

# Ways to Creating Better Value Models

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**Abstract.** Value models has several inherent benefits, compared to for example process models, when it comes to the description of high level exchanges of resources in a network of business actors. Compared to other approaches, value models enable the modeller to give an overview of a complex business domain, focusing only on those aspects that are essential for sustaining viable business relationships. However, the benefits with value models depend upon whether they are applied in a structured way or not. That is, simply using a value modelling technique does not ensure that the potential benefits can be achieved. In this paper, we outline guidelines that aid the creation of value models using the e3 value methodology, which is one of the most used value modelling techniques. These guidelines support the practitioners using the technique in several ways. Firstly, the guidelines can aid to grasp when to use different e3 value modelconcepts, for example by clearly state when to use the Actor concept and when to use the Market Segment concept. Secondly, the guidelines help the practitioner to create an e3 model on the correct abstraction level. For example, specifying which types of resources in the real world that shall be represented as a Value object concept, and which shall not. The guidelines are based on experiences from several case studies.

**Keywords:** value modelling, e3-value, guidelines,

## 1 Introduction

Many different kinds of models exist for representing and visualising the concepts used and actions performed in an enterprise, as well as its relation to customers, vendors and other business partners. One type of enterprise model is value model that focuses on actors, resources and resource exchanges [Gordijn et al, 2000, Gordijn et al, 2001, Weigand et al, 2005, Wieringa et al 2005]. A value model, sometimes called a value-based business model or just business model, is different from other types of models used in analysis and design of enterprises. In particular, a value model is different from process models, which deals with operational and procedural aspects of business communication, including control flow, data flow, state flow and/or message passing. Instead, a value model gives a high level view of a network of enterprises and the resources that are exchanged. Therefore, a value model can be used to describe the rationale of a network and its involved enterprises, to analyse the

economic viability of the network and its involved enterprises, to analyse different types of network architectures, or to be used as a starting point for generating a set of core business processes and services for the involved enterprises in the network.

A well-known value modelling technique is the e3 value methodology, which has a set of model concepts (called abstract syntax in [OMG, 2007]) and a related notation (called concrete syntax in [OMG, 2007] and is the graphical look of symbols used). However, as with all graphical modelling techniques, there is a need of practical guidelines how to use the technique, especially what the relation is between the model concepts and the concepts in the real world (this is called semantics [OMG, 2007]). At a first glance, e3 value methodology seems to be a straight forward technique to apply, but when using the technique, practitioners might spend a lot of time and attention discussing how to apply the technique in a specific situation. The result of that discussion could be crucial for developing an efficient value model, i.e. a model that fulfils its purpose. Note that e3 value methodology is mainly used to model network of commercial companies, but has also been used to visualise network involving publically funded and non-profit organisations.

In this paper we outline a set of guidelines that aid the creation of e3 value models. Each guideline is presented as a pattern description, with the name of the guideline, the problem the guideline address, the motivation for the guideline and a concrete example outlining how the guideline can be applied. The guidelines are based on several sources, such as experiences from a set of case studies, especially from the health care sector; OMG's meta modelling layers, and well-known business patterns and ontologies, such as REA.

An example from the health care sector will illustrate an e3 value model and the guidelines. The example is based on experiences from a project in the health care domain, the REMS project [Henkel et al, 2007]. The main aim of the project was to create a set of e-services that can be used to create, manage and transfer health care referrals between primary care units, an eye specialist hospital clinic, private eye specialist units, and opticians in the Stockholm area.

The paper is structured as follows: In section 2, the model concepts and related notation of e3 value methodology is briefly described, and in section 3, a value model created in e3 value methodology from the REMS project is introduced. In section 4 to 6, the guidelines are outlined. Finally, in section 7, conclusions and ideas of further research is presented.

## **2 The e3 Value Technique**

The value modelling technique e3 value is developed by Jaap Gordijn and Hans Akkermans. The technique has been used in several research papers and projects. It consists of a limited set of basic model concepts and related notation. However, some of the model concepts and notation has changed during the lifetime of the technique. The basic model concepts and related notation are based on [Gordijn et al, 2006], but partly interpreted by this papers authors. The model concepts and related notation are:

**Actor.** An economically, and often legally, independent entity. Examples of actors is a patient, and an organisation such as Metropolitan Hospital Centre. In the notation, an actor is represented by a plain rectangle..

**Value object.** Something that actors exchange which is of economic value for at least one actor. A value object is a service, a good, money, or an experience. Examples of value objects are medicine, healthcare investigation, patient fee, and feeling of safety. In the notation, a value object is represented as a label on a value exchange (see below).

