E^3-*value* in a Nutshell

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Abstract

Innovative e-commerce ideas have in common that they are hardly understood by the stakeholders involved, caused by hardly known products such innovative ideas contain by definition. For a better understanding of these ideas, we propose the e^3-*value* methodology, which helps in eliciting, analyzing, evaluating e-commerce ideas. This paper summarizes the e^3-*value* methodology, by explaining the concepts used to represent an e-commerce idea, and a by presenting a way of working with these concepts. The methodology is exemplified by a small running case study.

1 Introduction

Over the past few years, many innovative e-commerce ideas have been considered. Such ideas reveal new value propositions, which are enabled by new technological possibilities, such as the widespread use of the Internet and technologies on top of it.

During 1998-1999, the e-commerce hype reached its top. Recently, it became clear that many e-commerce ideas are not successful [11]. Many enterprises doing e-commerce have not been able to create profit with their e-commerce ideas. Some of these companies who relied entirely on future e-commerce profits have gone bankrupt.

An important reason for the failure of e-commerce ideas is the lack of a sound value proposition to customers. Moreover, many ideas did not contribute sufficiently to profitability of enterprises. Rather, many enterprises focused on maximizing market share and establishing a trusted brand name.

However, we still believe that many potential successful e-commerce ideas exist, which utilize enabling Internet related technical innovations in a profitable way. Moreover, some industries are forced to find new value propositions. For instance, the digital content industry is facing challenges with respect to new value propositions utilizing Internet technology, e.g. how to earn money by streaming music to an end-consumer's device.

A challenge in putting e-commerce ideas into operation, in addition to satisfying a profitability requirement, is that business *and* technology closely inter work. This greatly expands the e-commerce 'design space'. A new technological feature enables more than one business idea, while new business ideas are only possible if technological constraints are satisfied. This close interaction between on the one hand designing a sound value proposition and on the other hand designing an information system enabling this proposition is very typical for e-commerce projects, and results in more than only an information system or business design problem. Moreover, innovative e-commerce ideas tend to be formulated very vaguely initially. Such an idea is a statement about a combination of an innovative value proposition utilizing a new technological possibility, but it often lacks a precise description. As a result, many innovative e-commerce ideas are somewhat unfocused and inaccurate. This makes it different to put the idea into operation, and to develop a supporting information system. What is needed is an in-depth exploration process of an e-commerce idea, to understand the idea better as well as to formulate it more precisely, and to focus the idea into a direction that is feasible from an economical and technical perspective.

To facilitate such an exploration, we propose a methodology called *e*^{3}*-value* . This methodology has two main characteristics. First, it is a methodology, which recognizes the importance of *economic value*. Consequently, *e*^{3}*-value* analyses the creation, exchange and consumption of economically valuable objects in a multi-actor network. Second, *e*^{3}*-value* is founded on principles of multi-viewpoint requirements engineering and semi-formal conceptual modeling. Requirements engineering is the process of developing requirements through an iterative co-operative process of analyzing the problem, documenting the resulting observations in a variety of representation formats, and checking the accuracy of the understanding gained [9] *Multi-viewpoint* requirements engineering acknowledges that many requirements stem from a group of stakeholders with different foci (e.g. CxO's, marketeers, business process engineers, and IS-responsibles). This paper discusses one such a viewpoint, the *business value* viewpoint. The viewpoint captures who is doing business with whom, but does not say how this is accomplished. This is the subject of another viewpoint, capturing business processes. Viewpoints are expressed by semi-formal conceptual models. This enforces stakeholders to be precise in statements, but also allows for analysis and evaluation of the e-commerce idea.

Section 2 introduces the concepts we employ to describe a value model. In section 3 how we work with these concepts to come to a value model. Finally, section 4 raises questions for discussion.

