Inter-Organisational Controls as Value Objects in Network Organisations

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Abstract. Inter-organizational controls are mechanisms used to ensure and monitor that networked enterprises do not commit a fraud and behave as agreed. Many of such controls have, apart from their control purpose, an inherent *economic value* component. This feature requires controls to pop-up into business value models, stating how actors create, trade and consume objects of economic value. In this paper, we provide guidelines that can be used to decide whether organizational controls should be part of a value model or not. We demonstrate these guidelines by a case study on the Letter of Credit procedure.

Keywords: inter-organizational controls, value modelling, trust

1 Introduction

Due to the popularity and widespread use of the world-wide-web, information technology (IT) services increasingly become *commercial* services to final customers, rather than just enabling *technical* interoperability (e.g. using UDDI, SOAP, WSDL, etc) between multi-enterprise software components. Examples include the iTunes store of Apple, and Windows Live. Additionally, many commercial IT services are offered by a *partnership* of enterprises rather than just *one* enterprise. Many customer needs are in fact reasonably complex; therefore competencies of a series of companies are needed to satisfy them. It is actually the Internet itself that *enables* enterprises to work closely together on satisfying a complex consumer need.

Obviously, developing and deploying commercial IT-intensive services requires information systems that span multiple enterprises, assuming that such services are offered by a partnership. It is then important to understand first *which* enterprises are involved in the first place, and what they *exchange of economic value* with each other, before starting with a requirements engineering and software design phase for

developing information systems, enabling and supporting these value exchanges. To this end, we have proposed the e^3value methodology and ontology (see [11], [12] for an overview). Using this methodology results in a *value model*, stating actors (enterprises and final customers) exchanging *objects* of *economic value*, as well as an analysis whether these exchanges result in profit for all actors involved. We assume that sustainable profit for all actors is important for a successful value model.
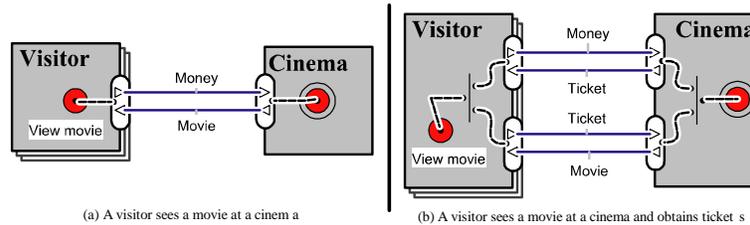
The notion of *value object* is a key concept in value models. A value object is created, traded, and consumed by actors, and is of economic value for at least one of the actors involved. In many cases, value objects can be found quite easily. For instance, a good obtained by a customer to satisfy his needs is a value object, as well as the money he pays for obtaining this value object. However, when we model *inter-organizational controls* [5], [17], [19], [20], [22], it is sometimes difficult to decide when something is a value object or not. Controls are measures to ensure that actors behave honestly: they can be used to prevent fraudulent behavior or can be used to discover that a fraud has been committed afterwards. Controls are of importance to create and enhance trust in execution of value exchanges.

Evidence documents often play an important role in inter-organizational controls; we call them *control documents*. It is argued in [5], [24] that one way to *reduce* the uncertainty in the behavior of trading parties is to exchange such documents. Many of such control documents have elements of *economic value*. For instance, consider a cinema ticket. A cashier sells the visitor a ticket which is checked by a controller to enter the theatre. The control purpose here is to prevent that the cashier allows free entrance to the cinema, which is accomplished by checking whether the amount of the tickets obtained by the controller corresponds to the total amount of money collected by the cashier. In this case, a ticket is a control document. Additionally, this ticket can be *sold* by the visitor to others, and the visitor can even earn money by doing so, if he resells the ticket for a higher price than he paid for it. Thus, the control document (the ticket) becomes also a *value* object.

It is, however, sometimes difficult to *decide* whether a control document *is* a value object. Consider e.g. a non-transferable plain-ticket. It is a control document, but is it a value object too? To answer this question, we extend the e^3-*value* ontology into two directions. First, we take an *economic* perspective on the notion of value object. The economic perspective is of importance because value objects possess economic value for some actors, and thus show why a value model may work at the first place. Second, we take a *legal* perspective. We argue that control documents have properties of a value object, if they represent an element of a *right*, which can be *traded* and is of *value*. We suggest that there is a need to distinguish between *possession* of a value object, *ownership rights* on a value object, and *control documents* that represent these rights. We argue that transfer of possession is not a value exchange, since the fact of possession cannot provide an economic value for someone who has no legal ownership rights. Finally, we present how our revised conceptualization of 'value object' is of use in a case on the Letter of Credit procedure, a rather complex service for securing payments.