**Market segment.** A set of actors that share a set of properties. Actors in a market segment assign economic value to value object equally. In the notation, a market segment is represented by a set of stacked rectangles.

**Value port.** Something that is used by an actor/market segment to provide or request a value object. In the notation, a value port is shown as a small arrow inside a value interface (see below).

**Value interface.** Something that group value ports together and show economic reciprocity. Economic reciprocity means that actors/market segment will only offer value objects if they will receive value objects in return. In the notation, the value interfaces are drawn at the sides of actor/market segments as a thin rectangle with rounded corners, with value interfaces within.

**Value exchange.** Connect two value interfaces and represent a potential trade of value objects. In the notation, value exchanges are drawn as lines connecting the port of actors/market segment to each other.

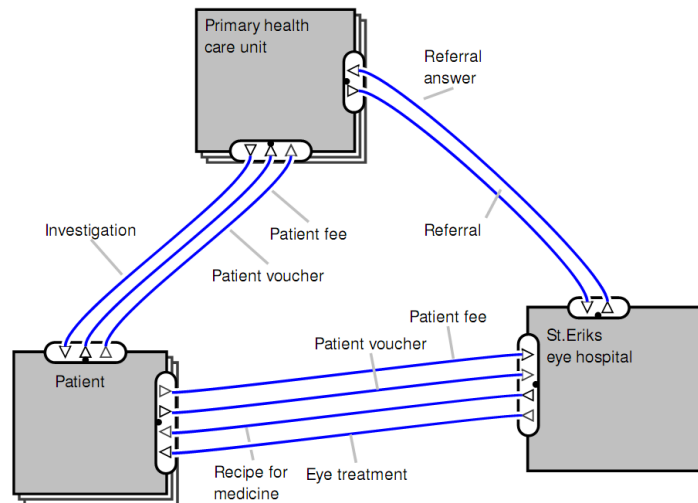
### 3 Value Model in the REMS case

To illustrate the guidelines we use a simplified value model produced in the REMS project [Henkel et al, 2006] A central part of the REMS project was to describe and analyse the creation, management and transfer of health care referrals between St.Erik's eye hospital (a set of eye specialist clinics) and primary health care units. Figure 1 illustrates an excerpt of a value model defined in the scope of the REMS project. The model will be shortly introduced here.

When a patient experiences an eye health problem, the patient will visit a primary health care unit. The basic/primary value object the primary health care unit offers is an *investigation* service. If the patient needs further specialist treatment the patient gets a *referral* to St.Erik's eye hospital that is able to provide advanced treatment. The referral is sent electronically to St.Erik's eye hospital.

When the patient visits the hospital, she/he will receive an *eye treatment* service from the clinic, and a *recipe for medicine*, if required.

On each visit to the primary care and St.Erik's eye hospital the patient pays a *fee*. Furthermore, the patient visit renders a *patient voucher* that enables the health care unit's further reimbursement from the County council.



**Fig. 1.** The e3-value model of the REMS case.

As shown in Figure 1 the main concepts of a value model is actors/market segments, value objects and the exchange of value objects. To provide e3 value modellers with guidance, we thus group the guidelines according in three groups, as presented in the next three sections.

## 4 Value Object Guidelines

In e3 value modelling, the concept that represents exchanges between actors is called value objects. Value objects are resources, i.e. viewed as being valuable by some actor(s). Without guidelines how to choose the right value objects, the value model may be cluttered with objects that is not value objects and/or less important value objects, etc. The result may be a non-focused value model and/or value models with a confusing mix of value, process and information model elements. To address these issues we propose a set of guidelines related to the identification of value objects.

### **Transferable value objects vs. not transferable values**

The e3 value methodology makes no differences between things that are transferable (e.g. medicine) and things that are not transferable (e.g. better health state). This may result in value models that are difficult to interpret. To address this issue we propose the following guideline:

Guideline 1: *“Value objects” should be transferable between actors, and phenomena that cannot be transferred (such as health state, knowledge) should not be depicted as value objects.*

*Motivation:* There is a conceptual difference between phenomena that are transferable and phenomena that are not transferable, which can be called “values”. Transferrable value objects work as enablers for non-transferable values, i.e. the non-transferable values are effects of the transfer of value object to an actor. Since value objects and values are two different concepts, ideally they should be modelled with different notations. A suggestion of how this can be done, and a more elaborated discussion on value objects vs. values, can be found in [Henkel et al, 2007].

