MASTER IN COMPUTER SCIENCE

About global and value model alignment...

Cieslik, Alain

Award date:
2009

ABOUT GOAL AND VALUE MODEL ALIGNMENT...

Alain CIESLIK

A THESIS SUBMITTED IN SEPTEMBER 2009
FOR THE DEGREE OF MASTER IN COMPUTER SCIENCE
DEPARTEMENT OF COMPUTER SCIENCE, UNIVERSITY OF NAMUR

Resume

Toute organisation est chaque jour confrontée aux changements...

Afin de faire les bons choix pour survivre, une bonne connaissance de tous les facteurs internes et externes aidera l'organisation à prendre les bonnes décisions. Mais ce n'est pas assez... L'organisation aura besoin de modèles pour gérer ces facteurs sur le long terme et pour les changer d'une manière structurée.

Pour ce faire, il faudra nous intéresser à la conception de la vision d'une organisation ; cette dernière est représentée à l'aide d'un modèle de but qui sera ensuite utilisé pour construire un modèle de valeur. Chaque changement dans la vision de l'organisation modifiera donc ce modèle de but et demandera une modification du modèle de valeur.

A travers ce mémoire, nous analyserons l'alignement entre ces deux modèles et tenterons d'offrir une méthodologie réduisant les erreurs d'alignements.
Des améliorations seront proposées concernant la méthode existante qui introduit un ensemble de templates aidant à garder les modèles en balance. Afin d'obtenir un résultat plus cohérent, la solution que nous préconiserons est une modification simultanée des modèles de but et de valeur.

Enfin, nous illustrerons cela par l'application de notre méthode à un cas d'étude bien précis.

Mots-clé:
Modèle de but, modèle de valeur, alignement de modèles, i*, e³value, modèle business

Abstract

Each organization is daily confronted to this changing situation and has to make the good choices to survive: technological choices, partnerships choices, distribution channels choices ... and many more. A good knowledge of all those internal and external factors may help to lead the organization but this is not enough. The organization also needs models to manage those factors and changes in a more structured way and with a long term vision.

In this context, we have to interest to the conception of the organization's vision. This one is represented by a Goal Model, next used to construct a Value Model. Every change in the organization's vision will modify this Goal Model and then the Value Model.

In this thesis, we'll analyze the alignment between these two models and try offering an ameliorated method with less of alignment errors.
Ameliorations will be proposed about the already existing Templates Method, to keep Models in balance.
To obtain a more coherent result, the solution proposed is a simultaneous modification of Goal and Value Models.

Finally, to illustrate our new method, we'll apply it to a specific study case.

Keywords:
Goal Model, value Model, model alignment, i*, e³value, Business model

Acknowledgements

I would like to thank several persons that have made this thesis possible:

Michäel Petit, the supervisor of this thesis, for the time and all the advices he give me during the preparation of this thesis

Fundp teachers that give me the technical background to do this job

My sister and Laetitia for the time they have spent to read my thesis

My family and my friends for the support they gave me during all my studies.

Contents

1 INTRODUCTION

« In today's business world, the relationship between an organization and its environment appears more complex than ever before ».[1]

This is the first sentence of the thesis "a method to support the alignment of a value models and goal models", and this has never been so truly than today.
In the context of economical crisis, the environment is completely unpredictable, extremely competitive and subject to fast and frequent changes.

Each organization is daily confronted to this changing situation and has to make the good choices to survive: technological choices, partnerships choices, distribution channels choices ... and many more. A good knowledge of all those internal and external factors may help to lead the organization but this is not enough. The organization also needs models to manage those factors and changes in a more structured way and with a long term vision.

As noticed by, "to be able to face this growing complexity, one solution is to use models that focus on different aspects.
Therefore, models are designed at different levels to represent the organization in a structured way within its environment.
With these models, it becomes possible to catch, communicate, analyze, simulate and modify the environment of a particular organization."[2]

But if it is important to work with different models: value models but also goal models it is crucial to create interfaces to try to align them all. This will be the approach, the basis of this thesis.

[1] A method to support the alignment of business models and goal models ; Pierre Alleux et Ludovic Mathieu; 2008; p.15
[2] Ib. Idem ; p.15

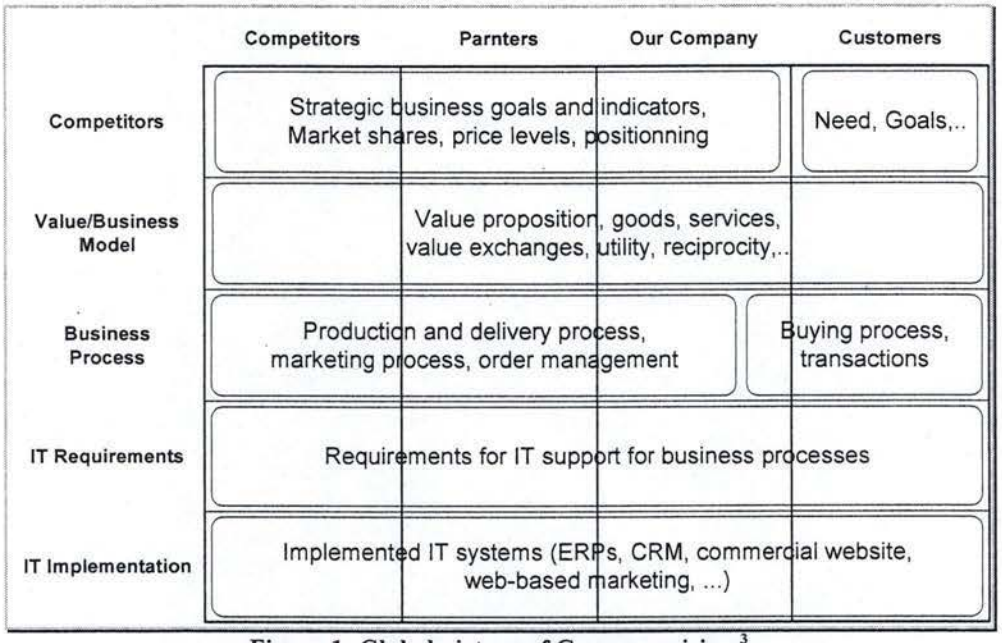


Figure 1: Global picture of Company vision [3]

These models can be classified according to a layered view (5 layers)

- The first layer: Competitors is the strategic layer and describes the goals of the different actors.
- The second layer: value model layer it describes the economical exchanges between actors.
- The third layer: business process layer it represents the different processes of the organization.
- The fourth layer: IT requirements layer it represents analyze of IT projects.
- The fifth layer: IT implementation layer it represents the implementation of IT projects.

This model is interesting because every different organization can be represented by these five levels.

More over, to manage each of these five levels, specific tools may be used. Those have been classified in the following figure.

[3] Claire LOBET-MARIS,. Michaël PETIT,Stéphane SANDRON, Business Modeling, Faculté de Namur

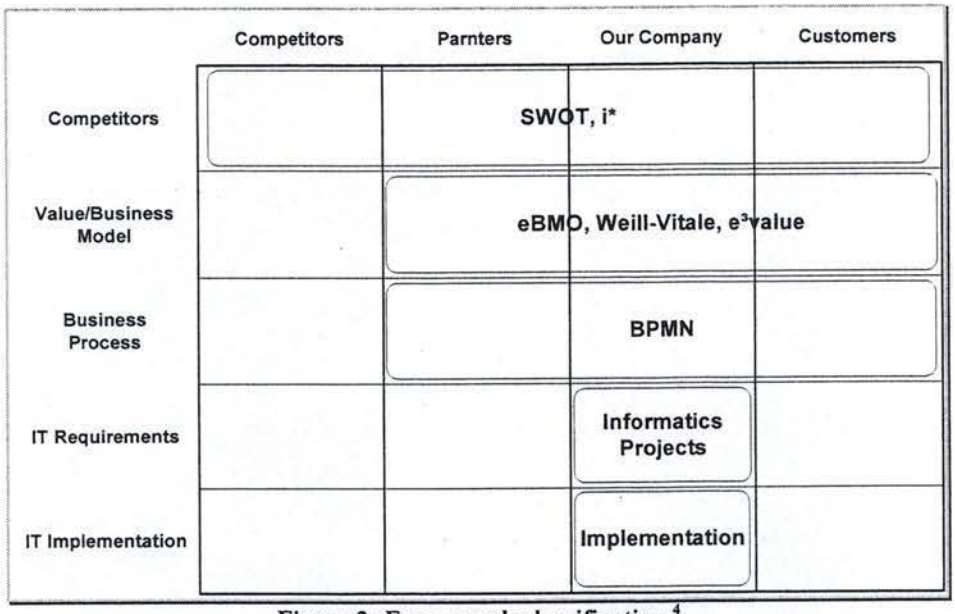


Figure 2: Framework classification [4]

Depending on the layer, specific tools will be suitable. For example, the SWOT analysis or the i* framework will be used for the analysis of the first layer.

Furthermore, the most important is to underline that all these levels are interdependent. When the organization wants to improve its strategic goals (first layer), it will have to work on different layers such as, for example, economical environment (second layer) If not, modifications done in one layer only without taking the interdependence into account may create a situation of non-alignment layers which would not be balanced anymore.

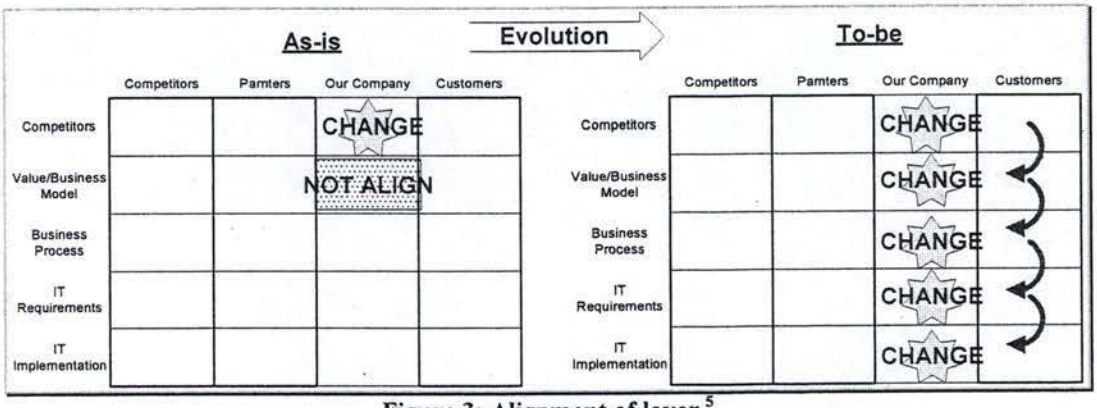


Figure 3: Alignment of layer [5]

Two stages have to be create in this model. A first one which describes the present situation that is the AS-is model. A second one will be the evolution to be reached called the To-be model.

[4] Claire LOBET-MARIS,. Michaël PETIT,Stéphane SANDRON, Business Modeling, Faculté de Namur
[5] Idem, Business Modeling, Faculté de Namur

1.1 Purpose of this thesis

The purpose of this thesis is to deeply analyze 'the alignment of value model and goal model. Our analysis will be based on two previous works done recently:
The first model (which will be called Method 1 in our thesis) has been presented in an article published by the University of Delaware[6]. This study has been further developed in the thesis submitted by Pierre Halleux and Ludovic Mathieu, University of Namur[7]. This last study will be called Method 2 in our thesis.

Our thesis will not analyzed the Method 1 as such but will sometimes use it as a background. We will focus on the Method 2.The first step of our thesis will be to present and analyze the Method 2. We will first identify the weaknesses and then propose some improvements to bring in a context of problems resolution. This new method, which is the object of out thesis, will be called Method 3.

Then, we will apply Methods 2 and 3 to a specific study case and we will compare the results.

Finally, we will identify all the improvements brought by the new method.

1.2 Structure of this thesis

This thesis will cover different aspects and will be organized as follows:

Chapter 2: Presentation of used concepts and frameworks.

Chapter 3: Analyze of the alignment models' theory by the Templates.
Identification of points to improve.
Solutions' proposal for the improvement of method 2.

Chapter 4: Application of Method 3 to a study case, already used in the Model 2:
Business case study of a massive multiplayer online gaming company (MMOG).
Comparison of the results of the Methods 2 and 3.

Chapter 5: Conclusions about Method 3, its limits and possible improvements.

It's important to underline that the aim of Method 2 was already to improve the existing alignment models (Method 1) by using the Templates. So, we have intentionally kept the same structure to offer to the reader the possibility to compare evolutions brought by the

[6] B. Andersson, A. Edirisuriya, T. Ilayperuma, M. Bergholtz, P. Johannesson, and J. Zdravkovic. On the alignment of goal models and business models. REA-25. A Celebration of the REA Enterprise Model, Geerts, G., University of Delaware. Department of Accounting and MIS. 2007, http://www.aisvillage.com/rea25/program.html.
[7] Pierre Halleux and Ludovic Mathieu, a method to support the alignment of business models and goal models, Faculté de Namur,2008.

Methods 2 and 3. This will help the reader to keep a reference to the used methods, in a context of Templates improvements.

2 BACKGROUND

In the context of a models alignment, two frameworks are used:

- i* in the strategic layer.
- e³ value in the value model layer.