2   The e^3-value ontology

In earlier work [11], [12] we have proposed the e^3-value ontology to model and analyze value networks consisting of actors exchanging objects of value. Below, we briefly review the e^3-value ontology, using the cinema example as explained in the introduction. Fig. 1 (a) shows a visitor who wants to see a cinema-movie and offers money in return. This can be conceptualized with the following e^3-value constructs (in bold). **Actors**, such as the visitor and the cinema are economically independent entities. Actors transfer **value objects** (movie, money) by means of **value exchanges**. For value objects, someone should be willing to pay, which is shown by a **value interface** being part of an actor. An interface models the principle of *economic reciprocity:* only if you pay, you can obtain the goods and vice versa. A value interface consists of **value ports**, which represent that value objects are offered to and requested from the actor's environment. Actors may have a **consumer need**, such as the need to view a movie, which when following a path of **dependencies,** results in the exchange of objects through a value interface. Exchanges through a value interface may result in other exchanges through another interface of the same actor, or may result in a **boundary element**. The latter means that we do not consider additional value exchanges.

(a) A visitor sees a movie at a cinem a   (b) A visitor sees a movie at a cinema and obtains ticket s

Fig. 1 A visitor going to a cinema in e^3-value

According to the e^3-value ontology [12], a value object is a good, service outcome, or experience, which is of economic value for at least one of the actors in the value model. This is fine for regular value models, but in some cases, it is not so easy to decide whether something is a value object or not. Specifically, consider Fig. 1 (b). Here, we model an organizational control. The purpose of an organizational control is that enterprises cannot commit a fraud. In the cinema example, we want to prevent that a cashier grants entrance to the theatre for free (e.g. for friends). Typically, this is

solved by creating a conflict of interest [20], [22]. A cashier sells a ticket, and this ticket is needed to enter the cinema. A controller at the theatre entrance obtains the ticket from the visitor. At the end of the day, the cashier counts the money, and the controller counts the tickets obtained. Obviously, there should be a correspondence between the total amount of money and the number of tickets. Note that the cashier and controller do not show up as actors in the value model, because they are just employees of the cinema and not profit and loss responsible entities.

A modeling question is if we show the tickets as value objects. On the one hand, tickets are just *controls*, and part of e.g. the business *process* of a cinema, and should perhaps therefore not be in a value model, but in a process model, which shows how a value model is *put into operation*. On the other hand, we can argue that tickets indeed show up in the value model, because the ticket is of *value* for its owner (the ticket can e.g. be resold). A similar example can be worked out for personalized airplane tickets, which cannot be resold: are these tickets value objects or not?

3 Extending the e^3-*value* ontology

The aim of this paper is to provide guidelines that help to decide whether a document, used for organizational control purposes, is a value object or not. To do so, we first extend the e^3-*value* ontology, and more specifically the part dealing with 'value object' (see Fig. 2). This extension includes two perspectives. First, we utilize the original *economic value perspective*, which already exists in the e^3-*value* ontology. One of the aims of using e^3-*value* is to understand how economic value is created, distributed and consumed in a network of enterprises. Additionally, we extend the ontology with a *rights perspective*. Many organizational controls *are* rights [16], which sometimes can be *traded*. This motivates the legal perspective on value objects.

3.1 An *economic value* perspective on the notion of value object

In a *value* model, objects are only shown if they are of *economic value* to stakeholders. In a *process* model (putting the value model into operation), objects are shown if they serve as required inputs of activities or are produced as outputs. As a consequence, not all objects that are part of a process model need to appear in a value model, because some objects may not be of *direct* value to someone.

