Why Is Aligning Economic- and IT Services So Difficult?

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Abstract. Since its inception, Service Orientation has promised to offer seamless alignment of the business and IT aspects of service-oriented systems. Practitioners, however, often report that such alignment is far from being solved. Specifically, current research in aligning services either remains at a too abstract, strategic level, or is too technology-oriented to be really useful in practice. In spite of being an "old" problem, business-IT alignment is still a dilemma. What makes alignment so difficult? In this work we address this fundamental question by questioning what should be aligned, and what are the concerns hindering alignment. This paper explores the conceptual gaps around the notion of service in the two economic- and IT perspectives. By framing the core constructs of Service Orientation and contrasting those constructs between the economic- and IT perspectives, this paper elicits five core alignment concerns. We illustrate the concerns using a real-life case study featuring an airport baggage handling system. The alignment concerns pinpoint promising solutions in which the alignment problem can be solved.

1 Introduction

Alignment has been a critical issue of service providers and consumers for years [1]. Empirical studies [2] show that alignment is a better predictor of organization's effectiveness than strategic orientation. More than twenty years ago, Henderson and Venkatraman proposed an influential model for business IT alignment [3]. Since then many approaches have proposed solutions for the old alignment problem, yet, how to actually realize it is no clearer today than it was decades ago.

Service Orientation is one of the paradigms that since its inception has promised to offer seamless alignment between multiple perspectives. Practitioners in the field, however, often report that such alignment is far from being solved. With so much hype surrounding Service Orientation, it is not surprising that academics and practitioners interpreted the concept differently and proposed different approaches for service alignment. Accordingly, soon there were abundance of unique methods that are hard to compare, leading to confusion on what alignment implies. Specifically, current research in aligning services either remains at a too abstract, or is too technology-oriented to be really useful in practice.

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As first step towards solving the "old" alignment problem, in this work we address the question of 'what makes alignment so difficult?'. To do so, we take a holistic view on which *perspectives* should be taken on the notion of service alignment, what are the *core elements* that need to be aligned, and what are the *concerns* hindering alignment.

Services, being one of the *core elements* of Service Orientation, are generally addressed from the business- and the IT *perspectives*. Term "business", however, is used in a very broad connotation, meaning anything that relates to the business objectives of a certain company. Eventually business includes IT, too, whenever IT is instrumental to realize, or support, the business. This confusion may conflict with the goal of aligning business and IT. To clarify the two perspectives, we scope down the business perspective (which encompasses organizations, markets and/or activities/services in the broad sense) to the economic perspective (which focuses on creating commercial value).

From the *economic perspective*, services are understood as deeds, processes, and performances [4]. Here a service typically corresponds to an activity (or series of activities) of more or less intangible nature [5]. In this perspective we may understand services as *economic* services, i.e. services for whose provisioning someone has to pay. From the *IT perspective* services refer to entirely different notion. For instance, in the realm of 'web services', a service is understood as "a software system designed to support interoperable machine-to-machine interaction over a network"[1]. In the field of service oriented architectures, a service means "a logical representation of a repeatable activity that has a specified outcome" (e.g. check customer data, deliver pizza, provide higher level education)[2]. A service is self-contained (state-less and adhering to a service contract); may be composed of other services (service composition); and is a black-box to its consumers [6]. Although the economic and IT perspectives on the notion of service are different, they are also related. Therefore they should be properly *aligned*; i.e., linked where relevant and kept consistent as a coherent whole.

To elicit the differing interpretations of the *core elements* per perspective, in this work we identify the shared terminology from both perspectives. To do so, we use a fragment of a real-life case study, featuring an airport baggage handling system, and model it using e^3value [7] and SoaML [8] modeling notations, which represent the economic- and IT perspectives, respectively. The discrepancies in interpretation of the *core elements* per perspective and, more importantly, the reason behind such discrepancies drive the identification of *alignment concerns*.

As a result, we elicit five fundamental concerns that are prevalent in service alignment endeavors. Those concerns suggest the following answer to 'what makes alignment so difficult?'; It is difficult because, in essence, the economic- and IT perspective pursue *incompatible objectives*. Without highlighting such incompatibilities, and specifically guiding how to balance such incompatibilities, alignment approaches are not able to sufficiently ease the alignment endeavors.

