Developing a domain-specific cross-organizational RE method

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Abstract

Cross-organizational requirements engineering (XRE) is the activity in which several business actors perform a joint problem-solving process in which a cooperative, cross-organizational business solution is designed. In XRE, partially conflicting concerns and views must be reconciled to create a shared vision of the goals and structure of a cooperative process. In this paper we report on the development of an XRE method, BusMod, by means of action research. Each iteration of our action research cycle consisted of a series of consultancy projects in which our method is used, followed by a reflection to draw lessons learned to improve the method. Although BusMod has been developed in the domain of electricity power generation, we hypothesize that it can be generalized to any domain of cooperating actors, and that in any such domain value engineering must be part of requirements engineering.

1 Introduction

Cross-organizational requirements engineering (XRE) is the joint activity of independent businesses to determine the desired properties of some technical solution that supports cooperative work among them. An example of a XRE process is the joint analysis of a newspaper, a telecom operator, a web page hosting company and an Internet service provider to elaborate the business case for the on-line sale of news articles and derive requirements on IT support and business process design from this.

Characteristic of XRE is that the cooperating actors have different and often conflicting concerns, terminology, and views of the world. There is no single consistent set of goals against which requirements can be validated: What is good for one actor may be bad for another. In addition, the different actors use language that can be incomprehensible to each other or, worse, sounds the same but means something totally different for the different actors. To solve this problem, the $e^3$-value XRE method has been developed and tested in a series of four action research projects, reported on in earlier publications [11, 12, 13]. Basically, $e^3$-value is a method for exploring an incompletely formulated e-business idea with all stakeholders. It introduces a number of simple conceptual modeling techniques, that can be understood by both engineers and managers of the companies involved.

The $e^3$-value method was used by the developer of the method (Gordijn) as a consultant to help companies explore a business idea concerning the on-line delivery of a product, such as music or news. However, when an attempt was made in a new project to let others use the method, and let them use it in a domain where delivery of products does not take place through the Internet, namely in the domain of electricity power generation, new problems were encountered and consequently new lessons were learned. This led to a simplified and domain-specific XRE method called BusMod. This paper reports about the development of BusMod.

BusMod is not particularly software-oriented. Nevertheless, we think the scope of RE is wider than just software requirements engineering, and that the lessons learned in the development of BusMod are relevant for software RE as well as for other kinds of RE. We will also argue that any goal-oriented RE method such as BusMod, must include a value analysis that borrows techniques from marketing and business science. This paper therefore imports several techniques from these areas into RE.

In this paper we report on the two action research iterations that led from $e^3$-value to BusMod. In section 2, we briefly introduce the reader to the domain of distributed electricity power generation. Section 3 presents our action research method, summarizes the $e^3$-value method, reports on its use in our first action research cycle and draws lessons learned from this. This lead to the definition of BusMod, which in a second action research cycle was then used in four consultancy projects. This is reported on in section 4.
Section 5 concludes the paper with a discussion of the hypotheses that BusMod is a method for XRE, and that any XRE method should contain a value engineering task.

2 Distributed Power Generation

Currently, the European electricity power industry is in a disruptive transition: The market changes from a few monopolistic supply-side players per country with life-time customers, to thousands of supply-side enterprises, with customers who can switch among electricity providers. This change is motivated by the demand to increase overall industry efficiency, and by an increasing social awareness of the need to reduce environmental impact of electricity generation and consumption.

In order to meet the goals of higher efficiency and reduced environmental impact, the trend is to build more intelligence in devices that switch themselves on or off at the most efficient time, and to use a network of small scale electricity power generators such as PV-solar cells, hydro power generators, wind mills and other devices. This will create a network of small scale generators and intelligent devices, called the distributed generation (DG) network. The DG network in turn spawns new services and enterprises. For example, balancing services facilitate the management of consumption and production of energy so that energy produced continues to exceed energy consumed.

The net effect is an industry that changes from a few big players to many small players with new products and services. Question is how to develop such new propositions?