2 The *e*^{3}*-value* ontology

The *e*^{3}*-value* methodology provides modeling concepts for showing which parties exchange things of *economic* value with whom, *and* expect *what* in return. These concepts are based on recent economics and business science literature on e-business [13, 6, 10] combined with formal ontology of systems theory [1]. The conceptualization of an e-business idea, which we call an e-business model, can be graphically represented (see for example figure 1). For diagramming purposes, the reader can download

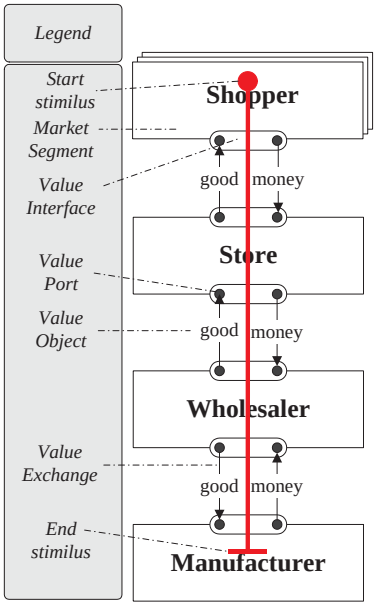

Figure 1: A shopper obtains a good from a store and offers money in return. So do the other actors. The scenario path shows that in reaction to a start stimulus (a consumer need), the store needs to buy a good also, and so does the wholesaler.

a VISIO tool stencil from our website at http://www.cs.vu.nl/˜gordijn/research.htm. What follows is a summary of the most important concepts.

Actor. An actor is perceived by its environment as an independent economic (and often also legal) entity. An actor makes a profit or increases its utility. In a sound, sustainable, e-business model *each* actor should be capable of making a profit.

Value Object. Actors exchange value objects, which are services, products, money, or even consumer experiences. The important point here is that a value object is *of value* for one or more actors.

Value Port. An actor uses a value port to show to its environment that it wants to provide or request value objects. The concept of port enables us to abstract away from the internal business processes, and to focus only on how external actors and other components of the e-business model can be 'plugged in'.

Value Offering. A value offering models what an actor offers to or requests from his/her environment. The closely related concept *value interface* (see below) models an offering to the actor's environment *and* the reciprocal incoming offering, while the value offering models a set of equally directed value ports exchanging value ports. It is used to model e.g. bundling: the situation that some objects are only of value in combination for an actor.

Value Interface. Actors have one or more value interfaces, grouping individual value

offerings. A value interfaces shows the value object an actor is willing to exchange *in return for* another value object via its ports. The exchange of value objects is atomic at the level of the value interface.

Value Exchange. A value exchange is used to connect two value ports with each other. It represents one or more *potential* trades of value objects between value ports.

Market segment. A market segment is a concept that breaks a market (consisting of actors) into segments that share common properties [8]. Accordingly, our concept *market segment* shows a set of actors that for one or more of their value interfaces, value objects equally from an economic perspective.

Composite actor. For providing a particular service, a number of actors may decide to work together, and to offer objects of value jointly, using *one* value interface to their environment. We call such a *partnership* a composite actor.

The concepts above allow us to model who wants to do business with whom, but can not represent *all* value exchanges needed to satisfy a particular end-consumer need. It occurs often that, to satisfy an end-consumer need, numerous other actors have to exchange objects of value with each other. As an example think of a store that exchanges economic values with an end-consumer: as a result, the store must also exchange values with a wholesaler. It is our experience that showing all such value exchanges to satisfy an end-consumer need contributes largely to a common understanding of an e-business idea. To that purpose we use an existing scenario technique called Use Case Maps (UCMs) [2]). UCMs show which value exchanges should occur as a result of a consumer need (which we call a start stimuslus), or as a result of other value exchanges. Below, the main UCM modeling constructs are briefly discussed.

Scenario path. A scenario path consists of one or more segments, related by connection elements and start and stop stimuli. A path indicates via *which* value interfaces objects of value must be exchanged, as a result of a start stimulus, *or* as result of exchanges via *other* value interfaces.

Stimulus. A scenario path starts with a **start stimulus**, which represents a consumer need. The last segment(s) of a scenario path is connected to a **stop stimulus**. A stop stimulus indicates that the scenario path ends.

Segment. A scenario path has one or more segments. Segments are used to relate value interfaces with each other (e.g. via connection elements) to show that an exchange on one value interface causes an exchange on another value interface.

Connection. Connections are used to relate individual segments. An **AND fork** splits a scenario path into two or more sub paths, while the **AND join** collapses sub paths into a single path. An **OR fork** models a continuation of the scenario path into one direction that is to be chosen from a number of alternatives. The **OR join** merges two or more paths into one path. Finally, the **direct** connection interconnects two individual segments.

3 The *e*^{3}*-value* way of working

Figure 2 presents the main steps we carry out to explore an innovative e-commerce idea from a value modeling perspective.

