Contribution to the Development of a Conceptual Model of Service and Service Delivery

Wael Touzi, Thècle Alix, Bruno Vallespir

Contribution to the development of a conceptual model of service and service delivery

Wael Touzi, Thècle Alix, Bruno Vallespir

Univ. Bordeaux, IMS, UMR 5218, F-33400 Talence, France.
CNRS, IMS, UMR 5218, F-33400 Talence, France.
firstname.name@ims-bordeaux.fr

Abstract. For a long time, it was highlighted that services have specific characteristics mainly used to differentiate themselves from goods. Proposed definitions and characteristics led to debates between specialists in economics, marketing and management for several years and result in different points of view and approaches. There is still no consensus in these disciplines. More recently, new ones have contributed to define the concept of service. The goal of this paper is to present, on the one hand, the existing literature proposed by economists and managers about services (definitions and specificities) and, on the other, perspectives proposed by other disciplines such as computer science, engineering science or the SSME that challenge them. The bibliographical analysis results in a conceptual modeling of service and service delivery.

Keywords: service modeling, service production, service delivery

1 Introduction

The tertiary sector is particularly important in the current economy and drove the recent job creation contributing to more than 4 million of "full-time equivalents" between 1990 and 2009 in France while other business sectors lost 1,4 millions over the same period[1]. In 2009, the tertiary sector represented about three quarters of the value-added and employed 89 % of the working population. The main reason of the shift to the service sector is linked to the high level of productivity gains in the primary and secondary sectors, to the automation of the processes in these sectors as well as to a growing need for services to individuals (health, leisure, culture, etc.) and to enterprises (transport, maintenance, accounting, commercial service, etc.).

Today, the share of unsatisfied service demands still lead to the creation of companies in the tertiary sector. As a result is an increase of the competition in the market and non-market-services that rise many questions such as the management of service production processes, service productivity measure, the quality measure of the services supplied and of the activities contributing to provide them, as well as the measure of the real service value-added for customers. Accordingly, rationalization and industrialization are of huge importance for those companies producing services

[1] http://www.insee.fr/fr/themes/tableau.asp?ref_id=natnon03146

as well as the positioning of their value-added in the competition.

The increasing use of information and communication technologies for service delivery strengthens this need as it allows to increase the number of service delivery over a given period by the automation of all or any of the service delivery process. Thus, the length of the interaction between the customer and the contact personnel is even decreased as the role and place of the customer is changed as he takes a position upstream and downstream to the production, as is in the industrial production. The resulting phenomenon may be assimilated to industrialization of the service sector.

To prepare this shift, it seems obvious to reuse approaches from the secondary sector. Unfortunately, optimization models stemming from industry do not really allow to analyse the value chains of the tertiary sector because of its specific characteristics: a fuzzy border between production and distribution, a value dependent on the context and not fixed a priori, a contribution of the customer to the production even to the design of the service, only few physical movement of material and finally the impossibility to reduce the hand of work.

Thus, before focusing on the rationalisation of service production activities, it is of vital importance to define the production ins and outs and to clarify upstream what is a service. On the later point, it must be noted there are as many definitions and characterizations of the concept of "service" as domains which are interested in it. Accordingly, with the objective of proposing a conceptual model of services and of their production, the paper presents a multidisciplinary literature review on the service concept and on the service production as well as some approaches that directly or indirectly address the service production.

2 The service concept through a multidisciplinary state of the art

Some disciplines such as the Management Science are interested since a long time in services. Others, such as the computer science approach the service concept in a different way and address the service-oriented architectures (SOA), the cloud computing and XaaS, the web services, etc. The functional analysis or value engineering method used in engineering and more specifically in product design does not evoke directly the concept of service but focuses on the concept of function that is similar to a certain extent to the concept of service. Finally, the service science, management and engineering (SSME), aiming to be a new discipline, addresses several concepts relative to services. The definitions and concepts relative to services on which these various disciplines lean are presented hereafter. The presentation is restricted to the relevant concepts with regard to our objective of modelling.