3 First Action Research Cycle: The Iberdrola project with the e³-value Method

3.1 Action Research

Action Research is a scientific research design [22, 4] that provides a specific framework for carrying out research such that it is not only academic, but also relevant and useful to professional practitioners in the field. This is an important issue that has been repeatedly stressed also in RE, recently by [9] and [16]. Although there are different traditions in Action Research, it has two common characteristics: (1) it is a collaborative process involving researchers as well field practitioners (which sets it apart from the positivist ideology in social sciences of statistical hypothesis testing with the researcher in the role of pure external observer); (2) it involves an iterative or spiral approach including research-based problem clarification and analysis, field action intervention, and reflective learning [24, 6]. Action Research caters for open-ended problems that are poorly defined and ill-structured, and is strong in explaining what goes on in organizations [2]. Thus, it is well suited as a research design for many RE problems, including the (inter-)organizational process of DG service & product development.

Figure 1. First Action Research Cycle.

Figure 1 presents a first Action Research cycle with a focus on exploration of the DG problem situation. The research theme is ‘Business modeling in a world characterized by distributed generation’. Checkland [6] states that the researcher should articulate a real-world problem that can be addressed with a framework $F$ and a method $M$. $F$ provides concepts to structure the situation and $M$ provides guidelines to perform actions in the situation. We use $e³$-value as research framework because $e³$-value was developed for the exploration of innovative e-commerce ideas, which involves creating a shared understanding and concerns across multiple enterprises, as we need to do in the DG domain. $M$ is the method presented in [12] and Section 3.3. We performed two parallel iterations through the Action Research cycle with $e³$-value, using two different companies. One of these is reported on here.

3.2 The Iberdrola Project

To finance the relatively high investments for renewable energy, the Spanish government subsidizes “renewable electricity producers”, defined as electricity generation plants of less than 50 MW capacities that generate electricity using renewable energy sources. The subsidy system works according to three rules. (1) The subsidy is paid according to the amount of the renewable electricity produced. The money for the subsidy comes from the final customers: They pay an additional fee for electricity consumed (regardless whether it concerns renewable or not-renewable electricity). (2) Suppliers are obliged to give priority to the renewable producers, and to purchase all the energy these want to sell, before they can purchase the energy from regular producers. (3) There are tax exemption schemes for
investments into some renewable technologies. Note that stakeholders were only able to articulate the idea after using the e3-value methodology, not before.

3.3 The e3-value Method

To explore the aforementioned DG business idea, we used the e3-value methodology. The e3-value method [12] allows creation of a shared understanding of a business case by constructing a value model, which represents the case graphically as a set of value exchanges and value activities performed by business actors, and by a financial profitability analysis, which gives an estimation of the profitability of the value activities for each actor. The e3-value approach is a lightweight approach; in business development tracks, value models should be constructed in a short time frame, and the same holds for the DG-cases.

Value models. Figure 2 shows a value model for Iberdrola project in Section 3.2. It uses the following concepts.

Actor. An actor is perceived by its environment as an independent economic (and often also legal) entity. An actor intends to make a profit or to increase its utility. In a sound, sustainable, business model each actor should be capable of making a profit. In Figure 2, the Distribution System Operator (DSO) is an actor.

Value Object. Actors exchange value objects, which are services, products, money, or even consumer experiences. A value object is of value to at least one actor. In Figure 2, Electricity and Electricity fee are value objects.

Value Port. An actor uses a value port to show to its environment that it wants to provide or request value objects. A value port has a direction, namely outbound (e.g. a service provision) or inbound (e.g. a service consumption). A value port is represented by a small arrowhead that represents its direction.

Value Exchange. A value exchange connects two value ports of different actors with each other. It is one or more potential trades of value objects between these value ports. A value exchange is represented by a line connecting two value ports. Note that a value exchange may be implemented by a complex business interaction containing data transmissions in both directions. The direction of a value exchange is the direction of value exchange, not the direction of data communications.