Step 1: *Have an innovative e-commerce idea.*
An exploration track starts with a vaguely articulated e-commerce idea. This idea is typically formulated by one or two sentences. We assume that this idea exists already in the mind of stakeholders. How to find and create such an idea is outside the scope of our research. Therefore, our approach must not be seen as a recipe to find new e-commerce ideas, but rather as an approach to explore, clarify and evaluate such ideas, as well as to find variations.

Although we assume the existence of an idea, it is our experience that during construction of a value model, stakeholders find other, new, e-commerce ideas themselves. This is a side effect of discussions between stakeholders to create a value model for the e-commerce started with. Figure 2 presents this effect by showing a feedback from the activity comprising the construction of a value model, to having the e-commerce ideas.

Step 2: *Construct a value model and set up a baseline.*
An e-commerce idea is used to construct a value model, which explains the idea by stating the actors involved, and the objects of value created, distributed and consumed by these actors. It serves as a baseline for finding alternatives as well as for evaluation. Value models are expressed using *e*^{3}*-value* concepts and scenario paths (see section 2).

Construction of a baseline value model takes a number of steps, which are detailed in [5], including guidelines how to perform these steps. Below, we briefly report on these steps.

Scenario identification. Scenarios are at this point short sentences, denoting the product, service, or experience desired by a *customer*. Scenarios are elicited by using the e-commerce idea as a starting point. This idea should contain fragments of or indications to product/services wanted by someone. By asking actors to formulate a scenario by taking a customer perspective, we increase the chance that products and services are really wanted by them. It is our experience that many stakeholders have products or services in mind they want themselves, rather than those wanted by their customer. A similar approach is also suggested by [13].

Actor identification. A list of actors is created, initially based on the actors initiating the idea, and the (end)-consumers they have in mind. After a number of cycles, some actors have been removed or added to this list. Actors are mentioned by listening their company name, or in the case of end-consumers by the role they play.

Actor versus market approach. After the actors are known, the next step is to state what actors are producing, distributing and consuming, and to identify what they want in return for objects they deliver. We distinguish two approaches for doing so: (1) the actor driven track, and (2) the market driven track.

The *actor driven* track starts with *one key actor* in the e-commerce idea, identifies the actor's offerings to and from his/her environment, and related concepts such as