Regular Value Object. We distinguish various kinds of value objects. The concepts 'good', 'service outcome', and 'experience' are already covered by the original e^3-*value* ontology. A good is a physical product, a service outcome is product of an intangible nature [14], although a service has in most cases some physical evidence (e.g. a seal – physical evidence - on the toilet of our hotel after it has been cleaned – a service). If there is no physical evidence at all, the value object is an experience. Obviously monetary instruments such as 'money' are also value objects. We have added the notion of 'evidence' as a potential value object which represents a control evidence document. In case studies we have done [16], [17], [18], [19] in the non-profit sector, evidence and other control documents are useful value objects. Briefly, this is needed to model that a service is provisioned to a customer (e.g. a healthcare

service to a patient), but the supplier (a hospital) has to prove to the government (or a representative) that the service has actually delivered. Since the evidence is required for the hospital to obtain its money, this evidence of service delivery is then of value for the hospital**.**

Willingness to pay. The question is: when is an object a value object? In answering this question, it is useful to look at what is meant by *economic value*. In economics, value is human driven (i.e., it is anthropocentric), meaning that goods and services are not considered to have value unless humans place value on them [1], [21]. This refers to the concept of *willingness to pay*. In the e^3*-value* terms, the expression 'willingness to pay' can be interpreted as some actor is willing to exchange a value object in return for another value object (including money).

The willingness to pay is for every person is *subjective* [15]. Every actor values the same object differently. The subjective component of value makes the value *context-dependent*. For example, a person in a desert values a bottle of water more than a person who has unlimited access to drinking water. In value model design, an object can be of value or not, depending on the context being modeled.

To summaries all the abovementioned arguments, we suggest the following guideline to identify a value object:

*Guideline 1. An object can be considered a value object for a given value model, if there exists at least **one actor**, who depending on his **context**, has a **need** for this value object and is **willing to exchange** this object in return for another value object.*

3.1 A *rights* perspective on the notion of value object

Control documents proved to be useful value objects [16], [17], [18], [19]. In simple cases, the physical transfer of an object triggers an exchange of corresponding *rights*. For example, if you buy bread you receive the loaf of bread in your possession, and you receive all the rights on it: e.g. you can use it, resell it, etc. In other cases, the possession of a value object is transferred separately from its rights. Suppose that in a local newspaper there are coupons, which give you a right for getting free loaf of bread on Sunday mornings by the local bakery. If you buy the newspaper, you get a coupon that entitles you to all the rights for the bread, but not the bread itself. You can only have the bread, if you present the coupon to the person in the bakery. The coupon in this case is a *control document* that facilitates the transfer of the value object 'bread'. In addition, you can resell your control document 'coupon' to someone else, which makes it a value object. For capturing the value of such control documents, we need to distinguish between transfer of a *possession* of a value object and the transfer of the related *rights*.

Thinking about the concept of *rights* leads us to property rights theory. Coase [5], whose work is considered as a start of property rights theory in economics, suggests that each asset relates to a *vector of rights* (or a *bundle of rights*). Conventionally, property rights include *use rights*, which define the potential uses of an asset, *income rights*, and *rights to transfer* a value object permanently to another party [1], [8]. Someone who has rights for a value object has it in *ownership*. We speak of *divided ownership*, if two or more actors (people or organisations) own 'different' rights for the 'same' *asset* [1]. In this case, rights for the same asset can be traded separately

from each other (e.g. stocks for company assets). In fact, since the fore mentioned rights may comply with our first guideline (willingness to pay for subjective value), on deciding whether something is a value object or not, they *each* can be seen as a *value object*.
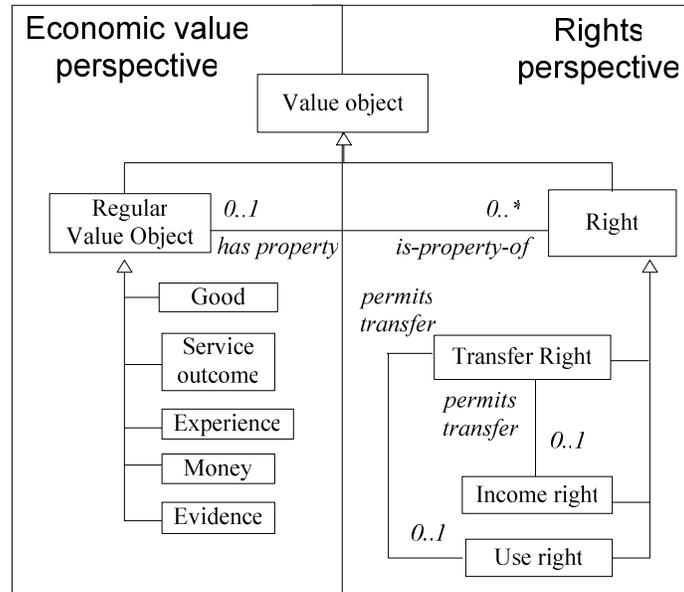
Fig. 2 Extension of the e^3-value ontology

