

## Embedding value activities in a layered model of services

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### 1. The proposed approach: services as layered events

The approach we present in this contribution moves from the aim of exploring the foundations of a new ontology of services aiming at establishing a common, unifying framework for representing services according to different views, based on a vision that considers services as complex systems of commitments and activities, involving real people, organizations, and actual circumstances<sup>1</sup>. In other words, we believe it is crucial to take into account the whole *service system* that interacts with Web services through complex chains involving people and computers, which however have always *people* at their ends.

The idea which is at the basis of this framework is that the object of service science is a complex event, whose components are other events, interconnected in such a way as to form a layered structure.

As a start, in order to avoid confusions, we propose an important terminological distinction: strictly speaking, it is not *the service* which is delivered, but its *content*, i.e., the actions intended to be performed in the interest of the customer. So a service implies first of all a concrete commitment (from the side of a *provider*) to guarantee the production of a certain content, consisting in actions of a certain kind executed in a certain way. Altogether, the various actions that ultimately lead to service content production (performed by the service *producer* on behalf of the provider) constitute the *service process*. We shall say that a service process *implements* a service commitment. The concrete delivery to a particular customer presupposes however a *service acquisition* activity engaged by the latter, which typically negotiates a *service offer* resulting from *service bundling and presentation* activities on the producer's side. Finally, to complete the picture, we have to take into account the activities related to the value exchange chain, which include the service exploitation from the customer's (*customer's exploitation*), the sacrifice needed to access to the service (*customer's sacrifice*), as well as the corresponding activities from the producer's side.

To be more precise, we could say that each event composing the structure can be paired with an event that can be defined, in terms of the  $e^3$ -value model, as a *value transaction*.

A value transaction is a complex event, formed by two events, called *value transfers*, in which an *actor* provides a *value object* to another actor. [dependency constraints between the two events?]

Actors are independent economic entities, while value objects are services, products or money. More generally, these can also be rights on some resources, that can be owned by one or the other actor participating in the transaction. In the case of services, the value object could be the right, given to the consumer, to use some resources owned by the provider, or it can be a transformation on some resource owned by the consumer or of interest for him or her (i.e. the restoring or amelioration of public buildings). In order to distinguish this latter case from the others, resources

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<sup>1</sup> This contribution builds on two previous papers of us (both retrievable from [www.loa-cnr.it](http://www.loa-cnr.it)): *Towards an Ontological Foundations for Services Science: the Legal Perspective*, and *Towards an Ontological Foundations for Services Science*.

whose value is augmented by a transformation enacted through the production of a service are called *value subjects*.

In most cases, one of the two value transfers can be an exchange of money, but this is not necessarily so.

So, a service is conceived as a complex event, with five main proper parts: service commitment, service presentation, service acquisition, service process, and service value exchange. In this presentation, we shall discuss these notions in more detail, with the aim to establish the basis for an ontology of services able to account both for *service descriptions* from an external point of view (typical of Web services and Service Oriented Architectures) and for *service processes* from an internal, business modelling point of view. Value chain?

First of all, a peculiarity of our approach is that all the constituents of a service are *events* (*perdurants*, in DOLCE's terminology). This means that they can be characterized, roughly, by their *temporal location* and by their *participants*, linked to the event by means of what are usually called *thematic relations*: *agent, patient, theme, instrument...* Specifying a service (or a service kind) amounts to constraining these events by imposing suitable restrictions on their temporal locations and thematic relations.

In this way, we believe we can offer a a clean ontological foundation to a business-oriented proposal. Moreover, specifying the agents involved in each event allows for a fine-grained account of the *organizational impact* of a certain service. Note that, although the relationships between these various events (for instance, whether or not they involve the same agents) may vary according to the nature of the service specified, there exists a systematic ordering relationship between them, so that a service has a *layered structure*. This ordering relationship is not so much a temporal precedence (indeed most of these events are temporally overlapping), but rather an (existential) *ontological dependence* relationship: in order for an event at a certain layer to occur, some event at the higher level has to occur. Ultimately, all the events belonging to the service process presuppose some acquisition event, which in turn presupposes the service commitment.

The service production thus results in a complex chain of value transactions, i.e. couples of value transfer events, in which the performance of an activity is traded with an amount of money or the acquisition of some rights.

## 2. Sub-events and thematic roles

We are interested in the idea of representing the events composing a service and the role participants have in these events together with the distribution of responsibilities across the events composing the complex structure of the service system.

