Combining the pillars of the Naples forum on Service: a multi-dimensional constructive tool

Track: Business models to manage networks and service systems

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ABSTRACT

Purpose – The paper aims to enrich conceptual frameworks of Service Dominant Logic, Service Science, and Network and Systems Theory by integrating their pillars in a common interpretative approach and providing a tool to support a better understanding of service functioning as well as design in Service Systems.

Design/Methodology/approach – The paper proposes an integrated literature review in order to link Service Dominant Logic, Service Science, and Network and Systems Theory in a common trans-disciplinary conceptual framework. Building upon this, the practical approach of recommender system and the modelling functionalities of IBM Bluemix are used to define an application overview of service design. Finally, theoretical and empirical reflections herein are developed within the context of Smart City

Findings – The paper proposes a multi-dimensional constructive tool for service and systems analysis in order to better understand the interactions among users, services, and infrastructures in a shared environment.

Research limitations/implications – The paper combines the pillars on which the Naples forum on Service is based providing an example about the building of a multi-dimensional constructive tool able to support both researchers and practioners interested in service design and management. Model and design approach herein require to be tested through widen empirical studies

Practical implications – We have deployed the proposed framework in IBM Bluemix, which is a real-world shared environment. This finding outlines the effective interactions between users, services, and infrastructures, which indicate that more alternatives and outcomes can be obtained by designing service and systems interactions. Therefore, for researchers and practitioners, this paper implicates that designing the services and related interactions is a critical lever in service and system design and manage

Originality/value – The paper contributes to the state of knowledge in the domains of Service Dominant Logic, Service Science, as well as Network and Systems Theory providing an effective application of a shared conceptual framework. Both theoretical and practical contributions can be used to build an effective application of multi- and trans- disciplinary models in order to better design and manage service systems.

Key words: *Service Dominant Logic; Service Science; Network and Systems Theory; Recommender system; IBM Bluemix.*

Paper type – Conceptual paper

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1. Introduction

The challenging growing of service sector is one of the most relevant topic of XXI century (Grönroos & Gummerus, 2014). The shift from a 'tangible market' based on the product selling and transfer to an 'intangible environment' in which actors interact with the aim to exchange their knowledge, competences, and capabilities to build shared solutions has attracted the interest of several researchers and decision makers (Vargo & Lusch, 2008a).

A new vision on the world in which we all live is emerging and both managerial and organizational studies are trying to develop new instruments, models, and techniques to face the related challenges (Sullivan, 1982; Baines *et al*., 2009). Accordingly, multiple contributions have in-depth analyzed the service domain (Fitzsimmons & Fitzsimmons, 1994; Grönroos, 2007; Barile & Polese, 2010; Badinelli *et al*., 2012). Some of them have pointed the attention on the ways in which market relationships and interactions are evolving in the light of service logic (Bitner, 1995; Johnson & Grayson, 2005; Del Giudice et al., 2017), on the opportunities for building shared pathways to solve common problems (Spohrer & Maglio, 2008; Edvardsson et al., 2011), and on the definition of common final purpose towards which address individual behaviors and actions (Espejo, 1996; Barile & Saviano, 2013; Saviano *et al*., 2014; Polese et al., 2016; Tronvoll et al., 2017).

The basic pillars of the paradigmatic shift on which both researchers and decision makers are called to reflect upon, have been built by the Service Dominant Logic (S-D logic) and Service Science (SS). Accordingly, Lusch and Vargo (2014) stated that "S-D logic implies that service is the foundation for *all* of exchange; the function of goods is to enable service –that is, goods represent a special case of service provision, one that has always been a fairly small subset" (p. 45) while Maglio *et al.* (2009) affirmed that "Service science is the study of the application of the resources of one or more systems for the benefit of another system in economic exchange" (p. 405).

Reflecting upon these fundamental assumptions, it clearly emerges that service domain is strongly based on the relationships among multiple actors involved in a defined environment. In such a line, building service systems requires to investigate the ways in which multiple (and sometime divergent) actors can build profitable relationships (Barros et al., 2005; Vargo & Luch, 2008b). With the aim to in-depth this dimension of service system, an intriguing contribution is provided by the Network Theory (NT) (Granovetter, 1983; Newman, 2003) as research field in which is "recognizing that numerous variables interact, that the number of unique situation is unlimited, that change is a natural state of affairs, and that processes are iterative rather than linear" (Gummesson, 2008: 16).

Again, defined the focus of service studies and the interpretative lens potentially usable for investigating in which ways several actors interact another relevant questions seems to be unsolved: *for which reason multiple actor decide to interact building formal or informal network?*

This question represents the building block on which multiple contributions and reflections have been developed in the last years both from managerial and marketing studies (Oliver, 1990; Hastings *et al*., 2004; Saviano et al., 2017). More researchers and decision makers have tried to investigate the reasons of organizations' behaviors, strategies, and plans (Child, 1972; Miles *et al*., 1978; Beckert, 1999). Among these contributions, amazing suggestions have been provided by the studies rooted in the System Thinking (ST) and, specifically, by the Viable Systems Model (VSM) (Beer, 1984; Espejo & Harnden, 1989; Espejo, 1990; Espejo & Reyes, 2011) and Viable Systems Approach (*vSA*) (Golinelli, 2010; Barile, 2011; Barile & Saviano, 2011; Barile *et al*., 2012a). Both this research streams focus the attention on the survival and on the viability of an organization affirming that a viable system "is a system that survives, remains united and is complete; it is homeostatically balanced both internally and externally and furthermore has mechanisms allowing it to grow and learn, develop and adapt, and thus become increasingly more effective in its environment" (Beer, 1985: 69) and that viable systems are "systems that aim to survive in their living context by establishing harmonic relationships with other entities that own the resources necessary for their functioning and survival" (Barile et al., 2014: 2008).