*Example:* In the REMS case study (figure 1), all depicted value object are selected such that they are transferable. Note here that the execution of services is being transferable, for example “eye treatment” and “investigation”. The effects of these services (i.e. values) are not show in the model. For example the effects of the investigation might be the values “knowledge on the health condition for patients” and “feeling of safety”.

#### **Value object on the operational level**

Value exchanges between actors can be on different levels, such as operational, policy and evaluation levels. The main value exchanges are on operational level where the actors are exchanging goods or services for money. However, in practice, value objects on different levels are found in the models. This may result in models cluttered by value objects representing policies (such as quotations and orders) instead of focusing on operational level value objects (such as goods, service and money). To address this we propose that the following guideline shall be used:

Guideline 2: *Strive to model value objects that are on the operational level, and not the supporting value objects on a policy level.*

*Motivation:* Value objects that are exchanged on operational level, e.g. money, goods, services, are the main exchange of value objects between actors in a network. Value objects on the policy level can be seen as supporting objects for these operational value objects. Value objects on the policy level, include value objects (e.g. quotations) supporting decisions regarding commitments or are the commitments (e.g. orders). These policy level value objects are needed in some business settings before the exchange of value objects on the operational level. Another way to put it is that the value objects on policy level are used to regulate the value objects on operational level.

The distinction between operational and policy level can be found in the REA pattern, and is discussed in [Hruby, 2006], The distinction is also emphasised in the action workflow approach [Medina-Mora et al, 1992], which also include an evaluation level.

The value object exchange on policy level is similar to the proposal and agreement phases in the action workflow loop, the value object exchange on operational level is

similar to the performance phase, and the value exchange on evaluation level is similar to the satisfaction phase.

*Example:* In the REMS case study (Figure 1) all value objects are on the operational level. An example of a value object that is not on the operational level is the patients' health plans, which are set up by the primary care physician in order to plan future activities (i.e. future value objects exchanges on operational level) with the patients.

## 5 Actor Guidelines

Creating e3 value models with a large range of actors on different levels of granularity can create models that are difficult to follow. A part of this problem stem from that it is tempting to depict a large amount of actors with a varying degree of independence ranging from standalone organisations to departments of the organisation, or specific actors in the organisation, such as physicians. This can make it difficult to distinguish between an organisation's internal and external aspect. What can further complicate the modelling of actors is that the e3 value methodology contains two concepts for actors: actors and the market segments. Thus, a practitioner using e3 value methodology must know which concept to use in a specific situation.

### **Independent actors**

As stated earlier, modelling actors on different levels in the same e3 model might lead to a cluttered model. Therefore, we propose the following guideline:

*Guideline 3: The actors in a value model shall have the same degree of independence compared to each other.*

*Motivation:* This guideline is in line with the definition of e3-value actors as being economically independent. However, we interpret "independence" in a wider sense, letting it denote the ability of an actor to control their internal actions in order to deliver the desired value objects.

The effect of following this guideline will be the creation of "balanced" value models, where actors form a network of peers. A drawback with following the guideline is that key stakeholders of an organisation participating in the modelling might not be able to see "their" area of influence represented in the value model. In the e3 value methodology, there are further concepts, such as "value activity" and "actor composition", that may be used to visualise internal actors. These concepts are not discussed in this paper.

*Example:* An example of the effect of following this guideline can be seen in the REMS case. During the modelling of the value model in Figure 1, much focus was put on a specific eye clinic within the St. Erik's eye hospital. Thus, it was tempting to put the eye clinic as actors in the value model. An example of this was the specific eye clinic responsibility to work as a "router" for referrals, taking incoming referrals and, if desired, route the referral to an appropriate private specialist. This was done if the clinics of the St. Erik's eye hospital did not have the resources to take care of all

patient. However, following the guideline, this “internal actor” was not shown in the value model, because it does not have the same degree of independence compared to the other actors. In this case, the routing of referrals can be seen as an internal business function.

### **Actor vs market segment**

The e3 value methodology contains two concepts for actors: actor and market segment. In e3 value methodology, an actor is defined as typically economically independent, while a market segment is defined as a set of actors that value objects equally. The difference becomes more evident when referring to [Gordijn et al, 2000] where the “market segment” is called “actor stack”. Thus, in essence the actor represents a single actor, while the market segment/actor stack represents a set of actors. To make this distinction between the actor and market segment clearer, we propose the following guideline for using the actors and market segment concept in the value model:

*Guideline 4: Use the actor concept to refer to a single physically existing actor (e.g. “Volvo”), while market segment should reflect a role that can be taken by multiple actors (e.g. “Car manufacturers”).*