[1] `http://www.w3.org/TR/ws-arch/`, visited May 30th, 2013.

[2] `http://www.opengroup.org/soa/source-book/togaf/soadef.htm`, visited May 7th, 2013.

This paper is organized as follows. Sect. 2 presents an overview of service alignment as well as the core concepts *shared* between both perspectives. In Sect. 3 we present our running example. Sect. 4 presents a series of alignment concerns. Sect. 5 briefly reviews related work. Finally, Sect. 6 concludes the paper.

2 Aligning the Economic- and IT Perspectives on Services

This section presents our definition of alignment and introduces shared terminology between the economic and IT perspectives.

2.1 What Does Alignment Imply?

Alignment has been perceived very differently in the many existing approaches. For example, alignment in [3] means *balance*, in [9] *linking*, and in [10] it implies *harmony*. These interpretations each indicate a different, fundamental aspect of alignment: (i) the **alignment process** that entails *linking* equivalent elements, and/or *balancing* and eventually *compensating* the incompatible objectives and (ii) the **alignment outcome** i.e., state of harmony between different elements to achieve a coherent whole. Considering that both process and end-result perspectives are instrumental for ensuring a successful alignment, we define alignment as follows:

From process view, alignment is *a continual process* which includes (i) *linking* the elements that are equivalent or belong to a single overarching concept, and (ii) *balancing* and mutually compensating the incompatibilities. In addition, the alignment process should be carried out *across multiple organizations* as service orientation centers around the idea of offering services in networked organizations [11] rather than a single organization. From the outcome view, alignment is a state in which the core elements make a *coherent whole*, across perspectives, and across multiple organizations.

2.2 Terminology and Basic Concepts

In the following, we introduce the terminology constructs that are shared between the economic- and IT perspectives, but have a different, more specialized, interpretation in the two perspectives. It is our assumption that this multi-interpretable shared terminology motivates conceptual overlap between the perspectives and therefore is an important source of alignment challenges. The proposed terminology is notation-agnostic, although we use our knowledge on value modeling (e^3value) and service modeling (*SoaML*) to elicit the shared terminology. In our past service-oriented design projects we have observed that these terminology constructs are recurring and they are application-generic. However, to ensure that they are the bare essentials of Service Orientation, further research is needed. In the following the constructs of the shared terminology are in typewriter (e.g., `actor`).

- `Actors.` From an economic perspective, actors are *legal entities* [7]. A legal entity can be an enterprise, a profit-and-loss responsible unit within an enterprise, or a final customer. From an IT perspective, actors are *participants*, being *legal entities*, *people*, or *systems* [8].
- `Services.` Actors offer and request `services`. For the economic perspective, these services are *commercial* services, meaning that someone has to pay (give something of value in return) for the provisioning of a service. For the IT perspective, services are logically grouped operations that can be invoked.
- `Interaction.` Actors *interact* with each other. In [12], different kinds of interactions are proposed, depending on the perspective taken. In this paper, we restrict ourselves to the economic and IT perspectives. Taking the economic perspective, we consider *economic value transfers* as interactions. A value transfer can be a service outcome, but can also reflect a payment by transferring money (in [7] the notion of value transfer/exchange and value object is further explained). Assuming the IT perspective, interactions also happen between actors, but now imply *message exchanges* cf. service oriented architectures.
- `Contract.` Both the economic and IT perspective are governed by `contracts`, although these contracts differ per perspective. For instance, a service contract in the economic perspective may state its pricing and service quality in terms of properties valued by the customer. A service contract in the IT perspective may contain an interface specification cf. WSDL and technical quality attributes such as uptime, latency, etc.

3 The Running Example: Baggage Handling System

Our running example is extracted from a baggage handling system. A SOA solution provider company has designed a service inventory for a baggage handling system that is adoptable in different types of airports (e.g. hub, domestic, international, low-cost) and can be used by different types of airlines (e.g. legacy, domestic, international and intercontinental). From a bird's-eye view, baggage handling is quite simple. The traveller arrives at check-in desk, and her/his baggages are tagged by the Airline. Airport plans and governs the baggage handling process. Ground handlers do the real baggage management. They can optimize the routes taken by the carts to get the bags needed most urgently to their destinations fastest. They also track-and-trace the baggages. Finally, the security provider support the screening of the baggage. Consequently, baggage handling relies on five different actors: traveller, airline, airport, ground handers, and security provider.

