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Service System Platforms to improve value co-creation: insights for Translational Medicine

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ABSTRACT

Purpose – The aim of this paper is to analyze how service system platforms can facilitate the value co-creation processes in healthcare context and then to foster the development of new compounds of medical protocols and/or treatments to improve patient's quality of life (Polese, Capunzo, 2013) according to the translational medicine purposes. We investigated how technological, interconnected, and smart solutions can facilitate the information-sharing processes by enabling researchers, clinicians, industries and patients to interact without the constraints of time, place and space by organizing data and information.

Design/Methodology/approach – The work is developed by integrating and applying the theoretical perspectives of Service Science (Maglio, Sphorer, 2008) and Service-Dominant logic (Vargo, Lusch, 2008) to the paradigm of translational medicine.

Findings – Translational medicine is a rapidly growing discipline in biomedical and public health research that aims to improve the health of individuals and the community by "translating" findings into diagnostic tools, medicines, procedures, policies and education, using a multi-disciplinary, highly collaborative, "bench-to-bedside" approach (Abraham et al. 2012; Stephen, 2008). It contributes to create value not only for the patient, but also for all involved actors such as clinicians, academic researchers, pharmaceutical industries, investors (Littman et al., 2007). In this sense, according to the Service-Dominant logic approach, service systems platforms could be useful to complete the value co-creation process in the translational medicine systems

Research limitations/implications –The work could be a first conceptual step for future researches on service science contributes to the underpinning of translational medicine paradigm. One of the lacks is in the conceptual identification of the findings; the concepts have to be deepened in the future with specific case studies.

Practical implications – For practitioners, the study offers advices on how improve rapidity, efficiency and effectiveness of translational medicine processes by highlighting the role of service systems able to sustain systemic integration, information and knowledge sharing and effective communication among the involved actors (Mele, Polese, 2011).

Originality/value – In this work the principles of S-D logic and Service Science are integrated in order to find new theoretical implications and new meanings to the value creation process in the translational medicine paradigm as synthesis of the multiplicity of generated values meanings and value co-creation

Key words Service System, Service Science, Value Co-creation, S-D logic, Translational Medicine

Paper type – Conceptual paper

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1. Introduction

This work, with a contribute on the branch of the managerial research, investigate on the role of the service system platforms in the translational medicine process using the theoretical framework of Service-Dominant logic (Vargo, Lusch, 2004, 2008) and Service Science (Spohrer and Maglio, 2008). We define the value co-creation process identifying strengthnesses and opportunities in the translational medicine process. Because the role of technology can facilitate the information-sharing processes by enabling researchers, clinicians, industries and patients to interact without the constraints of time, place and space it is possible to use frameworks and results that come from the research branch of value co-creation and IT (Sawhney et al., 2005; Kristensson et al., 2008; Mele et al, 2012; Carrubbo, 2013; Botti et al, 2014).

In recent years, in the medical field, it is developing a growing interest in translational medicine. Translational medicine is a discipline within biomedical and public health research that aims to improve the health of individuals and the community by "translating" findings into diagnostic tools, medicines, procedures, policies and education (Woolf, 2008). The rapid growth of this discipline is due to the need to translate in a better and faster way the precious results of basic research into new treatments for patients. At the same time, it has been realized that the information, data and experience acquired with the medical practice could be valuable for new developments in basic research; the solution has been found in the creation of a bi-directional flow between patient and laboratory, aimed at accelerate the transfer of information and knowledge gained through scientific research to clinical practice and so improve the conditions of patients (from bench to bedside i.e. "from the laboratory the patient").

In this work firstly it is described value co-creation, with a particular focus on healthcare management, highlighting the concept also in the S-D logic and Service Science perspectives; these perspectives are the link with the technology and the systemic approach. In a second step it is presented the connection between the theme of translational medicine and the management framework analyzing the strengths and weaknesses and cooperation and integration among the various actors.

Finally it is presented the role of technology in value co-creation and it is explained how service systems platforms allow value co-creation between participants, describing some technology platforms used in translational medicine, highlighting strengths and opportunities of the service science platforms in translational medicine useful to stimulate and uphold the value co-creation in medium and long run.

2. Value co-creation in health care context

Value co-creation allows the actors of a network to create value through interaction. It is the joint, collaborative, concurrent, peer-like process of producing new value, both materially and symbolically. There is an ongoing debate in the literature about the differences between co-creation and co-production and the need to distinguish between them (Grönroos and Voima, 2013; Cova et al., 2013). In this paper it is possible to use an approach in which the co-creation is considered as a more general concept that encompasses all the specific theoretical and empirical occurrences in which companies and customers generate value through interaction (Vargo and Lusch, 2008). Using the management approach it is possible to explain the value co-creation in healthcare.

The debate on value co-creation has increased significantly in the last decade, in fact, since the early 2000s, co-creation has spread swiftly through theoretical essays and empirical analyses, challenging some of the most important pillars of capitalist economies.

Galvagno and Dalli (2014) conducted a systematic literary review on the theory of value co-creation and they realized that co-creation is considered from different theoretical perspectives that are strictly tied to each other; the relevant are: Service science, Innovation and technology management, Marketing and consumer research but, given the number of papers, the service science is the dominant perspective.

As Ostrom et al. (2010, p. 5) note, "we define service science as an emerging interdisciplinary field of inquiry that focuses on fundamental science, models, theories, and applications to drive service innovation, competition, and wellbeing through co-creation of value". This literature is strongly related to service-dominant logic (SDL) (Vargo and Lush, 2004, 2008). As noted, in fact, S-D logic has been recognized as an important theoretical framework for the development of the study of value co-creation so it has emerged as a way of understanding markets and marketing that shifts the focus from creating and distributing outputs to co-creating value with customers via the service (i.e., applied knowledge or skills) that all offerings provide (Bettencourt et al. 2014).

Service-dominant (S-D) logic is a service-centered alternative to the traditional goods-centered paradigm for understanding economic exchange and value creation. It is based on the idea that service, the application of competences for the benefit of another party, is the fundamental basis of value creation through exchange; that is, service is exchanged for service, thus all economies are service economies, and goods, when involved, are service-provision vehicles (Vargo, Akaka 2009).

Therefore, analyzing the distinction between the two general meanings of value, ''value-in-exchange'' and ''value-in-use''(Smith, 1776), the first is referred to as goods-dominant (G-D) logic and is based on the value-in-exchange meaning of value (see Vargo and Lusch, 2004; Vargo and Morgan, 2005). In G-D logic, value is realized (manufactured) by the firm and distributed in the market, usually through exchange of goods and money. From this perspective the roles of ''producers'' and ''consumers'' are distinct, and value creation is often thought of as a series of activities performed by the firm. The second view, is referred to S-D logic and is tied to the value-in-use meaning of value (Vargo and Lusch, 2008). As Vargo, Maglio and Akaka (2008) argue, "in S-D logic, the roles of producers and consumers are not distinct, meaning that value is always co-created, jointly and reciprocally, in interactions among providers and beneficiaries through the integration of resources and application of competences. In this case, customers and manufacturers co-create value: manufacturers applying their knowledge and skills in the production and branding of the good, and customers applying their knowledge and skills in the use of it in the context of their own lives. At the same time, customers integrate and apply their own resources to provide service (often exchanged in the form of service rights – money – that the firm can use for its own value creating activities)". Value is co-created by this reciprocal and mutually beneficial relationship (Vargo et al. 2008).

