E3value Network Quality Properties

Hans Weigand

Tilburg University, P.O. Box 90153,
5000 LE Tilburg, The Netherlands
H.Weigand@uvt.nl

Abstract. E3value is a well-known technique for modeling value networks that abstracts from processes and platform specifics. Although there exist some methodological guidelines for value modeling, no formal properties have been defined so far that could distinguish "good" from "bad" value models. This is sometimes felt as a gap, both in practice and in teaching. In this paper, some basic formal properties are introduced, based on the notion of value cycle.

Keywords: value networks, formal properties.

1 Introduction

The e3value modeling approach provides a tool for modeling value analysis, helping to determine the value flows for each of the actors [2]. Gordijn's dissertation [1] contains a complete chapter with methodological guidelines for value modeling. Most of these have to do with the meaning or interpretation of the constructs, e.g. the meaning of value object (way of thinking). Others address the question what to do when (way of working). Less attention is given to the way of modeling. What makes a good value model? This is sometimes felt as a need in the application of e3value in practice as well as in teaching (cf. [3]). One could say that the profitability analysis is the "proof of the pudding", but this analysis requires quite some more work and data, and is of little help during the value model construction. There are two ways in which this need could be remedied.

One approach is to use *value network patterns*, and assess the quality of some value network in the way it instantiates a pattern or a combination of these, similar to the approach of Weill & Vitale [7]. Value patterns have been explored in the work of Zlatev [8] which has not been continued, unfortunately. In the form of control patterns, – so focusing on a particular aspect of e3value models – patterns have also been used in [4] although their definition is broader than a value network configuration.

Another approach aims at distinguishing "good" from "bad" business models by checking some *properties* of the network. This is not a replacement of the profitability analysis, but can help during the construction and discussion of the value network, before assumptions about the market volume and costs are made. In this short paper, we follow the second approach, using the notion of value cycle. In section 2, we give

I. Bider et al. (Eds.): BPMDS 2014 and EMMSAD 2014, LNBIP 175, pp. 464–471, 2014.

a brief overview of e3value. Section 3 introduces some network properties, using the concept of value cycle, and Section 4 provides two small applications.

2 E3value – A Short Overview

The e3value modeling approach provides a tool for modeling value analysis, helping to determine the value flows for each of the actors [2]. The core elements of e3-value models (Fig. 1) are value exchanges, which show the potential transfers or exchanges between collaborating entities in a network of value objects from one actor to another. A value object is of some (economic) value for at least one of the actors. Typical examples for value objects are products, payments and services. Value objects are often bundled; this bundling is represented by the value interface with a value port for each incoming or outgoing value object. Value interfaces also group the value object and the reciprocal value object that the other actor returns. Value activities represent activities that can be performed by an actor in an economically sustainable manner. As such, they are course-grained activities. They are included in the model to allow discussions on which actor is most suitable to perform this activity.

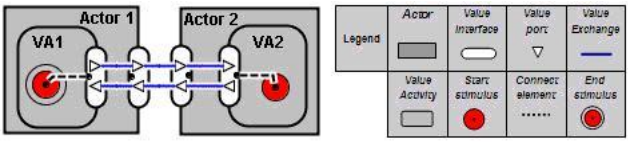

Fig. 1. Basic e3value constructs

3 Value Model Quality

In the original list of guidelines of [1], most principles are about the correct usage of a modeling construct, but two principles can be identified that have a substantial impact on the way of modeling and the quality of the value model: the *reciprocity* principle (guideline 2.7/2.13) and the *causality* principle (guideline 2.8). The latter urges the modeler to find causally related objects. For instance, if a certain good is sold by a trading company, it must have been bought. The two principles can also be paraphrased as follows: "in an exchange, you get nothing for nothing", and "value objects do not come from nothing". Formulated as such, they correspond closely to the REA exchange and conversion dualities [5]. Causal relationships are modeled in e3value by means of the scenario paths. However, the use of scenario paths overlaying the value network independently from the value activities has some disadvantages. Apart from that, it is unfortunate that the principles are only formulated as soft guidelines. It may be that formalization in terms of ontological axioms is too rigid, but perhaps there is something in between. In the following, I suggest an alternative approach that is based on the notion of value cycle.