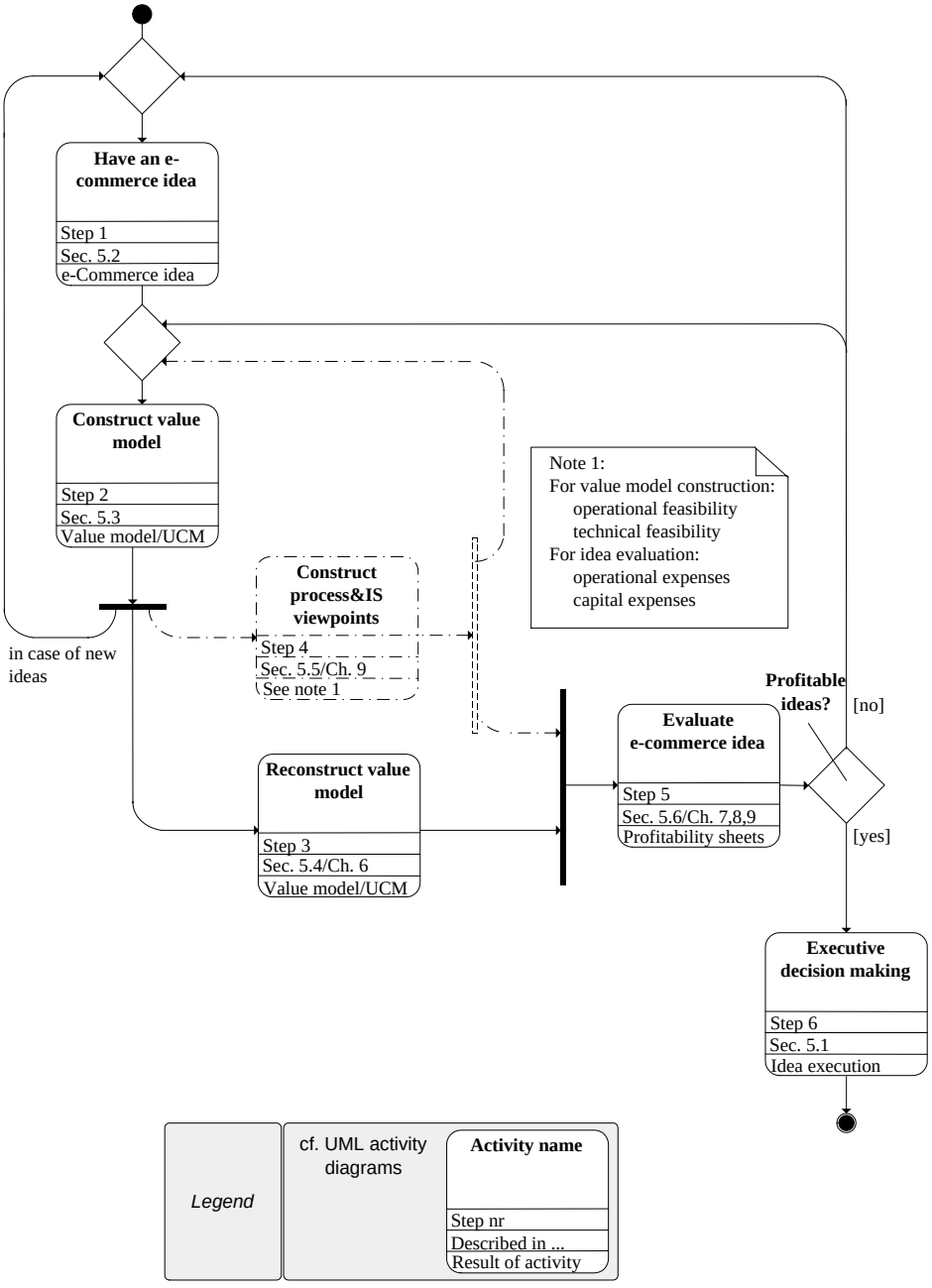

Figure 2: Exploring an e-commerce business idea: a value viewpoint perspective.

value interfaces, value ports and objects. Hereafter, value exchanges with other actors are identified.

In contrast, the *market driven* tracks starts with the *overall picture* of an e-commerce idea. First the value exchanges which should exist in the overall actor network are identified, as well as the objects exchanged. These exchanges are used to derive the individual actor's value interfaces, offerings, and ports. We choose for the actor driven track if an e-commerce idea is initiated by one key actor. A market driven track is useful if the e-commerce idea is initiated by a number of actors, who act as consortium in exploring and implementing an e-commerce idea. In such a situation, the e-commerce idea can not be pinpointed to a single actor.

Value object/ports and value offerings/interfaces identification.

- *Identify value objects and ports.* We use a number of guidelines to find value objects and ports: (1) the e-commerce idea and scenarios should trigger value objects, (2) actors want something in return for value objects they offer (economic reciprocity), and (3) actors need to obtain other value objects to offer a value object themselves (causally related value objects). By iteratively applying these heuristics, a number of value objects can be found, otherwise the e-commerce idea is stated wrongly, e.g. in terms of operational process rather than in terms of valuable products for customers.

- *Group value offerings into value interfaces.* To find value interfaces we use the following guidelines: (1) a value interface consists of two opposite offerings, and (2) causally related offerings are *not* grouped into a value interface. It is our experience that in nearly all cases, a value interface consists of two opposite directed offerings. The direction of an offering is equal to the direction of its ports. The reason for this guideline is that a rational actor only is willing to exchange an object o_{out}, if s/he obtains another object o_{in} in return. Two offerings are causally related, if a port in the first offering is causally related to a port in the second offering. Two ports are causally related if, in order to produce a value object o_{out} by a port, a value object o_{in} must be obtained by the other port. An actor does so by performing a value activity: s/he adds value to object o_{in}, resulting in object o_{out}.

Value exchange identification. A market oriented track starts with the identification of value exchanges rather than ports. The difference between both tracks is that during the actor oriented track, we ask for a specific actor what s/he offers and request *to and from his/her environment* (other actors), while during the market oriented track, we ask a number of actors (in many cases two or three actors), what they offer *each other*. Similar guidelines as the aforementioned guidelines for finding ports following an actor oriented track can also be used to find value exchanges by using a market oriented track.