For S-D logic, value results from the beneficial application of operant resources, such as knowledge and skills, which are sometimes transmitted through operand resources or goods (Vargo and Lusch, 2004). In addition, S-D logic argues that value creating resources are not confined to the firm;

customers, suppliers, and other stakeholders also constitute operant resources and contribute to value creation. More generally, S-D logic contends that value is always co-created (with the customers and others) and thus that firms cannot create and deliver value; they can only propose value and provide service as input to its realization.

Another theory which is very important in the comprehension of value co-creation is Service Science research, originally promoted and developed by IBM Almaden Research Centre, in USA.

Service science is the interdisciplinary field that "combines organization and human understanding with business and technological understanding to categorize and explain the many types of service systems that exist as well as how service systems interact and evolve to co-create value" (Maglio and Spohrer, 2008, p. 18); service science aims to integrate business related disciplines, such as management, operations, marketing and IT (Bitner and Brown, 2006), as well as in engineering and computer science schools (Chesbrough and Spohrer, 2006) by focusing on service as the central phenomena of interest (IfM and IBM, 2007).

Service science is centered on the study of value co-creation in relation to the service systems—dynamic and adaptive webs of exchange composed of interactions among people, organizations, and technology (Spohrer et al. 2007). Maglio et al. (2010, p. 1) elaborated that service science is the "systematic search for principles and approaches that can help understand and improve all kinds of value co-creation".

As Maglio and Spohrer (2008, p. 19) suggest, service-dominant logic provides "the right perspective, vocabulary, and assumptions on which to build a theory of service systems, their configurations, and their modes of interaction. Simply put, service-dominant logic may be the philosophical foundation of service science, and the service system may be its basic theoretical construct." Both service science and S-D logic therefore point to a systemic nature of value creation.

Specifically, from the service science perspective, co-creation is seen at the core of the theoretical development of a service systems science (Vargo et al., 2008; Ostrom, 2010; Maglio et al., 2009) rooted in SDL (Lusch and Vargo, 2006; Ballantyne and Varey, 2008) and strongly oriented toward innovation (Bitner et al., 2008)

As argued by Spohrer et al.(2008), service systems interact among them to co-create value. Value co-creation interactions between service systems are service interactions. Each service system engages in three main activities that make up a service interaction: (1) proposing a value co-creation interaction to another service system (proposal), (2) agreeing to a proposal (agreement), and (3) realizing the proposal (realization).

The issue of co-creation is relevant in health care, because providing health care services necessarily requires the active participation of various stakeholders. In fact, by definition, any form of assistance (basic, hospital, rehabilitation, home care, pharmaceutical, specialized outpatient, preventive, diagnostic, social and health care in general) involves a necessary orientation to the quality of the service, the attention to the user, the relationship with him, the sharing of the real problem, the definition of a solution of mutual interest.

Any health care system is, in fact, constituted by an interrelated set of actors, organizations and institutions aimed to produce and distribute health care services to protect health population.

The service nature of health system allows us to state that the logic focused on service (S-D logic) find its perfect location in both theoretical and managerial health care context and help to define the most efficient routes for creating "Health" value.

An interpretation of the health system in a service logic enables us to highlight the role of relationships, interactions and co-creation networks, where value and service for the patient (and other players) are the result of joint activities within the same system.

Consequently, we can assume that, in a more closely logic of service, the final value of health is co-created through shared activities, incorporating all the actors of the health networks, which are thus defined as endogenous to the processes of delivery of health services. At the same time, the actors involved can be identified as dynamic resources, assets, and as sources of competitive advantage for

the healthcare organization, as well as sources of value and innovation for the entire health care system. The first approaches to the service management in health care said that one of the most important actor in the network of value co-creation is the patient. Patient participation in the form of shared decision making has been shown to lead to improved psychological well-being, improved medical status, and a greater satisfaction with their physician (Ashcroft, Leinster, and Slade 1986; Fallowfield et al. 1990). The recent perspective says that understanding how individuals co-create value to better manage their health care is important not only for the individual but also for health care service firms such as clinics, health care providers, and government (McColl-Kennedy et al. 2012). Modern Health Systems have to engage citizens and patients to participate in the processes of prevention, treatment, rehabilitation, increasing their direct responsibility for operation because the relevant goal in the co-creation is the whole human health in the places.

The theme of health value co-creation has been extensively treated in academic world and different contributions highlight the relevance of value co-creation

The empirical study of McColl-Kennedy et al. (2009) investigates the multiple patients' approaches to co-creation identifying six styles of customer co-creation: "Team Manager", "Isolate Controller", "Partner", "Spiritualist", "Adaptive Realist" and "Passive Compliant". Then they compare the different styles with the level of quality of life of each patient. The results show that individuals who exhibit an "Adaptive Realist" style tend to demonstrate high quality of life, on psychological, existential and support dimensions. In contrast, the lowest quality of life was evidenced by those with "Passive Compliant" and "Isolate Controller" styles.

In a later work (McColl-Kennedy et al., 2012), the authors explore in-depth what health care customers actually do when they co-create value. They identify ''roles,'' ''activities,'' and ''interactions'' that underlie customer co-creation of value in health care. The authors uncover five groupings of customer value co-creation practices yielding a typology of practice styles and link these to quality of life. The practice styles are ''team management,'' ''insular controlling,'' ''partnering,'' ''pragmatic adapting,'' and ''passive compliance.'' Two in particular, team management and partnering, should be encouraged by managers as they tend to be associated with higher quality of life. The authors elaborate Vargo and Lusch's (2004, 2008) conceptualization by further expanding the type of resources that customers potentially integrate to self-generated resources and show empirically how customers actually do this co-creating value in practice, through activities and interactions with a range of others in their service network, thus more fully explicating the customer's role. Eight broad themes of activities were identified, comprising behavioral (doing) and cerebral (thinking) activities namely: (1) cooperating; (2) collating information (sorting and assorting); (3) combining complementary therapies; (4) co-learning (actively seeking and sharing information and providing feedback); (5) connecting with family and friends, doctors and other health professionals, and support groups; (6) changing ways of doing things; (7) coproduction (e.g., assisting with administering treatments, redesigning treatments, and reconfiguring the medical team); and (8) cerebral activities, such as positive thinking, psyching up one's self, reframing and sense-making, emotional labor, and being philosophical. These themes provide a basis for a customer value co-creation activities measurement scale in the health care context. The authors provide a health care Customer Value Co-creation Practice Styles (CVCPS) typology. The usefulness of the typology is demonstrated by showing links to quality of life and its potential application to other health care settings.

Chakraborty and Dobrzykowski have produced three works on the value co-creation in health care supply chain. Starting from the presuppositions of Service-Dominant Logic, Chakraborty and Dobrzykowski (2013) examine value co-creation in health sector in the form of translation of internal expertise in external capacities and develop a theoretical framework linking the S-D logic and Supply Chain Management. The authors, analyzing how the practices of SCM can affect the co-creation of value in health care, identify some elements that support value co-creation, such as the dialogue between the various actors of the SC, access to information within the SC, the Risk-Benefit analysis and transparency. In the subsequent works Chakraborty and Dobrzykowski (2014)

analyze the supply chain collaboration in health care (hospitals) using the lens of S-D logic to determine if and how the collaboration is a prerequisite for value co-creation and how it impacts on the performance of the hospital. The alignment of skills, the perceived control, alignment of processes and expectations were taken into account as members of the value co-creation in the supply network of the hospital. The results are the follows: collaboration in the supply chain has a significant positive effect on the value co-creation; value co-creation has a significant positive effect on the hospital performance (both clinical and financial).