2.1 Goal Modeling: i*

i* is an agent-oriented modeling framework used in the strategic perspective representing the organization (first layer).
This layer describes strategic goals of the organization, the actors, and all the dependences between them.

It will help the organization to have a better view to understand how, why and with whom it works.

The basic concept of i* may be understood with the following chart[8]:

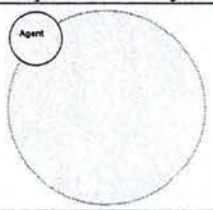
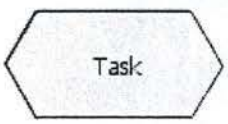
	**Actor:** entity who wants to reach some goals.
	**Goal:** something clearly defined having to be reached. i.e.: being cheaper than the concurrence.
	**Soft-goal:** something not-clearly defined and having to be reached. i.e.: improvement of the quality.
	**Resource:** a possessed object.
	**Task:** action having to be realized.

Table 1: Basic concept of i*

[8] http://istar.rwth-aachen.de/tiki-index.php?page=iStarQuickGuide#2_Basic_i_Notation

There are also different kinds of dependences in i*:

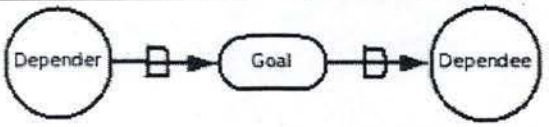
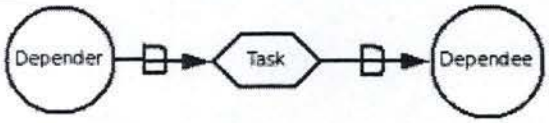
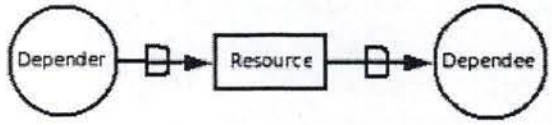
	**Goal dependency:** an actor is dependant on another to reach a goal.
	**Soft-Goal dependency:** an actor is dependent on another one to reach a goal.
	**Task dependency:** the task must be realized by another actor.
	**Resource dependency:** the resource must be provided by another actor.

Table 2: Kind of dependence in i*

In this goal modeling, two kinds of 'sub'-models are used to describe the organization's functioning:

- "Strategic dependency model" (SD Model) for the relations and dependences between actors.
- "Strategic rational model" (SR Model) for the way an actor realizes its goals.

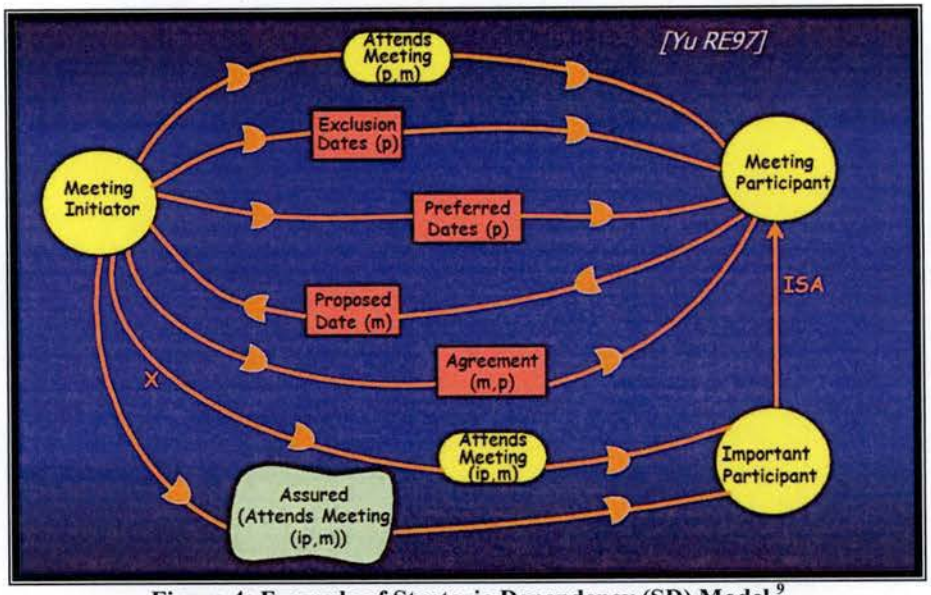


Figure 4: Example of Strategic Dependency (SD) Model [9]

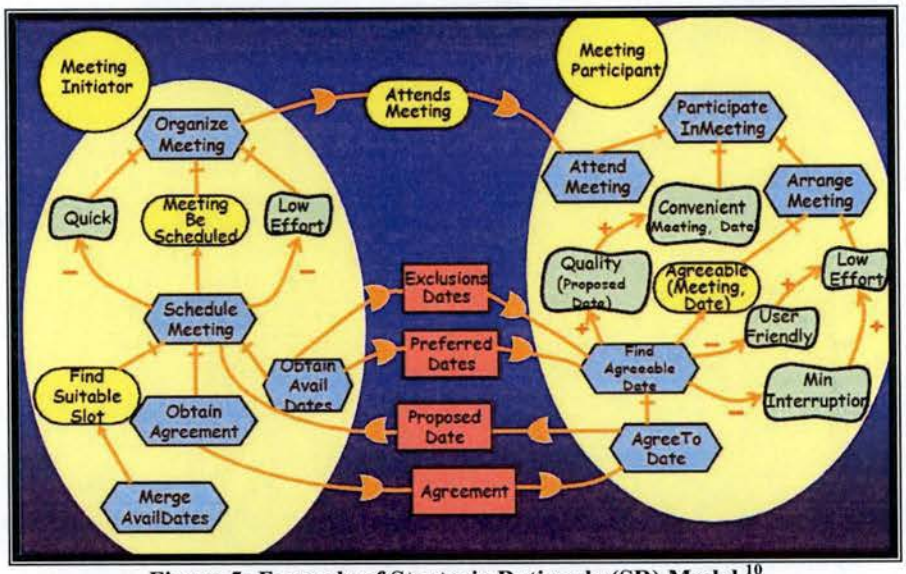


Figure 5: Example of Strategic Rationale (SR) Model [10]

[9] Eric Yu, Strategic Actors Modeling for Requirements Engineering -the i* framework, University of Toronto, 2005

[10] Eric Yu, Strategic Actors Modeling for Requirements Engineering -the i* framework, University of Toronto, 2005

2.2 Business Modeling: e³value

The e³value model has been created in the wave of the expansion of the e-business. Indeed, since the creation of e-business, many companies tried to use this new selling channel but without really understanding how all the relations between the different actors and levels. This explains why so many Organizations failed in their development.

To help those organizations, the e³value model has been developed. This model represents all economical exchanges between the different actors and allows a better estimation of the results.

"In this, model, an actor is an independent economic entity that exchange value object which are services, products, money, or even consumer experiences. A value object is valuable to one or more actors. Each actors have value activity that exist to make profit or to increase its utility
Links between actors are done thought a value interface, inside each interface; there is an in port and an out port. Each port represents the value object that is exchange between actors. A value exchange represents one or more potential trades of value objects between value ports.
It's possible to add price and quantity on each port and based on this information it will possible to estimate the economical result of this exchange. " [11]

The next figure illustrates an e³value schema sample:

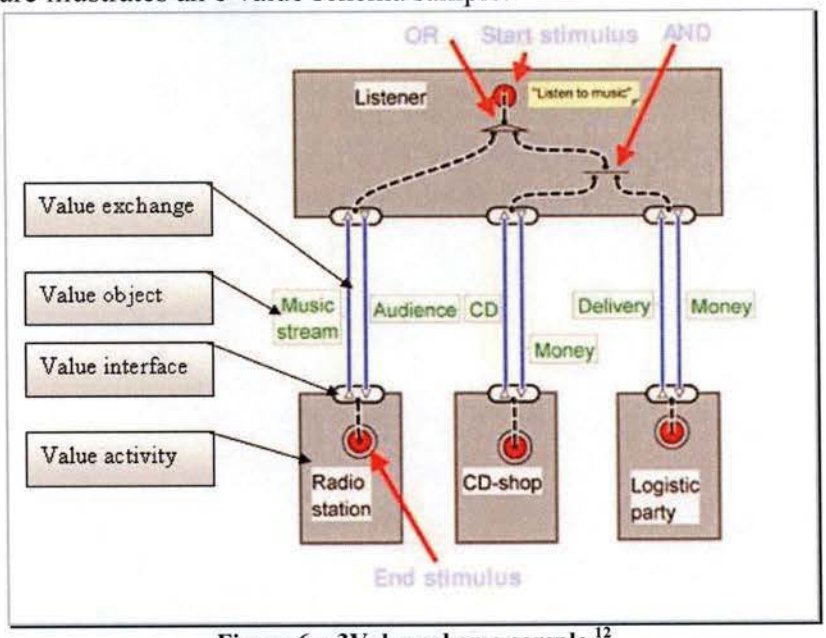


Figure 6: e3Value schema sample [12]

[11] Jaap Gordijn and Hans Akkermans, Designing and Evaluating E_Business Models, Free University Amsterdam , July 2001
[12] Jaap Gordijn & Hans Akkermans, Modeling networked value constellations with *e3value*

3 IMPROVEMENT OF THE METHOD

3.1 A Templates and Rules Approach for Goal and Value Models Alignment

Alignment of **value model** and **goal model** is a very prolific subject in the literature.

The method explained in the Method 1 and improved by the Method 2 brings a first answer to this problematic.

Models are considered as "aligned" when the goals defined by the goal modeler are applied in the value model; but it's difficult to have aligned models and, generally, this is not possible. The result will be two non-aligned models, involving a loss of information associated in the organization's strategic choices.

A solution has been found by the Method 1 and has been further developed in the Method 2. The aim was to work with 'Templates'. The role of each Template is to express a business intention and is composed by an event, a resource and an agent. This may be understood as a specific business action to be decided by the organization. In order to make it easier to understand, in the Method 3 those Templates will be called "Actions". An example of a syntax template will be the following: < Event, resource, agent > and 9 Templates were proposed by the Method 1.

Each Template is composed of two parts, a compulsory part that represent the business action and an optional part that represent consequence of the compulsory part. For example, we can say that offering a resource to a client is the compulsory part. An optional part will be to get a compensation for this resource. Optional part are generally a call to another template.

In this model, the organization who wants to change its strategic vision will first define its goals and identify its "means" to achieve them. This first step will be done at the level of the goals models. The goal modeler will then update its goal Model. At a second stage, thanks to the templates, it will be possible to modify the value model by the application of the templates transformations. This will lead to two "aligned" models.

This is described in the figure hereunder.

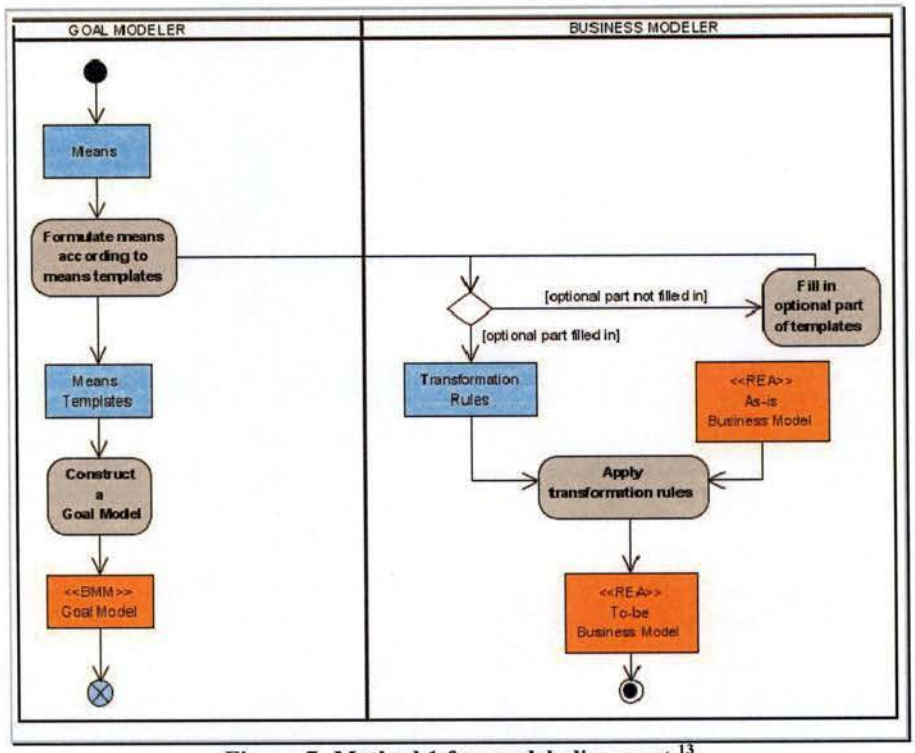


Figure 7: Method 1 for model alignment [13]

While bringing solutions, the Templates described in the Method 1 present many problems. Moreover, the method can be ambiguous and difficult to apply in some cases. The analysis Method 2 will highlight theses problems.

The work done in the Method 2 has for purpose to put in evidence these problems and their possible solutions.

In this improved method, the goal model "As-is" can be modified by the application of the new "means" corresponding to the new strategic orientations of the organization, in order to obtain a goal model "To be" (board 1: first part).