The contribution of the **management science** is multiple and concerns at the same time service definition, service specific characteristics as well as the characteristics of the system used to deliver the service. Regarding its definition, a service is defined at the same time by opposition to goods [1], [2], as an activity [3], [4], or as a result [5], [6]. Each point of view lead to introduce specific notions: i.e. some works aims at characterizing the system producing the service often called service delivery system [7]; others propose specific service characteristics called IHIP characteristics standing for immateriality, heterogeneity, inseparability, and perishability [8], [9], [10], [11].

The **service-oriented architecture** developed in the frame of **the computer science** aim to insure a company with the realization of technological advances and business progress [12]. This is done by combining process innovation with an effective-governance, a technological strategy centred on the definition and on the re-use of services. Here, a functionality is decomposed in a set of functions or of services supplied by components. A business service is a company functionality that seems to be atomic from the service consumer point of view. In this frame, a service is a connection to an application offering an access to some of its functionalities [13]. It appoints an action executed by a component "service provider" to the attention of a "service consumer" component, possibly based on another system. A service can propose different functions such as: data processing, information research, etc. A customer relationship management application can give access to a customer data processing service for example (address, telephone, etc.). As the service is available somewhere, a process is required to get it [14], [15]. Then, among the available services, it is necessary to choose the one that fits the best the requirements. A **service Broker** can be used to convey the information among the servers.

The **functional analysis** part of the **value engineering (VE) method** was firstly used to identify the needs within the frame of new products design (NPD) [16]. **VE** is characterized by a functional approach proposing to formulate NPD in terms of objectives rather than in terms of solutions. For that concern, VE method rests on several fundamental concepts: the value [17], the need [18], and the function [19]. The value is the assessment of the product based on the product user expectations and motivations expressed by a quantity that grows when, ceteris paribus, the user satisfaction increases and/or the expense concerned to the product decreases. The need is defined as a necessity or a desire felt by a user. Finally, a function is an action of a product or of one of its constituents expressed exclusively in terms of objective. The functions of a product define what the product/product subset is doing or what it is going to do. That perspective is very close to the service concept.

The **service science, management and engineering** (SSME) works on the principle that the world has became a system of huge service composed of six billion persons, million companies, and million high-technology products, linked to service networks. It has thus became necessary to develop a " service science, management and engineering" to better understand the design, the evolution and the emergent properties of the service systems and also to understand how the innovation leads to productivity gains in this sector [20]. The SSME consider the services as processes, performances or else results that a person (company, organization) realizes for the profit of another company/organization. It is thus the nature of the relation with the customer that characterizes at best the service sector. Several approaches such as " the triptych of technical criteria " [21], or the " triangle of services " are proposed [22].

3 A conceptual model of service and service delivery

In this section is presented a conceptual model of service based on the above-presented contributions. Objective is to embrace the main part of these contributions to be as generic as possible. The model details are developed in [23].

3.1 Basic principles

The first principle of the proposed approach is that a service is an interaction within a couple service provider/consumer; oriented from the provider to the consumer. The intensity of the service delivered grows in the same way than a parameter that characterises the coupling provider/consumer. A provider is identified with regard to his function and is noted F. A consumer is characterized by his need and is noted B (figure 1, left part). This classification obliges to position an object as provider or consumer and excludes the possibility for an object to be both at the same time. To avoid the limitation, a third possibility is added to the typology: the hybrid object able to behave simultaneously as both.

The initial principle presents an object as a one service provider or consumer. Obviously, a complex object is able to return several services and/or to consume several ones. Accordingly, an object can be a provider/consumer of several services and becomes a cross service (figure 1, right part). Service delivery relations become then more complex i.e. each relation is defined for a given service. A hybrid object is then part of a service delivery series, linked to another upstream object as service consumer and a downstream object as service provider.

Fig1. Basic principle and hybrid object generic representation

3.2 Service delivery process

A service is not immediately returned as a coupling between both objects is to be established at first. The process leading the service to be returned might then be defined. According to the existing terminology, we call service delivery a service production and service delivery process, the process of service production.