Recognizing the validity on the link among SS, S-D logic, NT, and ST, the Naples Forum on Service (http://www.naplesforumonservice.it/public/index.php) is the most relevant community in which possible connections among these research streams are analyzed, debated, and developed. Accordingly, building upon multiple contributions offered with reference to this topic (Barile & Polese, 2009, 2010; Saviano *et al*., 2010; Iandolo *et al*., 2013), the paper aims to enrich previous studies identifying possible design approaches to link SS, S-D logic, NT, and ST with the aim to support both researchers and decision makers in better understanding and managing service domain.

Following this approach, the paper aims to provide a possible answer to the following research question: *Is it possible to combine SS, S-D logic, NT, and ST to build a common multi-dimensional constructive tool to support both researchers and practioners engaged in service domain?*

In order to provide possible answers to this research question, the rest of paper is structured as follow: in Section 2 a brief literature review about SS, S-D logic, NT, and ST will be proposed and some propositions will be formulated, in Section 3 the methodology and research approach will be illustrated, in Section 4 the IBM Bluemix will be used to build a common multi-dimensional constructive tool for understanding and managing service systems, in Section 5 implications and limitations of research will be discussed, and in Section 6 some conclusions and possible future directions for research will be proposed.

2. Building a shared theoretical framework: some propositions

2.1 The Service lens for CAS

As already pointed out (Carrubbo et al, 2017; Bruni et al, 2016), the high level of connectivity that characterizes complex adaptive systems (CAS) allows for the creation of a dynamic network of agents that are constantly communicating and interacting (Coleman, 1999; Kelly, 1994; Lissack, 1999; McKelvey, Maguire, 1999; Waldrop, 1992). It is the people's unique knowledge and skill and organizational competence that make service systems adaptive to and sustainable with the changing markets environment (Spohrer et al., 2007). Accordingly, the variety and variability of information, about possible connections within CAS, promote new forms of co-operation, interpreted as relational interaction between involved actors (Carrubbo et al, 2017).

Under Service Research we know that every transaction is service-based, any kind of exchange are based on reciprocal satisfaction, it is the result of win-win logic, and it is direct to ensure the achievement of durable solutions. Suppliers and provider tends to propose new ideas and tools to involve the interested users in the process of delivering and fruition, in the attempt to stimulate their needs, wants, and conveniences. In such a line, value depends from the personal perception of users and in it is related to the ability to transfer the right information (Polese and Carrubbo, 2008)

According to Service Research each situation is different, therefore service systems are based on a dynamic process of adaptation in which decision-making configure and re-configure the organization with the aim to define more efficient solutions (Barile et al., 2013; Carrubbo et al. 2015; Polese and Carrubbo, 2016). The through-put useful to catch this goal is represented by the innovation. Innovative tools are the key to up-grade products (features), management (models), strategies and operations; in this sense innovation is stimulated by the need of adaptation (Barile et al, 2012b; 2012c; 2014). Thanks to the innovation process, organizations develop knowledge and competences require to compete, fostering the analysis of technological issues, and searching correlations between continuous external changes and performances (Caputo, 2017). Innovation, if well designed and managed, can enable costs reductions, quality improvements, technical performances advancements through a wise management of innovation based on both internal (R&D, production, engineering, marketing proposals, etc.) and external dimensions (related to the relationships with universities and other public research centers, scientific journals, other businesses, exports, suppliers, service providers, etc.).

Accordingly, we could say that:

> *The continuous learning, information sharing and co-operative processes in organizations, require to develop multi-dimensional tools able to achieve effective positive results from fitting*

and to re-orient the needs and the tasks/objectives due to both internal emerging constraints and exogenous opportunities.

2.2 Evolving Smart Service Systems go through, go further

SS researchers have investigated every potential evidence of service research 'on stage', referring to something really iterative, interactive, instrumented, interconnected, and intelligent. In this direction, a new generation of service systems which are capable of describing and analysing situations occurring and making decisions based on the available data in a predictive or adaptive manner could be defined as Smart (Demirkan et al, 2011a; 2011b; Polese et al, 2016). In fact, recent developments in SS Research have led to a new concept of service systems, leading to the definition of Smart Service Systems (SSS) (Barile and Polese, 2010).

Organizations are smart if they react to some circumstances and make a rational and efficient use of resources. As suggested by SS, any modern business company could be interpreted as Service systems. Service Systems that are able to follow changes in demand trends, or launch new value propositions each time even fitting with evolving customer need, or adapt their mode in action reacting to emerging external conditions, then they could be defined as Smart and become SSS in such a way (Ciasullo, Troisi, 2013; Cosimato, Troisi, 2015; Tommasetti et al, 2015; Loia et al, 2016; Ciasullo et al, 2017).