These "means" have permitted to identify the Templates used by the value model (board 1).

Then, the start point is the "As-is" model business on which template's transformations will be applied. After this transformation process, we will obtain a "To-be" value model aligned with the goal model which is explained in the following figure:

[13] B. Andersson, A. Edirisuriya, T. Ilayperuma, M. Bergholtz, P. Johannesson, and J. Zdravkovic. On the alignment of goal models and value models. REA-25. A Celebration of the REA Enterprise Model, Geerts, G., University of Delaware. Department of Accounting and MIS. 2007, http://www.aisvillage.com/rea25/program.html.

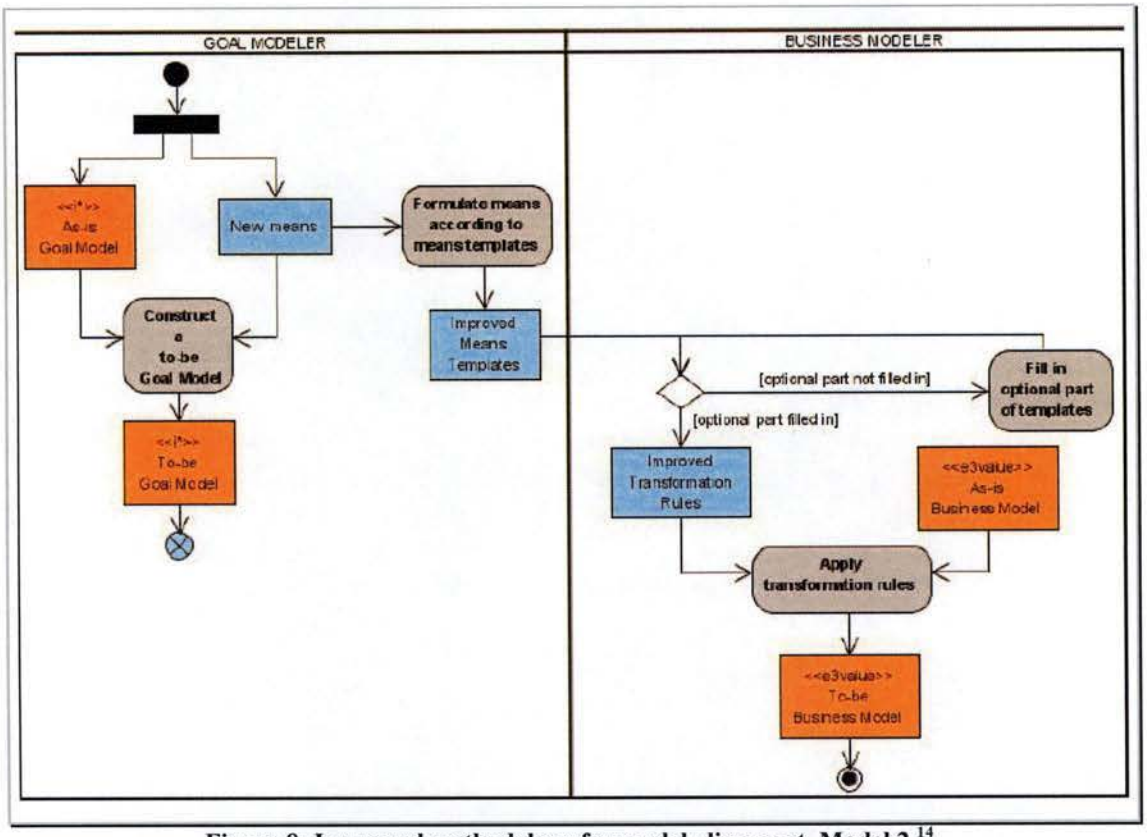


Figure 8: Improved methodology for model alignment, Model 2 [14]

3.2 New Method of alignment (Method 3)

As explained the methods 1 and 2 were aligning Goal model and the Value model via the templates which were having a direct impact on the Value model only. The Method 3 tries to further improve the alignment between both models.

Those improvements consist in the creation of actions which modify both goal and value models. In the model 3, the organization who wants to change its strategic vision will also define its goals and identify its "means" to achieve them. The goal modeler will identify new actions but those actions, on the contrary of the previous methods, will impact both models and not only the value model. And this will create real and deep alignments between the two models.

This improvement has been possible thanks to a transformation algorithm that constructs the to-be goal mode and the to-be value model.

[14] Pierre Halleux and Ludovic Mathieu, a method to support the alignment of value models and goal models, Faculté de Namur,2008

The "As-is" Goal model is used as an input model, the transformations will be applied on it. And the result represents the "To-be" Goal Model. The same will be done at the level of the Value model: the "As-is" Value Model will be used as an input model, the transformations are applied on it and the result will be the "To-be" Value Model. This is described in the figure 9.

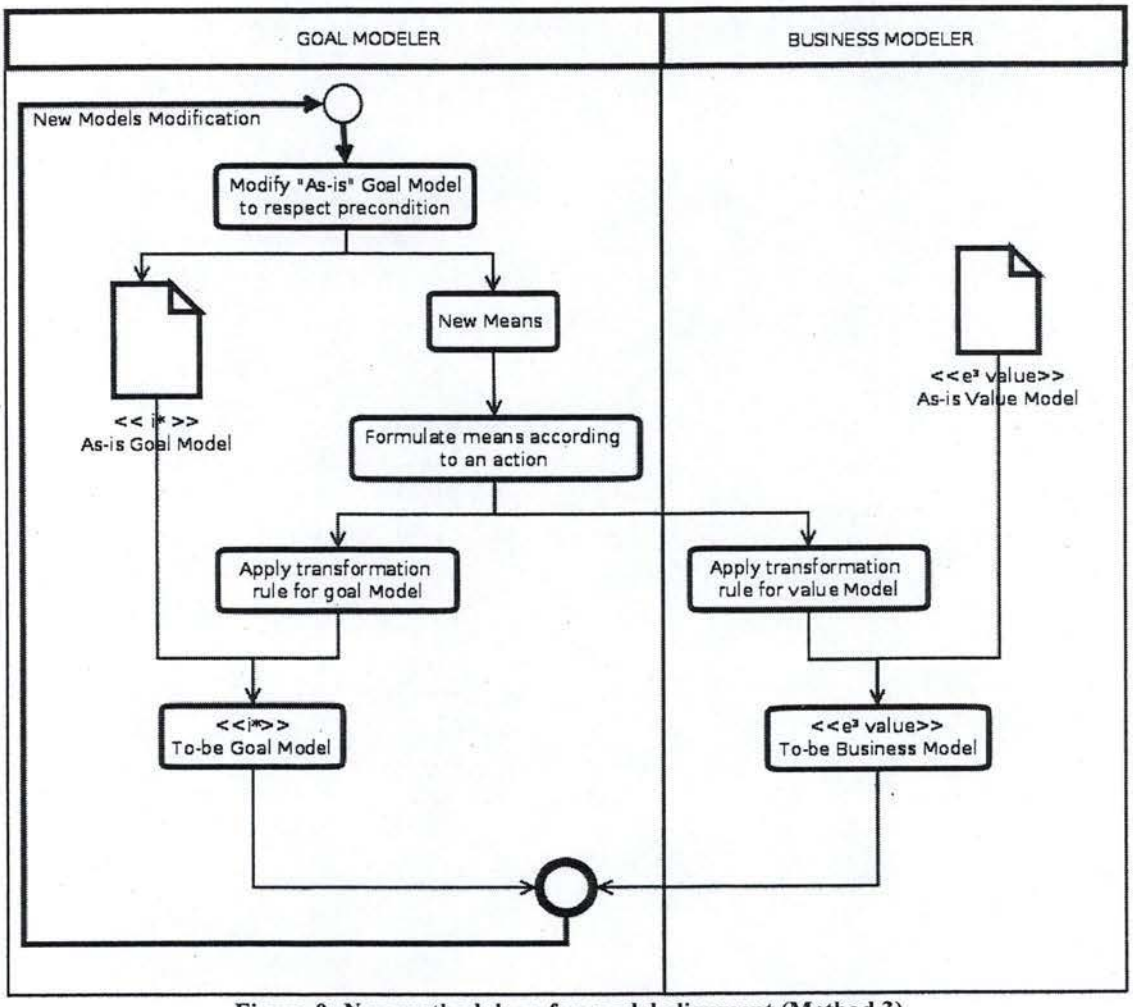


Figure 9: New methodology for model alignment (Method 3)

3.3 Methodology followed.

To improve the models 1 and 2, we will use the following steps:

First of all, it will be necessary to describe the model 2, the templates and all the transformations rules. We will than extract the business concepts associated to the templates.

Working on the templates will be the first step of our analysis. In the method 3, the templates have been modified. Since they have a different nature in the method 3 with a direct impact on both models we have called them "Actions". This name seems closer to their new nature. In this stage, we will identify each template, analyze it and transform it into one action. A first summary of weaknesses of the Method 2 will also be drawn.
In a second step, we will then analyze all templates as a whole and try to identify missing actions. A third step will be to create an i* representation expressing the business concepts, to put in evidence the impacts of an action on the goal and value models, to formalize the actions and, at the end, to use a "pseudo-code" to express the transformation algorithm.

Finally, we will apply the method 3 on the study case used by method 2 in order to compare the results.

3.3.1 Analysis and weaknesses of the Templates

In this section, we will present the 9 templates of the method 2 , give a short description of its objective. Some first weaknesses will then be stressed.

Template 1: <start offering, resource j, to, customer i>
[(start using existing value activity $_k$ XOR start producing resource j in value activity $_k$ XOR start procuring resource j from provider p) AND receive compensation from customer i]

This template has for objective to offer a resource to a client.
To reach this objective, we can use an activity already existing, start to product a resource or start to procure a resource from a provider.
The client gives compensation in exchange of this resource.

Weakness: This template offers some resources but never mentions the proposed quantities.

Template 2: <stop offering, resource j, to, customer c>
[(stop procuring resource j from provider p XOR stop producing resource j in value activity $_k$)]

This template has for objective to stop producing a resource.
In function of this decision, the company will stop procuring the resource from a provider or stop producing this resource in a value activity.

Weakness: no weakness identified.

Template3: <start procuring, resource j, from, provider$_p$>
[((start using resource j in value activity $_k$) XOR (start offering resource j to customer c)) AND start providing compensation to provider p]

This template has for objective to start procuring a resource from a provider.
This decision allows using it in a value activity or starting offering this resource to a client.
Compensation is offered to the provider.

Weakness: this template proposes to procure some resources but without mentioning the ordered quantities.

Template4: <stop procuring, resource j, from, provider p>
[(stop offering resource j to customer i) XOR (start producing resource j in value activity $_k$)]

This template has for objective to stop procuring a resource from a provider.
This decision can imply to stop offering this resource to a client or to start producing in the heart of a value activity.

Weakness: If you stop procuring a resource from a provider, the template permits to start producing this same resource.
That introduces incoherence because stop procuring a resource to product it by itself is the same thing that is an in sourcing action.

Template 5: <start producing, resource j, in, value activity $_k$ >
[start offering resource j , to, customer i]

This template has for objective to start producing of a resource in a value activity.
The implication is the possibility to start offering a resource to a client.

Weakness: Compared to the template 3, it is not possible to use the produced resource in a value activity; that introduces an ambiguity between templates.

Template 6: <stop producing, resource j, in, value activity $_k$ >
[(start procuring resource j from provider p) XOR (stop offering resource j to customer i)]

This template has for objective to stop producing a resource in a value activity.
The implication can be to start procuring the resource from a provider or to stop offering the resource to a client.

Weakness: start procuring a resource from a provider is the same thing that an out sourcing action; that creates an ambiguity.

Template 7a: <increase fraction of production of, resource $_j$, in, value activity $_k$>

This template has for objective to increase the resource production in a value activity.

Weakness: the template permits an increasing of production, but never takes into account the amount of quantity.

Template 7b: <decrease fraction of production of, resource $_j$, in, value activity $_k$ >

This template has for objective to decrease the resource production in a value activity.

Weakness: no mention about the amount of quantity and it's also possible to decrease production until the end and stop producing a resource; that is the same thing that the template 6.

Template 8: <insource fraction of production of, resource j, in, value activity $_k$ >
(start producing resource j in value activity $_k$ XOR increase production of resource j in value activity $_k$) AND (stop procuring resource j from outsourcer o)

This template has for objective to in-source a resource production in a value activity.
In-sourcing means stop procuring the resource from a provider and product it in a production activity.
Two actions are implicated: first, we can start producing a resource in a value activity or increase the production. Secondly, we can decrease or stop procuring a resource from a provider.

Weakness: no precision about the quantity of in-sourced resource; so, it is difficult to know the impact on the value model.

Template 9: <outsource fraction of production of, resource j, in, value activity $_k$ >
[(stop producing resource j in value activity k XOR decrease fraction of production of resource j) AND Start procuring resource j from outsourcer o]

This template has for objective to out-source a resource production.
Out-sourcing means stop producing the resource in a value activity and product it from a provider.

Two actions are implicated: first, we can stop producing a resource in a value activity or decrease the production. Secondly, we can start procuring a resource from a provider.

