Goods for sale: create service with just one click

ABSTRACT

Type of paper: Case study

Purpose

Given the complexity of the overall scenario in our globalized world, day after day it becomes more evident that the key of success resides in discovering *interactions*. Using a *biochemical* analogy, we can compare markets with the *primordial soup* where molecules fights to survive. Some ones actively interacted to *evolve* in more competitive organism, some others passively stay at the window and are doomed to be swept away. Following this analogy, we believe that Semantic Web technology, also called Web 2.0, can play the role of *activating enzymes* and we will discuss such a view by analyzing the case of a virtual network of heterogeneous Italian firms, which conduct a market service-centred behaviour implemented through a web based service system.

Design/methodology/approach

In the framework of a nationally funded research project called ABACO, firms in the Campania Region belonging to *tourism*, *cultural heritage* and *food* industry have been identified, and their use of Internet services, was assessed. We noticed that, even though each homogeneous group of firms may be considered a local network, these organizations lack of horizontal integration fostering a single value co-creation network built around tourism attraction forces.

While it was not possible in the past, nowadays Semantic Web technology can be viewed as a smart *automatic "activator"* of services keeping its fuelling from both the availability of goods and the use of sophisticated knowledge mining tools.

We are experimenting that this could be accomplished through an integrated ICT service system based on a network configuration for the co-creation of value, where co-exist both suppliers and consumers of services in order to create a virtual network of three areas. It is a semantic web-based service oriented architecture, in order to allow interoperability, where each product can be considered as a service. Each firm can easily participate to the virtual network by uploading its goods descriptions into the system database, which are then used by the system to create related services.

A customer of this system can be a real person who is interested in buying services or a firm's owner who is interested in either selling or buying goods as services. But the power of the system is to strengthen every actor capacity to co-design, co-produce and hence co-create value within the system, enabling the SD Logic issues with ICT solution based on semantic web models.

Implications and Practical inferences

For entrepreneurs to better design their communication and interaction systems and to realize more effective business relations. For researchers to better understand the ICT solutions enabling value co-creation in a real time participating process.

Findings

It is found that semantic web based architectures can easily allow firms to participate to a market place driven by service dominant logic.

Heterogeneous firms can be integrated in a virtual network where the dominant logic for creation of value is the service exchange. Each firm can easily participate to the network by using a web-based application: services can be created with just one click.

Originality/value

Semantic Web service oriented architecture can be used for creating virtual networks of firms where the co-creation of value can be obtained by following the service dominant logic.

Keywords

Viable System Approach, Service System, network, interoperability, World Wide Web, service oriented architecture.

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Premise

Given the complexity of the overall scenario in our globalized world, day after day it becomes more evident that the key of success resides in managing and valorizing interactions. Using a biochemical analogy, we can compare markets with the primordial soup where molecules fight to survive. Some ones actively interacted to evolve in more competitive organism, some others passively stay at the window and are doomed to be swept away. Following this analogy, we believe that Semantic Web technology, together with Web 2.0, can play the role of activating enzymes and we will discuss such a view by analyzing the case of a virtual network of heterogeneous Italian firms, which conduct a market service-centered behavior implemented through a web based service system.

We are experimenting that this could be accomplished through an integrated Information Communication Technology (ICT) service system based on a network configuration for the co-creation of value, where co-exist both suppliers and consumers of services in order to create a virtual network, integrating three areas of business. It is a semantic web-based service oriented architecture, in order to allow interoperability, where each product can be considered as a service. Each firm can easily participate to the virtual network by uploading its goods descriptions into the system database, which are then used by the system to create related services. A customer of this system can be interested in the offered services or an individual buyer firm's owner who is interested in either selling or buying goods and services. But the power of the system is to strengthen every actor capacity to co-design, co-produce and hence co-create value within the system, enabling the Service Dominant (S-D) Logic issues with ICT solutions based on semantic web models.

The paper starts by introducing the growing attention reserved to services (cfr. Section 1) as well as service theories and service systems (cfr. Section 2), then continues illustrating the role of ICT in nowadays business and service exchanges (cfr. Section 3) discussing how new technologies can be exploited for designing service systems (cfr. Section 4), and finally proceeds deepening a case study represented by a virtual network of heterogeneous Italian firms which accomplished a competitive market service-centered behavior implemented through a web based service system (cfr. Section 5).

Keywords: Viable System Approach, Service System, network, interoperability, World Wide Web, service oriented architecture.

1. Introduction: the growing attention on Services

The services sector has grown up to more than 75% Gross Development Product in rich countries and more than 40% of average employment in global economy (Fitzsimmons & Fitzsimmons, 2006), involving a lot of combinations of productive and technological activities. In all economies resources and investments in services are rapidly growing, thus increasing attention into new service perspectives and developments.

Many researchers and observers have detected this decisive trend, highlighting how the difference between goods and services was gradually shading and loosing significance (Kotler, 1977; Normann, 1991; Rispoli, Tamma, 1992; Cercola, 1996); along with the relevance of the service-oriented behavior, considered strategic for nowadays business competitiveness (Parasuramann, Zeithaml, Berry, 1988). A strong systematical effort in catching the multifaceted phenomenon was pursued through the

S-D logic proposal (Vargo, Lusch, 2004, 2008; Lusch, Vargo, O'Brian, 2007). Principally S-D logic introduces a paradigm shift from goods' dominant perspective to services' one, suggesting that new economies are based on service exchanges proposed by producers (*providers*), who can only offer value proposition, really concretized if and only if customers (*users*) are interested in the related service. Goods in this perspective represent only appliance for services provision (Vargo, Lusch, 2004), and the role of customers as co-creators of value comes to the fore, highlighting the importance of networks and relations among many actors (entities) operating in supply and demand markets.