Value Interface. A value interface consists of one or more value port to an actor’s environment and the reciprocal incoming ports. An actor has one or more value interfaces. The exchange of value objects across one value interface is atomic. A value interface is represented by an ellipsed rectangle.

Market segment. A market segment is a set of actors that for one or more of their value interfaces, ascribe value to objects equally from an economic perspective. Naturally, this is a simplification of the real world, but choosing the right simplifications is exactly what modeling is about. A market segment is represented by a stack of actor symbols. Final customer is an example of such a segment.

Value Activity. A value activity is an activity performed by an actor that is expected to be profitable for that actor. There are no value activities represented in Figure 2.

With the concepts introduced so far, we can explain who wants to exchange values with whom, but we cannot yet explain what happens in response to a particular end-consumer need. Showing all value exchanges triggered by the occurrence of one end-consumer need, considerably enhances a shared understanding of an e-business idea. In addition, in order to do profitability computations, we must count the number of value exchanges triggered by one (series of) consumer needs. For this purpose we include in the value model a representation of dependency paths between value exchanges. A dependency path connects the value interfaces in an actor and represents triggering relations between these interfaces. A dependency path has a direction. It consists of dependency nodes and connections.

Dependency node. A dependency node is a stimulus (represented by a bullet), an AND-fork or AND-join (short line), an OR-fork or OR-join (triangle), or an end node (bull’s eye). As explained below, a stimulus represents a consumer need, an end node represents a model boundary.

Dependency connection. A dependency connection connects dependency nodes and value interfaces. It is represented by a link.
Dependency path. A dependency path is a set of dependency nodes and connections with the same direction, that leads from one value interface to other value interfaces or end nodes of the same actor. The meaning of the path is that if a value exchange occurs across a value interface, then value interfaces pointed to by the path that starts at this interfaces, are triggered as well. If a branch of the path points to an end node, then no interfaces are taken into consideration anymore.

When an end-consumer generates a stimulus, then this triggers a number of value interfaces of the consumer, that are connected to value interfaces of other actors by value exchanges. Those other value interfaces are therefore triggered too, and this in turn triggers more value interfaces as indicated by dependency paths. To compute the profitability for each actor involved, we follow the paths determined by the value exchanges between actors and the dependency paths inside each actor.

The concept of a dependency path is reminiscent to that of use case maps [5], but it has a different meaning. A use case map represents a sequential scenario. Dependency paths represent coordination of value interfaces, and dependency paths in different actors may among each other not have an obvious temporal ordering, even if triggered by the same stimulus.

Figure 2 shows the logic of Spanish renewable energy consumption. The final customer in the figure is any legal or natural person buying electricity for its own use. The final customer can obtain electricity in exchange for a fee. When this happens, the supplier must do four things (a). It obtains distribution capacity from DSO in return for a distribution fee (i). DSO operates the medium-voltage, short distance transportation grid. It must also obtain high voltage, long distance transmission capacity from the Transmission System Operator (TSO) in return for a transmission fee. Third, the supplier pays renewable energy source (RES) taxes to the National Energy Committee (NEC) and so satisfies a regulatory arrangement (g). Finally, the supplier obtains energy (b). This can be obtained from a non-renewable producer (c) or from a renewable producer (d). If obtained from a renewable producer, then an electricity fee plus a subsidy is paid (e). The supplier obtains the latter fee from the NEC in return for its choice to use renewable energy (f).

Profitability sheets. Using the value model, we can compute the expected net cash flow based on the consumer need (in this specific the amount of KWh electricity consumed). To calculate profitability for each actor we (1) assign a formula to each value object exchanged denoting a monetary fee, and (2) extract the total value of the outgoing money objects from the total value of incoming money objects, using the dependency paths to combine values exchanged across different interfaces of one actor. The result is summarized in profitability sheets, one per actor. Table 1 shows a fragment of the profitability sheet for the supplier. Note that for a sustainable DG case, each actor needs to have a positive net flow at least.