3.1 Economic Perspective: Service Value Networks

We model the economic perspective using e^3value [7]. Fig. 1 presents an e^3value diagram representing the economic value aspects of the Baggage Handling System.

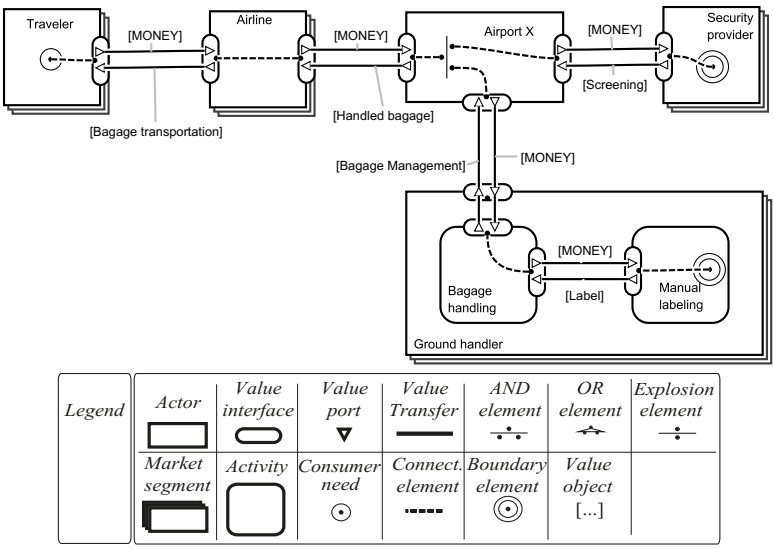

Fig. 1. The e^3*value* model for the baggage handling system

Basically, the e^3*value* model shows how `actors` create value in the context of the Baggage Handling System. First, there is a market segment called 'Traveler' who has the need to transport his baggage. A market segment indicates that are many `actors` that assign economic value in the same way. So in this case, there are multiple 'Travelers'. The notion of market segment is graphically depicted by stacked rectangles. In the economic perspective, the `actors` being part of a market segment are always legal entities or profit-and-loss responsible entities. The 'Airline' transports the baggage and uses services form the 'Airport' to do transportation. Equally to the 'Traveler', the 'Airline' is a market segment, indicating that many airlines are served by the same 'Airport'. The 'Airport', however is a single actor; in this e^3*value* model there is only one 'Airport', and refers therefore to a specific airport (e.g. 'Schiphol Amsterdam'). The actor construct is depicted as a single rectangle. The 'Airport' in turn uses two parties to the actual work. The 'Ground handler' offers 'baggage management' which includes operating the baggage handling system, and the 'Security provider' offers a 'screening' service'.

The `service` 'Manual Labeling' is modeled as a value activity that produces a service outcome named 'Labels' (in e^3*value* a value object). A value activity is an activity that, potentially, can be performed in a *profitable way* by some actor. Therefore, the *value* activity construct is not the same as the *operational* activity often found in process modeling approaches.The notion of profitability is important because actors should be interested in performing the activity.

The notion of `contract` is modeled using the e^3*value* construct 'value interface' (depicted as an oval rectangle including ports shown as arrow heads) that specifies the *interface* to the outside world. For instance, for the 'Airline', it represents that in order to obtain 'Handled baggage', the 'Airline' must provide

a payment. For instance the price (as a contractual element) can be modeled by the port requesting the 'money' value object. In this case the actor requesting the 'money' object determines the price.

The value transfers are a kind of `interactions` between actors or market segments and are depicted as lines between them, annotated with the value objects they exchange. The notion of value transfer assumes transactionality. For instance, the value interface of 'Airport' offering 'Handled baggage' and requesting 'money' in return assumes that *only* 'Handled baggage' is obtained if 'money' is returned, and vice versa.