Nambisan P. and Nambisan S. (2009) identify four alternate models of consumer value co-creation: the partnership model, the open-source model, the support-group model, and the diffusion model- and discuss their implications for health care organizations. They developed their theoretical framework by drawing on theories and concepts in knowledge creation, innovation management, and online communities. A set of propositions are developed by combining theoretical insights from these areas with real-world examples of consumer value co-creation in health care. The theoretical framework offered informs on the potential impact of the different models of consumer value co-creation on important organizational variables such as innovation cost and time, service quality, and consumer perceptions of health care organizations.

Another interesting work is that of Barile et al. (2012). The paper analyses health care services on the basis of Viable System Approach (VSA) (Golinelli, 2000; 2010; Barile 2000), S-D logic (Vargo and Lusch, 2004; 2008) and Service Science (Spohrer et al, 2006; 2007), approaching health as a service co-creation process involving numerous actors with various kind of resources and suggests that in order to detect performing health services a network perspective ought to be adopted, trying to valorize S-D logic suggestions and culture for the strengthening of value co-creation processes.

Different authors have investigated value co-creation in different areas of health care context, such as in the sector of medical devices (Wells et al., 2013), in the on line health communities (Stewart et al., 2014), in the prevention service (Zainuddin et al., 2013), in the patient daily diary (Elg et al., 2012), in the Sweeden NHS (Nordgren, 2008, 2009); but we have found only two papers about value co-creation in Translational Medicine: Polese, Capunzo (2013) and Polese, Carrubbo (2014).

Polese and Capunzo (2013) show how the numerous actors involved in translational medicine success, appear to be interconnected in value co-creation networks, in which value and service for the patient (and the other actors) is the outcome of joint activities within the same system. In this perspective, patients, clinicians, private and public hospitals, pharmaceutical industries, institutions are source and contributors to the system's performance. This latter, indeed, depends on the ability to establish wise and profitable relationships among each mentioned actor who, being satisfied by the system's outcomes, easily releases the possessed resource to the system, strengthening its sustainability.

As per the result of the literature analysis, health value co-creation is considered very important to the improvement of health services and, thus, of population health by many authors. However, the contributes about value co-creation in translational medicine are still scarce and, in our opinion, this gap must be bridged, because translational medicine produce a value that impact directly on the effectiveness of basic research, clinical practice and, so, on the patient care. The production of this value involves several actors belonging to different fields and, especially in this area, is necessary investigate the best practice in value co-creation.

3. Translational Medicine

The progress of science, powered by new technologies and tools for basic and clinical research in medicine, allows a continuous update of diagnostic and therapeutic procedures that contain and integrate elements from different scientific fields. If on one hand the large number of scientific information acquired from different clinical, experimental and technology sectors, has enabled the creation of a network very developed and constantly growing, on other hand it has raised the issue of which is the best way to integrate all this information. However, in view of this growing success of research, it is important to consider its high cost and, especially, its real practical impact on the

improvement of health, disease, and not least, patients quality of life. The integration of scientific and clinical research is thus becoming a crucial aspect in the scientific community.
In recent years, it has developed a new discipline consisting in transferring the results of basic research into useful clinical applications; this discipline, although defined differently by various groups in academia, regulatory institutions, and industry, is generally known with the name of translational medicine, and consists in translating basic scientific findings relevant for human disease into knowledge that benefits patients (Littman, 2011).
The question of how to define translational medicine remains unresolved and controversial mainly because different stakeholders look at distinct aspects of this issue (Woolf, 2008). Littman et al. (2007) proposed a generalized definition that should unify the expectations of all involved including the ultimate beneficiaries, the patients: "translational medicine represents a discipline that increases the efficiency of determining the relevance of novel discoveries in the biological sciences to human disease and helps clinical researchers identify, through direct human observation, alternative hypotheses relevant to human disease".
Fundamental and applied researchers therefore occupy different worlds, possess distinct cultures and have different drivers. In the medical domain, this makes it difficult to translate fundamental research results into practical applications that enhance human health and well-being (Palmer, 2013). To fill this gap, the concept of translational (or bench-to-bedside) research started in 1968 and has led to the concept of translational medicines research (TMR) (Morrow and Bellg, 1994; Kaitin, 2012) .
There are several definitions of translational research, but probably the John Hutton's definition could be relevant: "Translational research transforms scientific discoveries arising from laboratory, clinical or population studies into new clinical tools and applications that improve human health by reducing disease incidence, morbidity and mortality"[5].
In the similar way Barry S. Coller says: "Translational medicine is the application of the scientific method to address a health need". This definition highlights that the primary goal of translational science is improvement in human health instead the generation of new knowledge.
Thus, substantially, translational medicine realizes synergies between basic and clinical research, as not only the knowledge obtained through basic research can be conveyed to the application stage, but also the clinical applications may play an important stimulus to fundamental research. The result of this process is the creation of a bi-directional flow between patient and laboratory, aimed at accelerate the transfer of information and knowledge gained through scientific research to clinical practice and so improve the conditions of patients (from bench to bedside i.e. "from the laboratory the patient"). Therefore, the mutual exchange of information between basic and clinical research allows to evaluate different pathophysiological aspects in experimental condition and bring this knowledge to man, through clinical research.
Translational medicine has become a global priority, but there is still a major gap between the arrival of new treatments and the investment that many countries have made on this front. An essential issue that has been widely recognized to account for the transitional gap include the need for the capacity to stretch out beyond the boundaries of individual disciplines, for a more transparent dialogue between companies and regulators (Coller and Califf, 2009; Ludwig et al., 2010).
As observed by Bornstein and Licinio (2011), the success of any translational process in medicine depends on a close integration of government research institutes, academia and universities with hospitals and clinical care. Although the necessity for such an integration may seem obvious, it is anathema in most countries. The reality in most nations is that there are strict separations of interests for hospitals on the one hand and for research resources that fund biomedical science on the other. Indeed, in some countries, hospitals and universities often report to different entities.

[5] "Transforming Translation – Harnessing Discovery for Patient and Public Benefit" (Report of the Translational Research Working Group of the National Cancer Advisory Board, US NIH, 2007).

Funding streams from private or public insurance programs are kept separate from research revenue. This fundamental split between research and daily clinical practice clearly reduces the efficiency of the translational initiatives that many nations seek to launch.
Therefore, the effectiveness of translational medicine is the result of a complex system of relationships and requires the active participation of various actors, including not only scientific researchers and clinicians but also including institutional actors (local health authorities, hospitals, districts, nursing homes, municipalities, volunteer associations) which are responsible for the care and the provision of services; other national and local agencies of planning and control (Region, State, local entities) which collaborate in the support and delivery of services; actors who are currently in charge of the medical and scientific training (Public Administrations, professional associations, scientific societies, trade unions of category and Universities), citizens, providers of goods and services of health organizations.
Each mentioned actor participates in health creation and dissemination by exchanging resources and information and pursues a different interest.
Littman et al. (2007) assert that Translational medicine produces different values not only for the patient, but also for all involved actors such as clinicians, academic researchers, pharmaceutical industries, investors. For academic purposes, translational research also responds to the need of identifying novel scientific hypotheses relevant to human pathology through direct observation of humans and their diseases (Marincola, 2003); for people more directly involved in clinical practice (physicians, clinical laboratory professionals and patients), translational research responds to the need to accelerate the capture of benefits of research, closing the gap between 'what we know and what we practise' (Plebani, Marincola, 2006) and this means the transfer of diagnostic and therapeutic advances proven effective in large well-conducted trials to daily medical practice (Plebani, Marincola, 2006). For the commercial sector, translational research refers more to a process aimed at expediting the development of known entities particularly in early phases and/or identifying ways to make early go/no go decisions when the cost of product development is still relatively contained.