Weakness: no precision about the quantity of out-sourced resource; so, it is difficult to know the impact on the value model.

3.3.2 Weaknesses of the previous methodology.

In the method 2, we can stress some weaknesses. Those were used to develop the new method (3).

- There is no mention of the fact that a resource production can request the use of other resources.
- Each template has an optional part who calls some other templates. As we can see in the hereunder scheme, there is a recurrence in the templates. Templates call them mutually and that can create some ambiguous situations.

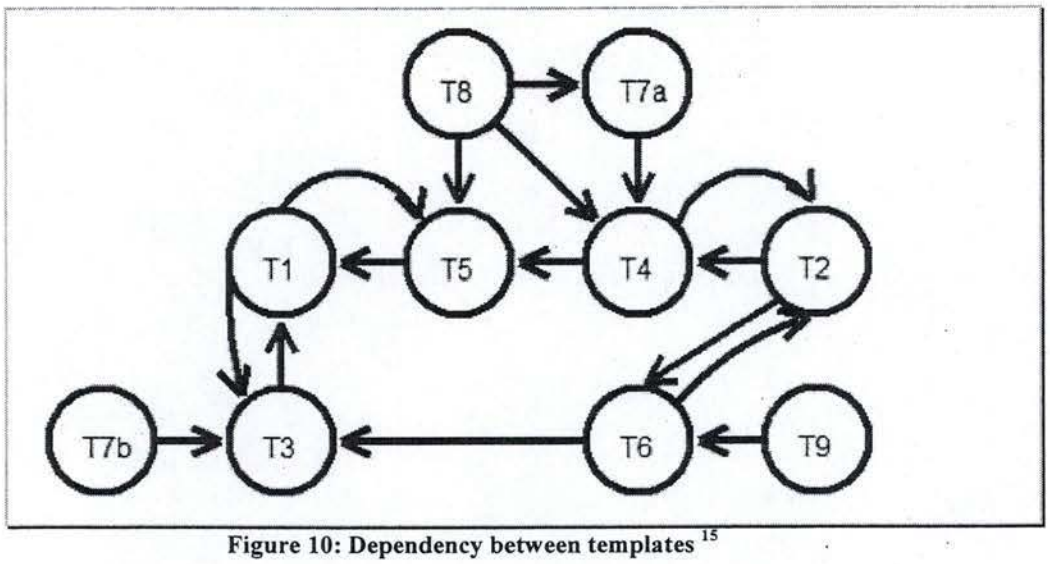


Figure 10: Dependency between templates [15]

- There are some missing templates to cover all the cases. Indeed, it's permitted to increase a resource production but without possibility to increase the order made to the provider.
- The templates application allows only an action on the value model, but there is no procedure to align, in one time, goal and value models.
- In several templates, a notion of quantity is present, but it is not enough developed in the Method 2. Then it is possible to increase or decrease the production of a resource but without having the capability to deal with the quantities.

[15] Pierre Halleux and Ludovic Mathieu, a method to support the alignment of value models and goal models, Faculté de Namur,2008

3.3.3 Concepts of the Method 2

Method 2 concerns companies that are making business by offering a resource to clients. To be able to reach this activity, a resource can be produced or acquired from a provider. For economical reason then company can modify the supplying way by in-sourcing or out-sourcing actions.

Based on the previous thesis we can identify the following business concepts:

- Offering a resource to a client
- Procuring a resource from a provider
- Producing a resource in a value activity

3.3.4 Actions coming from the last thesis:

Each template are impacting a specific business concept identified in the previous section. We classified each template with the related business concept.

Offer a resource:

- start offering a resource to a client (T1)
- stop offering a resource to a client (T2)

Procure a resource:

- start procuring a resource from a provider(T3)
- stop procuring a resource from a provider(T4)

Product a resource:

- start producing a resource (T5)
- Stop producing a resource (T6)
- Increase a resource's production (T7a)
- Decrease a resource's production (T7b)

The following templates are quite different; these actions have impacts on production and procuring business concepts:

- In-sourcing of the production (T8)
- Out-sourcing of the production (T9)

3.3.5 Missing Actions

To identify missing actions, two points must be developed:

First aspect
Three important business notions have been identified: Offering a resource, producing a resource and procuring a resource.

For each of these business notions, four actions are possible:
- Start;
- Stop;
- Increase the quantity;
- Decrease the quantity.

From this investigation, we can identify some missing actions:

1) The organization may desire a variation in the proposed quantity to the client; we can:
   - Increase the offer to the client;
   - Decrease the offer to the client.

2) The organization may wish to acquire more or less quantity from a provider; we can:
   - Increase the resource order;
   - Decrease the resource order.

Second aspect
The resource production may other resources for the production; it's the manufacture recipe. 2 actions are missing to express this situation:
   - Need an under-resource;
   - Stop to need an under-resource

*3.4 Business concept with i**

The business concepts detailed in the previous section are the first aspect of the Method 3 that should be representate with schema. It will be the starting point of our new method. Each business concept is an i*schema.

3.4.1 Offering a quantity of resource

The intention to offer a resource can be represented by the schema hereunder.

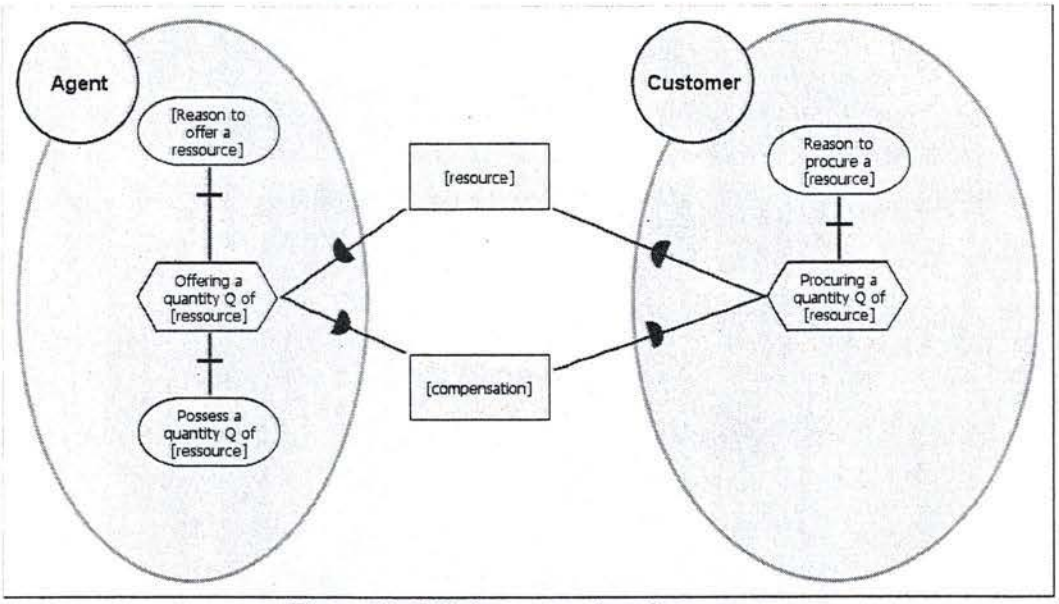


Figure 11: Offering a quantity of resource

A decision to offer a resource to a client is represented by a goal "Reason to offer a resource". The reason to offer a resource can be:

- Make profit
- Interest customer with new product
- Make concurrence with the market
- ...

We introduce a notion of quantity inside this schema. We need to represent it with a new goal "Possess a quantity Q of [resource] which should be satisfied.
The exchange between the client and the company is represented by a resource and a compensation for this resource.

3.4.2 Possess a resource quantity

To offer a resource to a customer, the company must be able to possess the necessary resource quantity. The goal "Possess of a quantity q of [resource]" will represent the intention to possess of a resource quantity.

There are several ways to possess a resource quantity:

- This resource quantity may be produced in value activity
- This resource quantity may be procured by a provider.
- A part of the quantity of this resource may be produced in value activity and the rest is procured by a provider.

3.4.2.1 Producing a resource

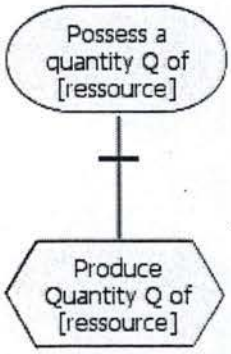


Figure 12: Producing a resource

Producing a resource quantity is represented by a simple task and this task "producing a resource" help to achieve the objective.

3.4.2.2 Procuring a resource from a provider

Procuring a resource quantity from a provider is represented by a simple task "Procuring a quantity q of [resource].

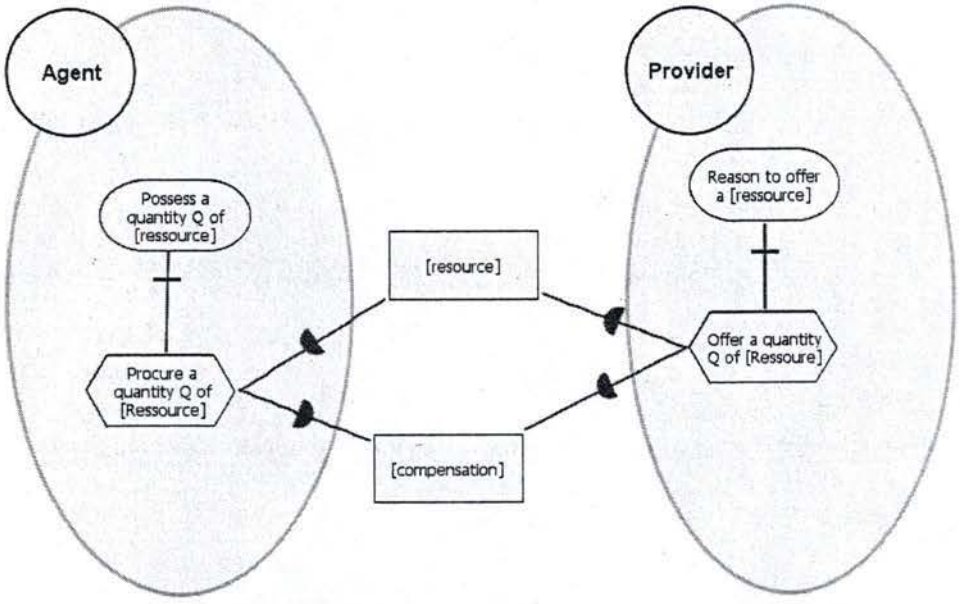


Figure 13: Procuring a resource

3.4.2.3 Procuring a part of quantity and producing the rest of the needed quantity.

To be able to represent a quantity Q1 produced in a value activity and, a quantity Q2 procured from a provider. We have to process in two steps:

First step: The goal "Possess of a quantity Q of [resource] must be split in sub-goal, representing the intention to possess of two smaller quantities: Q1 and Q2

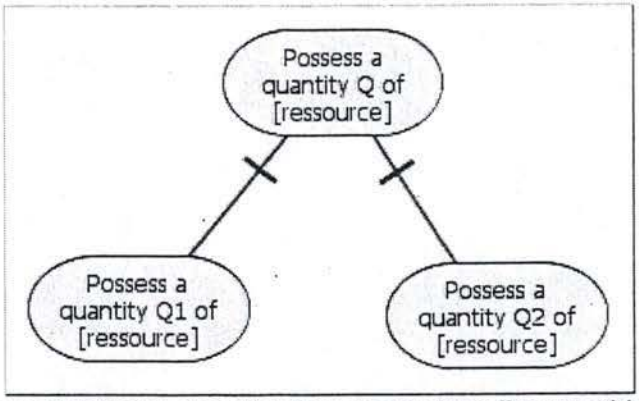


Figure 14: Split a quantity of resource in 2 smaller quantities

Second step: To reach the both sub goals, it's possible to use the actions « producing a resource », « procuring a resource » or the both.

3.4.3 Possess a sub-resource in order to produce a resource.

Sometimes sub-resources are needed to produce a resource; that represents the manufacture recipe of the resource.

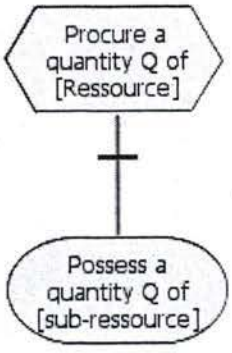


Figure 15: Possess quantity of sub-resource

All the actions "producing a resource", "procuring a resource" can also be used also for the sub-resources.

3.5 Explain transformation when actions are applied on the goal and the value models.

As we explain in the previous section, we have defined several business concepts that help to represent company strategy. Each action modifies a theses concept and finally permits to link all business concepts together.
At this stage of this thesis, all actions coming from the previous thesis have been identified. Several missing actions were added. We are now able, for all of them, to evaluate what will be their behaviors when applied on the goal and value Models.

All possible actions are listed hereunder:

- Start offering a quantity of resource to a customer
- Stop offering a resource to a customer
- Increase offering to a customer
- Decrease offering to a customer
- Start producing a quantity of resource
- Stop producing a resource
- Increase production of a resource
- Decrease production of a resource
- Start procuring a quantity of resource
- Stop procuring a resource
- Increase command of a resource
- Decrease command of a resource
- Insourcing production of a resource
- Outsourcing production of a resource
- Need of a sub-resource to produce a resource
- No need of a sub-resource to produce a resource
- Split the goal "Possess quantity $_q$" in two goals "Possess quantity": q1 and q2
- Merge two goals "Possess quantity": q1 and q2 in one goal "quantity $_q$".