In a way, S-D logic magnifies several theoretical proposals such as: i) the value constellation model (Normann, Ramirez, 1994), in which enterprises are in the centre of a value creating network of relationships of many co-makers; ii) the value co-creation proposals, that goes beyond the participation to value creation starting from the design momentum, through all the production/service delivery, and finally joining the idea of value fulfillment through the active co-creation of customers (Prahalad, Ramaswamy, 2004) and other actors in all the service exchange, giving rise to precious and memorable experiences; iii) the many-to-many marketing over passing the concept of a dyadic relationship between producer and customer and introducing a many-to-many relationship that connect a dense and intricate relational pattern represented by the offer network (co-producers, partners, suppliers, etc.) with a dense and intricate relational pattern represented by the demand network (in which client, customers, communities, social actors, individuals, friends and many others influence the service exchange) (Gummesson, 2007); iv) the knowledge based theory developed in the sense that knowledge is a fundamental part of the exchange also supported by ICT (Rullani, 1994; 2001) and plays a key role in value fulfillment, both from the supply and demand side (the emphasis is on the participation and exploitation of individual knowledge, see also Pietenpol, Gitlow, 1996).

In line with the service-centered orientation, other contributions come from the Service Science, Management, Engineering and Design (in short Service Science, also referred to as SSMED), an IBM initiative involving hundreds of researchers worldwide in the attempt of promoting a new discipline capable of satisfying an emerging research issue: the study of Service Systems (Maglio, Spohrer, 2008). It is indeed a multidisciplinary "open source" project, based upon many pillars represented by computer science, human behavior, organizational theory, industrial engineering, business strategy, management sciences, social and cognitive sciences, legal sciences. Service Science can be viewed as a "*Science of the artificial*" (Spohrer, Anderson, Pass, Ager, 2008) based on ten foundational concepts: resources (physical and non-physical potentially useful things), entities (dynamic value co-creation configurations of resources), access rights (constraints on service systems interactions and outcomes), value co-creation interactions (value proposition-based mechanisms), governance interactions (conflict resolution mechanisms), outcomes (win-win results), stakeholders (customer, provider, authority, competitor), measures (quality, productivity, compliance, sustainable innovation), networks (service system networks), ecology (macro-scale interactions of service system entities).

Within S-D logic and SSMED performing business means for firms to act as a resource facilitator and integrator, connecting internal and external service systems (Vargo, Maglio, Akaka, 2008; Maglio, Spohrer, 2008) on network-based logics.

Networking relationships were first emphasized in the 1970s when studies noted an increase in connections among firms characterized by exchange of information, continuity in relationships, and increased commitment, trust, and collaboration (Richardson, 1972; Hakansson, Ostberg, 1975). Various terms have been used to describe these voluntary ties among firms and other economic actors, including

‘heterarchy’ (Hedlund, 1986) and ‘polycentic structure’ (Forsgren, Holm, Johanson, 1991); however, the term ‘network’ has now become generally accepted to describe this emerging economic entity (Bartlett, Ghoshal, 1990). We believe emerging service systems theory could benefit from network theories for the strong similarities between networks and service systems.

A service system, in a way, concerns primarily customer-provider interactions and as an open system (Golinelli, 2005; 2008) it is capable of improving its own state and the one of another system through acquiring, sharing or applying resources, with the aim to create a basis for systematic service innovation (IfM, IBM, 2007). Hence a Service System is considerable as a dynamic value co-creation configuration of people, technologies shared information (language, value, measures) and other resources connected via value proposition (Maglio, Spohrer, 2008), and ultimately it can create competitive advantage through improving the management of value co-creation processes (Payne, Storbacka, Frow, 2008).

2. Service Systems

Global trends, such as demographic shift, self-service and web-based technologies, outsourcing and offshoring, are challenging us to create new ways of doing things. This requires a solid scientific foundation if we are to understand increasingly complex service systems. The final objective is to apply scientific understanding to advance our ability to design, improve, and scale service systems for business and societal purposes (e.g., efficiency, effectiveness, and sustainability). But what really really service systems?

Service is the application of competences for the benefit of another (Vargo, Lusch, 2008). Service depends on division of labor and effective co-creation of value, leading to complementary specialization and comparative advantage among participants (Normann, 2001). Before the development of globe-spanning trade and technology networks, service was usually performed in close contact with a client. Indeed, today services creation processes are knowledge-intensive and customized, based on client participation and input (Sampson, Froehle 2006). Following this logic, we define service systems as value-co-creation configurations of people, technology, value propositions connecting internal and external service systems, and shared information (e.g., language, laws, measures, and methods; Spohrer, Maglio, Bailey, Gruhl, 2007). 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 (Normann, 2001).

A service system is any number of elements, interconnections, attributes, and stakeholders interacting in a co-productive relationship that creates value. As defined by Pine and Gilmore, in general “services are intangible activities customized to the individual request of known clients” (Pine, Gilmore, 2000). This customization activity results in a co-productive relationship, which defines a service engagement that is different from other types of economic transactions. Thus, key characteristic that differentiates a service system model from a traditional economic transaction system model is the interaction with the clients as participants in the service process (Fitzsimmons & Fitzsimmons, 2006; Sampson, 2001).

Principal interactions take place at the interface between the provider and the customer. However, with the advent of ICT, customer-to-customer and supplier-to-supplier interactions have also become common. These interactions create a system whose performance is difficult to explain and forecast.

Service systems are capable of enabling connections and interaction among all involved parties within service exchange; in other words the technology upon which

service systems rely smoothens communication channel between B2B, B2C/C2B, C2C, B2S/S2B C2S/S2C (where B stands for business, C for Customer, S for Stakeholder and the first letter is the actor activating the interaction) (Gummesson, Polese, 2009).

Service systems can be divided into 'front stage' and 'back stage'. The 'front stage' is about provider customer interactions. The 'back stage' is about operational efficiency. Service performance relies on both front-stage and back-stage components.

Every services situation is unique and yet if one studies individual situation we can see patterns come out. These patterns represent the chance to create methods that can increase competence in providing service. In order to capture these patterns one needs to be able to bridge multiple areas of knowledge. Methods provide steady approaches to common activities and also can be a way to stimulate and realize service innovation.