4. The role of Service Science and Smart Service Systems in health care

Service systems are considered the basic unit of analysis in service science. Spohrer et al. (2007) define a service system as a dynamic value co-creation configuration of resources, including people, organizations, shared information (language, laws, measures, methods), and technology, all connected internally and externally to other service systems by value propositions (Spohrer et al., 2007). Maglio and Spohrer (2008) characterize service systems in the following way (p. 18): "The smallest service system centers on an individual as he or she interacts with others, and the largest service system comprises the global economy. Cities, city departments, businesses, business departments, nations, and government agencies are all service systems. Every service system is both a provider and client of service that is connected by value propositions in value chains, value networks, or value-creating systems".
According to Maglio and Spohrer (2008), we think the service system is a useful abstraction for understanding value and value co-creation, even in health care context.
Agree with the definition of service system (Spohrer et al., 2007) we can, in fact, easily define the health system as a service system. As Polese and Capunzo (2013) highlight, it consists, in fact, of several actors, including:

- Institutional actors (local health authorities, hospitals, districts, nursing homes, municipalities, volunteer associations) which is entrusted with the care and delivery of services;
- Other national and local planning and control (Region, State, Local Government): collaborate assistance and the provision of services;
- Actors which is currently in charge of the medical and scientific training (Regions and Autonomous Provinces, professional associations, scientific societies, trade unions associations and universities);
- Citizens;
- Suppliers of goods and services of Healthcare Companies.

These actors represent a set of parts connected and interacting that have the human health as common goal. The possibility of interaction enables them to improve the level of their performance and the improvement of the service offered to the benefit of all according to a win-win logic. The different subjects, to achieve the goal, continuously share resources and information, supported in this by the use of new technologies.
Service Science research is recently proposing advances focused upon smart service systems, also stimulated by maintenance technological advances and IT systems' latest proposals.
Smart service systems can be understood as service systems that are specifically designed for the prudent management of their assets and goals while being capable of self-reconfiguration to ensure that they continue to have the capacity to satisfy all the relevant participants over time. They are principally (but not only) based upon ICT as enabler of reconfiguration and intelligent behavior in time with the aim of creating a basis for systematic service innovation (IfM, IBM, 2008) in complex environments (Basole and Rouse, 2008; Demirkan et al., 2008).
Smart service systems are based upon interactions, ties and experiences among the actors. Of course, among these actors, customers play a key role, since they demand a personalized product/service, high-speed reactions, and high levels of service quality; despite customer relevance, indirectly affecting every participating actor, smart service systems have to deal to every other actor's behavior, who's expectations, needs and actions directly affect system's development and future configurations.
The smarter approach applied to healthcare is called "smarter healthcare". As IBM highlights, a smarter healthcare system is obtained through better connections for faster, more detailed analysis of data. Many of the current problems – rising costs, limited access, high error rates, poor response to chronic disease and the lengthy development cycle for new medicines – could be improved if better linkages were made between diagnosis, drug discovery, healthcare providers, patients, payers, and communities. Unfortunately, today's healthcare IT systems are typically designed for speed and performance to assist physicians in treating patients – not to integrate and aggregate data for analysis, query and reporting.
Smarter healthcare converts patient and clinical information into actionable insights to improve the quality of care while optimizing operational efficiency (Cosimato et al, 2014). By offering integrated data from multiple sources in one central location, these platforms can help enable more informed decision-making within and across clinical, business and research domains, leading to higher-quality care, enhanced patient safety and more efficient clinical and business operations. Doctors, patients and payers can all share information seamlessly and efficiently, applying advanced analytics to improve research, diagnosis and treatment (www.research.ibm.com/healthcare).

5. Technology platform and health care service

Technology contributes to the co-creation of value by enabling the sharing of information within and across service systems.
Orlikowski (1992) argues, "While technologies may appear to have objective forms and functions at one point, these can and do vary by different users, by different contexts of use, and by the same users over time" (p. 403). This view emphasizes the recursive nature of systems embedded with technology. The consideration of a duality of technology is important for understanding value co-creation in service systems because it emphasizes the operant and operand nature of technology. Orlikowski (1992, p. 406) argues that technology is the product of human action, while it also assumes structural properties. That is, technology is physically constructed by actors working in a given social context, and technology is socially constructed by actors through the different meanings they attach to it and the various features they emphasize and use.
However, it is also the case that once developed and deployed, technology tends to become reified and institutionalized, losing its connection with the human agents that constructed it or gave it meaning, and it appears to be part of the objective, structural properties of the organization. In other words, the duality of technology allows for the consideration of technology as an operand resource— one that requires action taken upon it to be useful, but it also sheds light on how technology might also be considered as an operant resource—one that is capable of influencing other resources as well. In sum, Orlikowski (1992) describes technology as a product of human action (operand resource) and as a medium of human action (operant resource) (p. 410).

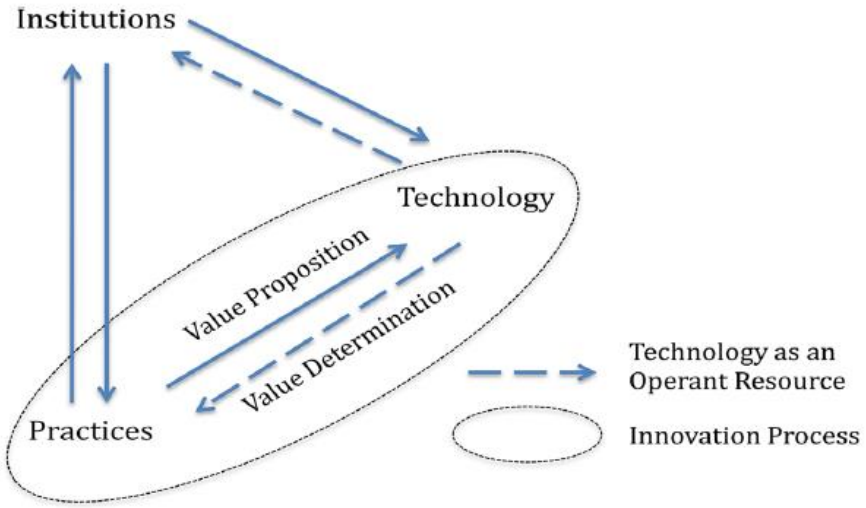

Figure 6. *Adapts Orlikowski's structurational model of technology to illustrate the process of value co-creation and structuration in service ecosystems (source:Orlikowski, 1992)*

In this model of structuration, the reinterpretation of technology by users, as they apply various technologies in their value co-creation practices, can potentially and recursively influence not only how value is determined but also how it is proposed (Vargo and Akaka, 2012).
Technology is even more important for healthcare organizations because they are amassing vast amounts of data. Physicians have been on information overload for decades, contributing to the estimated 15% of diagnoses that are inaccurate or incomplete (Harvard Business Review, April, 2010).
The health care sector has explored how information and communication technology might improve patient service for the past 50 years, but there is evidence that many, even most, health care information systems are failures (Avison, Young, 2007).
Nowadays, the role of ICT in healthcare processes, due the introduction of new internet and intranet technologies, has definitely changed, embracing not only internal performance improvement actions, but also more challenging external competitive programs based upon the simultaneous involvement of structures (Laboratory, Universities, Hospitals, etc.) along with partners, suppliers, customers and/or patient, other social actors, etc. (Carrubbo et al., 2013).
Forward-thinking organizations are connecting their healthcare data, systems and processes to facilitate secure communications and information sharing. Technology platforms can help establish the foundation for smarter healthcare systems that seamlessly deliver integrated care, centered on the patient.
Among the different technology platforms in healthcare, particular systems are able to facilitate value co-creation processes through the sharing of resources between the various actors and enabling an active participation of patients:

- **MobiHealth service platform**

The MobiHealth service platform is a result of a mobile healthcare project integrating various disciplines and partners, including hospitals and medical service providers, universities, mobile network operators, mobile application service providers and mobile infrastructure and hardware suppliers. The MobiHealth system allows patients to be fully mobile and pursue daily life activities, whilst undergoing health monitoring. With MobiHealth, a patient's health data can be collected and sent via a mobile service provider for monitoring by a healthcare professional. This project (supported by the Commission of the European Union in the frame of the 5th research Framework under project number IST-2001-36006) has developed an innovative value added mobile health service platform for patients and health professionals (Van Halteren et al., 2004).
The service enables remote patient monitoring through the use of advanced wireless communications and integration of sensors to a wireless body area network (BAN). It permits remote management of chronic conditions and detection of health emergencies whilst maximizing patient mobility.
The MobiHealth patient/user is equipped with different sensors that constantly monitor vital signals, e.g. blood pressure, heart rate and electrocardiogram. These are interconnected via a healthcarebody area

network(BAN). In essence this consists of sensors, actuators, communication and processing facilities connected via a wireless network.
MobiHealth aims to give patients a more active role in the healthcare process.

- **OSAMI (Open Service Ambient Intelligence)**

Open Source Ambient Intelligence Commons(OSAMI Commons) is a project launched by European ITEA 2[6] in order to provide an open service-oriented platform with common (horizontal) and domain-specific (vertical) services available under an open-source license. This platform is based on the utilization of adaptive software components supporting the cooperation of heterogeneous medical devices and services. These devices and services complement each other and adapt automatically to changing requirements, environments and tasks.
The mean fields of application are in hospitals for the monitoring of the diagnostic and therapeutic data, which are to be accessible for authorized external parties that guarantee immediate access to the case history of the patients.
The hospital can define patient-specific rehabilitation plans and supplies the necessary medical devices (e.g., ECG device).

- In the medical practice, the practitioner acts as a link between the patient and hospital. He controls the convalescence, modifies the training programs depending on the patient's medical condition and – if necessary – initiates his referral back to the hospital.
- In the case of treatment at home, a variety of standards devices are connected (e.g., PCs, smartphones, PDAs, DSL-routers), complemented by specialized medical devices. Data from medical sensors will be collected, forwarded and analyzed; the system starts predefined procedures once a critical condition occurs.

6. Service System Platforms in Translational Medicine

Translational medicine, aimed at understanding etiology, molecular pathogenesis, clinical features, and prevention and treatment of diseases, depends on quantitative and high-quality data from patients during different stages of disease (Amstrong et al., 2012).
To this end, large amounts of clinical data are as a rule captured in electronic medical records (EMR), but increasingly also occasionally in dedicated registries on patients with specific diagnoses, thus capturing information on clinical characteristics of disease, laboratory data, response to therapies, and comorbidities. The success of translational medicine also relies on efficient utilization of data generated from emerging technologies. Hence, to collect and manage large volumes of heterogeneous data has been recognized as a major enabler of translational informatics research (Schadt et al., 2010).
However, unfortunately, these pillars of translational medicine (clinical records and molecular data) generally reside in disconnected informatics systems. There is therefore an urgent need to reduce these barriers to accessing, sharing, reusing, and analyzing these different sources of data.
A number of technology platform solutions are available to manage biomedical data in translational research. There is a shortage of fully-integrated informatics solution that let researchers and clinicians integrate, store, and analyze clinical and omics data from diverse sources, generated in-house as well as by public consortiums.

- **i2b2 platform**

One of the commonly used platforms is Informatics for Integrating Biology and the Bedside (i2b2) (Murphy et al., 2010). The i2b2 platform is founded by the National Institutes of Health (NIH) and uses The International Classification of Diseases (ICD)[7] as a taxonomic standard to classify diseases, and it enables the creation of formal ontologies to meet the specific requirements of different research studies. The design of i2b2 provides software platform and scalable solutions that facilitate repurposing of clinical data into the

[6] ITEA 2 (Information Technology for European Advancement is a Eureka Europe's premier strategic industry-driven pan-European cooperative programme for advanced pre-competitive R&D in software for Software intensive Systems and Services (SiS).

[7] Slee VN:The International Classification of Diseases: ninth revision (ICD-9). Ann Intern Med1978,88(3):424–6.

research setting and to secure the access and management of patient information for research purposes. Two predefined test cases were supported by i2b2, as mentioned in (Murphy et al., 2010):
1. Explore patient data to find sets of patients that would be of interest for further research;
2. Make use of the detailed data provided by the Electronic Medical Record (EMR) to discover different phenotypes of the set of patients identified (first test case) in support of genomic, outcome, and environmental research (Abugessaisa et al., 2013).

- **tranSMART platform**

The tranSMART platform is an open-source, community driven knowledge management platform for translational medicine created by Thomson Reuters to drive translational biomedical research. This platform is a single, integrated analytics and data-sharing platform for clinical and translational research that is open to every scientist around the globe, and that can enable pre-competitive and private data sharing and foster collaboration within an organization or with partners and contractors around the world.
The platform enables scientists to discover and refine hypotheses by investigating the relationships between genetic and phenotypic data for cohorts of patients, and to assess their analytic results in the context of published literature and their internal work. It was designed to meet the needs of basic scientists, clinician-scientists, pharmacologists, toxicologists, and others involved in therapeutics and diagnostics discovery and development of new therapies for patients.
The tranSMART platform implements a set of data models, shared datasets, data transformation utilities, and analytical web applications all centered on the patient, to accelerate discoveries by creating a standardized and semantically integrated data warehouse of research results linked to reusable and scalable self-service analytics (http://transmartfoundation.org/overview-of-platform/).

- **STRIDE**

STRIDE (Stanford Translational Research Integrated Database Environment) is a research and development project at Stanford University, to create a standards-based informatics platform supporting clinical and translational research. A large portion of clinical information is contained within clinical documents, such as radiology reports, surgical pathology reports, operative reports, discharge summaries and clinic notes. Much of this document-based data represented as unstructured narrative text with little, if any, standardization of the language used to represent important information such as diagnosis, therapy or test results. The data contained within these documents is, therefore, difficult to integrate into clinical or research databases that need to support efficient standards-based retrieval. To address this problem a computer system is developed, called ChartIndex (Rosenbloom et a. 2011). This system can structure clinical documents, use natural language processing to identify important terms within narrative text and automatically map these terms to standard biomedical coding terminologies for research use within the STRIDE system.