Before going into the details, we must inform the reader of 2 restrictions of this new developments:

1. Both actions "increase and decrease offering to a customer" are out of the scope of this thesis as they were in the previous thesis. As the purpose of this thesis is propose a solution to align goal and value models like in the previous thesis. We will not develop several other concepts for those two actions.
2. In this thesis, a resource can not be acquired from more than one provider.

3.5.1 Starting offering resource

Starting offering a quantity of a resource to a customer is an action that intent to define all modifications that will appear on goal and value models when the company decides to take a specific action.

3.5.1.1 Apply the action on the goal Model

Pre condition
• The Agent exists • The goal "[Reason to offer a resource]" exists
As-is Model

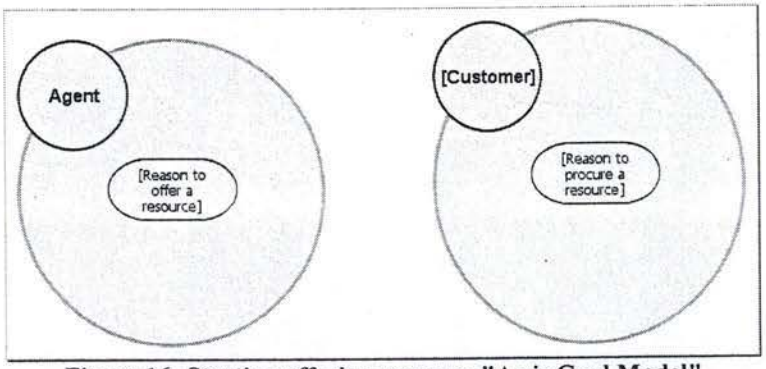



Figure 16: Starting offering resource "As-is Goal Model"
To-be Model

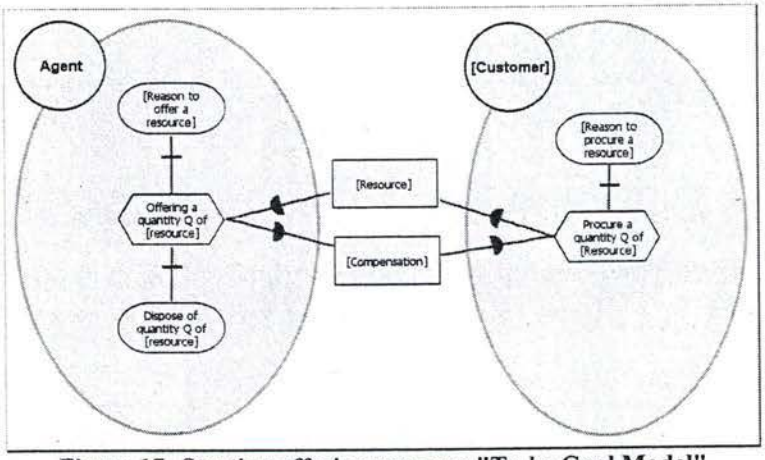



Figure 17: Starting offering resource "To-be Goal Model"
Remarks
The goal "Possess of quantity Q of [resource]" can already exist. In this case, it will be reattached to the task "offering a quantity Q of [resource]".

Table 3: Starting offering resource-Goal Model

3.5.1.2 Apply the action on the value Model

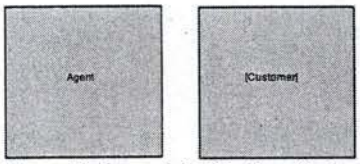
<table>
<tr><th colspan="3">Pre condition</th></tr>
<tr><td colspan="3">• The Actor "Agent" exists</td></tr>
<tr><th colspan="3">As-is Model</th></tr>
<tr><td>Scénario I</td><td>Scénario II</td><td>Scénario III</td></tr>
<tr><td> 

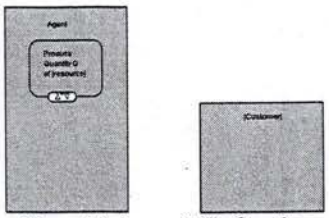
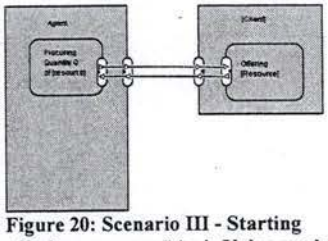
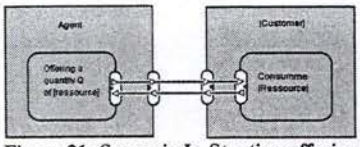
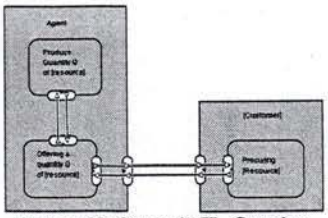
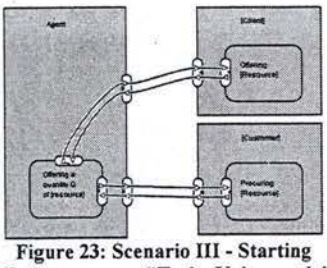
Figure 18: Scenario I - Starting offering resource "As-is Value model" [16]</td><td> 
Figure 19: Scenario II - Starting offering resource "As-is Value model"</td><td> 
Figure 20: Scenario III - Starting offering resource "As-is Value model"</td></tr>
<tr><th colspan="3">To-be Model</th></tr>
<tr><td> 
Figure 21: Scenario I - Starting offering resource "To-be Value model"</td><td> 
Figure 22: Scenario II - Starting offering resource "To-be Value model"</td><td> 
Figure 23: Scenario III - Starting offering resource "To-be Value model"</td></tr>
<tr><th colspan="3">Remarks</th></tr>
<tr><td colspan="3">• The value activity "Produce quantity Q of [resource]" can already exist.
In this case, a value exchange will be created between the value activity offering a resource and the value activity producing it.
• The value activity "Procure quantity Q of [resource]" can already exist.
In this case, a value exchange will be created between the value activity offering a resource and the provider. The value activity "Procure quantity Q of resource" will be removed from the model.</td></tr>
</table>

Table 4: Starting offering resource-Value Model

[16] Enlarge Picture are available in annex I

3.5.1.3 Improving Method

Action definition

Original Template 1
<start offering, resource $_j$, to, customer $_i$ >

Action 1
<start offering, resource $_j$, to, customer $_i$, quantity $_q$, goal $_g$, value activity $_k$ >

Goal Model transformation algorithm

IF goal $_g$ exist **THEN**
    ADD task t1 "offering a [quantity $_q$] of [resource $_j$]
    IF goal g1 "Possess [quantity $_q$] of [resource $_j$] not exist **THEN**
        ADD goal g1 "Possess [quantity $_q$] of [resource $_j$]
    END-IF
    CONNECT task $_{t1}$ with goal $_{g1}$
    CONNECT task $_{t1}$ with goal $_g$
END-IF
IF [customer $_i$] not exist **THEN**
    ADD actor [customer $_i$]
END-IF
ADD task t2 procuring [resource $_j$] for actor [customer $_i$]
ADD resource r1 for [resource $_j$]
ADD resource r2 for [compensation]
ADD dependency link from task t2 to r1
ADD dependency link from task r1 to t1
ADD dependency link from task t1 to r2
ADD dependency link from task r2 to t2

Value Model transformation algorithm

IF [customer $_i$] not exist **THEN**
    Add Actor [customer $_i$]
END-IF
IF value activity for [resource $_j$] exist **THEN**
    ADD one value activity for [resource $_j$]
END-IF
ADD one value activity procuring [resource $_j$] for [customer $_i$]
ADD one value exchange for resource j in new interface from value activity for [resource $_j$] to value activity for [customer $_i$].
IF value activity for produce [quantity $_q$] of [resource $_j$] **THEN**
    ADD one value exchange for resource j (in an existing or new interface) from value activity for [resource $_j$] to value activity for produce [quantity $_q$] of [resource $_j$].
END-IF
IF value activity for procuring [quantity $_q$] of [resource $_j$] **THEN**
    ADD one value exchange for resource j (in an existing or new interface) from value activity for [resource $_j$] to value activity providing [resource $_j$] for [provider $_p$].
    REMOVE value activity for procuring [quantity $_q$] of [resource $_j$]
END-IF

3.5.2 Stop offering resource

Stop offering a quantity of a resource to a customer is an action that intent to define all modifications that will appear on goal and value models when the company decides to take this specific business action.

3.5.2.1 Apply the action on the goal Model

Pre condition
• A Agent offer a quantity Q of [resource] to a customer
As-is Model

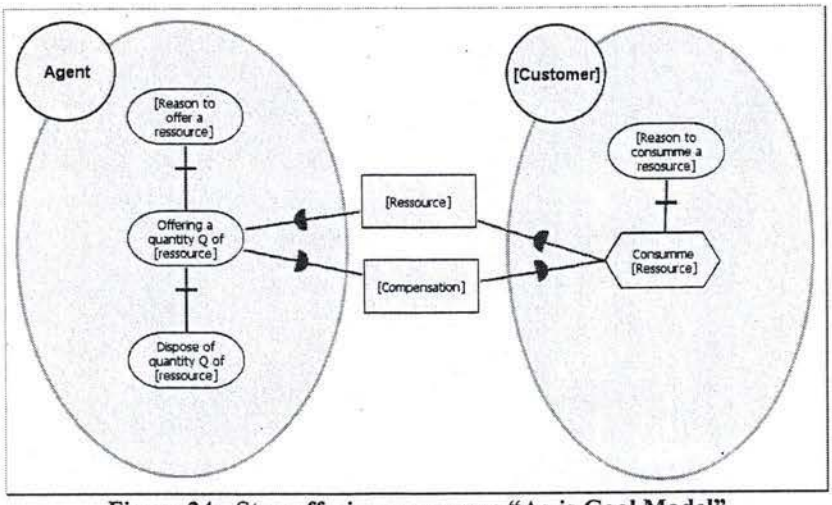



Figure 24: Stop offering a resource "As-is Goal Model"
To-be Model

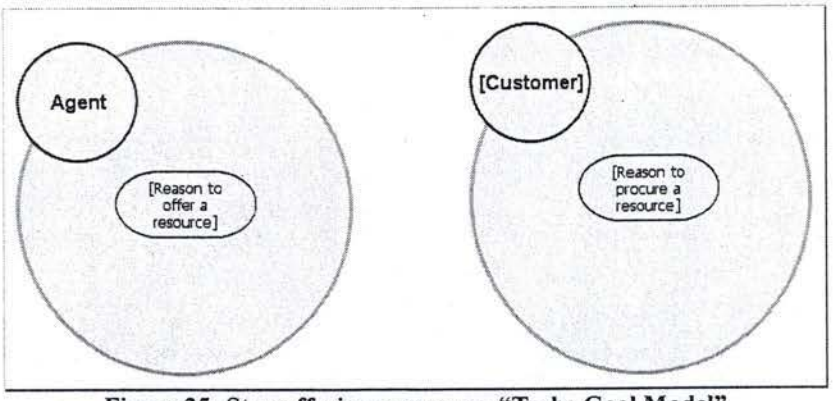



Figure 25: Stop offering a resource "To-be Goal Model"
Remarks
The goal "Possess of quantity Q of [resource]" may be linked to task "produce resource, task "procuring resource" or the goal "Possess quantity Q1/Q2 of [resource]. In this case, the goal will not be removed from the model.