In Fig. 2 we extend the e^3-*value* ontology based on property rights theory. We introduce the concept of 'Right'. Following property rights theory, rights of ownership can be 'use rights', 'income rights', and 'rights to transfer'. This is not an exhaustive set of rights. For example, there are intellectual property rights, such as copyright, which also can be modeled as rights in this ontology. A right is a property of a 'Regular Value Object'. 'Transfer right' has a relation *permits transfer* with 'income right' and 'use right'. A transfer right is seen as a right that is needed to transfer other rights (use right and income right) from one actor to another. Thus, the transfer right enables a transfer of rights, not a regular value object. Note that in economic literature this distinction is not made explicit: as it is understood in the property rights theory, transfer rights belong to a group of property rights [1], [8].

A right is also a value object itself. This makes it possible to have rights on rights, like, for example, the derivatives financial instruments are rights to buy or sell stocks, while stocks represent rights to companies' assets.

To distinguish rights from regular value objects, we name them differently. Rights are named as properties of the value object they relate to. For example, an income right for a house is stated as *house:income right*.

Physical possession of an asset is not the same as *ownership*. A person may have rights for an asset (ownership), but may not possess it (as in the coupon example). In property rights theory the concept of possession is omitted [7]; they argue that even if a law defines the ownership, the value of an asset is till available to many others. On the other hand, from legal perspective, if a person possesses an object, but does not have any rights on it (e.g. cannot resell it), the person cannot legally derive value of this object [3]. We chose to take the latter perspective, because it is more realistic for models we made so far, especially when we model fraudulent behavior. Thus, we argue that the transfer of possession alone is not a value exchange, while the transfer of rights is.

4   Documentary controls as value objects

Documentary controls can play various roles in value exchanges. To start with, documents can represent *evidence of rights*. These documents are used in two ways. First, a document may enable the *transfer* of rights. Second, documents may enable *claiming (execution of)* rights, which results in a transfer of possession. In addition, there are documents that do not represent any rights, but are just *outcomes* of a service (e.g. a certificate). Below we discuss every type in detail.

Rights evidence documents. In many cases documents 'carry' a value. Such documents are related to rights. For example, there is a definition of securities in the legal domain (in Dutch securities are: 'waardepapieren', which literally means 'value document'). In the Dutch law, the security documents have the following characteristics: 1. to be a certain form of legal document with a signature 2. deliver evidence about a right, and 3. by means of the document, the right can be transferred [23]. However, there exist many other documents that represent rights, which are not securities in legal terms (e.g. they do not have a signature); such as the examples above about coupons in a local newspaper or a ticket to the cinema. In earlier times money was also a kind of a right document: a banknote gave a right for golden coins from the Dutch Central Bank. In general, the distinctive feature of such documents is that they are an evidence of rights, and therefore they *enable* the exchange of value these rights represent.

There are two types of exchanges, with respect to the purpose of the rights evidence documents: (1) exchanges where the document enables the *transfer* of rights, and (2) exchanges where the document enables the *execution* of rights. If the document fulfils the first function, we call it a **transfer document**, and if the document fulfils the second function, we call it an **executing document**.

We argue that an exchange where the rights are transferred is a value exchange, and an exchange where the rights are executed is *not* a value exchange, because it implies the transfer of possession of the related value object, and we have argued that that possession is not of value (see section 3). However, in other exchanges, where no transfer or execution occurs, both transfer and execution documents can be value objects, if they are of value for some actor.