3.2 IT Perspective: Service Network Architectures

We model the IT perspective of the Baggage Handling System using SoaML [8]. More precisely, we use three models of (i) Service Architecture (Fig. A.I in Appendix), (ii) Service Contract (Fig. A.II), and (iii) Service Choreography (Fig. A.III).

Service Architecture shows how different `actors`, called participants in SoaML, collaborate to provide `services`. For example, the 'Baggage Transportation' service architecture in Fig. A.I represents how 'Airline' interacts with 'Airport' to provide baggage transportation service to 'Traveler'. In doing so, the 'Airport' itself, through its 'Baggage Handling System', collaborates with third-party actors (shown in dashed-boxes in the Baggage Management service architecture in Fig. A.I).

`Contracts` are represented using the model shown in Fig. A.II. First this contract shows that it has two actor roles: (i) provider and (ii) consumer. In the context of 'Baggage Handling Service' (Fig. A.I) 'Ground Handler' is the provider of the 'SetRoute' contract and 'Baggage Handling Sys.' is the consumer. Second, it shows the interfaces and operations that actors use to enact the service. As an example, any actor who plays the role of 'RoutPlacer' or 'RoutTaker' needs to use the interfaces shown in the bottom of Fig. A.II.

The `interactions` between actors involved in a contract are modeled using choreography (see Fig. A.III). The choreography is a specification of what *messages* are exchanged between actors to provide a service.

4 Concerns for Aligning the Economic Perspective and the IT Perspective

We see alignment as a general problem aiming at relating the two economic- and IT perspectives. Such alignment entails addressing a set of general concerns that cross-cut the two perspectives. We observed that many of these concerns in fact originate from the semantic discrepancies between the shared elements in the two perspectives. By making such discrepancies explicit we should be able to make alignment less difficult. In this section we present the discrepancies between the shared constructs introduced in Sect.2. It should be noted that the shared constructs and the discrepancies are notation-agnostic and we use e^3value

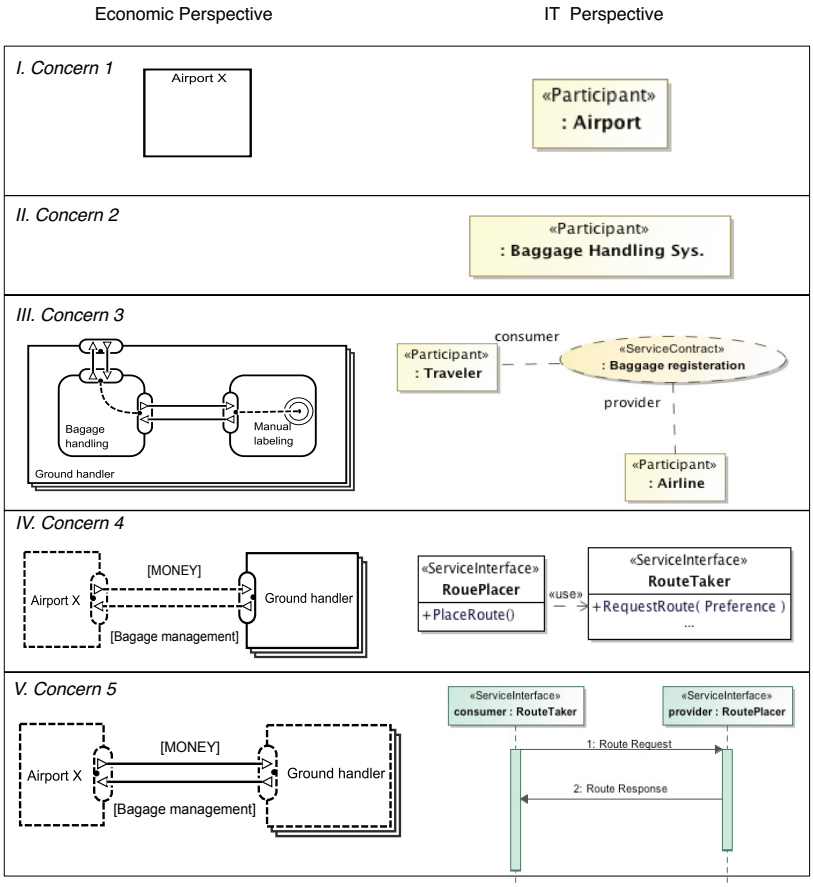

Fig. 2. Discrepancies between economic- and IT perspectives

and SoaML for illustration reasons only. By zooming into the origins of these discrepancies we identified 5 core architectural concerns for alignment. Related to each concern, possible alignment solutions are discussed. The concerns are categorized based on the shared constructs leading to the four areas of concern of `actor, service, contract` and `interaction`.