We start arguing how information technology, by facilitating the service integration function, has a dramatic effect on the ability of all entities in the value creation network to collaborate. In essence, the service revolution and the information revolution are two sides of the same coin. Information technology gives the company the ability to learn and to store more information about the customer, which in turn gives the company more ability to customize its services and to develop customer relationships. (Rust, 2004). The IT landscape has seen an explosive rate of growth over the past several years; four factors are making this change to increased collaboration (Lusch, Vargo, O'Brian, 2007):

- open standards: the consequence is that more ad more information and experiences are shared;
- specialization: the consequence is increased interdependency among all entities;
- connectivity: the market system is quick in responding to changes;
- network ubiquity: accelerates the consequences of open standards, specialization and connectivity.

As organizations work to achieve and sustain competitive advantage, the ability for IT departments to demonstrate their value and deliver results to the business has received renewed focus. Businesses are demanding more than ever from their IT function, requiring more than just minor operational efficiencies. In sum:

- Services depend critically on people, technology, and co-creation of value;
- People work together and with technology to provide value for clients;
- A services system is a complex socio-technical system;
- Growth requires innovation that combines people, technology, value, clients.

The goal is to discover paths to use information technology to remove waste from the value creation process.

3. The role of ICT in nowadays business and service exchanges

We live in an interconnected world, in which global players are worldwide related with many actors both on a local basis and on an international level. Business models suggest relations, interactions, and networks among subjects since these forms are powerful enablers of resource access and competitive behavior. Complex production systems (Service systems) networked more than ever are in contact with customers, customers' communities, people (these being interconnected and related as well). It is like a many to many relationship in which the fundamental basis of interactions in service. In this context, ICT plays the great part. It is not anymore a business matter. Enterprises have looked at ICT as internal processes enabler, but this change in socio-economic context is basically targeted to customers' population. Its them who need to

be connected, since the information goes fast towards possible clients, co-designing, co-producing, co-creating value with production systems. Internet, google, amazon, e-bay, facebook, wikis, e-marketplaces, myspaces, blogs and so on are just some examples of how much ICT can strengthen clients capacity to communicate and exert pressure and actions on the producers.

As well known, at first Information Technologies (IT) was introduced for better handling business processes, for instance for simplifying (automating) tasks that required human involvement. Nowadays the role of IT in business processes, due the introduction of new internet and intranet technologies, is definitely changed, embracing not only internal performance improvement actions, but also more challenging external competitive programs based upon the simultaneous involvement of firms along with partners, suppliers, customers and other social actors.

Today, in fact, modern IT systems rely on service-oriented architectures which provide methods for systems development and integration where systems package functions are considered as interoperable services. In other words SOA infrastructure, by allowing different applications to exchange data with one another, supports efficiently the service provider and service customer contact and value exchange.

Widening the role of technology, service systems should adopt a Service Oriented Architecture (SOA), "a paradigm for organizing and utilizing distributed capabilities that may under the control of different ownership domains; it provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects consistent with measurable preconditions and expectation" (Demirkan, Gaul, 2006, p. 549). So, the SOA can be a basis for service-oriented enterprises (Erl, 2005). Within SOA, indeed, ICT can help in mapping business processes and give measures to support service systems in developing a service oriented enterprise (so called SOE).

Considering a service system as constituted also by service providers and client (people/corporation, so called *participants* – Alter, 2008) working together with technologies support, according to network paradigm and value co-creation concept, policies (and related articulated work system strategies including value propositions) adopted by the service to produce the requested information, are often referred to the mechanism of transfer/exchange of information (Service Level Agreement - SLA). Today it is aimed to support the use of Web services (designed according to a model of SOA - Erl, 2005), to ensure interoperability between different systems, in which business and technical components provide reusable, dynamically discoverable, and complementary services (Demirkan, Kauffman, Vayghan, Fill, Karagiannis, Maglio, 2008), allowing the use of individual applications as components of business process and the demands of users (agents and non-artificial).

New service theories, and specifically both S-D logic and SSMED, highlight the importance of relations, interactions, networks, suggesting implicitly that often ICT tools represent strategic key factors, in order to successfully involve customers within the co-creation process. Indeed there is a technological focus of both S-D logic and SSMED. Nowadays practice, in fact, seems to show that Information and Communication Technologies play a key role in enabling the participation of customers to productions and service experiences: IT tools and models such as e–platforms. S-D logic, being based upon the participants' role, passes through ICT tools and enabling mechanisms, as well as SSMED. This last proposal, despite the fact that it still at a primordial stage since it is far from defining its research boundaries and a theoretical definite construct (due to its challenging goal of defining a new emerging science), surely is strictly linked to technology, and in particular to the above mentioned Service Systems. Upon these premises we wish to analyze the role and opportunities offered by ICT to the paradigm shift and within SSMED, deepening how such technologies can be exploited to create a real service system network (Polese,

Mele, 2009).

4. Semantic web and Web 2.0 technology as powerful Service activator

While it was not possible in the past, nowadays Semantic Web technology as well as Web 2.0 tools can be viewed as a smart *automatic "activator"* of services keeping its fuelling from both the availability of goods and the use of sophisticated knowledge mining tools. Hence we can observe how technologies can be viewed just as enabler of theoretical approaches fostering business competitiveness based upon relationships, and positive harmonic interactions, like the Viable System Approach (Golinelli, 2009, Barile, 2008). This approach underlines how businesses are addicted to their survival upon iterative processes of consonance and resonance, which can be interpreted as the activating enzymes selecting the survivals organism in a biochemical environment. In other words ICT could be interpreted as a concrete instrument upon which consonance and resonance processes can be activated and pursued, fostering business competitiveness on the long run.

As discussed before the attention of experts is being drawn to the value co-production process, where services are defined *as value co-production* (Chesbrough, Spohrer, 2006).