*Motivation:* By following this guideline it will be clear if the value model describes a general value network case (by using the market segment symbol), i.e. class/entity type/object type, a specific case with identified actors, i.e. instance/an entity occurrence/object, or a mix between them. In practice, the use of actor and market segment is confusing. For example, in [Weigand et al, 2006] a model describes an academic conference, with reviewers, program committee and the conference itself as actors, while authors are depicted with a market segment symbol. In this case the use of the market segment symbol for authors could indicate that they are many (a “mass market”), or that, compared to reviewers and committee members, they have a more “shallow” and short-lived contact with the conference. However, in [Soetendal, 2005] the actor symbol is used for a mass-market (DVD buyers, in this case).

*Example:* In the REMS case study (Figure 1), we employ the market segment symbol on two roles, this is reflected in the generic naming (“Patient”, “Primary health care unit”). In the REMS project there was only one hospital, St.Erik’s eye hospital. In this case we thus used the actor symbol. Originally, we used a notation that did not distinguish between actors and market segments [Henkel et al, 2007].

## **6 Value Exchange Guidelines**

In e3 value models the collaboration between (business) partners is captured by the use of exchanges of value objects. However it is not always simple to determine which value objects that should be used to represent exchanges and which actors that they are exchanged between. The first problem is that business partners can exchange a great deal of information, small services and maybe even goods. If all these

exchanges were to be depicted it would quickly create a model that were unwieldy. Secondly, sometimes it can be difficult to determine which parties that are exchanging value objects, since the original producer of a value object might be represented by actors that works as re-sellers or transporters of the original value object. This last problem is accentuated if several actors add value before the value object reaches the customer or end-consumer.

### **Contracted exchanges**

This guideline addresses the issue with interconnecting the right actors by the use of value exchanges.

*Guideline 5: Value exchanges shall primarily be modelled so that the sender of the value object has the legal responsibility for the value objects in the business relationship between the sender and receiver.*

*Motivation:* The above guideline can help a modeller to correctly capture all exchanges in a value network. A pragmatic view on “legal responsibility” is simply that the receiver of the value object should be able to get compensation for the value object if it is not following the business agreement (see the following example). By stipulating that the sender of the value object should have the legal responsibility for the value object, we will avoid diverting flows of value object from the main producer into actors that provide ad-on services.

*Example:* In the REMS e3 value model (Figure 1), referrals are sent from the primary health care unit to St.Erik’s eye hospital. In reality the referral can be physically handed over to St.Erik’s by the patient. So, if the desire was to capture the physical flow of the value object, the exchange would go from the patient to St.Erik’s. However, the patient is not legally responsible for the referral, that is, if something is wrong with the referral the primary care unit will be blamed and not the patient. Due to this responsibility, we thus draw the exchange from the primary care unit directly to St.Eriks eye hospital.

### **Valuable exchanges**

A central part of the e3 value model is to be able to analyze the economic viability of a network of actors. This analyze can be problematic if some value objects that are depicted in the value model are of no or minor value for the receiving actor. To avoid depicting value object of less value in the model we introduce the following guideline:

*Guideline 6: The depicted value object in a value model shall be of such a value for the receiving actor, that the actor is willing to pay for it in order to receive it.*

*Motivation:* By following the guideline we ensure that all value objects are valuable for the receiving actor,. This makes it easier to analyze and discuss the economic viability of a network of actors. The analyse of the economic viability is a driver behind the use of e3 value models. Note that this guideline is briefly mentioned in [Gordijn, 2007].



*Example:* In Figure 1, most value objects are of clear value for the receiver. An interesting value object is the referral sent between the Primary health care unit and St.Erik's eye hospital. This might seem as of little value to St.Erik's, as it is only information. However the referral can be viewed a potential income for St.Erik's, The patient visit, based on the referral, will give a patient fee and a patient voucher to St.Erik's eye hospital later on.

## 7 Conclusion

In this paper, we have presented a set of guidelines that support e3 value modelling. The benefits of using the guidelines are several: Firstly, the guidelines can aid a modeller to grasp how to use the e3 value concepts, which will speed up the modelling task as well as create consistent value models. Secondly, the guidelines help a modeller to create an e3 model on an efficient correct abstraction level, preventing cluttered value models.

However, the designed guidelines are only focusing on a limited set of concepts in the e3 value technique, and we have started our work writing guidelines for the rest of the concepts. We are also planning to suggest a set of extensions to the e-value methodology, some of these are already presented in [Henkel et al, 2007]. Finally, we are planning to evaluate the benefits of the guidelines.

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