A document transfers rights in an exchange, if in this exchange, actor A transfers the document to actor B, which triggers that actor A gives up or issues the rights for some value object, and B acquires the rights. In Figure 1, if the visitor buys a ticket from the cinema, the rights for viewing a movie are transferred to the visitor; in this

exchange, the ticket is a *transfer* document. The rights for a movie are of value to the visitor. We argue that the exchange when the rights are transferred in return for a value object is a value exchange, because the rights are always of value:

*Guideline 2 (rights transfer value exchange). An exchange is a value exchange if (1) it includes an exchange of a value object (see guideline 1) in return for a document, which represents a set of rights for some other regular value object, and (2) in this exchange a **transfer** of the rights occurs: the actor who has this document as an outgoing object looses its rights, and some other actor acquires them.*

When the visitor transfers the ticket to the cinema, it does not transfer any rights, but *enables execution of the rights* for movie. In this exchange the ticket is an *executing* document. The execution of rights triggers a transfer of possession for some good, or, in case of Movie, the transfer of *access* to a service. Because the possession alone is not a value object, we consider that the exchange of execution document in return for a transfer of possession should not be a part of a value model. Basically, we suggest that the exchange of Ticket and Movie in Fig. 1 is an invalid value exchange. The following guideline is suggested:

*Guideline 3 (transfer of possession). An exchange, where the document enables an **execution of rights**, and is exchanged only in return for a transfer of possession or access to a value object, **is not a value exchange**.*

Should an executing document be modeled as a value object in other value exchanges, where it does not fulfill the executing function? For example, a bank may use stocks of a customer as collateral in giving a credit (the customer and the bank exchange the stocks for a credit). In this exchange the rights for the stocks are not transferred to the bank, neither they are executed: the bank does not have a right to get income from the stocks (trade them), unless the customer defaults (does not pay). But is this a value exchange? We argue that in such cases the document (stocks) is also of value, because there are other *potential* exchanges (e.g. in case of defaulting), which creates a willingness to pay for the document. So, we suggest the following guideline:

Guideline 4. A executing document can also be a value object in value exchanges, where it does not fulfill an executing function, as long as it fully complies with guideline 1 (willingness to exchange).

Are rights evidence documents goods, money, service outcomes or experiences? In the cinema example in Fig. 1, a service for what the visitor is paying is a movie, not a ticket. To our understanding, the ticket and other rights evidence documents are a separate type of regular value objects, which we call *evidence* (see Fig 2)**.**

Documents as service outcomes. Some documents are produced as *outcomes* of (commercial) services (e.g. a certification service), but they do not transfer or enable an execution of rights. Therefore, we introduce the following guideline:

*Guideline 5**.** If a document is not a transfer or execution document, it can only be modeled a value object if this document is a service outcome, and if it complies with guideline 1.*

In the following section we demonstrate the ontology extension and the corresponding guidelines by modeling the "Bill of Lading" from a value perspective.

5   Case "Bill of Lading"

Suppose we have a seller in Hong Kong and a buyer in the Netherlands. The actors are geographically far apart, and the goods have to be transported by a carrier from the seller to the buyer (we assume by sea). On the one hand, the seller does not want to ship the goods onto the carrier's vessel (and thereby lose control over them) without first receiving payment from the buyer. On the other hand, the buyer does not want to pay the seller (and thereby lose control over the money) before the goods have been shipped. In international trade, the risk of non-payment and non-delivery can be prevented by accommodating such an instrument as the document/letter credit procedure (LoC). To secure the risk of non-payment, a contract (*Letter of Credit*) between the seller, the buyer, and the bank is made, in addition to the sales contract between the buyer and the seller.
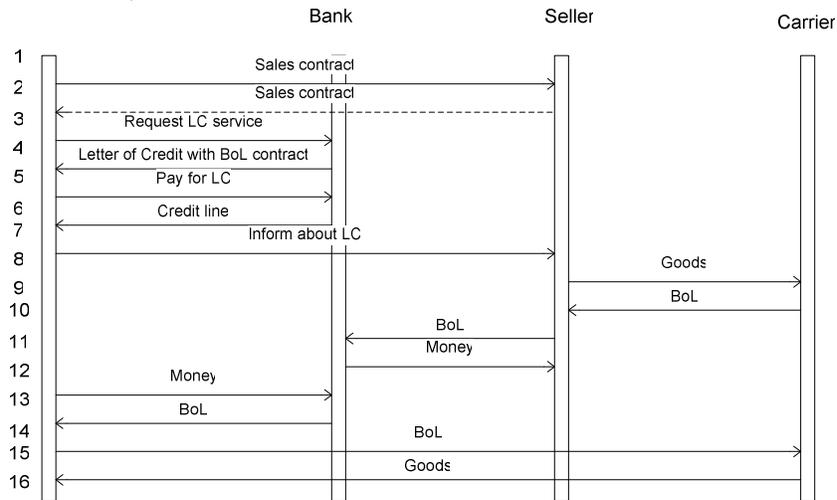
**Fig. 3** Time sequence diagram for the Letter of Credit procedure