7. Conclusions

The service system platforms can support the value co-creation process stimulating the concept of resonance inside the translational medicine systems. The flow of information, activities, data, researches, materials and products, contacts and feedbacks that starts from the concept of new "ideas to save the life" find help in the service systems platforms that in their design and production components are able to improve the optimization of the sharing interaction and materialize the concept of relationship among the elements of the translational medicine system. The compatibility among the elements of the system; sure this is an asset that creates the basis to define the correct meaning of "value", shared by the elements of the system. In that way, the principle of SD-Logic and Service Science are able to integrate new theoretical implications and new systemic meaning into the translational medicine. With these approaches, a new vision emerges of the translational medicine that could be seen not only as a set of tools useful to solve problems but as a system useful to improve the quality of life in which all actors involved have a double role: continuous improvement of the performance of the translational medicine system and elements that give value to the system– *with the research and the innovative medicine approaches* – stimulating the value co-creation inside the system with the commitment of all the actors.
Among the strengths there are high level and speed of information diffusion, advanced technology, open information and the management of the data. In the same time, the high level of compatibility and the user friendly approach at all level of the system give to the whole activity the right flexibility to survive in complex systems and in the variability of the environment conditions. Researchers and practitioners can use this work to find a new approach to the research, management information and use of the feedbacks that

come from all the rings of the translational medicine framework because the open management and the strong and fast connection are elements to create recognized benefits to all elements of the system.
Studying the translational medicine with the framework of the SD-Logic and Service Science approaches under the lens of value co-creation, it is possible to highlight the criticalities that it is possible to overcome with service system platforms able to work in a value co-creation framework. In a translational medicine system, starting from the first goal of the translational medicine – *shift the focus from generation of new knowledge to the improvement of human health* - it is possible to recognize general criticalities – *continuous improvement of the human health, of the quality of the work of researchers, medical workers and the quality of the life for patients, improvement of the commitment of the pharmaceutical companies, improvement of the technologic companies involved in the projects, etc* - and technical criticalities – *high quantity of data to manage, necessity to define the forecasts, integrate information, openness to global cooperation, integration of scientific and clinical researchers* - that the service system platforms will be able to overcome under the value co-creation approach based not only on the satisfaction of the patients but on the generation of a continuous improvement of activities of the actors, involved in a loop without an end but based on the infinite research of the improvement of the human health. The goal of the service system platforms in the translational medicine it is not a definitive subject or a definitive result but it is the continuous improvement of the technology towards the innovative research searching for the improvement of human health day by day.

8. Bibliography

Abraham E., Marincola F.M., Chen Z., Wang X. (2012), "Clinical and translational medicine: Integrative and practical science", in *Clinical and Translational Medicine*, vol. 1, n. 1.

Abugessaisa I., Saevarsdottir S., Tsipras G., Lindblad S., Sandin C. (2014), "Accelerating Translational Research by Clinically Driven Development of an Informatics Platform–A Case Study", in *PLoS ONE*, vol. 9, n.9.

Armstrong A.W., Reddy S.B., Garg A. (2012), "Novel approach to utilizing electronic health records for dermatologic research: developing a multi-institutional federated data network for clinical and translational research in psoriasis and psoriatic arthritis",in *Dermatology online journal*,vol. 18, p. 2.

Ashcroft J., Leinster S.J., Slade P.D. (1986), ''Mastectomy vs Breast Conservation: Psychological Effects of Patient Choice of Treatment'', in M. Watson and S. Creer, eds., *Psychological Issues in Malignant Disease*, Oxford: Pergamon Press, pp. 55-71.

Avison D., Young T. (2007), "Time to rethink health care and ICT?", in *Communications of the ACM*, vol. 50 n. 6, pp. 69-74.

Ballantyne D., Varey,R. J. (2008), "The service-dominant logic and the future of marketing", in *Journal of the Academy of Marketing Science*, vo. 36, n. 1, pp. 11–14.

Barile S. (2000), *Contributi sul pensiero sistemico in economia d'impresa*, Arnia, Avellino.

Barile S., Polese F., Saviano M., Carrubbo L., Clarizia F. (2012), "Service Research Contribution to Healthcare Networks",in *Innovative Service Perspectives*, Hanken School of Economics.

Basole R. C., Rouse W. B. (2008), "Complexity of service value networks: Conceptualization and empirical investigation", *IBM Systems Journal*, vol 47, n. 1, pp. 53-71.

Bergamaschi M. (2008), *Creazione del valore e organizzazione in sanità*, Collana management e sanità, McGraw-Hill.

Berry L.L., Bendapudi N. (2007), "Health Care: A Fertile Field for Service Research", in *Journal of Service Research*,vol. 10, n. 2, pp. 111-122.

Bettencourt L. A., Lusch R., Vargo S.L. (2014), "A Service Lens on Value Creation: Marketing's Role in Achieving Strategic Advantage", *California Management Review*, vol. 57, n. 1, pp. 44-66**.**

Bitner, M. J., Brown, S. W. (2006), "The Evolution and Discovery of Services Science", in *Business Schools, Communications of the ACM*, vol.49, n. 7, pp. 73-78.

Bornstein S.R., Licinio J (2011), "Improving the efficacy of translational medicine by optimally integrating health care, academia and industry", in *Nature medicine*, vol. 17, n. 12, pp. 1567-1569.

Botti, A. Tommasetti, A., Troisi, O., Vesci, M. (2014), "Customer satisfaction, commitment, loyalty ed implicazioni nella governance delle università: una ricerca esplorativa", *Azienda Pubblica*, n.3 luglio – settembre, pag.219-242

Capunzo M., Polese F., Boccia G., Carrubbo L., Clarizia F., De Caro F. (2013), "Advances in Service Research for the understanding and the management of service in healthcare networks", in Gummesson, E., Mele, C., Polese, F. 2011(a cura di), *Service-Dominant Logic, Network & Systems Theory and Service Science: integrating three perspectives for a new Service Agenda*, Giannini Editore, Napoli.

Carrubbo L. (2013), *La Co-creazione di valore nelle destinazioni turistiche*, Collana "Opera Prima", ed. RIREA, n. 2.

Carrubbo, L., Clarizia, F., Hysa, X., Bilotta, A. (2013), "New'Smarter'Solutions for the Healthcare Complex Service System", in Gummesson, E., Mele, C., Polese, F.(a cura di), *System Theory and Service Science: Integrating Three Perspectives In a New Service Agenda*, Giannini, Napoli, pp 14-17

Chakraborty S., Dobrzykowski D. (2013), "Supply Chain Practices for Complexity in Healthcare: A Service-Dominant Logic View", *The IUP Journal of Supply Chain Management*, vol. 10, n. 3, pp. 53-75.

Chakraborty S., Dobrzykowski D. (2014), "Examining value co-creation in healthcare purchasing: a supply chain view", *Verslas: Teorija ir praktika / Business: Theory and Practice*, vol. 5, n. 2, pp. 179–190.

Chakraborty S., Dobrzykowski D. (2014), "Linking service-dominant logic and healthcare supply chain", in 24th Annual Pom Conference Denver, Colorado, Usa.

Chesbrough H., Spohrer J. (2006), "A Research Manifesto for Services Science", in *Communications of the ACM*, vol. 49, n. 7, pp. 35-40.

Coller B. S, Califf R.M. (2009), "Traversing the Valley of Death: A Guide to Assessing Prospects for Translational Success",in *Sci Transl Med. Vol. 1*, n.1.

Cosimato, S., Tommasetti, A., Troisi, O. (2014), "Patient Empowerment and Health online Community: two ways to give the new viability doctor-patient relationship", *Comunitania*, n.8, pp.10-23.

Cova B., Ezan P., Fuschillo G. (2013), "Zoom sur l'autoproduction du consommateur", in *Revue Française de Gestion*, vol. 34, n. 234, pp. 115-133.

Demirkana H., Kauffmana R.J., Vayghanb J.A., Fillc H.-G., Karagiannisc D., Maglio P. (2008), "Service-oriented technology and management: Perspectives on research and practice for the coming decade", in *Electronic Commerce Research and Applications*, vol. 7, Issue 4, pp. 356–376.