As recently stated (Carrubbo et al; 2014), according to a relational logic (Hakansson, Snehota, 1995; Nahapiet, Ghoshal, 1997; Barabasi, 2002; Prahalad, Ramanswamy, 2004), SS suggests that all actors are considered parts of a dynamic, operant and active network (Lovelock, Gummesson, 2004; Achrol, Kotler, 2006) oriented to balanced customer centricity (Gummesson, 2008). Therefore, activities and entities are not associated with 'simple' dyadic relations, but they affected by many-to-many relationships (Gummesson, 2008). These relations are consciously determined and finalized to a necessary mutual satisfaction (Lusch et al., 2007) as a function of systems consonance and competitiveness (Barile, 2009). Today business scenarios are affected by an increasing complexity (Barile et al., 2013) that reduce the ability of organizations to act in efficient way as consequence of inexistent ex ante defined rules. To tackle with this uncertainty, firms should broaden their boundaries and establish relationships with other entities (Maturan and Varela, 1975; Lazlo, 1996).

In such a line, SSS are able to foster connections and interactions among the multiple actors involved in the process of exchange (Mel and Polese, 2011). From this perspective, SSS combine advances in IT studies with the evolution in thinking about dynamic interactions, adaptive skills, sustainable development, enhanced learning, reconfiguration capacities, and service innovation (IfM and IBM, 2008) with the aim to define more efficient instruments in understanding and managing complex situations (Basole, Rouse, 2008; Demirkan et al., 2011b).

Nowadays, any supply-chain can be analysed in terms of SSS as changeable, adaptable and evolving entities affected by the changing contextual conditions (Carrubbo, 2013) and by the subjective perceptions about external dynamics (Barile, 2008; 2009). The multi-part contributions of knowledge, the application of skills, the ability to configure and re-configure, and the desire to maintain long-terms relationships, represent the basic elements of adaptive logic on which SSS are based.

Due to the fact that the adaptive is today used to model each economic, managerial, organizational, industrial or computer system, it ca easily adopted to better explain design and management of SSS as consequences of a dynamic adaptation to external dynamics (Demirkan et al, 2011a). Accordingly, we could say that:

Adaptation and re-configuration of service system require to develop multi-dimensional tools able to reduce the mismatch of the service exchange process which involves both the provider and the client in the design, creation, application and delivery of the service.

2.3 Network Theory

In 1986, Richard Barras reflecting upon the possible application of innovation framework in service domain outlined the great relevance of connections and interactions in ensuring the survival and success of service based companies and organizations. This relevant evidence, perhaps, represents the first step of a long research history influenced by multiple perspectives and points of view in which multiple researchers from different research streams have analysed the role and contributions of interactions, relationships, connections, and links among several entities in ensuring the survival of an organized entity (Bhatt, 2001; O'Mahony & Bechky, 2008; Hollensen, 2015; Caputo, 2016).

Along the time, among the multiple research streams that have focused the attention on the ways in which different entities (clients, providers, users, organizations, infrastructures, …) interact, the NT have provided the more structured conceptual framework contributing to the advancements in knowledge in different domain and topics (Granovetter, 1983; Nohria & Eccles, 1992; Lin, 1999; Rowley, 1997; Formisano *et al.*, 2015).

Several definitions have been provided about the concept of network as summarized in the following Table 1.

Author/s	**Network is ..**
Scharpf (1978)	… "an essential prerequisite for successful interorganizational policy formation and policy implementation" (p. 62).
De Meyer (1993)	… "of high importance for the diffusion, validation and integration of newly acquired know-how" (p. 111).
Rowley (1997)	… "an important determinant of [organization] behaviour" (p. 905).
Borgatti and Foster (2003)	… "a set of actors connected by a set of ties. The actors (often called "nodes") can be persons, teams, organizations, concepts, etc." (p. 1005).
Provan and Kenis (2008)	… "a mechanism of coordination, or what has often been referred to as network governance" (p. 231).
Walker *et al.* (2010)	… "is different from […] hierarchy" (p. 733).

Table 1. Some definitions of network (Source: Authors' elaboration)

Anyway, despite the increasing relevance of NT in business studies, "business marketing has also been at the forefront of development of network theory, a third critical step in a theory of markets and marketing. But this network theory has been largely focused on the industrial "sellers" and "buyers" and, almost by definition, given the B2B context, not what has traditionally been considered the "consumer"" (Vargo & Lusch, 2008a: 257). Recognizing the same gap, in 1992 Burt Ronald have tried to extend the boundaries of NT investigating in which ways the locations of individual nodes can impact of network performances. Thanks to Burt's work today it is clear that an organization in strongly affected by the locations of each node and that different location have different strategic power in accessing and use available and valuable resources.

Following this approach, Granovetter (1973, 1976) have analysed in which ways the power of nodes with strategic location affect behaviours and performances of other nodes and he have underlined risk and opportunities of network configuration related to the building of strong ties to avoid the 'dead' of week nodes. Indeed, Lin (1999) highlighted that not all the nodes have the same information, influence, social credentials or reinforcement using the following examples: "*A bridge linking an individual looking for a job in a corporation to people occupying influential positions in large corporations will likely be of significantly more utility to that individual than from a bridge that leads to others who are members of a health club. On the other hand, a mother with young children would prefer to live in a dense, cohesive community rather than one with a mobile population and open access to the external world"* (Lin, 1999: 36).