Certainly, the co-production is not a new aspect in the service sector and scholars have studied it long before now, for instance Fuchs may have been the first to define services effectively as co-production (Fuchs, 1968; Boselli,Cesarini, Mezzanzanica, 2008). However in the field of service science these aspects are mainly related to the customer participation in service processes (Xue, Harker, 2003), which certainly can be enabled by exploiting Web –based technologies. Most of the previous work on such a field is focused on the concept that the value of co-production can be measured as the proportion of the whole service task outsourced to the customer by the service provider neglecting that such a value could be in alternative measured as a result of a relationship between users, knowledge and technology. As discussed before, the key issue of this work is based on the concept that the involvement of knowledge co-creation supported by technology, specifically Semantic Web combined with Web 2.0 tools, in the whole service development and delivery process could in principle enhance efficiency of service systems. In this direction previous studies about models and patterns for services design and process have pointed out that three key points must be taken into account to obtain better service effectiveness:

- Knowledge exchange between provider and customer;
- Reduction of time needed for customer knowledge acquisition;
- Fostering of the value co-production.

This approach can be effectively supported by particular kind of ICT-based services that emerge from Web 2.0 jointly with web semantic technologies (Boselli, Cesarini, Mezzanzanica, 2008).

Specifically, the first item can be obtained by creating interoperability among IT system and by using tools for modify the role of customer in service delivery process. Such a role can become active, the customer can share knowledge by exploiting IT infrastructures, for instance through the Web. Some more the reduction of time can be obtained by improving the usage of these tools and by using tools for recording human behavior, and data mining, again this can be achieved by exploiting these new technologies. Finally, the core of co-production is the interoperability among systems, that is informative systems, and again more they can take advantage of Semantic Web tools and languages for cope it. By following this approach we could design a service system which could have some basilar peculiarities: enabling *interoperability*, offering

a better quality of web resources' *content and services*, and last enabling a sort of *user interaction*. As a consequence of such assertions we argue that a system designed in this way could in principle support a more effective market service-centered behavior, moreover in Section 5 we will show such a behavior can be reached for a real example of a group of Italian firms.

4.1 Service improvement and Semantic Web technologies

Although the introduction of metadata language, amongst those XML is the most important, has been useful for cope data exchange problem and syntax-level interoperability, IT infrastructure requires semantic interoperability to fully exploit and interoperate with respect to all its data and service resources (Berners-Lee, Hendler, Lassila, 2001). For that a new concept of Web resource has been introduced, based on the concept of Semantic Web that shows how the use of formal knowledge representation, typically in the form of ontologies, leads to machine-processable descriptions, and how the adoption of ontologies that provide common vocabulary and shared knowledge leads to improved semantic interoperability (Sheth, Verma, Gomadam, 2006).

Models of data semantics promote reuse and interoperability among independently created and managed services (more in general service systems), the utilization of ontology-supported representations based on formal and explicit representation lead to more automation; and finally the explicit modeling of the entities and their relationships between them allows performing deep and insightful analysis, like data mining. Each aspect allows coping with all items considered before and to setting up a right environment for services improvement process.

Ontologies provide the most accepted way of creating conceptual models for domains. W3C-recommended ontology specification languages like OWL and RDF/S provide a way to specify conceptual models using formal languages, while UML maybe an alternative language for modeling assets such as software (Smith, Welty, McGuinness, 2004). In this scenario, the ontologies are considered as mean for conveying knowledge and specifically they are formal specifications of knowledge that capture or represent agreements.

Service systems can take advantage of web semantic findings by integrating semantics in the creation process of a service. Specifically much of the modeling effort on services has so far focused on standard Web services in the context of SOA enabled by Web Service Description Language (WSDL), SOAP (Simple Object Access Protocol, an XML-based message exchange format) and UDDI (Universal Description, Description, Discovery, and Integration), a technical specification for implementing registries that allow publication and discovery of Web services. It is, however, possible to take XML-based descriptions used by these standard Web services (and in principle, other syntactic descriptions of services) and annotate them with semantics specified in ontologies or conceptual models to gain the previously described benefits of a semantic approach.

Web services provide a standards-based solution for creating such services by facilitating reuse, interoperability, and composition of existing services and applications. While Web services standards resolve platform heterogeneities, and XML provides the basis of syntactic interoperability, there are many other types of heterogeneities in the business environment (Sheth, 2003).

In the emerging field of Semantic Web Services (SWS), semantics is exploited to discover services using semantic (rather than syntactic) descriptions to more effectively integrate, compose, or orchestrate services to support workflows or processes.

The same approach to semantic interoperability can be accorded to fast-growing Web-based services using Web 2.0 technologies (such as REST and AJAX), often termed as lightweight services, and to more expansive knowledge services that go beyond the scope of Web services to encompass human skills and organizational aspects.

In addition, with the help of semantics descriptions of Web 2.0-based services, Web interfaces to aggregate data from multiple sources can be quickly created for customer and internal use.

4.2 Service improvement and Web 2.0 technologies

The term "Web 2.0", originally coined by technologists from Tim O'Reilly's organization, is until the 2005 commonly accepted to describe the next generation of Web-based application development platforms. It was introduced with a set of oppositions against classic Web techniques and design metaphors: tag systems versus directories, RSS syndication versus Web site stickiness, wikis versus content management systems, open Web APIs versus screen scraping, blogs versus personal Web pages, massive user participation versus client/server style publishing (O'Reilly 2005, Boselli, Cesarini, Mezzanzanica, 2008).

As deeply discussed in literature, Web 2.0 is not about one particular technology or a description of a set of tools, rather it allows World Wide Web to build composite applications in a service-oriented fashion. By following this paradigm we can have applications capable of integrating data and services coming from multiple locations to create a resulting service that is presented to its user and can be reused as input to other Web-based services. This type of on-demand delivery model encourages humans (users) to be more active in the service creation process, who are going to request real-time access to data or services from different sources. In this scenario, we need to point out that users are really interested in sharing knowledge in order to properly participate to whole chain of services production.