Scenario path identification. A scenario is modeled using one or more scenario paths. Scenario paths show which value objects need to be exchanged via actors' interfaces as a result of the execution of a scenario. As such, scenarios paths are traces through a use case map. To identify scenario paths, we first have to construct one or more use case

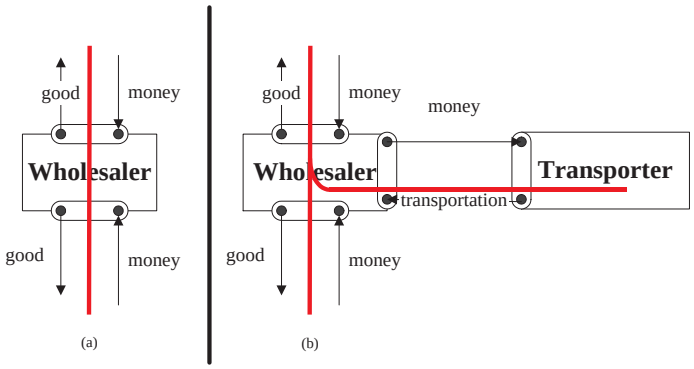

Figure 3: A wholesaler (see also Fig. 1) sources the transportation of goods out to a transport company and pays a fee for transportation. This is called *activity* deconstruction, because the value adding activity of the wholesaler is split into smaller ones, which each can be assigned to different performing actors.

maps on top of the value model, and hereafter we have to identify the paths through such maps. Essentially, use case maps are developed by taking a start stimulus and finding value exchanges an actor must do, to fulfill needs expressed by such a stimulus.

Step 3: *De & and reconstruct a value model: find variations.*
If a value model is known, it can be used to find variations. A way to find such variations is to *deconstruct and reconstruct* a value model. Deconstruction and reconstruction takes the following steps (see [5] chapter 6 for a more detailed discussion). First, we deconstruct value objects and ports into smaller value objects and ports to find smaller portions, which can be requested or offered by an actor from or to his/her environment, Second, we debundle value interfaces and value offerings, into value interfaces and offerings with a smaller number of value ports. Third, we deconstruct value activities into smaller value activities. Finally, we reassemble new value models, by assigning the newly found value activities to actors. Figure 3 exemplifies deconstruction of a value model.

Step 4: *Develop other viewpoints: process viewpoint and information system viewpoint.*
The focus in this paper is how to execute an exploration track from a value perspective. However, an e-commerce idea is information technology intensive and often requires a change in inter- and intra business processes, or a new design for these. Consequently, exploration of an e-commerce idea is not only about an economic value-based assessment of this idea, but also entails exploration of enabling information technology and business processes. We call this *multi-viewpoint* exploration (a concept borrowed from requirements engineering [12]). At least the value-, process-, and information system viewpoint are worthwhile to explore, because these viewpoints yield insight in substantial revenues or expenses. How to explore other viewpoints than the value viewpoint

is not a topic of this paper. However, the outcomings are important. On the one hand, these viewpoints can indicate whether a value model is operational and technical feasible. As such, exploring these viewpoints may cause changes in a value model. We discuss in [4] how the exploration of a security viewpoint influences the value model at hand. On the other hand, exploration of process and information system viewpoints yields knowledge about operational and capital expenses, which are of use to construct profitability sheets.

Step 5: *Evaluate an e-commerce idea: is the idea profitable?*
Evaluation of an e-commerce idea focuses on the question whether an idea is feasible from an economic point of view, that is whether an idea is profitable for each actor involved. It is our experience that *numbers* on profitability *themselves* are not are very useful for stakeholders involved, because it is not possible to predict profitability numbers for innovative e-commerce ideas accurately. Results of exploiting such innovative ideas are unknown by definition, which makes it very difficult, if not impossible, to estimate important numbers to determine profitability, e.g. the number of scenario occurrences per timeframe. What is however important for stakeholders, is to *reason* about profitability, and to do a sensitivity analysis. This contributes to a better understanding of the e-commerce idea, in this case from a profitability perspective. To do so, we (1) create profitability sheets for each actor involved in the value model, (2) ask actors to assign economic value to objects delivered and received, and (3) use evolutionary scenarios to determine effects of expected changes in the future that influence profitability.

Profitability sheets. Profitability sheets are constructed for each actor involved, and present revenues and expenses associated with the execution of the e-commerce idea under consideration. An example profitability sheet is shown in Table 1. It contains for each actor value objects flowing into- and out as a result of scenario path execution. Profitability sheets are found by following for each scenario the scenario paths. Each time the path crosses a value interface, value objects are entering and leaving an actor. These entering and leaving objects are shown in the sheet for that actor. Other viewpoints (e.g. the business process and information system viewpoint) may result in expenses and thus in changes in the profitability sheet for the actor making these expenses.