Elg M., Engström J., Witell L., Poksinska B. (2012), "Co-creation and learning in health-care service development", in *Journal of Service Management*, vo. 23, n. 3, pp. 328-343.

Erat P., Zorzi O. (2007), "Networked Healthcare: Organising for Networked Healthcare: Towards Future Organisational Models", in *Journal of Medical Marketing*, vol. 7, n.1, pp.6-17.

Fallowfield L. J., Wayne H., Graeme P. M., Michael Baum (1990), ''Psychological Outcomes of Different Treatment Policies in Women with Early Breast Cancer Outside a Clinical Trial'',in *British Medical Journal*.

Galvagno M., Dalli D. (2014),"Theory of value co-creation: a systematic literature review", in *Managing Service Quality*, vol. 24, n. 6, pp. 643 – 683.

Gill L., White L., Cameron I.D. (2011), "Service co-creation in community-based aged healthcare", in *Managing Service Quality: An International Journal*, vol. 4, n. 4, pp 375-395.

Golinelli G. M. (2000), *L'approccio sistemico al governo dell'impresa. L'impresa sistema vitale*, vol. 1, Cedam, Padova

Grönroos C., Voima, P. (2013), "Critical service logic: making sense of value creation and co-creation", in *Journal of the Academy of Marketing Science*, vol. 41, n. 2, pp. 133-150.

Halteren A.T., van Bults R., Widya I.A., Jones V., Konstantas D. (2004), "Mobihealth: wireless body area networks for healthcare, Wearable eHealth systems for personalised health management'', in *Studies in Health Technology and Informatics*, Il Ciocco Castelvecchio Pascoli Lucca, Tuscany, 11–14th December 2003, Vol. 108, ISBN 1 58603 449 9, IOS press, Amsterdam.

Iandolo F., Calabrese M., Antonucci E., Caputo F. (2013), "Towards a Value Co-Creation Based Healthcare System", in Gummesson, E., Mele, C., Polese, F. (a cura di), *Service-Dominant Logic, Network & Systems Theory and Service Science: integrating three perspectives for a new Service Agenda*, Giannini Editore, Napoli.

IfM and IBM (2007), Succeeding through Service Innovation: A Discussion Paper. Cambridge, United Kingdom: University of Cambridege Insitute for Manufacturing.

IfM and IBM. (2007), *Succeeding through Service Innovation: A Discussion Paper*, Cambridge, United Kingdom: University of Cambridge Institute for Manufacturing.

IfM IBM .Succeeding through Service Innovation: A Service Perspective for Education, Research, Business and Government. University of Cambridge Institute for Manufacturing; Cambridge, UK: 2008.

Kaitin K.I. (2012), "Translational research and the evolving landscape for biomedical innovation", in *Journal of Investigative Medicine : The Official Publication of the American Federation for Clinical Research*, vol.60, n.7, pp. 995–998.

Krisjanous J., Maude R. (2014), "Customer value co-creation within partnership models of health care: an examination of the New Zealand midwifwry Partnership Model", in *Australasian Marketing Journal*,

Kristensson P; Matthing J; Johansson N (2008), "Key strategies for the successful involvement of customers in the co-creation of new technology-based services", in *International Journal Of Service Industry Management*, vol. 19, n. 3, pp. 474-491.

Lanjananda P., Patterson P.G. (2009), "Determinants of customer-oriented behavior in a health care context", in *Journal of Service Management*, vol. 20, pp. 5-32.

Littman BH., Di Mario L., Plebani M., Marincola F.M., (2007), "What's next in translational medicine?", in *Clinical Science*, vol. 112, pp. 217 – 227.

Ludwig B., Zimerman B., Steffen A., Yavriants K., Azarov D., Reichel A., Vardi P., German T., Shabtay N., Rotem A., Evron Y., Neufeld T., Mimon S., Ludwig S., Brendel M.D., Bornstein S.R., Barkai U. (2010), "A novel device for islet transplantation providing immune protection and oxygen supply", in *Horm Metab Res*, vol. 42, pp. 918–922.

Lusch R. F., Vargo S. L. (2006), "Service-dominant logic as a foundation for a general theory", in. Lusch R. F, Vargo S. L. (eds), *The Service-Dominant Logic of Marketing: Dialog, Debate and Directions*, pp. 406–420, Sharpe Inc., Armonk.

Maglio P, Spohrer J (2008) Fundamentals of service science, in *Journal. Acad. Marketing Sci*, vol.36, n. 11, pp.18–20.

Maglio P. P.,. Vargo S., Caswell L N., Spohrer J. (2009), "The service system is the basic abstraction of the service science", in *Information Systems and E Business Management*.

Maglio P.P., Kieliszewski C.A., Spohrer J.C. (2010), "Introduction: Why a handbook?", in Maglio P.P., Kieliszewski J.A., Spohrer J.C. (eds), *Handbook of Service Science* (Springer, New York), pp. 1–7.

Marincola F.M. (2003), "Translational medicine: a two-way road", in *Journal of Traslational Medicine*, n. 1, pp. 1.

Marincola FM. (2003), "Translational medicine: a two-way road. Journal of Translational Medicine"; vol.1, n.1.

McColl-Kennedy J.R., Vargo S.L., Dagger T.S., Sweeney J.C. (2009), "Customers as Resource Integrators: Styles of Customer Co-creation", in Gummesson, E., Mele, C., Polese, F. (a cura di), Service Science, S-D logic and network theory, Giannini Editore, Napoli.

McColl-Kennedy J.R., Vargo S.L., Dagger T.S., Sweeney J.C., van Kasteren Y. (2012), "Health Care Customer Value Co-creation Practice Styles", *Journal of Service Research*, vol. 15, n. 4, pp. 370-389.

Mele C., Polese F., (2011), "Key dimensions of Service Systems: Interaction in social & technological networks to foster value co-creation", in: Demirkan H., Spohrer J., Krishna V., editors, *The Science of Service Systems*, Springer, pp. 37 – 59.

Mele, M. Calabrese, M., Troisi, O. (2012), "La comunicazione negli enti locali: tra comunicazione istituzionale e comunicazione politica", *Sinergie Journal*, Rivista di studi e ricerche, n. 89, pp.89-107.

Meyer M., Müller I. (2006), "Networked Healthcare: A Practical Guide to Understanding Influence Networks in the Health-Care Industry", *Journal of Medical Marketing*, vol. 6, n. 4, pp. 250-259.

Moliner M.A. (2009), "Loyalty, perceived value and relationship quality in healthcare services", *Journal of Service Management*, vol. 20, n.1, pp. 76-97.

Morrow GR, Bellg AJ. (1994), "Behavioral science in translational research and cancer control", *Cancer*, vol. 74(4 Suppl), pp. 1409-1417.

Murphy SN, Weber G., Mendis M. , Gainer V. , Chueh HC. (2010) "Serving the enterprise and beyond with informatics for integrating biology and the bedside (i2b2)", *J Am Med Inform Assoc*, vol. 17, n. 2, pp. 124–130.

Nambisan P, Nambisan S. (2009), "Models of consumer value cocreation in health care", *Health Care Management Review*, vol.34, n. 4, pp. 344, 354.

Ng I., Maull R. (2009), "Embedding the new Discipline of Service Science", in The Science of Service Systems, Demirkan, H, J.H. Spohrer and V. Krishna Eds, volume in *Service Science: Research and Innovations (SSRI) in the Service Economy*, Book Series, Springer.