In a nutshell, the word web 2.0 is referred to a class of Web-based applications sharing certain design patterns radically modifying the design and the use of ICTs, having specific features, such as:

a) Improving an open, flexible, participatory model promotes third-party and user collaboration, and intelligence to deliver content (obtained with User Interface technologies such as Asynchronous Java and XML – Ajax and powerful scripting languages).
b) Fostering collective intelligence, social networks, user –contributed content and tags for knowledge/data creation by allowing knowledge acquisition from heterogeneous sources.
c) Promoting authoring through open APIs, without being limited by an imposed architecture.

The applications of the Web 2.0 paradigm increase the capacity of knowledge sharing and exchange between users, which in turn enables service-centered behavior, where services emerging from people collaboration, and not by companies with specific products. The core of such a technical proposal is based on the idea that users, technologies and business models are highly customizable and interoperable, and that can live together in the same system with the scope to improve services. As argued in (Boselli, Cesarini, Mezzanzanica, 2008): "the key principle at the core of the Web 2.0 philosophy is that the service improves with the growth of cooperation and user involvement".

Hence, Service Systems can take advantage of Web 2.0 tool in service provision,

because it supports collaborative work (especially knowledge work) and collaboration is a key component of co-production, promoting a key issue: “co-production based on collaborative technologies”.

As a conclusion, in a world where knowledge and information pay a fundamental role in the services creation process, the exploitation of semantic web technologies together with Web 2.0 tools for managing knowledge will have a strong impact on the co-production activities, that is the main feature of a service-centered business system.

5. The ABACO case

Here we will discuss how a Service System, based on SOA architecture combined with Semantic Web and Web 2.0 technologies, can support and facilitate a market service-centered behavior; it will be treated by referring to a real case of a virtual network of heterogeneous Italian firms.

The main ideas behind our work are developed in the framework of a nationally funded research project called ABACO, which we will briefly present in following. This project is a Public-Private Laboratory formally named "*ABACO: e-business platform for an innovative technological solution which system integrator services in the fields of tourism, cultural heritage, agro-food*" financed by Italian Ministry for University and Scientific Research (MIUR) call on public private laboratories in 2005. It involves jointly University of Salerno, IBM Italia S.p.a, National Association of Food and Vegetable Conserve Industries (ANICAV), Research Institute on Service Activities of the National Research Council (CNR-IRAT) and others (MIUR decreed cost of about 10M €).

Objective of the Project is to achieve effective integration of business in three areas of interest, on several levels, firstly at the level of single chain and then across sectors (or systemic), by exploiting web based innovative technological solutions discussed in previous sections. As result an *e-business* platform for system integration of services, namely a service system, for the areas (sectors) of tourism, cultural heritage, agro-food will be designed.

The project has been divided into three main phases. At first time is spent to identify the real needs of each sector that the system aims to overcome and then for defining the hypothetical market for the products that project team wants to achieve (B2B-B2C). After an analysis of the current status, follows a phase of technological assessment and definition of the logical model of the prototype for each sector that obviously must be verified and validated. Finally, after validation, we will shift attention on the realization phase of prototypes of integration between sectors, which in turn must be also validated.

For our scope we report here results obtained by pursuing the first phase, where firms in the Campania Region belonging to *tourism*, *cultural heritage* and *food* industry have been identified, and their use of Internet services, was assessed. As discussed extensively in previous sections, the technology for interaction, which are the basis for a service-centered behavior, can not be exclusively dedicated solutions, for example, we can not report a software management (intranet) or other planned and controlled by companies tools to assess the effective integration within a service system. Indeed, through an open web, interactive, possibly synchronous, application, which certainly can be included old-style instruments, you can assess the actual competitiveness of companies in the sectors investigated. Regardless of the technological equipment company, replicating one of the old view of IT that is the rationalization process, we note that it may be obtained through scalability. For sure Internet and its services (e.g. Web) support scalable applications: each actors may participate *on demand* through a simple Internet connection, *with just one click*.

We noticed that, even though each homogeneous group of firms may be considered

a local network, these organizations lack of horizontal integration fostering a single value co-creation network built around tourism attraction forces. We are experimenting that this could be accomplished through an integrated service system based on a network configuration for the co-creation of value, where co-exist both suppliers and consumers of services in order to create a virtual network of three areas. It is a semantic web-based service oriented architecture, in order to allow interoperability, and create an effective service exchange between many actors. Moreover the system allows cyclic interactions gradually improving service experiences due to knowledge, information and needs mutual exchange/sharing. Each firm can easily participate to the virtual network by uploading its goods descriptions into the system database, which are then used by the system to create related services.

A customer of this system can be a real person who is interested in buying services or a firm's owner who is interested in either selling or buying goods as services, or simply a big supplier or a heterogeneous community. But the power of the system is to strengthen every actor capacity to co-design, co-produce and hence co-create value within the system, enabling the SD Logic issues with ICT solution based on semantic web models.

5.1 Three Dimensions of observation

Recall that we are interested in evaluating how new technologies have invested the three sectors, and then we choose to observe how firms of this network make use of Internet services, that is we have focused on the evaluation of their Web resources. In order to make correspondence with the previously discussed in Section 4, where some basic peculiarities of a service system has been identified, we have focused our attention on the evaluation of three dimensions of observation: *content and services*, *user interaction* and *interoperability*. The analysis in this case has been structured through the use of three main parameters, which are summarized in Table 1.

Table 1. Content and Services dimension parameters

Content and services dimension	
Content	Quantity and quality of information
Support services	Multimedia (e.g.: animated photo galleries, videos, etc), various tools (newsletters, user registration, site searches, etc)
Community services	Tools related to Web 2.0 (e.g. forums, blogs, surveys / questionnaires, forms, applications, etc)

The parameter *content* can be decomposed, in turn, into practical information on: *products showcase*, the products list and characterization of the products based on the properties and criteria for purchasing logistics; *contexts of use*, set of information directly related to products (e.g. recipes, exhibitions, events, etc); *news historical / cultural information*, on folk and traditional links to the most interesting and possibly stimulate the curiosity of the "surfer";

As regards the analysis of the second dimension, the interaction with users has been characterized by the parameters reported in Table 2.