4.1 On Actors

The notion of actors is perceived differently in the two perspectives. In the economic perspective actors are *concrete instances*, usually *legal entities*, that are *profit-and-loss responsible*. In the IT perspective actors are *actor types*, and not necessarily a legal entity. This discrepancy leads to two alignment concerns described in the following.

Concern 1: Aligning Actor Instances and Actor Types

Description of the concern. In the economic perspective actors are *actor instances*, whereas in IT perspective actors are *actor types*. Fig. 2.I shows such a discrepancy; in the economic perspective 'Airport X' represents a certain instance of an airport, such as Schiphol airport. Its corresponding element in IT perspective is the 'Airport' participant, which is defined at the type level. This pinpoints a fundamental difference in the goals that each of the perspectives pursue. The economic perspective, on purpose, defines the actors at instance level because it represents a business model. A business model cares for how each specified actor would make *profit* or increases its *utility* [7]. The profit calculations are mainly actor-dependent; for instance, the profit of baggage handling for Schiphol airport would probably differ from the profit of another airport. Consequently, the economic perspective focuses on certain instances of actors. In contrast, the IT perspective deliberately aims for actor types to care for flexibility and openness (actors should be able to come and go on-the-fly). To this aim, by focusing on actor types the IT perspective expands the potential participants of 'Baggage Transportation' service network to any 'Airport' that is able to play the same role (i.e., provide/consume the same services). If not known and aligned properly, this discrepancy may have the following implications: it may (i) hinder profitability of the actors' collaborations -if the actor types do not constrain actors with certain value objects and expected profit- and/or (ii) hinder flexibility and openness -if the types are too specific such that they cannot support openness. Thus, the concern is *how to align actors in such a way that their profitability and openness are ensured simultaneously?*

Possible alignment solutions. One way to address this concern is to increase the level of abstraction of actors in the economic perspective to the *market segments*, instead of actor instances. A market segment is an enumeration of actors and as such is between an actor instance and an actor type. Thus, it helps bridging the gap between them. A market segment such as "Ground Handlers" indicates that there are a certain number of ground handlers that share common value transfers. Focusing on the common value objects the actors provide/consume, a market segment broadens the scope to a market, while ensuring the market's profitability.

Concern 2: Aligning Legal Entities and Non-legal Entities

Description of the concern. In the economic perspective the actors are both *legal entities* and *profit-and-loss responsible*. This constraint, however, does not necessarily apply to actors in the IT perspective. This discrepancy is evident in Fig. 2.II, where 'Baggage Handling System', belonging to the airport, appears in the IT perspective and not in the economic perspective. The economic perspective, on purpose, omits 'Baggage Handling System' because it is not the entity that exchanges value in the marketplace. The IT perspective, deliberately, illustrates this actor because it is the consumer of the services offered by 'Ground

Handler System' and 'Security Provider'. In order to support the business model of the economic perspective, the non-legal entities of IT perspective should eventually relate to a legal entity. Thus, the concern is *how to relate non-legal entities to legal entities?*

Possible alignment solutions. To align the non-legal entity actors with the economic perspective, we can use their owning actors, who is an *Expense Carrier*. An expense carrier is an actor or market segment in the economic perspective that create revenues to pay these expenses [13]. For instance, 'Airport' is the expense carrier of 'Baggage Handling System'. By representing the internal structure of 'Airport' in Fig. A and annotating 'Airport' as the expense carrier, we can link the constituent non-legal actors as well.

4.2 On Services

In the economic perspective services are commercial services, which produce outcomes of some value. In IT perspective, a service is a repeatable capability that might not directly produce economic value. Consequently, not all economic services can be mapped to IT services and vice versa. This leads to an alignment concern explained in the following.