In order to represent all this, we take inspiration from a notion introduced in linguistics to account for the internal structure of events: so-called *thematic relations* (or *thematic roles*), expressing the nature of the relationship between an event and its participants. Adding thematic relations to those linking an event to its own qualities (such as temporal and spatial location) we have a full set of attributes at our disposal, among which the following ones appear to be as especially relevant for our purposes:

- Agent (the active role, the one who acts in the event)
- Theme/Patient (the one who undergoes the event; the patient changes its state, the theme does not)
- Goal (what the event is directed towards – typically a desired state of affairs)
- Recipient/Beneficiary (the one who receives the effects of the event)
- Instrument (something that is used in the performance of the event)
- Location (where the event takes place)
- Time/duration (when the event takes place, or how long it lasts)

Basically, we can think that every sub-event composing our layered structure (except the initial commitment) can be seen as an event of value transfer (that is, part of a value transaction), so we can also represent value transfers with thematic roles.

When we have a value object, such as money or a product to be exchanged, we can recognize as agent the actor who pays the amount or sells the product, the actor who receives the payment or acquires the product as recipient, the value object as theme. When, on the contrary, we have a service with a value subject that gains value thanks to the execution of a service, then we can see the service producer as agent, the consumer as recipient, the value subject as patient. In both cases, if other details of the transaction are known, these can be added to picture by assuming one of the remaining thematic roles.

Again, another interesting thing to inquire are the relationships between the thematic roles of the two value transfer events corresponding to a transaction. For instance, if we take a transaction where a service delivery is traded with money, we have that always the agent of one event is the recipient of the other, and vice versa. Sometimes we can also have that, in particular situations, further constraints are imposed, for example the two value transfer events might be required to have the same location and/or starting time.

### 3. Goods and services

To better understand the nature of our proposal – that services are temporal entities (events) based on *commitments* – let us briefly discuss the difference between services and goods. According to the World Trade Organization, services are a sort of intangible goods, so that a service might be defined as anything you can buy, but “you can’t drop on your foot”. Yet, Ted Hill insists on the fact that services are not a special kind of goods, because goods and services belong to quite different ontological categories: goods are both *transactable* and *transferable*, while services are transactable, but not transferable. In Hill’s own words, “a surgical operation is not some kind of immaterial drug”: when you buy the drug you become an *owner* of it, in the sense that you can decide about its behaviour (i.e., assuming it in your body), while when you pay for the surgical operation you are not actually becoming the owner of it. In support to this argument, we argue that the ontological reason why services are not transferable is exactly because they are events: you cannot *own* an event, since if owning implies being in control of temporal behaviour, then, strictly speaking (at the token level), the temporal behaviour of an event is already determined, and changing it would result in a different event. So events are not transferable simply because they are not “ownable”. Since services are events, they are not transferable as well.

So, in conclusion, it seems legitimate to assume that goods are *objects* (endurants, in DOLCE’s terms), while services are *events* (perdurants). One may observe however that our economy is full of examples of transactions involving services, where the service seems to pass from hand to hand: certainly somebody may buy Amazon, for instance: our point is that in this case the transaction involves the Amazon *company*, not Amazon’s *service*: there is a change of ownership concerning the service producer, but not the service itself, which remains the same (as long as the Amazon company doesn’t change its legal identity, and its service content – the actions it offers – remains the same).

#### *Transferability of services as transferability of a right*

We have seen that a service, being an event, is not transferable. However, certainly we can transfer a right *to a service*. In the context of services, a right to a service implies a deontic position, in the sense that someone has a right if there exists a certain corresponding duty. A right of *A* of receiving a service would correspond then to the duty of *B* to provide the service, namely, to the duty of participating (as the main agent) in the *commitment event* that is at the basis of every service. A right can be reified, that is, considered as an object, and this is actually a common move in the legal

domain<sup>2</sup>. And a right can be *owned*, in the sense that somebody can decide how to affect its “behaviour” (e.g., deciding *when* the right is claimed).

What is the conclusion of this conceptual analysis with regard to the notion of service? That even if a service is not directly transferable, since it is an event, *rights to services* are transferable: the object of the transmission is in this case the right, and the service is the event which the right refers to. In other words, having the right to a service is the same as being able to legitimately claim the performance of a certain service (set of actions) by some other party. And what can be transferred, from a legal perspective, is precisely this legal position that enables someone to legitimately claim the performance of a service.