3.1 Basic Definitions

The *value cycle* is a well-known concept in accounting theory, to describe the cycle of money-purchasing-goods-sales-money, or some variant of it (e.g., [6]). To be profitable, this value cycle must contain a value jump, which means that the money flowing into the cash buffer is more than the money outflow. We can map this concept (not in all its details) on the value network in the form of the following requirements:

- A value network is *sound* iff every value exchange between actors (its value object) is part of at least one value cycle and the network is connected.
- A *path* is a chain of value ports $V_1 \rightarrow V_2 \,..\, \rightarrow V_n$ connected by value exchanges (between each two subsequent nodes). A value cycle V is a set of value ports with source $V_1 \in V$ iff each value port in V is on a path from V_1 to V_1
- We assume that value objects can only be transformed in a value activity. That is, if we have a *transformation* subsequence $V_i \rightarrow V_{i+1}$ where the value objects requested and offered, respectively, in V_i and V_{i+1} are different, then the two ports are contained in a value activity, one as in-port and one as out-port (a type III value exchange). In all the other value exchanges in the model, the value objects flowing in and out are the same.
- A value cycle is *simple* when the value exchanges between the subsequent nodes are the only value exchanges existing between any V_i and V_j, for $i< j$. When there are more of these value exchanges (the value cycle includes different paths), the value cycle is called complex.
- A value interface is *balanced* if it contains at least one value port in each direction (in and out). A value network is balanced iff all value interfaces are balanced.
- In a value interface, the incoming and outgoing value objects should be of a different type (cf. Gordijn's guideline 14).

We restrict the notion of value transaction as follows:

- A value transaction includes value exchanges between two actors (not more). There is at least one value exchange in each direction.

The basic e3value model in Fig.1 is balanced (with only one transaction), and it is also sound (one value cycle). The e3value diagram in Fig. 2a is sound but not balanced.

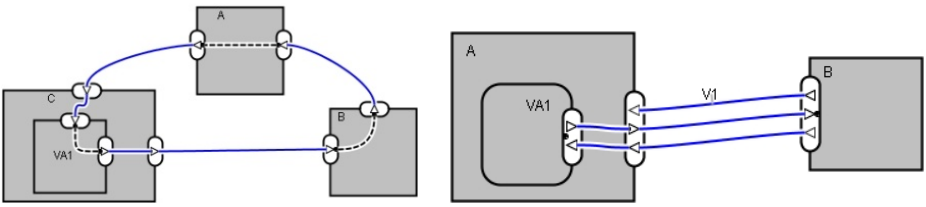

Fig. 2. (a) A non-balanced sound network and (b) a balanced non-sound network

The network in Fig. 2b is balanced but not sound. It is not sound for two reasons: (a) because of a missing value activity in actor B that could close the value cycle, and (b) value object V1 is not part of a value cycle.

3.2 Balancing and Reciprocity

Balancing is related to the reciprocity principle formulated in [1:111] as follows: "A value interface should consist of two reciprocal offerings". This guideline is adhered to quite strictly in Gordijn's dissertation, but has been relaxed sometimes in later work. One reason is that a service bundle may include many offerings. Some of these offerings, such as after-sales support, do not stand in a 1-1 economic exchange duality with a counter offering. Another reason is that the reciprocity makes sense both from a social point of view, as human exchanges strive for symmetry, and as an economic principle, but these two are not the same. We suggest that value transactions are used for those cases where there is a strict economic reciprocity. Consider for example the Google search case, where a web user gets a search service without paying for it. This is not an economic transaction. However, the "attention to advertisements" is one thing that the user returns. If we add this value exchange, the value interfaces (at both sides) are balanced, according to the definition above, but we suggest not modeling a value transaction here.

To turn the value network of Fig. 2a into a balanced network, one of the actors, e.g. C, could be changed into an intermediary. Then instead of B exchanging a value object to A directly, he returns it to C, who forwards it in some way to A.

3.3 Soundness and Causality

To turn the value network of Fig. 7b into a sound value network, the designer has to ask for the added-value of V1. Assume that the transaction is a simple "goods for money" exchange between provider A and customer B, and V1 stands for personal data that B provides as part of the transaction. The added-value of V1 could be that A aggregates the personal data and sells it to a third party. The money received in return is invested into the sales activity (VA1) and so benefits the customer via the goods that he buys. This closes a value cycle, once we have also added a value activity "consume" inside B that produces the value object V1. In Fig.3, we have used two line formats to distinguish the two value cycles in this network. Together, they cover all value exchanges, so the network is sound.