Table 2. User Interaction dimension parameters.

User interaction dimension	
Attractiveness	The placement on search engines, the presence of instruments of community (which give visitors the opportunity to invite friends to visit the site) and the

	availability of content in different languages
Permanence	The completeness of content and services that represent the major determinants of prolonged stay of the visitor to the site itself, the ease of interaction and the level of interactivity and immersive navigation
Return	Content updating, the profiles as well as tools for community that make the stay more pleasant and that determines the return of the users on the site

Finally the last dimension can be appropriately evaluated by observing the parameter reported in Table 3.

Table 3. Interoperability dimension parameter.

Interoperability dimension	
Interoperability	Indication regarding the exchange of information between company and consumer, e.g.: *e-commerce services*: quotations, inventory availability, promotions and special offers, shopping on-line

Evaluation metrics

Referring to the measurement of the first and second dimensions and the metric introduced during the analysis of sites, we can highlight substantially six categories/classes, with their meanings, Table 4.

Table 4. Evaluation metric for Content and services, User Interaction dimensions.

Evaluation metric 1	
None	Indicates that there is no indication in relation to the size/parameter assessed
U.C.	Under Construction indicates that the size/parameter is considered important by the company, and therefore included in the site, but is currently being developed or maintained
Error	Indicates that when the size/parameter can not be assessed for causes not declared and not seen
High	Indicates that the size/parameter considered was considered essential for the characterization of the site/company and provides an excellent level of integration between the various services relating to these categories
Medium	Indicates that the size/parameter considered was considered average for the characterization of the site/company and provides a good level of integration between the various services relating to these categories
Low	Indicates that the size/parameter is considered collateral that is considered low for the characterization of the site/company and provides a level of integration between the various services relating to these categories sometimes totally inadequate

To have a clear idea of what the parameter for Interoperability dimension has been introduced, it was considered appropriate to highlight the metric reported in Table 5.

Table 5. Evaluation metric for Interoperability dimension.

Evaluation metric 2	
None	Indicates that there is no indication in relation to the size/parameter assessed
Level 0/Low	No interaction
Level 1/Medium	Interaction "one way" (e.g. completing the request form to request information or first contact with the company);
Level 2/High	Interaction "two way" (e.g. able to book / buy a product online or through a service from the site).

5.2 Evaluation

During the evaluation step about 100 of business has been analyzed for each area; to evaluate and analyze the results of observation and to demonstrate the interoperability and interaction with users found in the various companies through their websites, we have followed this procedure:

a) Achieve *N* cluster of firms based on dimensions score;
b) Choose a representative site for each class (namely the main value of the cluster);
c) Representing the classes (with their respective reference sites) through positioning matrix.

The following figures (see *Figure 1*, *Figure 2*, *Figure 3*) is rather aim to highlight the distribution of sites inspected with respect to the classes chosen for the debate. Those figures report 3D plot of the dimension of observations: the indexes on the individual bars indicate the number of hits to sites like (or similar with respect to the dimensions introduced in this project) to illustrate the specific weight of each class in the field.

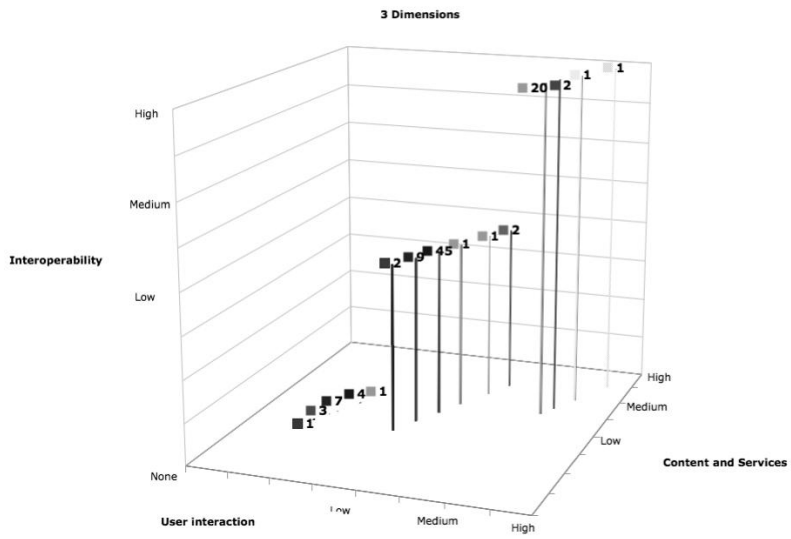

Figure 1. 3 dimensions plot for heritage sector

Note that the heritage sector has few sites with high level of user interaction and content and services dimensions and Level 2 of interoperability (cfr. *Figure 1*). here we can see that mostly of the firms are allocated in the medium region with interoperability assessed to *Level 1*.

By observing *Figure 2* we can see the tourism sector is quite similar to the heritage one, in the following we can see that some firms belongs to both the sectors. Here we can have more firms with interoperability assessed to *Level 2*.

Finally, by observing *Figure 3*, we can say that such a sector appears to be the less infused by new technologies and many firms don't use technologies at all.