In Fig. 3, we explain the LoC procedure in detail by using a sequence diagram. In the LoC agreement is stated that that the bank will pay to the seller as soon as the seller will provide the *accompanying documents*. Normally, in international trade goods are accompanied with documents, for example, a Certificate of Origin or Bill of Lading (BoL). These documents are very important control components for the whole process. The bank receives the documents (BoL) from the seller (#11), and in case the documents are fine and comply with the requirements in the LoC, the bank will pay the seller (#12). Further, the buyer has to pay the bank (#13), and the bank then has to transfer the documents to the buyer (#14). The buyer presents the documents (and probably also the LoC and the sales contract) to the carrier (#15), and after that becomes the owner of the goods (#16).

The bank takes the risk that, after the money is paid to the seller, the buyer may default or refuse to pay. Therefore, the bank has to ensure that the money will be always reimbursed. The assessment of the customer's capability to complete the

payment is confined to the general reputation of the customer, the type, complexity, and magnitude of the contract, and the country where the contract is to be performed [1]. When it concerns substantial deals, banks require other securities, for example, additional counter-guarantees from other banks. In this model, a BoL plays a role of both accompanying documents, and plays a role as *security*. In the situation when the buyer refuses to accept the BoL, for whatever reason, the bank can use the BoL to obtain the goods. In this specific case study, we consider the situation when the BoL is a tradable, or also called negotiable, document not 'on name', which means that the person who owns the BoL has the rights on the underlying goods.

5.1 A first value model for the Letter of Credit

Unlike the time sequence perspective, the value perspective models *only* the exchanges of objects of *value*. There is no notion of time at all. First, we construct a so-called *ideal* value model (see [16], [17]). An ideal value model supposes a perfectly honest world: in e^3-*value* this means that all actors respect the atomicity of the value interfaces (if you get something, you offer something in return). The value model in Fig. 4 shows a simple situation: a customer wants to buy a good and provides money in return.
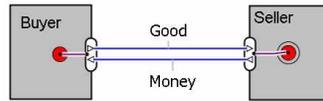
Fig. 4 A customer buys a good from a seller

Second, we now *relax* the assumption that all actors behave ideally. Instead, actors can behave *sub-ideally*, like not paying for a delivered good (the extension of sub-ideality to e^3-*value* is called e^3-*control* and is in detail discussed in [16], [17]). This is where the Letter of Credit (LoC) comes in: to secure that the supplier gets its money, even if the customer *defaults*. This situation is expressed in Fig. 5. Note that we not consider LoC and BoL themselves; they show up in Fig. 6. The customer need begins at the Customer, and the OR-fork splits the path into two paths: an *ideal* path and a *sub-ideal* path. The ideal path is when the buyer pays to the seller, and receives goods in return. The sub-ideal path considers the situation when the buyer does *not* pay to the seller. Sub-ideality is indicated by the *dashed* money exchange between the buyer and seller, representing that this exchange does not happen. As was described above, according to the LoC procedure, the seller will be paid by the bank and the bank receives the goods due to the defaulting of the customer to pay the fee for the goods. (Actually, the bank can never use the goods, but will have to sell them, but we do not model it here, for simplicity reasons).

The LoC procedure is a control mechanism to reduce the risk for the seller. The seller also gets money immediately upon presenting the documents (see Fig. 3, #11 & #12). Note that, we are aware of other sub-ideal situations, for example, when the buyer receives damaged goods. From the buyer's perspective, this procedure is more secure, because he is able to determine, through the LoC, which documents he

requires to prove the seller's performance. However, this procedure does not guarantee the buyer that the goods will be delivered. Another control mechanism should be in place, like insurance. We do not consider these situations in his paper due to lack of space.
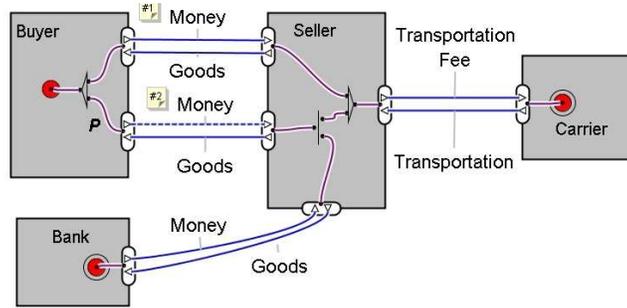

Fig. 5 The Letter of Credit: securing the fee for the supplier.