Because the value models and profitability calculations are subject to uncertainty, we perform a sensitivity analysis to discover potential strengths and weaknesses in the case at hand. Also for reasons of brevity, this sensitivity analysis is not shown in this paper. It can be found in [17].

### 3.4 Reflective learning

Two enterprises, Iberdrola and SINTEF, were given a course on $e^3$-value and then subsequently explored their DG business idea using the $e^3$-value methodology. During their exploration, participants had the possibility to ask us for help, and we actively reviewed and commented on their value models. After a number of iterations this resulted into a model that, according to the enterprises, represented their business idea. We here describe two of the lessons learned in this process.

#### Lesson 1: It is hard for participants to conceptualize their DG business idea.

We experienced the following problems.

1. **The $e^3$-value concepts and supporting modeling process are too abstract.** The $e^3$-value concepts are based on established concepts in Business Science. They are fairly general and can be used for any business domain. Our participants are business developers of electricity industry companies. In many cases, they have an electrical engineering background, sometimes with MBA-level courses. They found it difficult to apply these general concepts to their specific DG context.

2. **No shared understanding of the electricity industry and DG domain.** In the DG domain, examples of value activities are Supply, Distribution, Transportation, Balancing and Generation. Sometimes, the participants have a different interpretation of these activities, or they assign different names to a same interpretation. For instance, some consider Supply as an activity to provide electricity to an end-consumer, whereas others

<table>
<thead>
<tr>
<th>Actor</th>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exchanges with</strong></td>
<td><strong>Value object</strong></td>
</tr>
<tr>
<td>Final customer</td>
<td>In: Electricity retail fee: 97.370.041</td>
</tr>
<tr>
<td>TSO:</td>
<td>Out: Transmission fee: 2.947.299</td>
</tr>
<tr>
<td>DSO:</td>
<td>Out: Distribution fee: 24.124.192</td>
</tr>
</tbody>
</table>

**Table 1.** Part of Supplier’s profitability sheet.
see Supply as a commercial selling act only, and see Distribution as the activity comprising physically delivering electricity. The e³-value methodology is only of limited help here, because it merely prescribes that stakeholders have to identify value adding activities, but does not provide domain specific hints on how to do so.

3. Poor understanding of the DG idea. An important explanation why conceptualization is felt to be hard, is that the participants themselves do not understand the DG idea well. Clarifying the idea and reaching a shared understanding is precisely the purpose of using the e³-value modeling method. We have assisted the participants intensively during this first Action Research cycle, and in many cases participants were not able to formulate clear answers. For instance, in the Iberdrola project, the participants did not succeed in explaining the subsidy scheme (including revenue streams) clearly. The value model assisted in a more precise understanding. It showed that some enterprises would make significant loss, assuming the information supplied by the participants was right.

   Proposed remedies. If participants should contribute more significantly to conceptualisation of their DG business idea, a more domain specific method is required. First, the participants indicated that a library of domain specific concepts (e.g. specific types of DG value activities and actors) are useful. Consequently, the participants themselves did and extensive DG domain analysis with respect to existing [10] and future DG-business scenarios [20]. We used these analyses to construct a library of value model fragments (see also Section 4.2). An interesting observation here was that the expected future DG business scenarios hardly revealed new constructs in terms of e³-value actors, interfaces, activities or exchanges. These were nearly all found by analyzing the current scenarios. Future scenarios were almost all about different assignments of activities to actors, or bundling or unbundling of value interfaces (e.g. unbundling of electricity supply into physical electricity delivery and selling).

   Second, participants called for an easy to follow, stepwise process to construct value models, tailored to their DG domain. In Section 4.2 we present such a stepwise approach. Additionally, they asked for a more structured financial assessment approach based on the e³-value models constructed. Although this is an inherent part of the e³-value method, stakeholders found it difficult to do. A possible explanation is that it requires, besides conceptual modeling skills, significant investment & financial analysis skills.