Table 5: Stop offering resource-Goal Model

3.5.2.2 Apply the action on the value Model

Pre condition
• The Actor "Agent" exists • A value activity $_{va1}$ "Offering a quantity Q of [resource]" exist • A value activity $_{va2}$ "Procure a quantity Q of [resource]" exist • A value exchange between va1 et va2
As-is Model

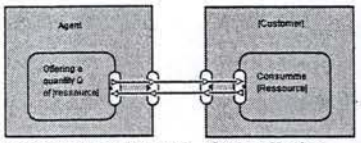
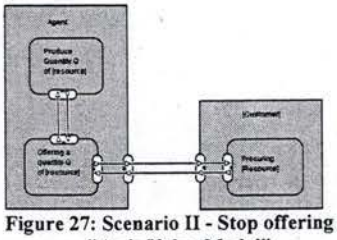
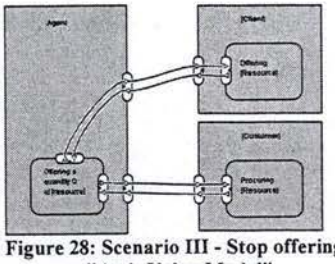
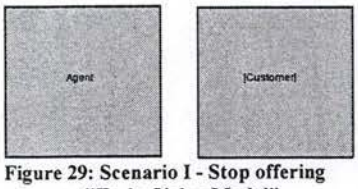
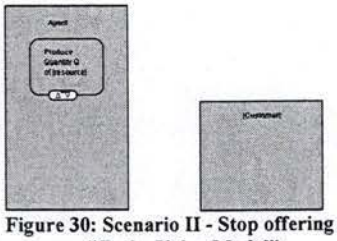
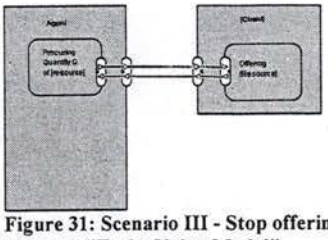
Scenario I	Scenario II	Scenario III
 **Figure 26: Scenario I - Stop offering resource "As-is Value Model"** [17]	 **Figure 27: Scenario II - Stop offering resource "As-is Value Model"**	 **Figure 28: Scenario III - Stop offering resource "As-is Value Model"**
As-is Model		
 **Figure 29: Scenario I - Stop offering resource "To-be Value Model"**	 **Figure 30: Scenario II - Stop offering resource "To-be Value Model"**	 **Figure 31: Scenario III - Stop offering resource "To-be Value Model"**

Table 6: Stop offering resource-Value Model

3.5.2.3 Improving Method

Action definition

Original Template 1
<stop offering, resource $_j$, to, customer $_i$ >

Action 1
<stop offering, resource $_j$, to, customer $_i$ >

[17] Enlarge Picture are available in annex I

Goal Model transformation algorithm

IF task t1 "offering a [quantity $_q$] of [resource $_j$] exist
THEN
    REMOVE task t1 "offering a [quantity $_q$] of [resource $_j$]
END-IF
IF task t2 procuring [resource $_j$]
THEN
    REMOVE task t2 procuring [resource $_j$]
END-IF
REMOVE resource r1 for [resource $_j$]
REMOVE resource r2 for [compensation]
IF task procuring [quantity $_q$] of [resource $_j$] not exist **AND**
  task producing [quantity $_q$] of [resource $_j$] not exist
THEN
    REMOVE goal g1 "Dispose [quantity $_q$] of [resource $_j$]
END-IF

Value Model transformation algorithm

REMOVE value exchange concerning [resource $_j$] from the principal actor to [customer $_I$]
REMOVE value activity for [resource $_j$]
REMOVE value activity offering [resource $_j$] for [customer $_i$]
IF actor [customer $_I$] has no more interface with the outside
THEN
    REMOVE actor [customer $_i$]
END-IF
IF value exchange for procuring [quantity $_q$] of [resource $_j$] exist **THEN**
    ADD one value activity "procuring a quantity Q of [resource $_j$] from provider"
    ADD one value exchange for resource $_j$ (in an existing or new interface) from value activity offering for [resource $_j$] from provider to value activity providing [resource $_j$] for [provider $_p$].
END-IF

3.5.3 Start producing resource

Starting producing a quantity of a resource to a customer is an action that intent to define all modifications that will appear on goal and value models when the company decides to take this specific business action.

3.5.3.1 Apply the action on the goal Model

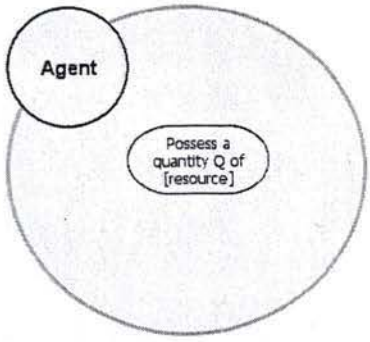
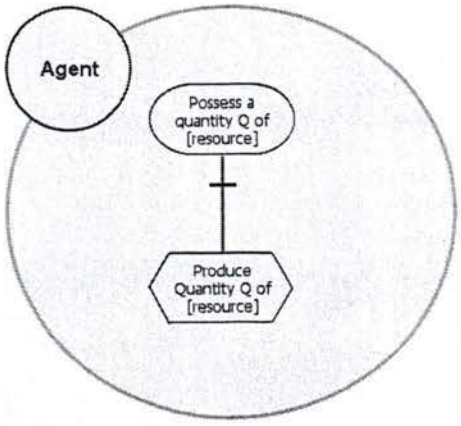
Pre condition
• An Agent exist • The goal Possess of quantity Q of [resource].
As-Is Model
 **Figure 32: Start producing a resource "As-is Goal Model"**
To-be Model
 **Figure 33: Start producing a resource "To-be Goal Model"**
Remarks
The goal "Possess of quantity Q of [resource]" can be attached to several kind of elements: • A task :"Offering a quantity Q of [resource]" • A task :"Produce a quantity Q of [resource']" • A goal : "Possess of a quantity Q' of [resource]" • May be nothing. It do not impact the result of the "As-is Goal Model".

Table 7: Start producing resource-Goal Model

3.5.3.2 Apply the action on the value Model

Pre condition
• The Actor "Agent" exist
As-is Model
Scenario I / Scenario II

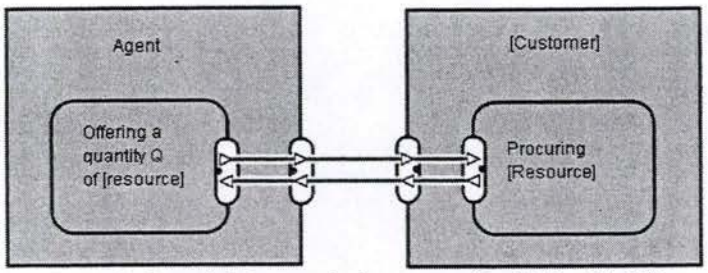


Figure 34: Scenario I-Start producing resource "As-is Value Model"

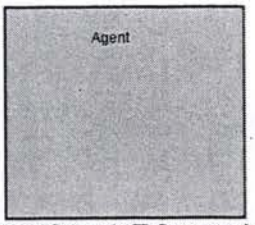


Figure 35: Scenario II-Start producing resource "As-is Value Model"

To-be Model

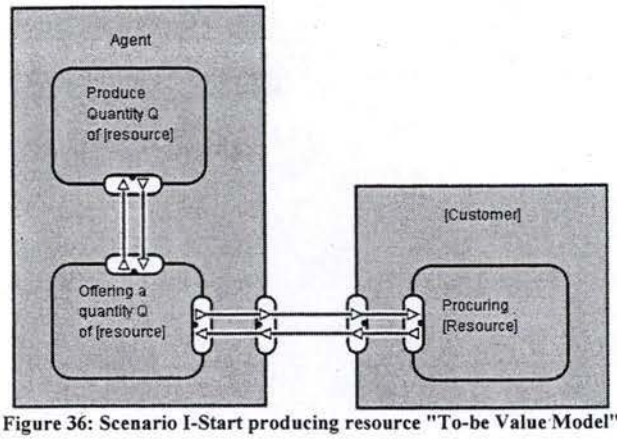


Figure 36: Scenario I-Start producing resource "To-be Value Model"

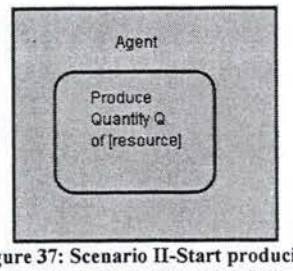


Figure 37: Scenario II-Start producing resource "To-be Value Model"

Remarks

The goal "Possess of quantity Q of [resource]" can be attach to several kind of element:

- A task :"Offering a quantity Q of [resource]"
- A task :"Produce a quantity Q of [resource']"
- A goal : "Possess of a quantity Q' of [resource]"
- May be nothing.

It do not impact the result of the "As-is Goal Model"

Table 8: Start producing resource-Value Model

3.5.3.3 Improving Method

Original Template 1
<start producing, resource $_j$, in, value activity $_k$ >

Action 1
<start producing, resource $_j$, in, value activity $_k$, quantity $_q$, goal $_g$ >

Goal Model transformation algorithm

IF goal g1 "Possess [quantity $_q$] of [resource $_j$]
THEN
ADD task $_{t1}$ producing [quantity $_q$] of [resource $_j$]
CONNECT task $_{t1}$ with goal $_{g1}$
END-IF

Value Model transformation algorithm

ADD one value activity $_k$ producing [quantity $_q$] of [$_j$
IF value activity offering a quantity Q of [resource $_j$] **THEN**
ADD one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.offering a quantity Q of [resource]
END-IF
IF parent of Possess quantity of [resource $_j$] is produce a [resource $_x$] THEN
ADD one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.producing a quantity Q of [resource $_x$]

END-IF

3.5.4 Stop producing resource

Stop offering a quantity of a resource to a customer is an action that intent to define all modifications that will appear on goal and value models when the company decides to take this specific business action.

3.5.4.1 Apply the action on the goal Model

Pre condition
• A agent must produce a quantity Q of [resource]
As-Is Model

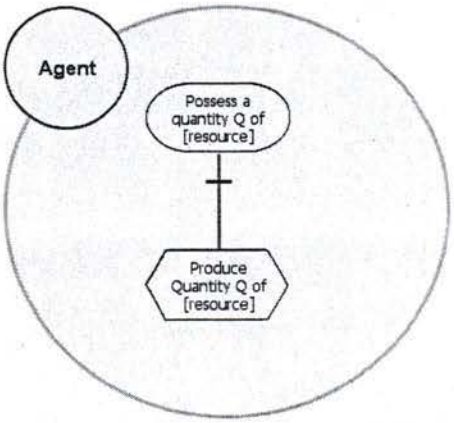



Figure 38: Stop producing resource "As-is Goal Model"
To-Be Model

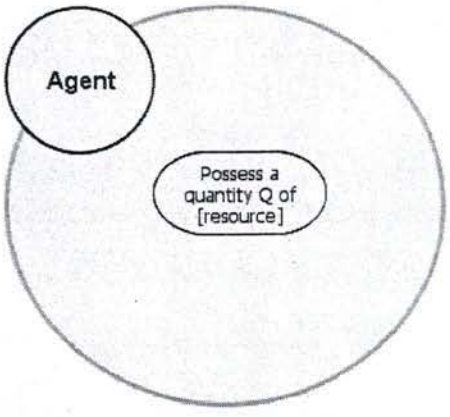



Figure 39: Stop producing resource "To-be Goal Model"
Remarks
The goal "Possess of quantity Q of [resource]" can be attached to several kind of element:

• A task :"Offering a quantity Q of [resource]" • A task :"Produce a quantity Q of [resource']" • A goal : "Possess of a quantity Q' of [resource]" • May be nothing. If the goal "Possess of quantity Q of [resource]" is not linked to any other objectives. It will be remove from the Goal Model

Table 9: Stop producing resource-Goal Model

3.5.4.2 Apply the action on the value Model

Pre condition	
• The Actor "Agent" exist • A value activity "produce Quantity q of [resource] exist	
As-is Model	
Scenario I	Scenario II

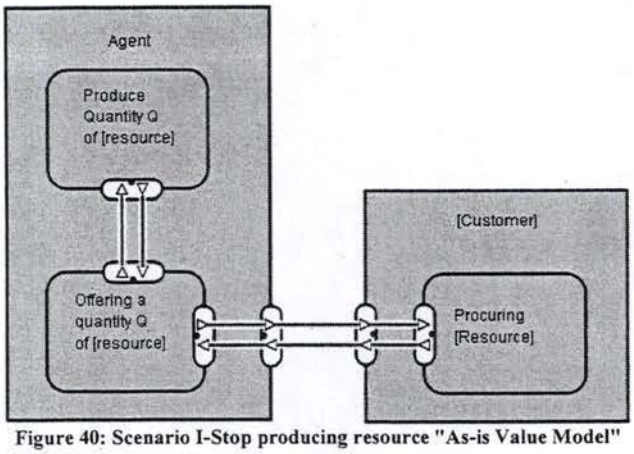
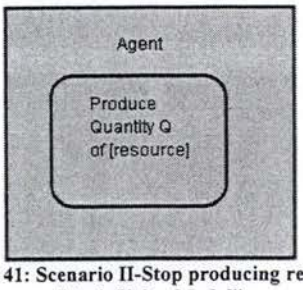

	

Figure 40: Scenario I-Stop producing resource "As-is Value Model"	**Figure 41: Scenario II-Stop producing resource "As-is Value Model"**
To-be Model	

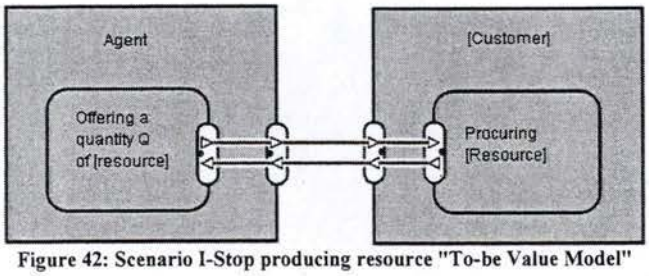
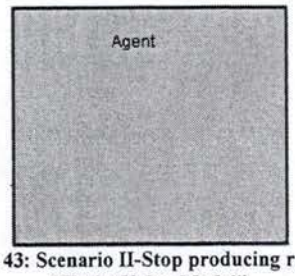

	

Figure 42: Scenario I-Stop producing resource "To-be Value Model"	**Figure 43: Scenario II-Stop producing resource "To-be Value Model"**

Table 10: Stop producing resource-Value Model

3.5.4.3 Improving Method

Original Template 1
< stop producing, resource $_j$, in, value activity $_k$ >

Action 1
< stop producing, resource $_j$, in, value activity $_k$ >

Goal Model transformation algorithm

REMOVE task $_{t1}$ producing [quantity $_q$] of [resource $_j$]
IF goal "Possess [quantity $_q$] of [resource $_j$] has no relation
THEN
    REMOVE goal g1 "Possess [quantity $_q$] of [resource $_j$]
END-IF

Value Model transformation algorithm

REMOVE value activity $_k$ producing [quantity $_q$] of [resource $_j$]

3.5.5 Increase production of resource

Increase the production of a resource to a customer is an action that intent to define all modifications that will appear on goal and value models when the company decides to take this specific business action.