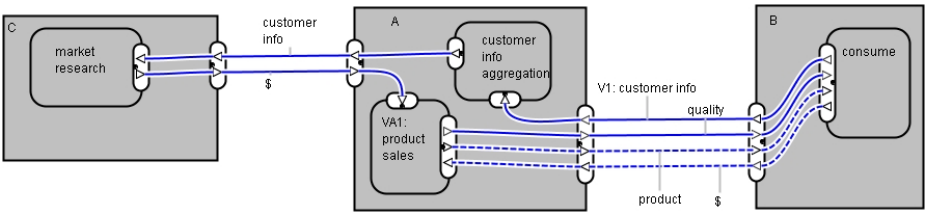

Fig. 3. A sound version of network 2(b), after some extensions

There is a close relationship between value cycle and the concept of scenario path. Both try to capture the causality principle, but in slightly different way. When the

value network has only reciprocal transactions, it can be easily verified that each scenario path corresponds to a value cycle (perhaps some value activities must be added). Just follow the path from start stimulus to end stimulus and back. If it is also the case that *each* value exchange between actors is covered by a scenario path – note that this is currently not a requirement in e3value –, the value network is sound. However, the value chain requires transformations of value objects to be explicitly represented as value activities. The difference reflects a subtle difference in perspective on value creation. Value is not only created in economic transactions (value-in-exchange), but also in the combination of different resources to produce something new (co-creation of value). The first kind of value creation is valid for instance for trading companies, but when innovation is becoming a strategic concern, the second kind of value gains in importance.

Scenario path modeling is supported by Use Case Maps that include AND and OR splits. We did not define something equivalent for value cycles (yet). A scenario path with OR splits can be seen as an abstract representation of several value cycles. A scenario path with one or more AND splits corresponds to one (complex) value cycle.

4 Application

To illustrate the methodological use of the balanced and sound properties, consider the "free Internet" example from ([1]. Fig. 4(a) is the initial e3value model. The internet user gets free internet access. This model is not balanced, so we search for a reciprocal value object. In this particular case (the early days of Internet), the Internet provider has a deal with the telecom provider that he gets paid for connections he establishes, a so-called termination fee. So the value object returned by the internet user is the termination, cf. 4(b). To close the value cycle, value activities are inserted, as in 4(c).

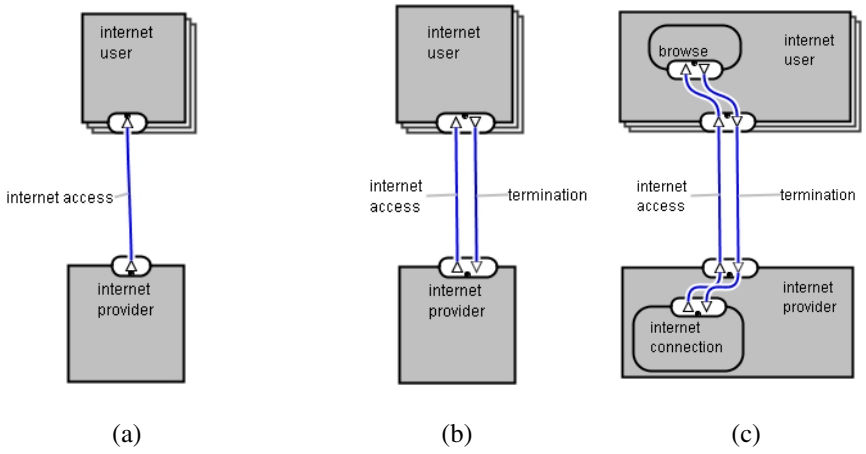

Fig. 4. Free Internet example (a) initial (b) balanced, (c) sound

Although 4(c) is a sound network, it is not clear how the termination is generated by the Internet user, and how it is turned into Internet access at the provider. This leads to an expansion of the model depicted in Fig. 5. Here the termination is traced back to a "call" activity (not free for the browser) and the termination is forwarded to the telecom provider, to boost his connection service (which is also used to serve the "call" from the user). In the resulting model, every value exchange is part of one big value cycle, paraphrased as: (browse) Internet access (internet connection) $ (connect service) termination – connection (call) connection (connect service) $ (call) $ (browse) (value activities are put between brackets and we omit identifications of the value interfaces). It should be noted that this kind of value network is just one possible business model for (early day) Internet providers.