Lesson 2: Difficult to motivate and explore a rationale for a DG business idea. The e³-value method is intended to explore innovative business ideas. Such ideas have in common that they are hardly known to the market [23]. Finding such ideas is a very creative process and falls outside the scope of the e³-value method. The method simply assumes the existence of a vaguely outlined business idea, and the method then supports the precise articulation of the idea. In contrast, our participants state that many DG business cases are driven by well known enterprise and social goals, such as decreasing the depletion rate of fossil fuel exhaustion, and reduction of CO₂ emission. In addition, DG ideas are enabled by availability of new technology, e.g. new generator technology, or new information & communication technology to control generators on a large scale. Our participants therefore desired support for the creation of DG ideas from an analysis of these social and technical developments.

   Proposed remedies. We developed (1) a taxonomy of strategic goals, and (2) a taxonomy of operational goals, and (3) a taxonomy of DG technology and identified patterns that relate these tese goals and technologies. These taxonomies are based on the extensive domain survey mentioned earlier [10, 20]. We discuss these taxonomies in Section 4.2.

4 Second Action Research Cycle: Four Energy projects with the BusMod Method

4.1 Action Research Revisited

Figure 3 shows a second Action Research cycle. The research theme is the same as in the first cycle (see Figure 1), but the problem situation we aim to address is more general. Whereas in the first cycle, we concentrate on exploration of two specific DG business cases, with the aim to learn how to develop a method for DG business idea exploration, we now take DG business idea exploration in general as our problem situation. To this end, we have developed a method, called BusMod (see Section 4.2) to do such exploration, based on the discussed e³-value method plus the learnings from the first Action Research cycle. This BusMod method is then used in four industrial projects to test and improve the method, again by reflective learning (see Section 4.3)

4.2 The BusMod Method

The BusMod method (see Figure 8) consists of a series of steps to be performed by DG-business developers (see also [17]). Each step is described by a number of tasks to do, questions to ask to stakeholders, and guidelines to use. Moreover, each step is illustrated by examples from the Iberdrola project. Additionally, the method consists of goal & DG technology taxonomies and a library of value model
1. **Business Idea Description.** The stakeholder is asked to state **concisely** his/her DG business idea. We have developed a description template that can be used to state the idea in structured English. This template calls for (1) a one-liner presenting the essentials of the idea, (2) a statement of scope (e.g., for DG the region is of importance), (3) the core business processes that are required for the idea, (4) the main enterprises (actors) involved, (5) potential DG and ICT equipment/components that may be required for the idea, (6) the ownership of equipment (DG ideas often require massive investments), and (7) regulatory incentives (some ideas lean on subsidy schemes).

2. **Goal Selection.** In this step, stakeholders representing various enterprises are asked to specify the goals a particular DG business idea may serve. To aid the goal specification process, we constructed two taxonomies of long-term strategic goals and short-term operational goals, respectively (Figure 4). Taxonomies are kept as simple as possible; most DG business developers are not skilled in constructing models.

3. **DG Technology Selection.** Understanding goals is important to select suitable DG-technology and to construct, in the next step, a value model. To help stakeholders with technology selection, we have two tables, again based on a DG-domain current and future business scenario analysis. Figure 5(a) presents properties of DG-equipment that can be used to select specific equipment, given strategic goals, by consulting Figure 5(b) (a similar table exists for operational goals). A filled diamond says that a property is important to reach a goal, a hollow diamond indicates the property is less important, and an empty cell says that the property is not needed to reach the goal. For instance, to contribute in reaching goal 'Reduce environmental emissions' (goal S2.1), DG equipment with low CO₂ emission is important, and all other properties are relatively unimportant.

4..9. **Value Model Construction.** To construct a value model, stakeholders decide what activities should be carried for a specific DG business idea, what their value interfaces are, how these are related by value exchanges, which dependency paths are relevant, and who will perform activities. General guidelines on constructing such a model can be found in [12]. To give domain-specific help, Bus-Mod contains libraries of value activities and value interfaces specific to the DG domain. These activities and interfaces relate directly to selected goals. Figure 6 shows an example value interface. This also presents possible connections with other interfaces. Stakeholders should select one of these interfaces. This causes new value activities to emerge, that again have to be considered, etc.