The coupling between both objects enables a service delivery. This service is returned as long as the coupling exists. The coupling is momentary, when it is interrupted, the service stops and each object finds back its freedom. A first change around this principle concerns the case where the coupling persists. In that case, it is not necessary to insure the sustainability of the service. A second change corresponds to the case where the service is not only associated to a coupling existence but also by the check to an exogenous functioning conditions. The service delivery is then synchronous with a condition or similarly is framed by a start up event and a closing event. The service delivery process is here non-autonomous.

The abovementioned situations suppose that the service delivery process can only be led during the coupling. Obviously, the interaction between the service supplier/consumer is the main part of the service delivery process. However, in more complex cases both actors can require to be prepared in an upstream phase (some sort of pre-process) and to get free in a downstream phase (some sort of post-process) (figure 2). The corresponding phases are the following ones:

Initialization: this phase does not require the coupling to be established but requires to know that the service must be returned. Information on the service needs is necessary to activate the phase.

Customization and contextualisation: in case the service is not standard, a phase of customization based on information coming from consumers is to be envisaged. The contextualisation focuses on the adaptation to the context (consumer, surrounding conditions, etc.) of the service to be returned and of the service delivery process.

Closing and de-contextualisation phases exist when both actors require a process to close the activity. This process is similar to the one of the initialization phase but occurs after the service delivery.

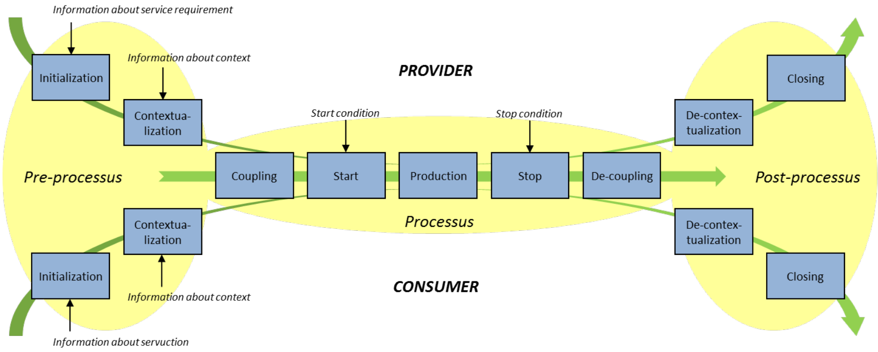

Fig.2. Cartography of the whole service delivery process

3.2 Function capacity and need load

An object may use its function in different ways: possibility to implement a function one or several times, in a successive or simultaneous way. These operational situations differ according to the object capacity to implement a function. Conversely, when an object possesses a need, the need can lead to different load levels.

Valuation of capacity and load: the capacity is a variable belonging to an interval [0, Max_c]. It can be boolean or expressed on a continuous or discrete scale. When the capacity is lower than Max_c, the object is able to implement the function but not with its maximum potential. Similarly, the load need can be boolean, continuous or discrete. As function and load are intrinsic characteristics of an object, as function capacity and need load are time variables. In particular, the provider capacity can be low or non-existent at a given moment because, at this moment, the object is occupied or not operational for example.

Capacity variability: Several phenomena can lead to a temporary or long-lasting capacity variation of an object to return a service. When an object returns a service, its capacity is decreased. Once the service is returned and the service delivery process ended, two situations can occur: either the capacity returns to its initial value (the function is long-lasting), or the capacity maintains its new value (the function is consumable). The first case corresponds to non-perishable objects while the second one corresponds to the consumption of not renewable resources.

In the case of long-lasting functions, several phenomena can appear: wear (capacity decreases each time the process is launched), learning (capacity increases each time the process is launched) and unlearning phenomenon (capacity decreases because the process is not launched as often as it should).

3.2 Global dynamics of complex services

The above-presented model focuses on an elementary service. Indeed, even if the provider (resp. consumer) proposes several functions (resp. need), the result is systematically a set of coupling function/need (i.e. a set of elementary services).