Building upon these contributions and reflections with the aim to investigate its applicability in service domain, the following proposition is stated:

Modelling, management, and analyse of service system require to develop multi-dimensional tools able to consider role, locations, and power of each involved entities and the strength of links among the involved entities.

2.4 Systems Thinking

A large part of marketing and organizational studies refer to the concept of system as basic element to explain and clarify logics and dynamics that affect consumers', companies', and actors' decisions and behaviours (Bagozzi, 1974; Drucker, 1988; Kaplan & Norton, 1996; Kotler et al., 1991; Mintzberg, H. (2009). Despite the extensive use of this concept in managerial studies, it has been formalized in natural science and, more specifically, in biology. In such a field, the father of ST has been Ludwig von Bertalanffy that postulating conditions of isomorphisms among entities with different properties introduced in biological studies the concept of 'open system' affirming that the viability of an entity depends on the exchange of resources with its environment. This basic assumption represents the key pillar of the General Systems Theory (GST) (von Bertalanffy, 1972).

Approximately in the same years, Gregory Bateson proposed some concept that will be key pillars for the ST in the next years such as the concept of *schismogenesis* related to a positive feedback able to destroy a relationship over the time and the concept of *levels of learning* with which he hypothesized the existence of a hierarchy in the learning approaches (Bateson, 1972).

Again, others pillars of ST have been provided by Norbert Wiener who introduced the world cybernetic as "the entire field of control systems and communication theory, whether in the machine or in the animal" (Wiener, 1948: 11), by Ross Ashby with the formulation of the Law of Requisite Variety (Ashby, 1956), and by Peter Senge with the concept of learning organisation as complex of people that (continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collection aspiration is set free, and where people are continually learning how to learn together" (Senge, 1990: 11).

All these thinkers with their contributions have defined some of the most relevant key pillars on which modern ST is based. Building upon their studies, two research stream have been formulated in managerial and organizational studies: the Viable Systems Model (VSM) (Beer, 1984; Espejo & Harnden, 1989; Espejo, 1990; Espejo & Reyes, 2011) and the Viable Systems Approach (*vSA*) (Golinelli, 2010; Barile, 2011; Barile & Saviano, 2011; Barile *et al*., 2012a).

These two research streams can be considered the more recent advancements in knowledge within the research streams of ST and they represent the two interrelated faces of the same domain (Basile & Caputo, 2017). Specifically, the VSM "provides a language to account for the complexity of the operational domain based on the assumption of organizational autonomy, that is, on the assumption of *recursive structures*" (Espejo, 1993: 521). It can be considered "a powerful tool for exploring and understanding the governance of an organization by looking at its management functions, their communications channels and their appropriate and evolving balances" (Leonard., 2015: 928) direct to ensure, verify, and maintain the multiple balances on which the system's viability is based.

From the other side, the *vSA* is a meta-level framework in which "any observed phenomenon (a problem or entity) can be investigated by adopting a double perspective: on the one hand, by objectively analysing the parts and relations that configure the 'structure' of the investigated phenomenon (how it is made); on the other hand, by interpreting its interaction dynamics as an open system living in its context (how it behaves)" (Barile et al., 2016: 655). In such a line it "incorporates both reductionist and holistic views of a given social or business phenomenon by focussing on the links between parts in a whole system" (Pels et al., 2014: 566).

Contextualizing and combining both these contributions, it is possible to analyse and emphasise conditions that must be respect in order to ensure internal and external balances of a system and, consequentially its viability (VSM) and it is possible to exploit elements and conditions that affect decisions, actions, and behaviours of both part involved in a system as well as of whole system (*vSA*). In such a line, the most powerful contribution provided by the ST can be summarized in the opportunities for analysing each kind of organized entity adopting the same interpretative lens (Calabrese et al., 2017). Anyway, this kind of analysis is strictly affected by the purpose of the investigated entity. Indeed, as underlined both by VSM and *vSA* a system can be considered viable only if it aims and it is structured to survive within its environment. From this specification, it clearly emerges that to investigate and understand each kind of system (included service system) it is needed to clarify and know its purpose as whole and the purposes of its involved parts. Accordingly, the following proposition is stated:

> *Modelling, management, and analyse of service system require to develop multi-dimensional tools able to include both the purpose that affect systems' behaviours and decisions and the purposes that influence actions and choices of its parts.*

3. Methodology

We follow the research methodology proposed by Nunamaker et al. (1990), in which they propose to first construct a conceptual framework, then develop a system architecture, analyse and design the system, build the prototype system, in the end observe and evaluate the system. We adapted the research methodology as follows: we have constructed the conceptual framework from the existing service thinking and theories, then system architecture and system design are based on service diamond modelling, afterwards we have developed the prototype with IBM Bluemix and provided the observations and implications based on indications provided by Nunamaker et al. (1990).