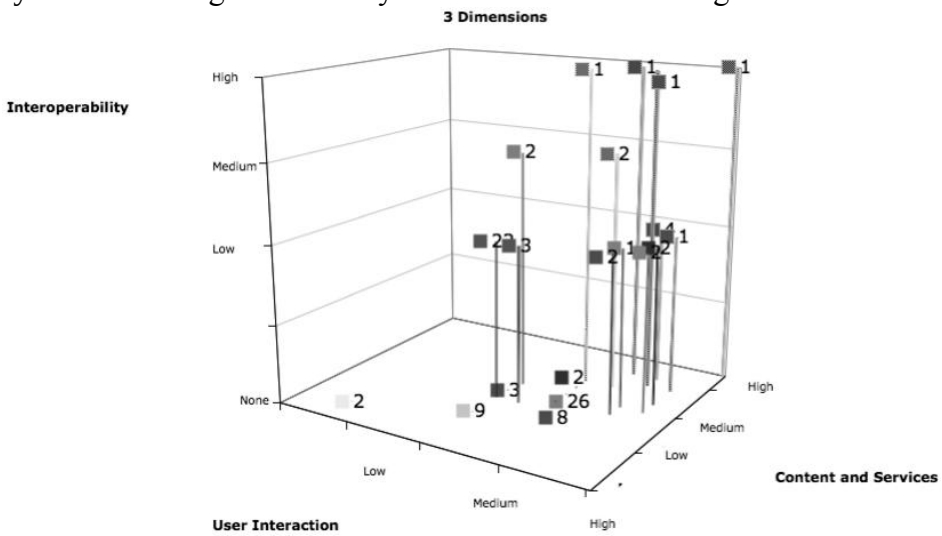

Figure 2. 3 Dimensions for tourism sector

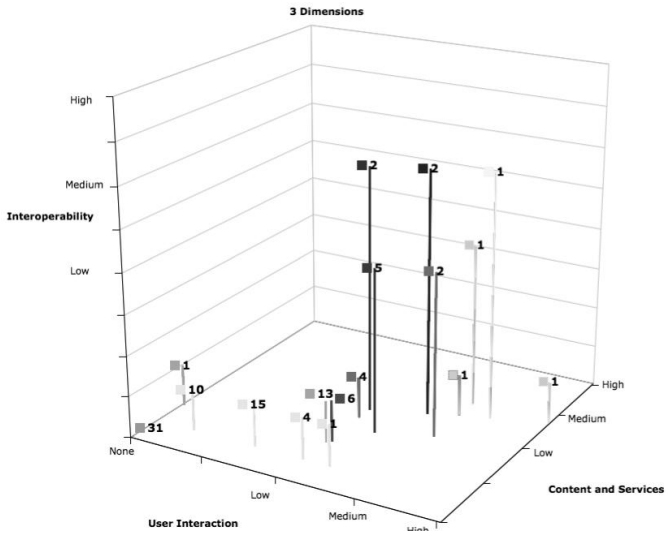

Figure 3. 3 Dimensions for food sector

The analysis shows that the sector with the lowest degree of technologies use is agro-food, while cultural heritage and tourism areas appear more or less than average, with a minimum advantage of tourism (such result was awaited due the tendency of companies to promote tourism activities B2C and B2B).

5.3 Positioning matrix

In order to simplify the analysis of data we propose an alternative visualization that we call *positioning matrix* (cfr. *Figure 4*); in the following we suggest how to read such a plot:

• values on cartesian axes are indicative of the levels previously introduced to the two dimensions of reference (by *Content and Services* - *Interaction with users*), with particular attention to the origin that identifies the level None - no information/site;

• each site relating to an identified class is characterized by a "node" of a different color depending on the level of *Interoperability*;

• each "node" is the name of the site used to represent each class derived in previous analysis;

5.4 Clustering and Market place

By overlapping the data referred to each sector we obtained the plot reported in *Figure 4*. In such visualization the conclusions discussed above are more visible, and we can easily note how tourism and heritage sector are mostly overlapped.

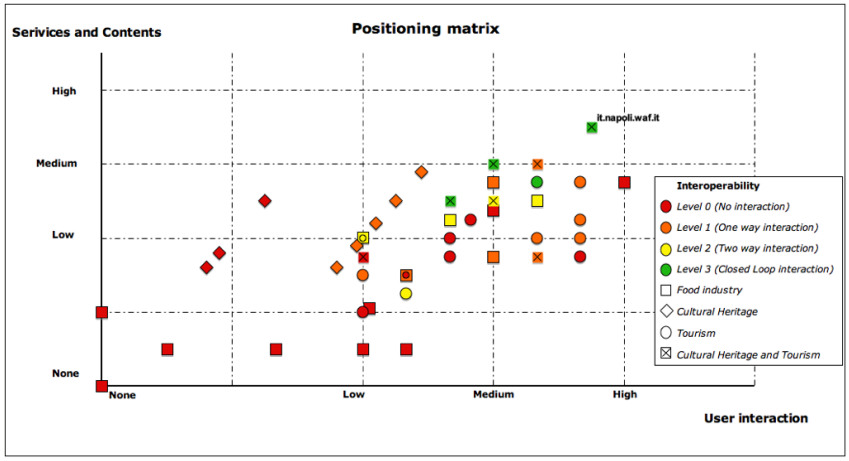

Figure 4. Positioning matrix

Starting from *Figure 4* we can obtain *Figure 5* where we have grouped firms in clusters by their level, formally we have: *worst cluster*, *low/medium cluster*, *medium/high cluster*, *best cluster*. Finally we can obtain *Figure 6* which represents how is the population of firms is distributed for each sector; note that plotting confirms that agro-food sector is the worst case.