Nordgren L. (2008), "The performativity of the service management discourse: "Value creating customers" in health care", *Journal of Health Organization and Management*, Vol. 22 No. 5, pp. 510-528.

Nordgren L. (2009), "Value creation in health care services – developing service productivity: Experiences from Sweden", *International Journal of Public Sector Management*, Vol. 22, n. 2, pp.114 – 127.

Normann R. (2001). *Reframing Business: When the Map Changes the Landscape*. New York, NY: John Wiley & Sons.

Orlikowski WJ (1992), "The duality of technology: Rethinking the concept of technology in organizations", *Organ. Sci*. vol. 3, n. 3, pp.398–427.

Ostrom E (2010) Beyond markets and states: Polycentric governance of complex economic systems. Amer. Econom. Rev. 100(June), pp. 1–33.

Ostrom, A.L., Bitner, M.J., Brown, S.W., Burkhard, K.A., Goul, M., Smith-Daniels, V., Demirkan, H. and Rabinovich, E. (2010), "Moving forward and making a difference: research priorities for the science of service", *Journal of Service Research*, vol. 13, n. 1, pp. 4-36.

Palmer A.M, Sundstrom L. (2013), "Translational medicines research", in *Drug Discovery Today*, vol. 18, pp. 505-508.

Pardeep Kumar and Hoon-Jae Lee, 2012, Security Issues in Healthcare Applications Using Wireless Medical Sensor Networks: A Survey, *Sensors, vol. 12*, n.1, pp. 55-91

Pinho N., Beirão G., Patrício L., Fisk R.P. (2014),"Understanding value co-creation in complex services with many actors", *Journal of Service Management*, vol. 25, n. 4, pp. 470-493.

Plebani M.,Marincola F.M. (2006), "Research translation: a new frontier for clinical laboratories", in *Clin Chem Lab Med*., vol. 44, n. 11, pp.1303-1312.

Polese F. (2013), *Management sanitario in ottica sistemico vitale*, Collana di studi e ricerche aziendali, Giappichelli editore, Torino.

Polese F., Capunzo M. (2013), "The determinants of translational medicine success. A managerial contribution", *Traslational Medicine @ UniSa*, vol. May-Aug, n. 6, pp. 29 – 34.

Polese F., Carrubbo L. (2014), "A Managerial View of Translational Medicine", *Annals of Translational Medicine & Epidemology*, vol. 1, n. 1, pp. 1-3.

Rosenbloom S.T., Denny J.C., Xu H. (2011), "Data from clinical notes: a perspective on the tension between structure and flexible documentation", *J Am Med Inform Ass*., vol. 18, pp.181-6.

Saviano M., Bassano C., Calabrese M. (2010), "A VSA-SS Approach to Healthcare Service Systems the Triple Target of Efficiency, Effectiveness and Sustainability", *Service Science*, vol. 2, n.1/2, pp. 41-61.

Sawhney, M; Verona, G; Prandelli, E (2005). Collaborating to create: the internet as a platform for customer engagement in product innovation, Journal Of Interactive Marketing, 19 (4):4-17

Schadt E.E., Linderman M.D., Sorenson J., Lee L., Nolan G.P. (2010), "Computational solutions to large-scale data management and analysis", *Nature reviews Genetics*, vol. 11, pp. 647–657.

Slee V.N. (1978), "The International Classification of Diseases: ninth revision (ICD-9)", *Ann Intern Med*, vol.88, n.3, pp. 424–6.

Smith A. (2000), *The Wealth of Nations* (1776), New York: The Modern Library.

Spohrer J, Maglio P, Bailey J, Gruhl D (2007) Steps toward a science of service systems. Computer 40(1):71–77.

Spohrer, J., McDavid, D., Maglio, P. P. and Cordata, J. W. (2006), NBIC convergence and technology coevolution: Towards a services science to increase productive capacity. In Managing Nano-Bio-Info-Cogno Innovations: Converging Technologies in Society, (eds) W. S. Bainbridge and M. C. Roco, pp. 227–254. Springer, New York.

Spohrer, J., Vargo, S., Caswell, N. and Maglio, P. (2008). The Service System is the Basic Abstraction of Service Science. 41st Annual HICSS Conference Proceedings.

Stephen H. W. (2008), "The Meaning of Translational Research and Why It Matters", in *JAMA*, vol. 299, n. 2, pp. 3140–3148.

Stephen L. Vargo and Melissa Archpru Akaka (2012), "Value Co-creation and Service Systems (Re)formation: A Service Ecosystems View,"*INFORMS Service Science* 4 (3), 207-17

Stewart Loane S., Webster C.M., D'Alessandro S. (2014), "Identifying Consumer Value Co-created through Social Support within Online Health Communities", in *Journal of Macromarketing*, Online First.

Van Halteren, Bults, Wac, et al 366 The Journal on Information Technology in Healthcare 2004; 2(5): 365–373

Vargo S. L., Fred W. M. (2005), "Services in Society and Academic Thought: A Historical Analysis", in *Journal of Macromarketing*, vol 25, n. 1, pp. 42-53.

Vargo S. L., Lusch R. F. (2006). Service-dominant logic: What it is, what it is not, what it might be. In Lusch, R. F., & Vargo, S. L. (Eds.), The servicedominant logic of marketing: Dialog, debate, and directions (pp. 43–56). Armonk, NY: M. E. Sharpe.

Vargo S. L., Maglio P. P., Akaka M. A. (2008), "On value and value co-creation: A service systems and service logic perspective", *European Management Journal*, Vol. 26, pp. 145-52.

Vargo S.L., Akaka M.A (2009), "Service-Dominant Logic as a Foundation for Service Science: Clarifications", S*ervice Science*, vol. 1, n. 1, pp. 32-41.

Vargo S.L., Akaka M.A (2012), "Value Cocreation and Service Systems (Re)Formation: A Service Ecosystems View", *Service Science*, vol.4, n.3, pp. 207-217.

Vargo S.L., Lusch R.F. (2004), "Evolving to a new dominant logic for marketing", *Journal of Marketing*, Vol. 68 No. 1, pp. 1-17.

Vargo S.L., Lusch R.F. (2008), "Service-dominant logic: continuing the evolution", *Journal of the Academy of Marketing Science*, Vol. 36 No. 1, pp. 1-10.

Vargo S.L., Maglio P.P., Akaka M.A (2010) "Advancing Service Science with Service-Dominant Logic: Clarifications and Conceptual Development" Handbook of Service Science, Service Science: Research and Innovations in the Service Economy.

Vargo S.L., Maglio P.P., Akaka M.A. (2008) On value and value co-creation: A service systems and service logic perspective. Eur. Management J. 26(3):145–152.

Vargo S.L., Maglio P.P., Akaka M.A. (2008), "On value and value co-creation: a service systems and service logic perspective", *European Management Journal*, n.26, pp. 145-152.

Wells R., Gallarza M.G., Andreu L., Calero R. (2013),"Application of Service Dominant Logic to the Medical Device Industry", in *Atti del Convegno EGPA Annual Conference*, Edinburgh.

Wieland, Polese, Vargo, and Lusch (2012) "Toward a Service (Eco)Systems Perspective on Value Creation "International Journal of Service Science, Management, Engineering, and Technology, 3(3)

Woolf SH. (2008), "The meaning of translational research and why it matters", in *JAMA*., vol. 299, pp. 211-213.

Zainuddin N., Russell-Bennett R., Previte J. (2013), "The value of health and wellbeing: an empirical model of value creation in social marketing", *European Journal of Marketing*, vol. 47, n. 9, pp. 1504-1524.