Concern 3: Aligning Service as a Value Activity and Service as a Reusable Capability

Description of the concern. In the example of baggage handling system, 'Manual Labeling of Baggage' is a commercial service that is not realized using IT services. In contrast, 'Baggage Registration' is an IT service, which since it does not have a direct economic value, does not appear in the economic perspective (see Fig. 2.III) The economic perspective, on purpose, omits 'Baggage Registration' because it focuses on *value activities* that an actor is willing to pay for. In contrast, the IT perspective, deliberately includes 'Baggage Registration' because it is a *repeatable* and *reusable capability*, which serves *economies of scale*. Consequently, in the two perspectives services pursue two different, possibly contradicting purposes, i.e., profitability and reusability. If not known and if not cared for, this may have the following implications: it may (i) hinder creating value-adding services that are profitable, and/or (ii) hinder reusability and economy of scale. Thus the alignment concern is *how to design services in such a way that their profitability and reusability are ensured simultaneously?*

Possible Alignment Solution. What can possibly facilitate alignment of profitable- and reusable services, is the notion of *capability* in the economic perspective. A capability identifies the ability of actors (in terms of assets and processes) to perform a value activity [14]. Some of the capabilities will be required in multiple value activities. The capability model could support identification of *reusable* capabilities which realize *profitable* value activities.

4.3 On Contracts

In the economic perspective, contract information includes what determines the economic value of a service. Examples are pricing, services or quality attributes. In the IT perspective, however, contract information represents an agreement between the involved actors for how the service is to be provided and consumed. This agreement includes the interfaces, choreography and any other terms and conditions.

Concern 4: Aligning Value Interface and Service Interface

Description of the concern. Fig. 2.IV shows the contract between 'Ground Handler' and 'Airport' in the two perspectives. In the economic perspective, the contract (e.g., value interface in e^3value) indicates pricing for 'Baggage Management' and quality aspects such as 'Baggage Lost Ratio'. Usually, pricing is specified as a property of the port of the actor (in this case the 'Ground Handler') requesting the 'Money' object. The economic perspective restricts itself to such value objects because the goal is to determine the economic value co-creation of a service. The corresponding contracts in the IT perspective include 'SetRout', 'Track-Baggage', and 'Screen-the-Baggage' (see Fig.A.I). As shown in Fig. 2.IV, the information describing the contracts entail the operations and properties of the services realizing these contracts. The IT perspective deliberately focuses on this information because this is what actors need to agree on for communication. This indicates a discrepancy in the purpose of the contract in the two perspectives: economic perspectives seeks for *value determination or pricing* whereas IT perspective seeks for *interoperability.* At the end, the operations of the IT perspective contracts, although designed for interoperability, should realize the assigned value in the economic perspective. Hence, the alignment concern is *how to align the contract information in the IT perspectives with the value interfaces in the economic perspective such that the contact is value-determinable while it supports interoperability?*

Possible alignment solutions. To align contract information in the two perspectives, we envision to devise analysis models that guide one's reasoning in transforming value interfaces to operations and properties of contracts in the IT perspective.

4.4 On Interactions

In the economic perspective, interactions between actors occur in terms of *value transfers.* In the IT perspective, such interactions occur in terms of *message exchanges* in the context of choreographies.

Table 1. Overview of related work

		Alignment Process		Alignment Outcome
		Linking elements	**Balancing incompatible objectives**	
Business Science	[22,23,15]	Linking the elements of value models and coordination models	Homogenizing semantic and syntactic incompatibilities between value and coordination models	Consistent business case and coordination models
	[24]	Linking value models and services	–	–
	[25]	Mapping actors, communication channels, and services between the value model and the IT models.	–	–
	[26]	Link strategy, operational, execution and implementation models	–	–
	[27]	Mapping value proposition on business processes, data flow, and IT infrastructure.	–	Harmonization between the technical and business dimensions of the service-based system.
	[28]	Linking business, technical, and operational services (different types of relationships)	–	–
Computer Science	[29]	Mapping business artifacts and services	–	–
	[19,20]	Linking business process elements to services	–	–
	[30]	Linking business services to service compositions	–	–
	[11,18]	Linking service networks and business process models	–	–