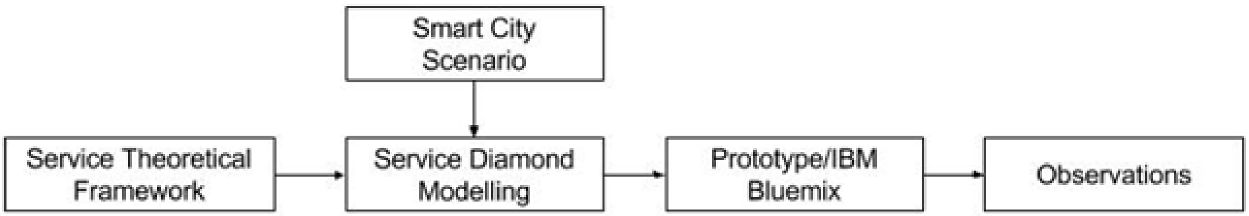

Figure 1. Research methodology
(Source: Authors' elaboration)

Regarding the research process, we have adopted a theoretical lens to investigate service system, in which S-D logic, SS, Network theory, and Systems thinking are integrated with the aim to define a common conceptual framework. This framework is mainly constructed by a set of propositions. Based on the literature view, we have further investigated the pillars on which the proposed conceptual framework is based. Building upon this, we have adopted the service Diamond model to specify the roles and relations within service systems. Detailed examples have been given to show the effects of context changing on service model. Based on the model, we have developed a prototype of traffic recommender system in the context of Smart City. Finally, theoretical and empirical reflections are herein provided to stimulate possible future steps of the research.

4. An application of IBM Bluemix for service design and management

4.1 Context view of the service

What exactly is the model of service provision? Is it possible to formalize the service in the continuously changing environment? Reflecting upon these questions, Staníček (2009) formalized the ways in which a service is designed proposing the Diamond Do reported in the following Figure 1.

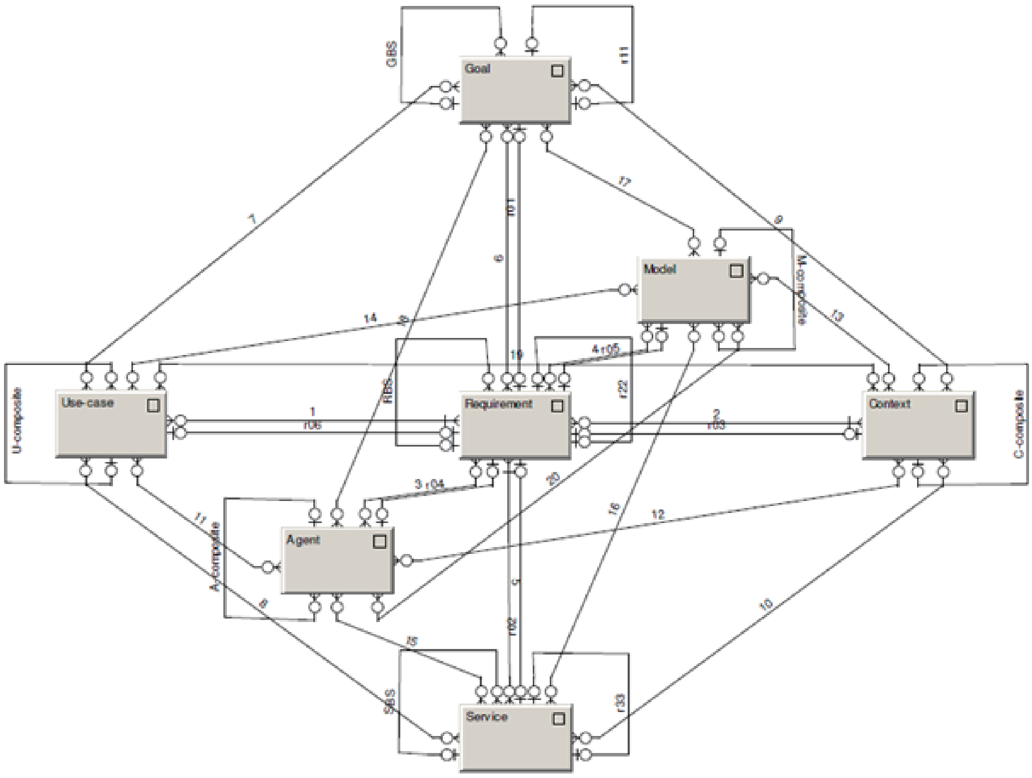

Figure 1. A conceptual representation of Diamond Do (Source: Stanicek, 2009: 285)

Diamond Do is based on the idea that every *service* is a reaction to a specific *request*. This request is a part of the wider project, represented by the *goal*. According to this model, the request is formulated by and/or the service output is used by the *agent*. The role of data in the entire process are represented by *Use Case* (current situation and actual data) and it is recorded in the Model to be used in the future.

The Diamond Do (also called Diamond of predictive behaviour) can be used to analyse any kind of the service to be seen from many different perspectives. As we try to show on particular example, its power is to be adapted to any possible situation or change in the perspective and still offer proper reaction to specific request.

The most important part of this Diamond is the *context* in terms of data that will be used and result (utility) of the service. Reflecting upon this representation, a question emerges: *It possible to reduce the problem just into the selection of concrete data and their usage?*

In our perspective, the contextual view is also affected by the aim (the goal) of the agent's and therefore the model that is used depends on multiple conditions.

To see the example, the goal "to get to the specific location" could produce request like "to find an optimal route". This request's solution could be done in many ways, depending on the context – that can be for example:

- Healthy run of the citizen
- Race of the moto bikers
- Emergency service

How will other elements change when the context is changed? Does it mean anything for the final design of the service?

