange and value cocreation (Zainuddin *et al.*, 2013).

Ecosystem managers need to make sure that resource integration is facilitated to foster benefits for all actors engaging in value cocreation activities. Results showed the need to facilitate value cocreation. This was especially true concerning health care professionals having the proper training to use the EHR, the usability of the EHR, and the information (organization, standardization, security). Lacking even one of these factors might cause difficulties for actors in integrating resources or result in resource misuse. These aspects are mostly related to the EHR usage. Also, context is influenced by

interactions (Edvardsson *et al.*, 2011) and by the context in which specific technology is applied (Akaka and Vargo, 2014). Furthermore, service providers should involve patients in health care service development by providing tools and resources that may enable patient value cocreation (Elg *et al.*, 2012). Thus, it is important for service managers to facilitate resource integration for each actor by avoiding value losses within the service ecosystem.

Actors play different roles by switching from being a beneficiary in one moment to a provider in another, leading to dynamic evolution of actors' roles over time (Edvardsson *et al.*, 2011). So, it is critical for service managers to shift beyond a micro level dyadic value cocreation view between a firm and customers and extend their view to all actors in the service ecosystem by understanding the importance of mutual value cocreation at the system level.

Belonging to an ecosystem enables actors to access critical resources, meet knowledge or skill needs, and establish important relationships (Zahra and Nambisan, 2011). For instance, health care information emerged as a critical operant resource (capable to act upon others resources) consistent with the view that it is the core, dynamic element of service ecosystems (Barrett *et al.*, 2015). The study results showed that health information is a critical resource contributing to considerable effectiveness, efficiencies, and citizens well-being across levels. The absence of adequate health information has negative effects on the cost and quality of health care (Mannan *et al.*, 2006). As a result, service providers should facilitate information access and sharing across actors in the ecosystem. However, health information security and privacy are critical and must be assured. Also, several actors referred to the need to integrate other actors in the ecosystem, such as private hospitals. This would allow broader and sharing of health information potentially resulting in improved viability and well-being. These decisions must be defined by the keystone player at the macro level.

Information technologies can enable cost reductions, foster better health care (Mannan *et al.*, 2006), and nurture service innovations (Lusch and Nambisan, 2015). Interestingly, some interviewees proposed several new service innovations in e-healthcare, such as telemedicine and electronic management of chronic diseases using applications integrated with the EHR. While these suggestions pose potential cost reductions and might enable broadened health services coverage, they raise important challenges for service ecosystem managers such as integration with other health care services, and decisions about allowing information technology companies to offer services using the EHR platform. An integrated ecosystems view is necessary to understand the impact of these new service ideas on ecosystem viability and actors' well-being. Thus, the service ecosystem keystone player should create the conditions to enable and shape innovation by clearly defining a vision and business rules. Also, it is important to better understand the role technology plays in value cocreation and service innovation. Technology, considered as an operant resource, can contribute to value cocreation at the various levels of interaction (Akaka and Vargo, 2014). Future research could study the role and scope of technology in service ecosystems (Akaka and Vargo, 2014).

Importantly, the results showed that clear definition of system rules and norms was considered fundamental to minimize uncertainty by actors at the micro and meso levels. Thus, governance/institutions generation is a critical value cocreation factor. This means that the ecosystem keystone player must ensure the establishment of shared norms, a common language, and rules that shape interactions and resource integration which contributes to ecosystem evolution and viability. Macro level decision-making shapes the service ecosystem as those decisions govern micro and meso levels.

## Conclusion

This study enabled a detailed understanding of the nature and dynamics of value cocreation in service ecosystems from a multilevel perspective, uncovering value cocreation factors

and value cocreation outcomes. The study also demonstrated that ecosystem levels are intertwined and embedded in one another.

Future research should empirically extend this research beyond health care to understand the similarities and specificities of other contexts. Also, it is important to explore the duality between value cocreation for each actor and value cocreation for the ecosystem. Actors engage in constant, multiple resource integration activities by accessing, sharing, and recombining different resources, which may create uncertainty for other actors and the overall ecosystem. Future studies might explore value cocreation outcome dichotomies and trade-offs such as system viability vs actors' well-being. Viability must be assured at each ecosystem level since it impacts actor's well-being. Thus, future research should test the applicability of the study results beyond health care.

Studies exploring actors' roles in the ecosystem could offer valuable insights into the value cocreation process by moving beyond dyadic interactions to an ecosystem perspective. Actors' roles are far from passive and enabling beneficial interactions within and across levels is critical to service ecosystem viability and well-being. As such, from a meso and macro perspective it is important to extend the patient system network outside the customer-firm dyad to include other actors (individual or organizational) that can improve quality of life (Sweeney *et al.*, 2015; McColl-Kennedy *et al.*, 2012). For example, outside resources may come from customer self-activities, family or friends, other firms not directly related to traditional healthcare (McColl-Kennedy *et al.*, 2012), and online health care communities (Yao *et al.*, 2015). This poses a challenge to service ecosystem managers to integrate the different actors enabling value cocreation and system viability and well-being.

As technologies are increasingly embedded in ecosystems, it is important to understand how technology enables ecosystem emergence and, at the same time, raises important challenges for keystone ecosystem players. The design of the ecosystem should integrate both service and technology to enhance system viability and facilitate service innovation. The findings showed the importance of governance/institutions generation for ecosystem viability. This has been theoretically conceptualized in the literature, but empirical studies are needed. More thorough empirical research addressing the design of platforms for service ecosystems and the role of keystone players would benefit ecosystem development and sustainability.

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