5.2   Introducing the Bill of Lading and the Letter of Credit

The model in Fig. 5 does not present the exchange of the BoL and LoC themselves, and therefore does not yet give a complete picture of control mechanisms from an economic value perspective. In Fig. 5, we model the LoC procedure in more detail.

First, the Letter of Credit (LoC) is a service, provided by the bank to the buyer. In return, the buyer pays the bank money. There is also a document, named Letter of Credit. However, the transfer of the document LoC does not result in an execution of the LoC service. The LoC service is executed if the BoL is transferred to the buyer by the bank. The LoC document does not represent the outcome of LoC service and does not comply with guideline 5. We do not model LoC document as a value object. Instead, we model the LoC service outcome as a value object.
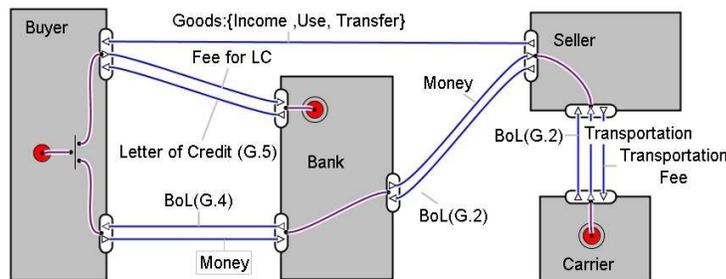

Fig. 6 Document credit procedure with Bill of Lading.

According to the ontology of value objects, Goods is a *regular value object* (guideline 1), which has the following rights as properties: use rights, income right,

and transfer right. The BoL is a *rights evidence document*, which enables both transfer and execution of the rights for the goods. It is an *evidence* type of a *regular value object*.

The supplier obtains the BoL from the carrier as a part of exchange of Transportation Fee and Transportation, as in Fig. 5. In this exchange, the BoL is issued as evidence that the seller has rights for the goods. This is needed because the possession of the goods is transferred to the carrier. We consider the BoL in this exchange is a *transfer document* (see guideline 2). Formally speaking, the seller initially has all the rights for the goods. However, because the carrier obtains the *possession* of goods, the BoL is issued as *evidence* of rights. We do not model the transfer of possession of the goods.

In the exchange where the seller exchanges the BoL with the bank in return for a payment, the BoL is a value object, because it complies with guideline 2. At this point, the seller gives up his rights for goods, which indicates that in this exchange the rights are transferred. According to the LoC agreement, the bank is not allowed to sell the BoL or exchange it for the goods. This means, that although the BoL is transferred physically to the bank, the bank does not receive the rights for the goods. The income, use, and transfer rights *Good:{Income, Use, Transfer Rights}* are received by the buyer. At the buyer, the value object *Good:{Income, Use, Transfer Rights}* is in the same interface as the LoC. This way, we model that these rights are a necessary component of the customer to get the LoC: they guarantee a creditworthiness of the buyer, and play a collateral role. This example provides an extension to guideline 2, demonstrating that a transfer document may enable a transfer of rights, between actors different from those exchanging the document physically. If the rights were transferred exactly between actors exchanging the corresponding control document, they would not be modelled explicitly, only the document would be modelled.

In the exchange between the bank and the buyer, the bank transfers the BoL to the buyer after the latter pays (see process model #15). No rights are transferred or executed here. However, in this exchange the BoL is presented as value object, because it complies with guideline 4: (1) the BoL is needed to claim the goods (an execution document in other exchanges, see the explanation below), and (2) there is a buyer willing to pay for the BoL.

In the value model, we do not model the exchange, where the buyer exchanges the BoL with the carrier in return for goods (see #15, #16 in Fig.3). Here the BoL plays a role of the *executing* document. According to guideline 3, because the executing document BoL is exchanged in return for a transfer of possession of the goods, this exchange is not modelled as a value exchange.