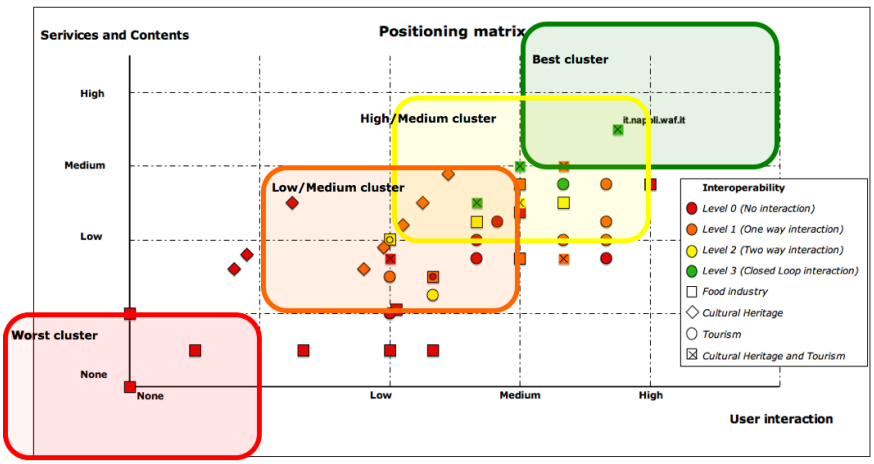

Figure 5. Sectors grouping by level

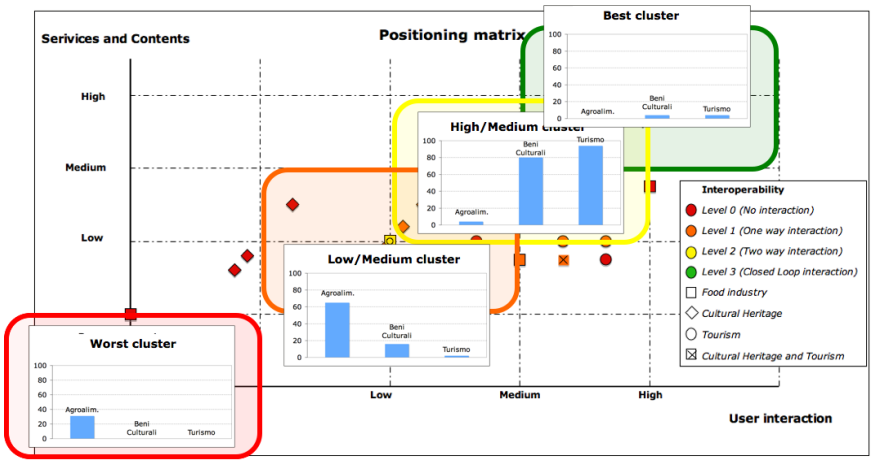

Figure 6. Sectors grouping by level, population histograms

Now we are ready for the identification of the real market place. The portion of the matrix reported as "real market place" represents a potential group of companies as possible actors of the system, due to their level asset, cfr. *Figure 7*. However, as discussed in previous sections, a market service-centered behavior can be obtained by contemporary exploiting new web based technologies for knowledge interoperability, namely web semantic tools, and new tools for improving user interaction, namely Web 2.0 tools. Most of the distinguishing features of Web 2.0 technology can be expressed only if the value for both the size, "*Content and Services*" and "*Interaction with the Users*", is high. Analogously, the core of semantic web technology, languages and tools for manipulating them, can be supported by infrastructure to which can be assigned level of "*Interoperability*" equals to 3. As a consequence, a portion of positioning matrix can be identified as the portion of market where firms can be ideally exploiting technologies to realize a service-centered behavior, formally we call it ABACO market place, cfr. *Figure 8*.

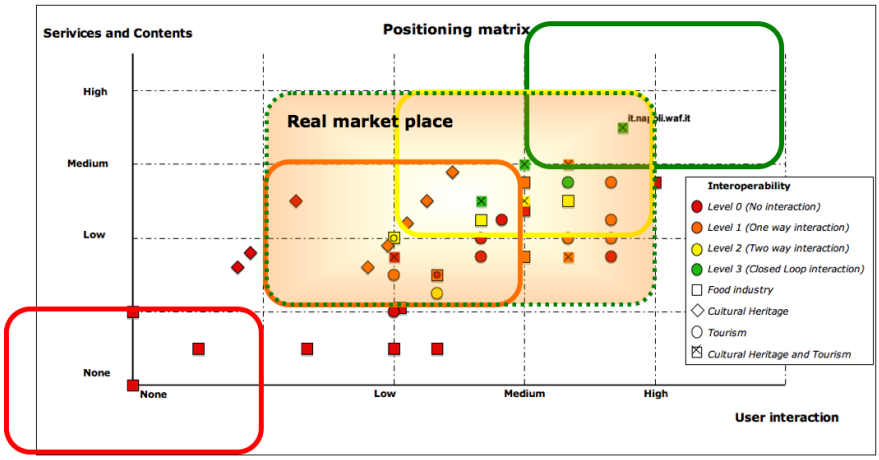

Figure 7. Real Market place

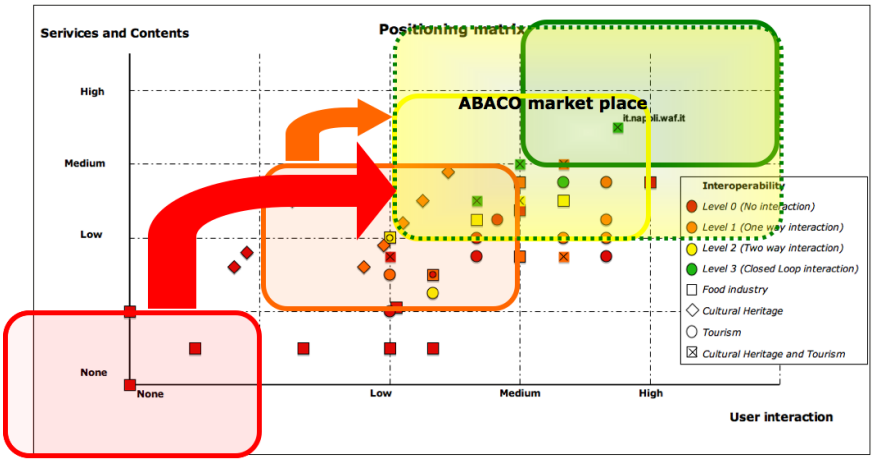

Figure 8. Abaco Market place

Since most of the market is located in a region that doesn't support service-centered behavior, then a Semantic Web service oriented architecture platform can provide the technological infrastructure to move the real market place in a better position, namely the market place ABACO.

6. Conclusion and future works

It is found that a service system based on SOA architecture, developed in the framework of Semantic Web and Web 2.0 technologies, can easily allows firms to participate to a market place driven by service dominant logic. Heterogeneous firms can be integrated in a virtual network where the dominant logic for co-creation of value is the service exchange. Each firm can easily participate to the network by using a web-based application: services can be created *with just one click*. We have argued that such a service system represents the basic infrastructure, which allows creative freedom to the actors, on which each person on a voluntary basis, independently, building their service experience with the tools that believes.

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