3.5.5.1 Apply the action on the goal Model

Pre condition
• A agent must produce a quantity Q of [resource]
As-Is Model

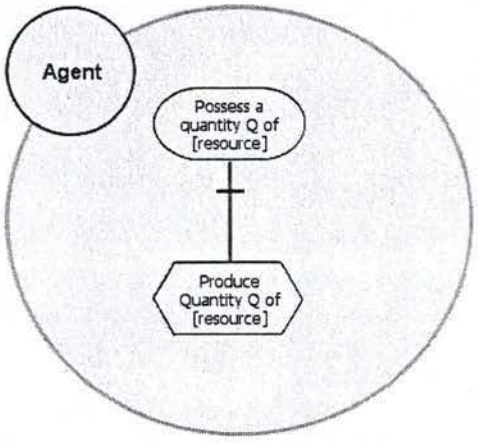



Figure 44: Increase production of resource "As-is Goal Model"
To-Be Model

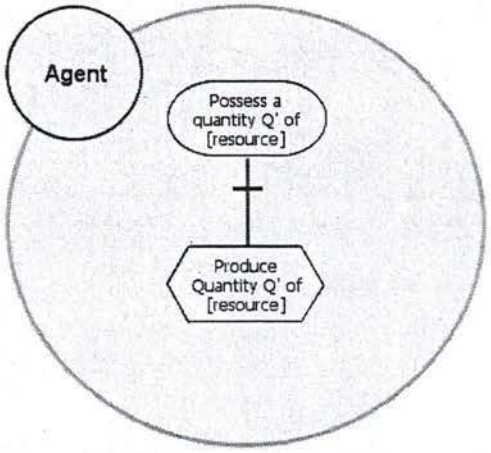



Figure 45: Increase production of resource "To-be Goal Model"

Table 11: Increase production resource-Goal Model

3.5.5.2 Apply the action on the value Model

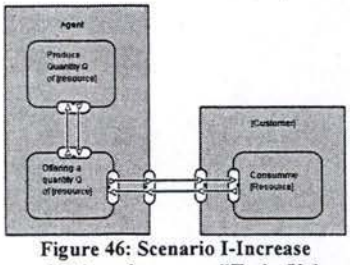
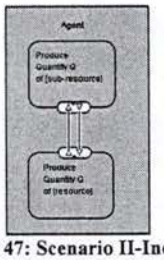
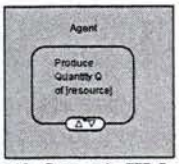
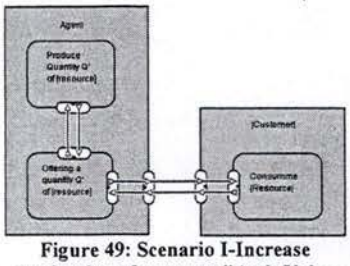
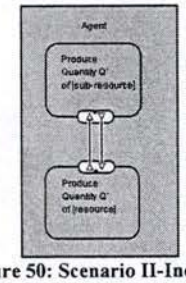
Pre condition		
• The Actor "Agent" exist • A value activity "produce Quantity q of [resource] exist		
As-is Model		
Scenario I	Scenario II	Scenario III
 **Figure 46: Scenario I-Increase production of resource "To-be Value Model"** [18]	 **Figure 47: Scenario II-Increase production of resource "To-be Value Model"**	 **Figure 48: Scenario III-Increase production of resource "To-be Value Model"**
To-be Model		
 **Figure 49: Scenario I-Increase production of resource "As-is Value Model"**	 **Figure 50: Scenario II-Increase production of resource "As-is Value Model"**	 **Figure 51: Scenario III-Increase production of resource "As-is Value Model"**

Table 12: Increase production resource-Value Model

3.5.5.3 Improving Method

Original Template 1
< increase fraction of production of, resource $_j$, in, value activity $_k$ >

Action 1
< increase production of, resource $_j$, in, value activity $_k$, quantity $_z$, goal $_g$ >

[18] Enlarge Picture are available in annex I

Goal Model transformation algorithm

CHANGE quantity $_q$ in "Possess [quantity $_q$] of [resource $_j$] with q = q + z
CHANGE quantity $_q$ in producing [quantity $_q$] of [resource $_j$] with q = q + z

Value Model transformation algorithm

CHANGE quantity $_q$ in value exchange for activity $_k$ with q = q + z

3.5.6 Decrease production of resource

Decrease production of a resource to a customer is an action that intent to define all modifications that will appear on goal and value models when the company decides to take this specific business action.

3.5.6.1 Apply the action on the goal Model

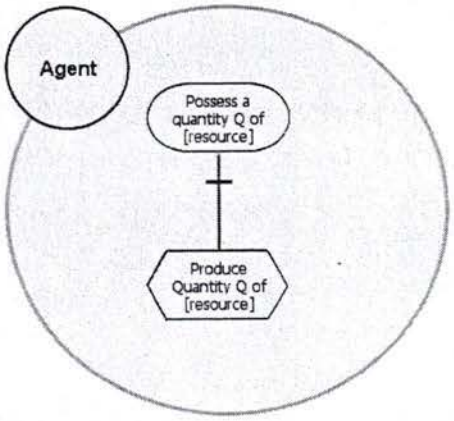
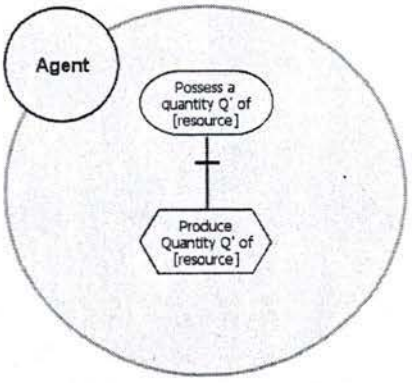
Pre condition
• A agent must produce a quantity Q of [resource] • Quantity $_Z$ < Quantity Q
As-Is Model
 **Figure 52: Decrease production of resource "As-is Goal Model"**
To-Be Model
 **Figure 53: Decrease production of resource "To-be Goal Model"**

Table 13: Decrease production resource-Goal Model

3.5.6.2 Apply the action on the value Model

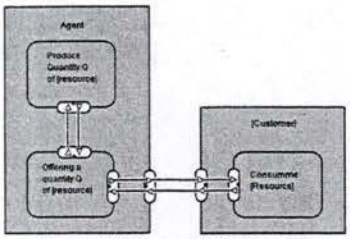
<table>
<tr><th colspan="3">Pre condition</th></tr>
<tr><td colspan="3">• The Actor "Agent" exist
• A value activity "produce Quantity q of [resource] exist
• Quantity z < Quantity Q</td></tr>
<tr><th colspan="3">As-is Model</th></tr>
<tr><td>Scenario I</td><td>Scenario II</td><td>Scenario III</td></tr>
<tr><td> 

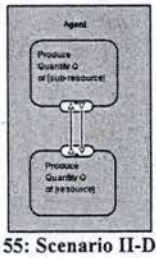
Figure 54: Scenario I-Decrease production of resource "As-is Value Model" [19]</td><td> 

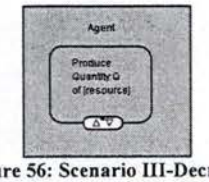
Figure 55: Scenario II-Decrease production of resource "As-is Value Model"</td><td> 

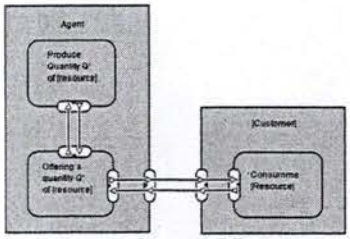
Figure 56: Scenario III-Decrease production of resource "As-is Value Model"</td></tr>
<tr><th colspan="3">To-be Model</th></tr>
<tr><td> 

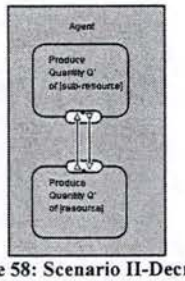
Figure 57: Scenario I-Decrease production of resource "To-be Value Model"</td><td> 

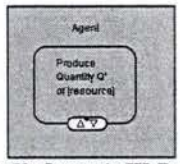
Figure 58: Scenario II-Decrease production of resource "To-be Value Model"</td><td> 

Figure 59: Scenario III-Decrease production of resource "To-be Value Model"</td></tr>
</table>

Table 14: Decrease production resource-Value Model

[19] Enlarge Picture are available in annex I

3.5.6.3 Improving Method

Original Template 1
< decrease fraction of production of, resource $_j$, in, value activity $_k$ >

Action 1
< decrease production of, resource $_j$, in, value activity $_k$, quantity $_q$, goal $_g$ >

Goal Model transformation algorithm

CHANGE quantity $_q$ in "Possess [quantity $_q$] of [resource $_j$] with q = q - z
CHANGE quantity $_q$ in producing [quantity $_q$] of [resource $_j$] with q = q - z

Value Model transformation algorithm

CHANGE quantity $_q$ in value exchange for activity $_k$ with q = q - z

3.5.7 Start procuring resource

3.5.7.1 Apply the action on the goal Model

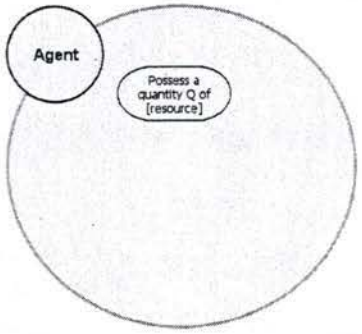
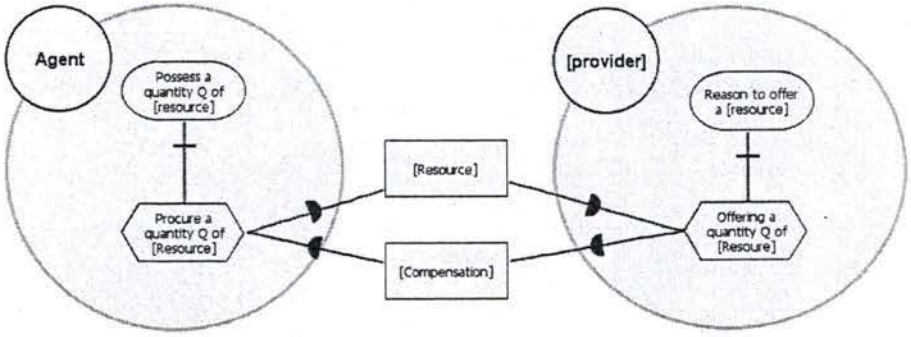
Pre condition
• An Agent exist • The goal "Possess of quantity Q of [resource]".
As-Is Model
 **Figure 60: Start procuring resource "As-is Goal Model"**
To-Be Model
 **Figure 61: Start procuring resource "To-be Goal Model"**
Remarks
The goal "Possess of quantity Q of [resource]" can be attach to several kind of element: • A task :"Offering a quantity Q of [resource] • A task :"Produce a quantity Q of [resource'] • A goal : "Possess of a quantity Q' of [resource] • May be nothing. It don't impact the result of the "As-is Goal Model"

Table 15: Start procuring resource-Goal Model

3.5.7.2 Apply the action on the value Model

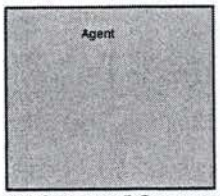
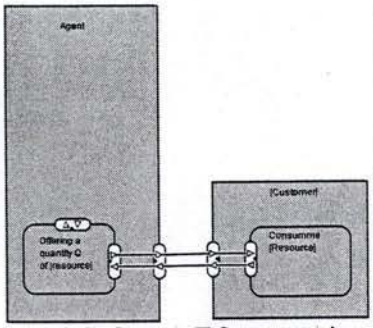
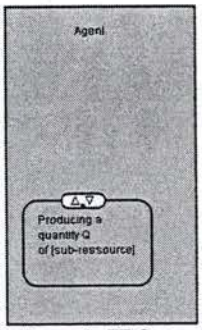
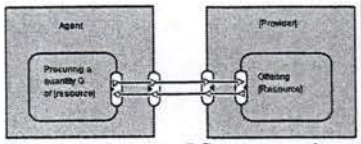
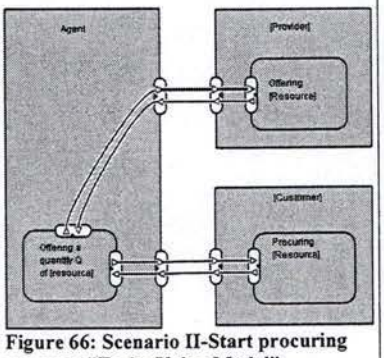
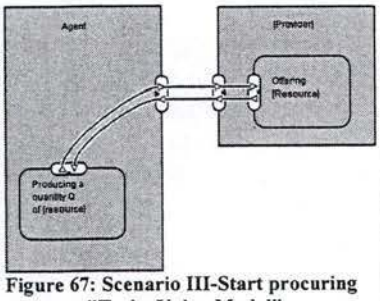
Pre condition		
• The Actor "Agent" exist		
As-is Model		
Scenario I	Scenario II	Scenario III
 **Figure 62: Scenario I-Start procuring resource "As-is Value Model"** [20]	 **Figure 63: Scenario II-Start procuring resource "As-is Value Model"**	 **Figure 64: Scenario III-Start procuring resource "As-is Value Model"**
To-be Model		
 **Figure 65: Scenario I-Start procuring resource "To-be Value Model"**	 **Figure 66: Scenario II-Start procuring resource "To-be Value Model"**	 **Figure 67: Scenario III-Start procuring resource "To-be Value Model"**