Concern 5: Aligning Value Transfers and Message Exchanges

Description of the concern. Consider the Interaction between 'Ground Handler' and 'Airport' in the economic perspective. This interaction shown in Fig. 2.V is a value transfer that models the *principle of economic reciprocity*: Only if 'Airport' pays, it can obtain the 'Baggage Management' services and vice versa. This principle, inherently, embraces the notion of transactionality, i.e., the value transfers are guaranteed to perform completely or not at all. One of the corresponding interactions between 'Ground Handler' and 'Airport' is shown in Fig. 2.V. This interaction is message-based and illustrate the behavior of 'SetRout' contract. Instead of the detailed, internal interactions needed to enact 'Baggage Management' services, the IT perspective, on purpose, isolates the interactions in the scope of contracts. This is because it aims at *openness* (i.e., actors and their services can come and go on-the-fly as long as they comply with the contract behavior). At the end, interactions between actors should serve both goals of transactionalty and openness. The overall effect of message exchanges should enable transactionality, while the interactions support openness. Thus, the alignment concern is *how to align interactions in such a way that openness and transactionality are supported simultaneously?*

Possible alignment solution. A possible solution for supporting both transactionality and openness is to use a model that frames and highlights *how* using independent message transfers a transaction is realized. This model could add the business process perspective on the interactions in the economic perspective. The business processes lead moving from transactional value transfers to message exchanges in the context of contracts [14,15]. It should be noted that, such model differs from the approaches and technologies that address transactionality in the business process executions (e.g., WS-Transaction) [16,17]. The focus of these models should be on guiding service designers to design for transactionalty rather than how to implement it.

5 Related Work

Alignment has been researched in both Business- and Computer Sciences. Table 1 classifies a number of recent approaches from both *alignment process* and *alignment outcome* views. This table reveals the following two main findings. First, from alignment process view, existing approaches focus only on *linking different elements*, and *balancing incompatible objectives* is not supported. This implies that the current focus, common in both Business- and Computer Science field, consists of mapping the matching elements, rather than balancing incompatibilities. This work, to the best of our knowledge, is the first that externalizes the incompatible objectives and makes the concerns posed by such incompatibilities explicit. Second, from alignment outcome perspective, most existing approaches leave the outcome of alignment implicit, making governance of alignment difficult. We specify the alignment outcome as the state where the core elements (i.e., actors, services, contracts, and interactions) make a coherent whole across both perspective, while their incompatibilities are balanced.

Alignment Approaches in Business Science. An analysis of over 150 articles reveals that most approaches in this field focus on integration between business- and IT strategies and goals of a *single* enterprise [3]. In recent years, a number of approaches addressed alignment in networked organizations (see Table 1). Their IT perspective, however, is scoped down to high-level analysis models only (e.g., business and coordination process models [15]).

Alignment Approaches in Computer Science. Alignment in these approaches entails *linking* different service-oriented elements. Some link service network- and business process models [11,18]; while others link business- and software service models [19,20][3]. Although the aforementioned approaches appear to be quite different, they all converge to a common perception of "business", i.e., activities or services that are eventually supported by IT services. In this sense, business services are higher-level abstractions of software services, the

[3] In a systematic literature review on service identification methods, Gu and Lago [21] report that 40% of the methods use business processes to align business- and software services.

same as analysis models are higher level abstractions of design models. In practice, however, "business" does not entail higher level abstractions of IT services only. In turn, business might include elements that are in essence inconsistent with their corresponding IT elements. We argue that such simplistic perception of "business" is one of the main sources of confusion which make alignment especially challenging.

6 Conclusion

When Service Orientation was first introduced, many companies perceived it as providing *the solution* for the *old* alignment problem. After a decade, alignment still remains unsolved. This paper argues that the reason behind such difficulty lies in the semantic discrepancies between the economic- and IT perspectives. By framing the core elements of Service Orientation and contrasting those elements between the economic- and IT perspectives, this paper identifies five core alignment concerns. Although these concerns by no means are complete, they are representative as they cover alignment between the core elements.