A sub-ideal scenario. In Fig. 7, we model the scenario when the buyer refuses to accept the BoL from the bank or when the buyer defaults. This scenario corresponds to the sub-ideal path as explained in Fig. 5.

In case the buyer refuses to pay, the value exchange Money between the bank and the buyer does not occur. Because the bank does not transfer the BoL before the payment by the buyer (see the process model), the value exchange BoL also does not happen (between the bank and the buyer). Hence we model these exchanges as sub-ideal value exchanges.

If the buyer does not pay, the rights for the goods are transferred to the bank. In the same value exchange as the not transferred credit and BoL, we model that

Good:{Income, Use, Transfer Right} is exchanged from the buyer to the bank. This corresponds to the sub-ideal path in Fig. 5, when the exchange of Secure Fee and Goods occurs between the seller and the bank. Note that here the rights are transferred without an exchange of the BoL.
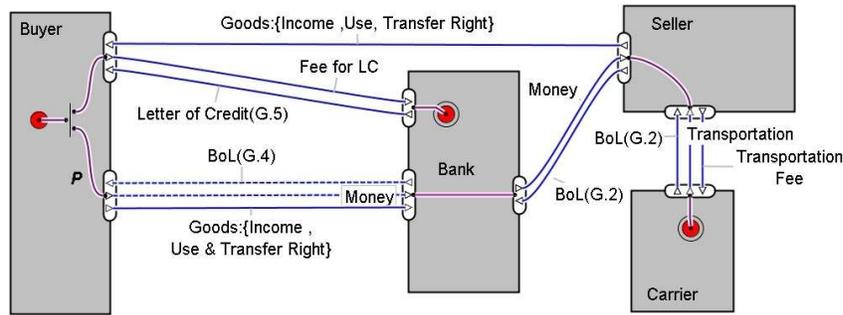

Fig. 7 Document credit procedure with Bill of Lading, sub-ideal scenario

5   Related research

There are several proposals in the literature that are related to our work. With regards to e^3-*value* ontology, there have been a few other ontological approaches on business modeling, among the most related are Tropos, REA, and BMO. Tropos [6] is a methodology that provides an extensive set of tools, including goal modelling, to facilitate early requirements engineering. However, it is not specifically focused on value modelling. Ontologically REA [9] is very similar to e^3-*value*. From a methodological point of view, REA is not an approach for business development, whereas e^3-*value* provides a methodology for doing so, e.g. by value model construction and reconstruction, and by profitability-based sensitivity analysis. The BMO ontology was compared with e^3-*value* ontology in [13], where the merge of the two ontologies was proposed. The main difference is that BMO focuses on one actor, while e^3-*value* has a focus on the network of actors. The extensions proposed in e^3-*control* concerning modelling sub-ideality, and the extensions in this paper, with regards to distinguishing legal and economic perspectives, and the extension of the notion of value object with the concept of rights, to our knowledge, have not been proposed until recently.

6   Conclusions and future research

In network organisations, the transfer of rights for a value object often occurs apart from the value object itself. Such a transfer is enabled by evidence documents that

represent rights, which also play a role of control mechanisms. From the general definition of a value object in the e^3-*value* ontology, it is not clear when these documents are objects of value. In this paper, we formulated five guidelines that can used to decide if evidence documents are value objects. We demonstrated the approach with a case study of Letter of Credit procedure. We proposed an extension of the e^3-*value* ontology with a concept of rights, and a more precise definition of a concept of value. Value is *subjective* by nature, and an actor considers an object to be of value depending on *needs* of the actor. Thus, an evidence document can be of value for those actors who are *willing to exchange* this evidence for another value object. With regards to rights, we argue that in some cases, when an evidence document has properties of a value object, there is a need to distinguish between modeling (1) possession of a value object, (2) rights on this value object, and (3) control documents that represent the rights. To support this, we extend the ontology of a value object with a concept of a right. Furthermore, we distinguish between evidence documents that are outcomes of a service, and documents that represent rights. Within the second type, we distinguish two types of documents: the document that enables the *transfer of rights* and that enables the *execution of rights.* We argue that the transfer of rights is always a value exchange, while the execution of rights is not, because it triggers the transfer of possession of a good or an access to a service, while the possession cannot be used to derive value legally without an ownership. Note that we suggest using this approach of modeling the rights explicitly only if the notion of a value object is not sufficient to represent the value of control documents.

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