We can summarize them into the following Table 1:

Context	Requirement	Service	Agent	Goal	Model	Use Case
Healthy run of the citizen	To find optimal road	Road planner	Citizen	To be healthy	Relaxing roads	Current status of weather and air pollution
Race of the moto bikers	To find optimal road	Road planner	Moto driver	To win the race	Race maps	Weather (rain / sunny), position of other participants
Emergency service	To find optimal road	Road planner	Driver of emergency vehicle	To get to the place of accident	City street map	Current situation of traffic

Table 1. Context of services – An example (Source: Authors´ elaboration)

It is obvious that information –that are necessary to complete the same *requirement*– depend more on the context than on the character of the service – what is even the same in all cases (Caputo et al., 2016a). The main problem is how the context can be recognized? And what kind of entity can recognize the context and decide how specifically prepare the optimal reaction?

Obviously, it is not tasks that can be solved by just one service – you need different data to navigate emergency service and/or runner to win the race. And in both situations the stakeholder would need a different complementary information – like traffic density, air pollution etc.

Therefore, it is necessary to combine different services together to be able to react on the actual requests and change actual settings of service design. But is that a service who decide what data it really needs? Or could be data smart enough to recognize the context and, according previous experiences saved in the Model, could offer possibly useful “appendix” of the data? For example, the fact that it is sunny in the moment of race planning could be affected by the data about weather forecast – but not in all cases. The question is how should service developers create such smart services?

4.2 Smart Service Design

The idea of the smart services is based on the idea to use a huge amount of the date to provide better, smarter and clever output for the best utility of the final receiver possible. To understand the concept of modern service provision we need to look to the modern service design frameworks – like IBM Blue Mix, in which we can optimally combine multiple services (databases, IoT, data analysis etc.) very easily in a way for the better utilization of the final service. Via this, the service designers can focus more to the final utility of the service and less to the programing development.

One of the typical smart services is the service recommender system (RSs=. Recommender system are information search and filtering tools (Konstan and Riedl, 2012) that help users to make better choices while searching for products such as movies, restaurants, vacations, and electronic products. As RSs are playing an important role throughout the Internet, they have been applied in a large number of Internet applications such as Amazon, YouTube, Netflix, Yahoo, Tripadvisor, Last.fm, and IMDB etc. (Davidson 2010, Linden 2003). Moreover, social networks such as LinkedIn and Facebook have also introduced recommendation technology to suggest groups to join and people to follow (Baghaei, 2011). In the context of smart service, we term the recommender system as smart recommender system.

Different from smart recommender system, in the traditional recommender system context, a recommender system is usually based on a two dimensional model (Users · Items) and suggests a user u the items i with the largest system-predicted rating r*(u,i) for the user. A recommender system computes the predictions r*(u,i) on the base of users’ preferences that are represented by the user ratings. More recently, a novel line of research in smart recommender systems is Context-Aware Recommender Systems (CARS). CARS generate more relevant suggestions by adapting to the specific contextual situation of the recommendation. For example, some music recommender systems can provide different recommendations based on user's location and activity. Thus, the music recommended to the user can be quite different depending on the situations the user is living; for instance, different music will be recommended when a user is in a gym over the weekend, and when a user is on the way back from work.

In order to demonstrate the smart recommender system, we will use the following route recommendation scenario. Consider that one user would like to obtain the route recommendations from A to B. The traditional route recommender usually recommends the shortest path between A to B. However, this may reduce the usability of the system, since there can be more factors and context that the system need to take into account, such as the traffic, weather, user's personal plan etc. for example, the user wants to avoid the heavy traffic and also plans to buy some food on the way from A to B. Then the recommender can re-compute the route by considering the real-time traffic and searching for some supermarket on the way from A to B. There can be different kinds of supermarkets such as open outdoor market on the street or a normal indoor supermarket. Then this can depend on the weather status.

To realize the traffic recommender system, we could consider that a user is requesting a route recommendation service, this request is sent to a service hub. This service hub is a collection of different service for example, real-time traffic service, location-based mobile service, route computing service, weather forecast service, etc. Those services can depend on each other or a set of service can be used as the input for one service. In line with the service hub, IBM Bluemix is a platform to facilitate the developers to realize different services. Regarding the smart route recommender, in the following we will show how to develop the important components in the smart route recommender that work with GPS sensor, IoT and Google Map.

1. *Sensor definition.* We define the GPS sensor simulator. Either we could use a mobile phone or similar device, the principle is still the same. We are using Node Red to define the flow