We propose that these are fundamental issues that a service architect needs to address for achieving a coherent service-based enterprise. One way of addressing the alignment concerns is to guide the decision making of architects using *architectural viewpoints* [31]. With the goal of making alignment less difficult, future work will design viewpoints for aligning economic- and IT perspectives.

The concerns we identified go beyond mere design or modeling, and pose interesting challenges for other aspects of services. For instance, service adaptation is often triggered by changes in economic services. Solving the alignment challenges more formally would allow carrying out adaptation automatically and across both perspectives. In sum, alignment concerns more attention in various aspects of service science.

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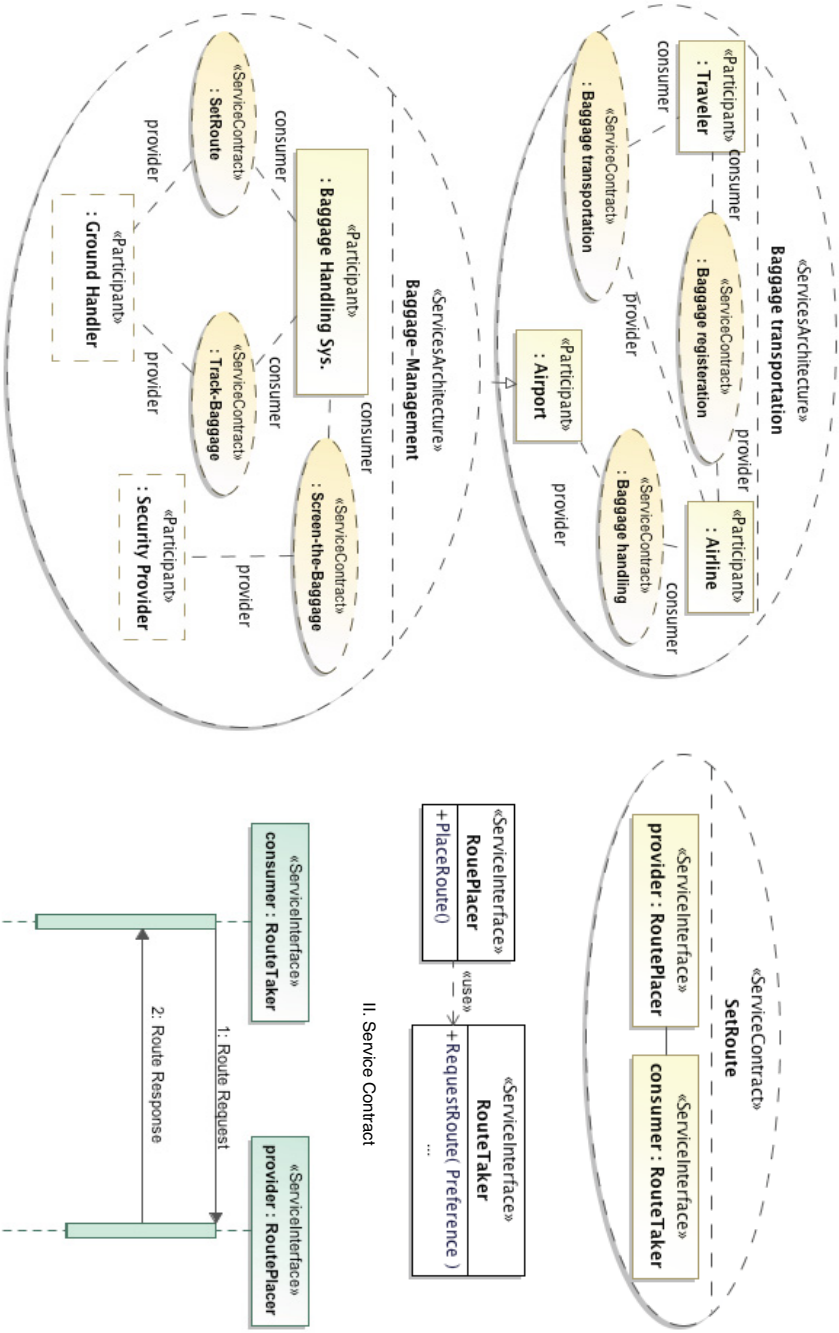

Fig. A. Appendix: The SoaML models for the baggage handling system