A similar analysis can be applied to the notion of “good”. In this case however the ownership (intended as the capability to influence the temporal behaviour) concerns the good itself, and not just the right to use it. In other words, we can own a good *in addition to* owning the right to exploit it, while for services the only thing we can own is the right to exploit them. Note that, although in many cases ownership transfer for goods implies a physical transfer (change in physical location), this is not always so, as in the case of real estates.

### ***Transferability of services as transfer of a duty***

From the provider’s point of view, a service transfer might be understood as well as the *transmission of the duty to provide the service content*. However, we should distinguish between *total* transfers of this duty from an agent to another (including all related responsibilities towards the service customer), and *partial* transfers (i.e., *delegations*), which maintain some responsibilities on the side of the delegating agent. The latter case is typical of public services, whose content is to be guaranteed by the state. Indeed, the public entity can *transfer a part of the duties* that compose its obligation to a private entity –namely, the obligation to actually *produce* the services in specific circumstances- but not its general duty and it will therefore keep part of the responsibility. Let us imagine health services. Health service can be a public service in the sense that the State has the responsibility of guaranteeing it. The State can, however, agree with a private party (private medical company) that whenever citizens need health assistance, the private party will provide it. The responsibility over the service remains in the State, since it cannot completely delegate this duty. However, the particular duty of satisfying concrete needs arising from specific situations (e.g. concrete medical care needs derived from the situation in which someone breaks his leg) is assigned to the private entity to which the service is entrusted. The duties related to health services are thus split between the state (the *provider*) and a private actor (the *producer*). A similar situation occurs in the case of subcontracting, by which the general contractor delegates to the subcontractor the performance of a specific task, keeping nonetheless responsibility towards the client.

On the contrary, a *total* transfer of duty can happen in the private sector, where we can distinguish two cases, depending whether the duty comes from a *generic* commitment towards potential customers, or a specific commitment concerning an *actual* customer, under specific circumstances. In the first case, it is common to talk of business transfers. This means that, if a business provides a private service with no special limitations on its transfer (and assuming that the service buyer fulfils all the necessary legal requirements), the full responsibility is simply transmitted to the acquiring party (let us imagine for instance the previously mentioned transfer of Amazon, or the transfer of a restaurant, or a hairdressing salon). In the second case, the transmission of a particular service, that is, of the concrete obligation to provide a service to a party, will be possible if this does not substantially alter the quality of the service contracted by the party or, if otherwise, the latter provides consent (let us imagine for instance that we reserve a room in a hotel and when we get there the hotel is full and they send us to another hotel within the same group).

As a conclusion, let us insist that, despite the cases above can be described as service transfers in the everyday jargon, properly speaking, according to our definition, the transfer does not involve

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the service itself, but rather certain *normative positions* (duties or obligations) that refer to it. Moreover, we maintain that, while an internal delegation process concerning the actual *production* of service content certainly does not alter the identity of a service under our definition, a *total* transfer of duty implies the existence (or the creation) of *another* service, different from the original one. If the owner of Amazon changes, while Amazon maintains its legal status and its service content remains the same, then the service remains the same, because the provider is still the same. On the contrary, if the provider changes (e.g., because the company dissolves after being bought by another), then the service changes, although the service content may remain the same. Suppose that for instance there are two companies, A and B, providing exactly the same service content (possibly at different prices). According to our definition, we say that there are two distinct services. If now A buys B (that is, the *company* B, with all its duties and rights, is transferred to A) the result is that the service provided by B disappears, and only one of the previous services survives.

It is interesting to notice that all these transfer events (ownership transfers for goods, right or duty transfers for services) are part of a pair in a value transaction. In a complex event, the same agent can participate to a number of value transactions by assuming very different roles in each value transfer event. As an example, we can take a service of long term car rental, in which a transaction could be composed by the first transfer (the provider giving the consumer the right to use a car) and the complementary transfer of money from the consumer to the provider. We could also imagine that, among the rights acquired by the consumer, there is also a right to get the car repaired if it breaks. However, the provider might not be able to deliver this service directly, so another value transaction has to be put in place, in which the provider transfers the car maintenance duty to a third party; in exchange, the provider transfers money to the producer. The former transaction is an example of transfer of right, while the latter is an example of transfer of duty.