To assist in the allocation of value activities to actors, we have developed a table of frequently occurring assignments (Figure 7). For instance, 'Leasing' DG-equipment is the main activity of a 'Lease' company but can also be an option for a 'Manufacturer' of DG-equipment, and 'Balancing' supply and consumption of electricity power is the main activity of a 'Balancing group' enterprise. Additionally, there are regulated assignments; an activity is then assigned by regulation (often stated by country law) to a specific actor. For instance, a long distance electricity 'Transport' activity is in some countries assigned to one specific actor.

The result of selecting value activities, interfaces and relating these by value exchanges, as well as assigning activities to performing actors is a baseline e-value model that can be used for further analysis.
10. **Profitability Calculation.** To assess the sustainability of the business idea, profitability calculations are done. To understand the profitability of the idea, stakeholders must construct dependency paths for different end-consumer stimuli. Next, stakeholders must decide on valuation functions for value interfaces that exchange objects representing money (often fees). Actually, a pricing formula has to be given, e.g. the price per KWh for electricity. If we estimate these valuation functions, as well as the number of start stimuli per time frame, it is possible to calculate the net cash flow for each actor involved. We require that each actor has a positive cash flow. Net cash flow calculation is one of the most popular approaches in Business Science to judge investment proposals [15]. Using a tool we have made (see http://www.cs.vu.nl/gordijn/tools.htm) it is then possible to automatically generate these net cash flow calculations on a per actor basis. Additionally, the tool checks whether the $e^3$-value model is well-formed and complies with certain business rules.

**Sensitivity Analysis.** Valuation functions as well as the number of start stimuli are only estimates. We have experienced that playing with these number is of far more value to stakeholders than relying on the numbers themselves. So, a final step is to think over possible future events, which may strengthen the business case, or which may threaten the case. Similar approaches exist in scenario-based strategic decision making [25] or even sensitivity analysis for quality attributes of software architectures [3]. Such events may influence valuation, the number of stimuli, or even the struc-
Properties of DG related to specific equipment

Operational goals related to properties of DG equipment

Figure 5. Goals, equipment and properties.

4.3 Reflective learning

Four electricity consortia have used the BusMod method to assess specific DG business ideas, after having a two-day course on the method. We have followed their exploration tracks by providing a method help-desk, by organizing a workshop half-way the modeling process to discuss models constructed, and by interviewing the consortia about the use of the BusMod method as well as problems encountered. Below, we present the most important lessons.

Lesson 1: Regulatory issues are difficult to model.

DG-business models, especially those on renewable energy, often exploit forms of regulation (e.g., subsidy schemes). There are no explicit steps in the method to consider regulatory issues. Rather, regulations are an intrinsic part of the method. For instance, regulatory actors and activities are included that produce valuable objects (e.g., reduction of CO$_2$ emission) for society. Paying more explicit attention to regulation is viewed as important because users indicate that the BusMod method is usable to develop regulations themselves, and to assess consequences of specific regulations for enterprises.

Remedies. In a new version of method we have added explicit questions to ask concerning regulatory issues, as well as how to model these. For instance, step 1 (Business Idea Description) now specifically asks for regulatory requirements. Additionally, during value model construction, specific questions are asked regarding regulation and the libraries offered now contain explicit hints how value interfaces and related constructs can be used to model regulatory issues.
Lesson 2: The boundary of a value model can not be determined easily. Stakeholders have indicated that is difficult to decide whether a specific value activity, and consequently its performing actor, should be included in the value model or not. Essentially, this refers to question what the boundary of a value model actually is: for instance, should we model the supplier of a supplier? Of course, this is a recursive question, so we cannot avoid answering it.

Remedies. The main purpose for constructing DG value models is to understand which actors need to be involved, which objects of economic value they exchange with each other, and if they all can do so in profitable way. A first guideline to decide whether to include an activity and performing actor or not, is to ask whether the actor can perform the activity profitably or not. For instance, in the energy industry, specific forms of obtaining fossil fuels are known to be profitable. Since these activities and actors are known to be profitable already, they need not to be considered.