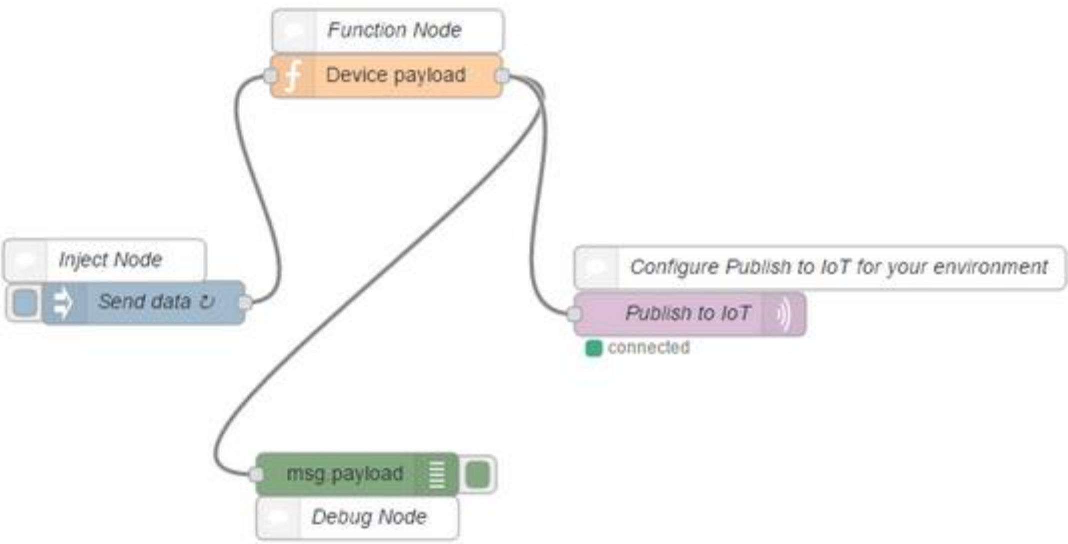

Figure 2. GPS sensor simulator (Source: Authors' elaboration)

2. Than we define the IoT interface for this service. We can use more than one sensors to be connected to the same interface – and then to get more data to be processed

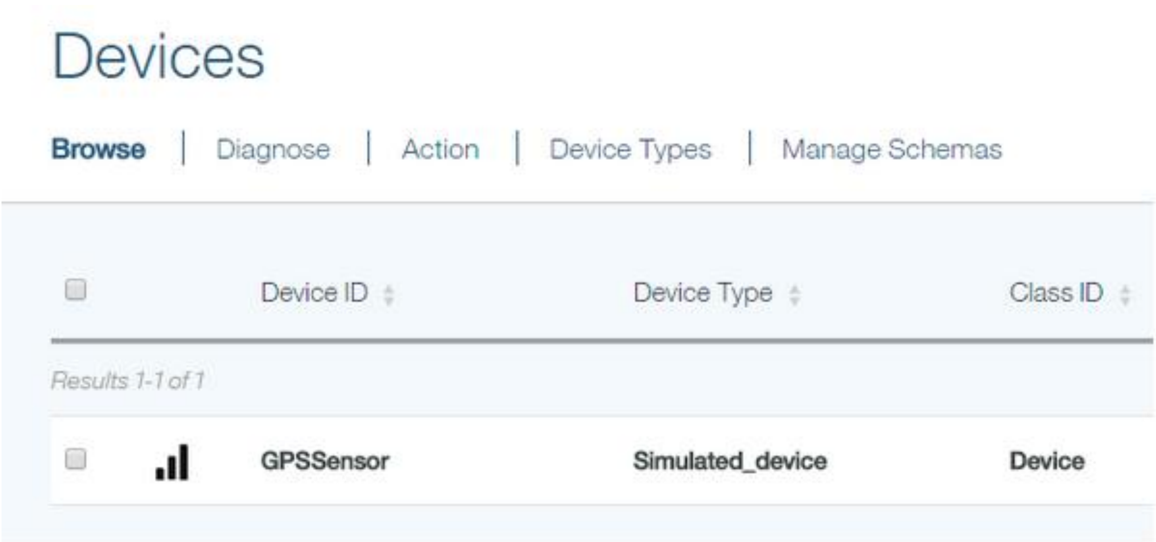

Figure 3. Device configuration for IoT interface (Source: Authors' Elaboration)

3.

Finally, we design a very simple application, connected to IoT interface, working with the sensor and showing received coordinates on the map using Google API interface.