The first arising question concerns the matching between a function and a need. How a consumer can define the function that will fulfil his expressed need and which provider proposes the function? The second question is relative to the matching or sequencing of elementary services to provide complex ones. How these matching or sequencing can be implemented and how to represent them?

Matching provider/consumer: Facing a need, raises the problem to define the appropriate supplier. For that concern, at first the supplier has to declare publicly the functions he can fulfils. Then, the consumer must be able of expressing his needs. It is only from there, that the matching between both can be made.

Function statement. A provider declares his functions in a “service directory” that indicates the precise nature of the proposed functions. The function offer can then be compared and got in touch with expressed needs. The function statement is to be made according to a standard expressed in a “service repository”. The nature of the function is the static part of the statement while the capacity that can be used at a moment corresponds to the dynamic part (figure 3, left part).

Expression of needs. A consumer expresses his needs at first in term of nature and then in term of load. From a nature point of view, the expression will be done according to the service repository and then completed by the requirement in term of associated load (figure 3, central part).

Matching. The two previous steps allow the matching provider/consumer. Once the service statement, the dynamic is the following (figure 3, right part): (1). expression of needs by the consumer, (2) comparison to functions reported in the service repository, (request), (3) choice among providers able to fulfil the need, (4) provider selection.

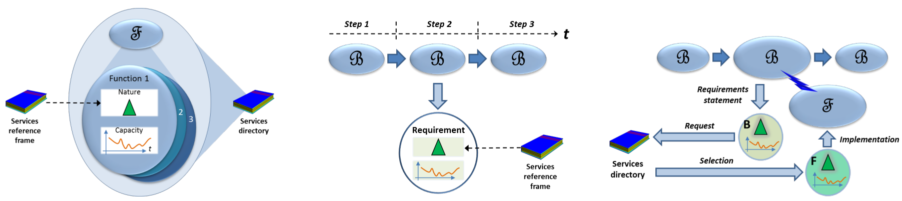

Fig. 3: Service statement, expression of needs and matching sequence

Service composition: In the practice, technico-economic transactions lean on composite services that are “compositions of several existing services to obtain a more complex service which can meet the needs of the user”. These composite services are generated thanks to complex dynamics of elementary service implementation. In this frame, the service description above-presented corresponds to these elementary services. Objective is now to represent the dynamics of the system.

We assume that the studied system can be modelled based on a set of states. A set of active services corresponds to a state implying that the service delivery process runs within the framework of this state. A change of state means that at least a service delivery process starts or stops. It is possible that a service delivery process takes place during several successive states. A change of state is conditioned by a logical function consisted of conditions and events relative to the starting up or to the stop of a service. The logical function corresponding to the stop of a service will be similar to that of the starting up of another service when both are linked without intermediate state (figure 4). It is to note that, even if the approach seems to focus on a sequential composition of services, it also supports parallel compositions as when several elementary services are attached to one state, they might be activated simultaneously.

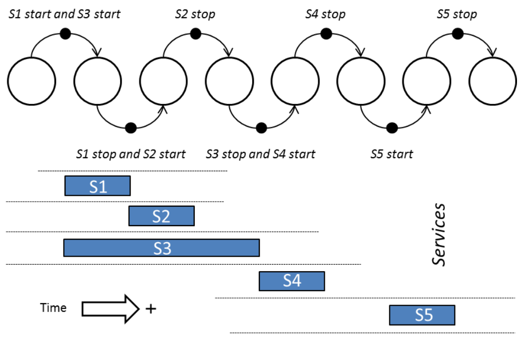

Figure 4: Global dynamics of complex services

4 Conclusion

The conceptual service and service delivery modeling presented here is built upon concepts stemming from disciplines initially remote but which become integrated rather naturally to get a first level of modeling of service activities. The modeling is to be tested in the short term, to achieve its robustness to any kind of service. Till now, only personal services were considered: higher education or health services [23]. Others are to be tested as well as market services (B to B or B to C). At the same time, other concepts need to be explored (around service quality, web services, etc.) and specific issues should be duly addressed (how to select a provider when the function capacity is similar from one to another? or else, in the case of service composition, how to compose? and how to ensure composition effectiveness? etc.)