However, sometimes such activities/actors need to be shown in the model, at least at what they are offering to and requesting from their environment. For instance, Combined Heat Power (CHP) facilities need fuel, which is an important factor to determine potential profitability of such a CHP device. Consequently, we model then a fuel provision actor, but only what it is offering (the fuel) and what it is requesting in return (the fee). We do not analyze the fuel actor for profitability itself.

Lesson 3: Goal selection. A feedback from the case study partners was that goal selection is not always easy. First, some stakeholders may have conflicting goals. Second, goals themselves may positively or negatively influence each other. For instance, a strategic goal "Reduce dependency on subsidies", obviously negatively influences "To benefit from the subsidizing schemes".

Remedies. First, the goal taxonomies we provide have been extended with a table that pair-wise states positive or negative influences between goals. We have chosen for a lightweight approach because it should be usable by non RE-experts such as DG-business developers. Additionally, these developers need to add goals if appropriate to the library we provide. More heavy-weight approaches can be found in [18]. In the i* approach [21], goals can influence each other in a positive or negative way. We have used this idea to extend the goal table, to be filled in by stakeholders, with a slot for indicating conflicting goals between stakeholders. An additional improvement may be to introduce also AND and OR relations between goals relations between goals, as is done in KAOS [8].

5. Discussion and Conclusions

We view RE as the activity of analyzing a problem and specifying solution properties. XRE is an RE activity performed by a number of cooperating businesses who explore a cooperation goal by specifying a feasible solution. In this paper we reported on the further development of a given method for e-commerce RE, e$^3$-value, into a domain-specific method for XRE in the DG domain. The particular taxonomies of goals and technologies, and the libraries of value activities and value interfaces and the links between them, are domain-specific. However, the structure of the method, using domain-independent techniques such as value modeling, profitability analysis and sensitivity analysis, is domain independent. We claim, as our first hypothesis, that BusMod is an instance of a general XRE method for networked business. Networked businesses are businesses that cooperate over an IT network. We believe our hypothesis is true because e$^3$-value and its derivative, BusMod, have jointly been used in the domains of on-line sale of music, on-line sale of news, on-line sale of contact advertisements, and distributed electricity power generation. The generic structure of BusMod is motivated by the common structure in these domains: A networked business structure. We intend to further validate this hypothesis by applying BusMod in yet other domains of networked business.

If RE is problem analysis, goal analysis is an essential part of it. This has been recognized by several RE researchers [1, 7, 19]. We claim that value analysis is an essential part of goal analysis. Goals are desirable states, and states are desirable because they have value. In XRE, the value analysis part turns into a commercial profitability analysis because different businesses are involved, with different commercial goals. However, we claim that value analysis should be part of any RE process. Value analysis was already part of the early systems engineering methods [14], but seems to have been forgotten in software engineering. But in other engineering branches, value analysis is a part of any engineering project: The engineer must do a cost/benefit analysis of proposed solutions and do sensitivity analysis. Our second hypothesis is therefore that value analysis is part of any effective RE method. To validate this, we should compare the use of a value-based RE method with the use of an RE method not containing value analysis, and trace some of the differences in effects of using these methods to the presence or absence of value analysis.

Finally, as a point for discussion we claim that research in RE method must at some point use Action Research as a research methodology. Application of a method by its inventor on a toy problem does not constitute a validation. One possible validation of a method is to let students use the method in lab projects; this is similar to a lab experiment but this validation is only limited. Students are quite different from stakeholders in real-life enterprises. Another possible validation is using it yourself on real (commercial) projects and feeding back the lessons learned into an improved version of the method; this is the Action Research
approach we have taken in this paper. A third possible validation is to have others use the method in real projects, observe this without intervening, and evaluate the results; this is case study research. We hope this progression of validation methods will be used more widely than it is now to validate RE methods.

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