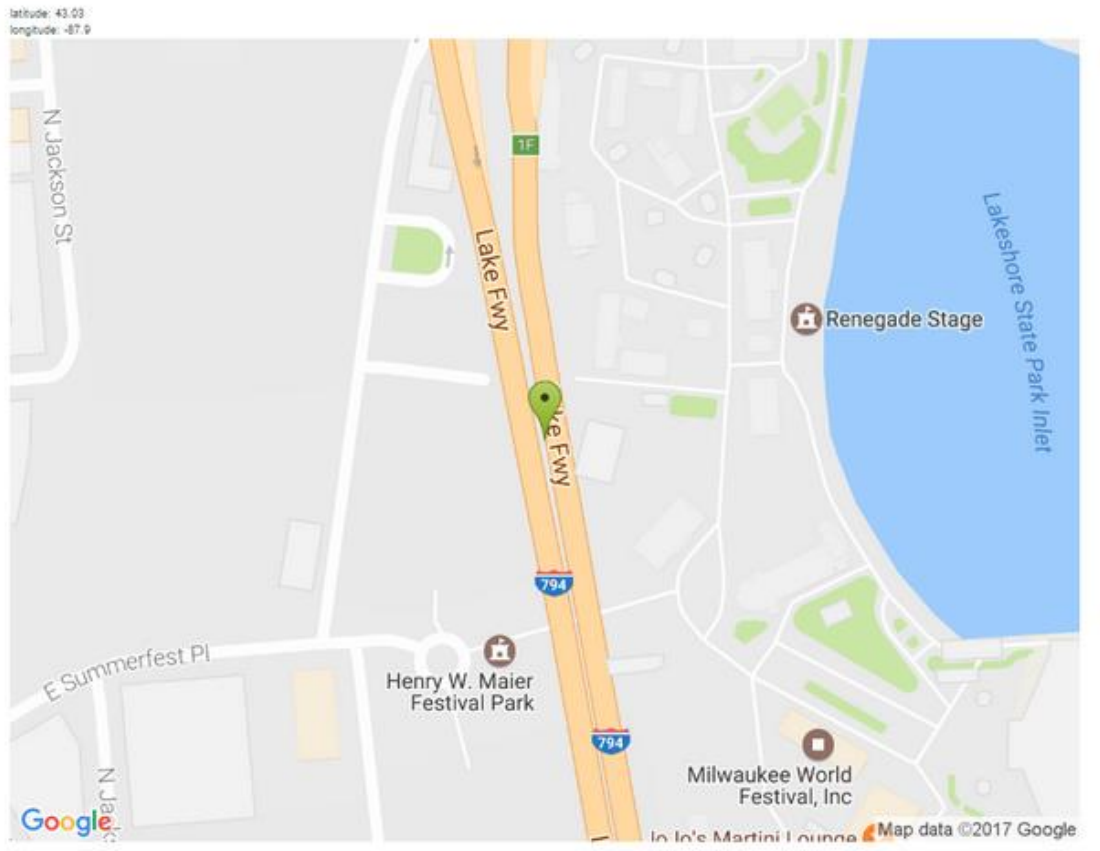

Figure 4. Example of the position representation (Source: Authors' elaboration)

While designing such a complex service is not problem anymore in the frameworks like IBM Bluemix, we should concentrate to context view of the problem – what will be the characteristic of the data we are using and we are producing and how suitable they are for the utility of the Agent within specific context.

5. Implications, limitations, and conclusions

We have taken a step further to realize the service system into practice. The implementation is based on the IBM Bluemix, which itself is a service based platform. One lessons learned is that how to bridge the service thinking and service modelling to the implementation of service system. In Service Science there is a variety of key pillars that are moderated within S-D logic. Based on that, the service modelling can include different roles and their relations (Dominici et al., 2017). The modelling is usually conducted in certain context such as Smart City (Caputo et al., 2016b; Saviano et al., 2016). However, most the service design stays in the stage of modelling or the reflections of real-world examples. There is still a gap between service thinking based modelling or design to service system implementation. That means, how to test the service thinking in reality (bottom-up) remains challenging, we therefore tackle this challenge to how can service science guild the future ICT development (Caputo & Walletzky, 2017). Whereby we recommend that the service-oriented development should not focus only on the technical architecture, but the service thinking supported design.

Building upon the reflections proposed in the previous sections some implications can be stressed both for theoretical and practical points of view. Specifically, from theoretical point of view it emerges the need for:

- Overcoming the limitation imposed by specialized knowledge in social science because the dimensions and dynamics that affect design, management, and control of service systems require to build widen multi-disciplinary research framework
- Deepening the studies about the perceptions of actors involved in service design and management as relevant pillars able to make possible the implementation and survival of a service system
- Enlarging studies about the subjective acquisition, decoding, and elaboration of information from the context in order to build prevision models strongly aligned with the perceptions of the involved actors.

At the same time, from practical point of view we can stress the need for:

- Developing multi-context studies direct to verify in which ways perception of actors involved in a service system are affected by external dynamics and flow.
- Building multi-disciplinary tools able to measure and monitor dimensions related to subjective perceptions and evaluations of actors involved in service systems.

In nutshell, the paper underlines that most research in service domain stays in conceptual or theoretical level. There is a lack of rigorous validation for the research work in service science, especially when the service is connected with smart city, which is usually termed as smart service. Many smart services are designed or modelled in a conceptual level and there is still a lack of knowledge of how to evaluate the smart service in the experimental or field study. Thus, it may create a barrier for practitioners to further implement the smart service. Furthermore, it is more interesting to study the effects of the smart service in the context of smart city. We therefore recommend that the evaluation methods in service science should be further consolidated. For example, experimental research can be conducted in service science. As such, this paper intends to enhance the researcher's attention to practical validation of the service hypothesis or smart service models. Accordingly, the paper shows that *it is possible to combine SS, S-D logic, NT, and ST to build a common multi-dimensional constructive tool to support both researchers and practioners engaged in service domain.*

In such a perspective, it is shown the relevance of context in service design and underlined the role of interaction between service provider and agent in ensuring the effective functioning of service system. From this point of view, the paper enriches previous knowledge about the ways in which example, we can see hot how the pillars of Naples forum on Service can work together to improve, quality, efficiency, and effectivity both in social and economic configuration.

6. Conclusions and future directions for research

We have tried to introduce the problem of complex service design from different perspectives. Each perspective (Service Dominant Logic, Service Science, and Network and Systems Theory) offers unique solution. But only by using combination of those perspectives, supported by ICT and service related framework (like Blue Mix) we can get a valuable, sustainable and adaptive system that can continuously provide a utility to a customer. The first issue for the further research is to precise and extend the usage of Diamond model for the practical use to analyse and design complex services. Of course, the example we introduced is very simple. For the future research, it is necessary to point to the value, provided by complex services in different contexts and investigate a real role of ICT and data usage in them.
And the last research stream, that we are identified, is the architecture of service frameworks – how they support more the interconnections among different services on various levels and how to use big data to be enable the developers to create more useful and value providing applications.

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