Valuation by actors. After a profitability sheet for each actor has been constructed, actors are asked to assign economic value to objects flowing into or out themselves. We then can calculate profitability numbers for each actor. Note that if we only calculate this 'profitability' for the value viewpoint, we do not take in account operational expenses as a result of executing business processes and exploiting an information system. Also, investments needed are not part of this profitability number. However, if for one of the actors profitability is less or equal to zero, the e-commerce idea is not likely to be profitable for such an actor, given the identified model and estimations on scenario occurrences, on scenario path likelihoods, and on valuation of objects by actors. We distinguish two actor types, who assign economic value to objects in a different way:

Table 1: Example profit sheet for the store in Fig. 1.

Actor	*Store*	
Scenario	*Buy a good.*	
Occurrences/timeframe	20,000 per month	
	Value Object In	*Value Object Out*
Scenario path	*1*	
Likelihood	100 %	
	Euro $price_{sale}$ good	good Euro $price_{buy}$

1. enterprises: these are actors who produce, resell, or distribute objects to *make profit*, or at least to cover their expenses. For these actors we only consider value objects which represent fees (as is suggested by standard economic investment theory [7]). Value objects being goods are supposed to enter and leave the actor, so these do not substantially effect profitability numbers.

2. end-consumers: these are actors who do not resell value objects, but use obtained objects to *create economic value* for themselves. In [8] end-consumers choose for the object that delivers the most utility per Euro, if s/he is a rational acting person. This is in axiology literature also known as *consumer value* maximization [6]. As a consequence, to assess to what extent an end-consumer maximizes his/her consumer value, we need to know how an end-consumer assigns economic value, especially to non-monetary objects. We do so by a multi-criteria quantitative valuation scheme, based on Holbrook's axiology.

Evolutionary scenarios. The profitability for each actor estimated by using profitability sheets, valuation functions, and scenario occurrences and path likelihoods, may differ substantially from reality, during execution time of an e-commerce idea. There can be various reasons for this, such as incompleteness in identified factors that influence the value of an object or uncertainties (e.g. in the number of forecast scenario occurrences).

Consequently, it is more useful to reason about these profitability numbers rather than to suppose that they are an accurate forecast of reality. To facilitate reasoning about profitability sheets we employ *evolutionary* scenarios. In contrast to *operational* UCM scenarios, which describe behavioral aspects, evolutionary scenarios describe events which are expected to possibly occur in the future. As such, effects of events underlying risks and structural uncertainties are analyzed, as well as effects of wrong estimations. Evolutionary scenarios can be found in e.g. a change in the value model (actors entering or leaving the model), wrong estimations on the valuation or objects, or incorrect number on forecast scenario occurrences. As an example, in Table 1 we assume 20,000 scenario occurrences per month; an evolutionary scenario can be an underperformance, e.g. only 10,000 occurrences per month.

4 Further research

In this paper, we have summarized the *e*^{3}*-value* methodology. The focus is on the exploration, analysis and evaluation of the value model. However, as we already indicated, other viewpoints, such as the inter- and intra organizational business processes as well as the enabling information technology are also needed to explore and assess an innovative e-commerce idea. These viewpoints may reveal substantial expenses and can also show barriers which hinder implementation of the idea.

A first question for further research is which additional viewpoints are important for idea exploration. Can these viewpoints be identified in advance, or should viewpoint identification be part of the *e*^{3}*-value* methodology itself.

Secondly, viewpoints themselves may interrelate. Decisions made on the value viewpoint influence decisions to be made on other viewpoints. Can we articulate these interrelationships more precisely, so that we are able to detect conflicts in decisions made on each viewpoint, and that we can trace related decisions clearly?

Thirdly, the methodology itself needs more validation. It has been developed using an action research approach [3], but more use of the methodology is needed to generalize results properly. To this end, the *e*^{3}*-value* methodology is now used in two EC-funded projects: OBELIX, aiming at an ontology based development of e-goods and services, and BUSMOD, with a focus on the exploration of innovative business ideas in the energy sector. Additionally, these projects yield automated tool support, which is needed to do e-commerce idea modeling, analysis and evaluation in a reasonable timeframe.

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