Considering middle term perspectives, three aspects need to be explored: At first, as there is a difference between buying a service and buying a product returning a service, all which concern service provider ownership and transactional aspect of the object or of its functions is to be integrated into the modelling. Second: provider or consumer lifecycle was not considered. Knowing in which phase of its lifecycle a provider is able to implement its functions, or knowing what it becomes in the other phases or, the phases over which it can consume a service, are so many questions which have to find answers within the framework of a lifecycle modelling. Third, service measurement is a problem of huge importance. In case of similar function, is a provider service delivery better than another one? Even if the problem of measurement is difficult to be settled, it would enable to clear up some other aspects presented here.

5 References

1. Rathmell, J.M.: What is meant by Services? Journal of Marketing, vol.30, pp32-36, (1966)
2. Judd, V.C.: The case for redefining Services. Journal of Marketing, vol.28, pp58-59, (1964)
3. Berry, L.L.: Services Marketing is different. Business Journal, vol.30, pp24-29, (1980)
4. Lovelock, C., Wirtz, J. and Lapert, D.: Marketing des services. Pearson Education, (2004)
5. Hill, T.P.: On goods and services. Review of Income and Wealth, vol.23, n°4, pp315-338, (1977)
6. Zarifian, P.: Valeur de service et compétence, in: La relation de service: regards croisés, n° 28, L'Harmattan, (2001)
7. Eiglier, P., Langeard, E., Servuction, le marketing des services. Mc Graw Hill, (1987)
8. Rosengren, W.R.: Organisational Age, Structure and Orientation toward Clients, Social forces. Social Forces, vol.47, n°1, pp1-11, (1968)
9. Issac, J.: Les codes de déontologie: outils de gestion de la qualité dans les activités de services, Thèse de doctorat, Université Paris Dauphine, (1996)
10. Dumoulin, C., Flipo, J.P.: Entreprises de services: 7 facteurs clés de réussite. Ed. d'organisation, (1991)
11. Shostack, G.L.: Breaking free from product marketing. Journal of Marketing, vol. 41, pp73-80, (1977)
12. Touzi, J.: Model transformation of collaborative business process into mediation information system. In: Proc of the IFAC World congress, (2008)
13. Raymond, G.: SOA: architecture logique, principes, structures et bonnes pratiques, (2007)
14. Zaidat, A.: Spécification d'un cadre d'ingénierie pour les réseaux d'organisations. Thèse de doctorat de l'Ecole des Mines de Saint-Etienne, (2005)
15. Izza, S.: Intégration des systèmes d'information industriels, une approche flexible basée sur les services sémantiques. Thèse de doctorat, Ecole des Mines de Saint-Etienne, (2006)
16. Miles, L. D.: Definitions: Lawrence D. Miles value Engineering Reference Center: Wendt Library, (1963)
17. Grandhaye, J.P., Soltan, E.: Value management project: processing Unforeseen events in Design and production activities; a methodology and a case study. In: Proc. of the 5th European Project Management Conference, (2002)
18. Perrin, J.: Valeurs et développement durable : questionnement sur la valeur économique. L'harmattan, (2004).
19. Grandhaye, J.P., Poisson, P.: Le Management par Valeur pour Concevoir et Rédiger un Projet d'Etablissement. In : Proc of the Congrès International AFAV, (2001)
20. Zhao, G., Perros, H.G., Xin, Z.: How service science management and engineering (SSME) can evolve to an academic discipline?. Int. journal of Web Engineering and Technology, vol. 5, n° 4, (2009)
21. Spohrer, J., Maglio, P., Bailey, J. Gruhl, D.: Steps Toward a Science of Service Systems., IEEE Computer, vol. 40, n° 1, pp71-77, (2007)
22. Tabas, L.: Designing for Service Systems. *ISD Symposium*, UCB I School Report, (2007)
23. Touzi, W.: Conceptualisation et modélisation de la production de service: application aux domaines de la santé et de l'enseignement. Thèse de doctorat, Université Bordeaux 1, (2001).