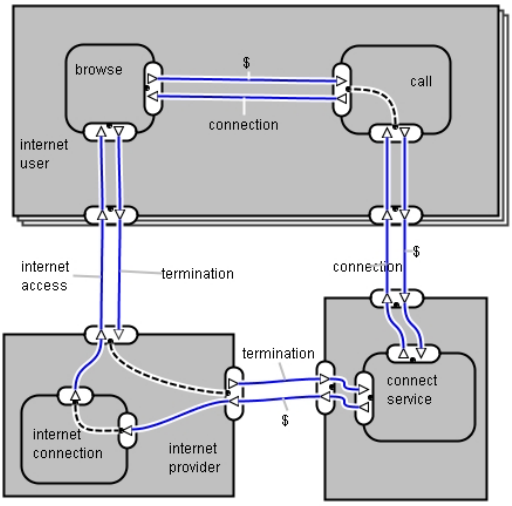

Fig. 5. Free Internet value network complete, equivalent to [1:49]

The two properties "balanced" and "sound" help to make better and more complete value networks. Still, the completeness is relative. It is possible to model a manufacturing company as a value actor with one value activity, "production", with money inflow and a product outflow. In a more complete picture, the manufacturing company uses the money inflow to buy raw material and other resources to support the production. However, every model is bounded, so we do not require the value activity "production" to be decomposed.

A second example is the eye treatment case of Henkel & Perjons [3]. The three actors in this case are the primary health care unit, the patient and the hospital (Fig. 5). First thing to note is that the network is balanced. The value activities are missing, but when they are added, it is not hard to identify two important value cycles: the cycle patient self-care (patient fee+voucher) primary health care (investigation) patient self-care; and, patient self-care (patient fee+voucher) eye surgeon (eye treatment + recipe) patient self-care. Both are complex cycles as they involve some extra exchanges: the patient voucher (that is

used by the receiver for further reimbursements from the County Council) and the recipe. What is a bit more difficult is the role of the referral and referral answer. According to the authors, the referral is of value to the hospital as it will increase its income. However, this seems a bit artificial, as in most cases, referrals are necessary because of governmental regulations, and not meant as a marketing channel. It is not clear what the value is of the referral answer, apart from the fact that it creates balancing.

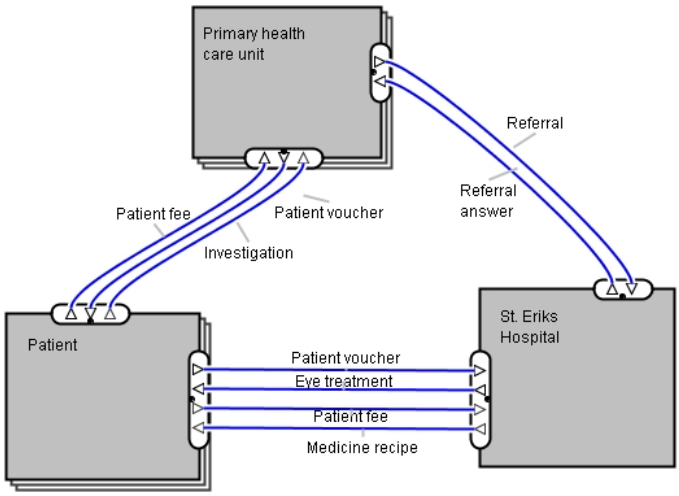

Fig. 6. The Eye Hospital case, taken from Henkel & Perjons [3]

An alternative approach is to view the *right* of referral as something of value to the primary health care units (protection of their market position), and, assumingly, this right is granted by the hospital (based on regulations). On the basis of this right, the health care unit provides a referral to the patient; this is of value as it allows him/her to get into the hospital. The referral is passed on to the hospital. It is not of value to the hospital, we assume, but that does not stop making it a value object, as it is of value to the patient. It can be a required part of the value transaction with the patient (required because of regulation). All together, this means that we can identify a third value cycle: (hospital referral control) right of referral (health unit service) referral (patient self-care) referral (hospital referral control). With this cycle added, the value network is sound. Note that the resulting network is not completely balanced, and that the third value cycle is rather different from the first two ones. This is probably due to the legal as opposed to economic nature of the value exchanges involved. More experience with inter-organizational value cycles is needed in order to get insight in the different patterns that can occur.

5 Conclusion

In this paper, some formal properties of value networks have been defined that can help to distinguish “good” from “bad” value models. The two properties sound and

balanced correspond to two basic e3value principles: causality and reciprocity. However, the two properties defined need not be the only ones. This is one topic for future research.

Although the concept of value cycle is not new, its application in an interorganizational setting can be seen as innovative. A traditional value cycle is typically a combination of a physical stream and a money stream. In the market exchange, the two streams get connected and make up a cycle. Services differ from goods, but can be modeled as resources in the stream as well. An interorganizational value cycle contains several parts, of several types. It may be interesting to look at these types in more detail. For instance, physical streams should cycle, sooner or later, for a sustainable network. For that reason, Fig. 3 is incomplete, and to make it complete, as least for the focal actor(s), a "product return" exchange could be added from B to A.

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