Table 16: Start procuring resource-Value Model

3.5.7.3 Improving Method

Original Template 1
<start procuring, resource $_j$, from, provider $_p$ >

Action 1
<start procuring, resource $_j$, from, provider $_p$, quantity $_q$, goal $_g$ >

[20] Enlarge Picture are available in annex I

Goal Model transformation algorithm

ADD task t1 procuring [quantity $_q$] of [resource $_j$]
CONNECT task $_{t1}$ with goal $_g$

IF [provider $_p$] not exist **THEN**
    ADD actor [provide r $_p$]
END-IF
ADD goal g1 "Reason to provide a [resource]
ADD task t2 providing [quantity $_q$] of [resource $_j$] for actor [provide r $_p$]

ADD resource r1 for [resource $_j$]
ADD resource r2 for [compensation]

Value Model transformation algorithm

IF [provider $_p$] not exist **THEN**
    ADD Actor [provider $_p$]
END-IF

ADD one value activity for procuring [quantity $_q$] of [resource $_j$]
ADD one value activity offering [resource $_j$] for [provider $_p$]
ADD one value exchange for resource j in new interface from value activity for procuring [quantity $_q$] of [resource $_j$] to value activity offering [resource $_j$] for [provider $_p$].

IF value activity offering [resource $_j$] for [customer $_i$] exist **THEN**
    one value exchange for resource j in new interface from value activity offering [resource $_j$] for [customer $_i$] to value activity providing [resource $_j$] for [provider $_p$].
END-IF
//Use goal model to decide if the sub-resource is use inside a production activity
IF parent of Possess [quantity $_q$] of [resource $_j$] is produce **THEN**
    one value exchange for resource j in new interface from value activity producing [quantity $_q$] of [resource $_j$] to value activity for procuring [quantity $_q$] of [resource $_j$].
END-IF

3.5.8 Stop procuring resource

3.5.8.1 Apply the action on the goal Model

Pre condition

- An Agent must procure a quantity Q of [resource] from a provider.

As-Is Model

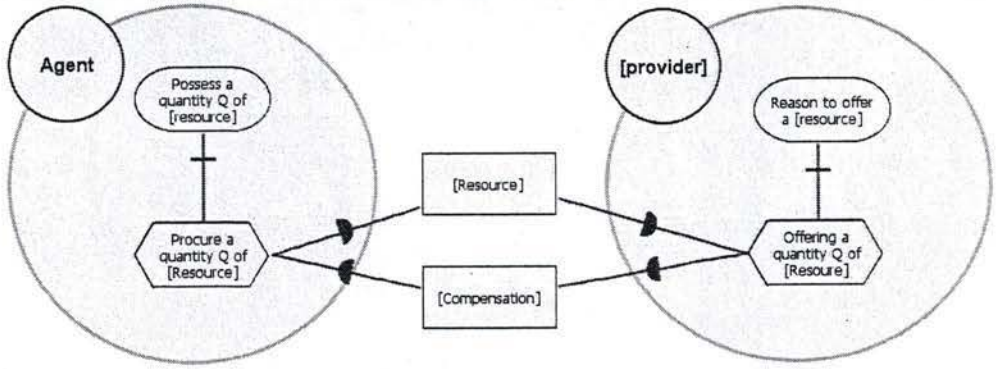


Figure 68: Stop procuring resource "As-is Goal Model"

To-Be Model

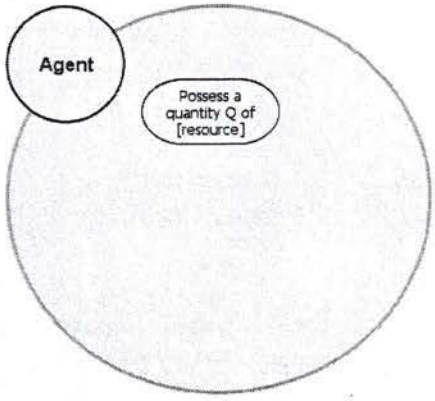


Figure 69: Stop procuring resource "To-be Goal Model"

Remarks

The goal "Possess of quantity Q of [resource]" can be attach to several kind of element:

- A task :"Offering a quantity Q of [resource]
- A task :"Produce a quantity Q of [resource']
- A goal : "Possess of a quantity Q' of [resource]
- May be nothing.

The result of the "As-is Goal Model" is different regards of links that this goal have. If the goal "Possess of quantity Q of [resource] is not linked to any other object. It will be remove from the Goal Model

Table 17: Stop procuring resource-Goal Model

3.5.8.2 Apply the action on the value Model

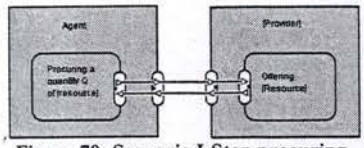
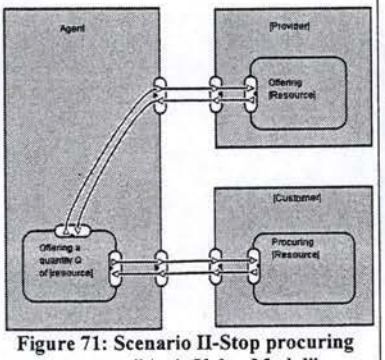
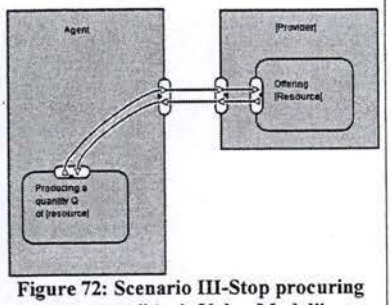
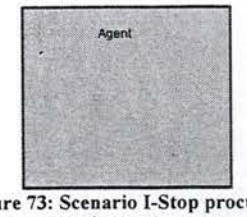
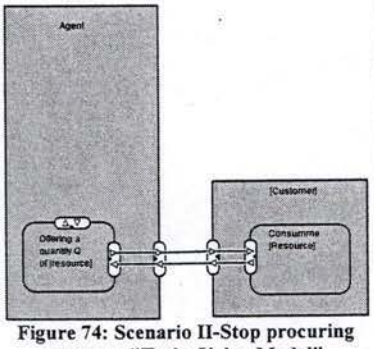
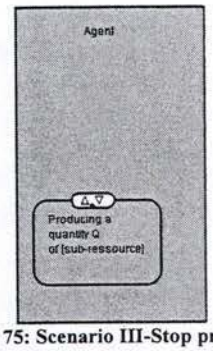
Pre condition		
• The Actor "Agent" exist		
As-is Model		
Scenario I	Scenario II	Scenario III
 **Figure 70: Scenario I-Stop procuring resource "As-is Value Model"** [21]	 **Figure 71: Scenario II-Stop procuring resource "As-is Value Model"**	 **Figure 72: Scenario III-Stop procuring resource "As-is Value Model"**
To-be Model		
 **Figure 73: Scenario I-Stop procuring resource "To-be Value Model"**	 **Figure 74: Scenario II-Stop procuring resource "To-be Value Model"**	 **Figure 75: Scenario III-Stop procuring resource "To-be Value Model"**

Table 18: Stop procuring resource-Value Model

[21] Enlarge Picture are available in annex I

3.5.8.3 Improving Method

Original Template 1
< stop procuring, resource $_j$, from, provider $_p$ >

Action 1
< stop procuring, resource $_j$, from, provider $_p$ >

Goal Model transformation algorithm

REMOVE procuring [quantity $_q$] of [resource $_j$]
REMOVE providing [quantity $_q$] of [resource $_j$] for actor [provide r $_p$]
REMOVE resource r1 for [resource $_j$]
REMOVE resource r2 for [compensation]
REMOVE goal "Reason to provide a [resource]
IF [provide r $_p$] has no link **THEN**
    REMOVE [provide r $_p$]
END-IF

Value Model transformation algorithm

REMOVE value activity offering [resource $_j$] for [customer $_i$]
REMOVE value activity for procuring [quantity $_q$] of [resource $_j$]
IF [provide r $_p$] has no value exchange **THEN**
    REMOVE [provide r $_p$]
END-IF

3.5.9 Increase procuring resource

3.5.9.1 Apply the action on the goal Model

Pre condition
• An Agent must procure a quantity Q of [resource] from a provider.
As-Is Model

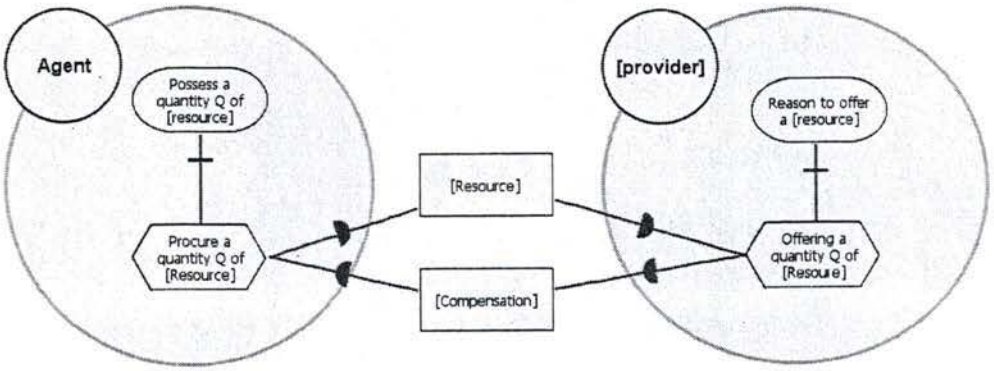


Figure 76: Increase procuring resource "As-is Goal Model"

To-Be Model

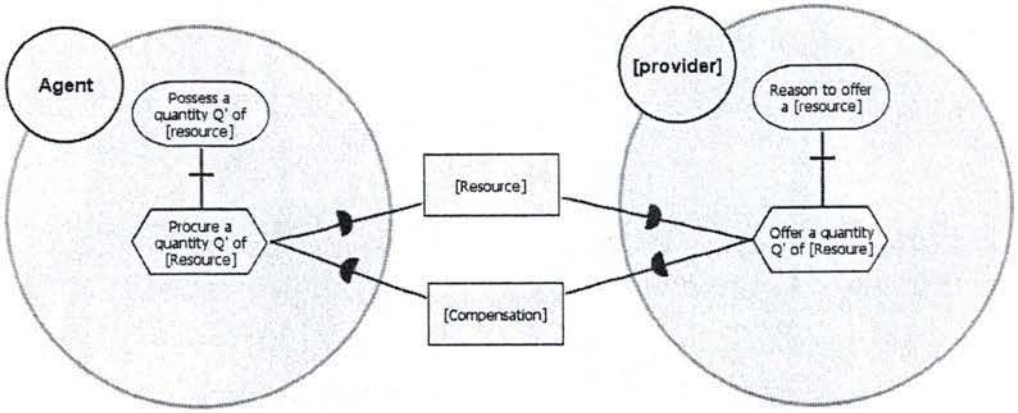


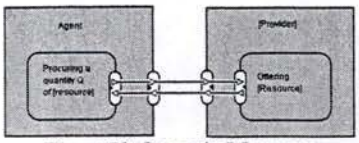
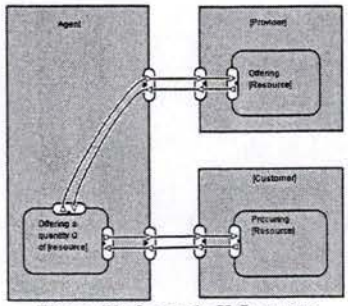
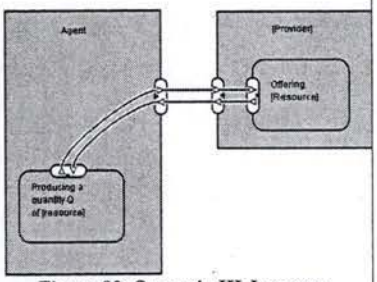
Figure 77: Increase procuring resource "To-be Goal Model"

Table 19: Increase procuring resource-Goal Model

3.5.9.2 Apply the action on the value Model

Pre condition
• Agent exist • Procuring a resource from a provider exist

As-is Model

Scenario I	Scenario II	Scenario III
 **Figure 78: Scenario I-Increase procuring resource "As-is Value Model"** [22]	 **Figure 79: Scenario II-Increase procuring resource "As-is Value Model"**	 **Figure 80: Scenario III-Increase procuring resource "As-is Value Model"**

To-be Model

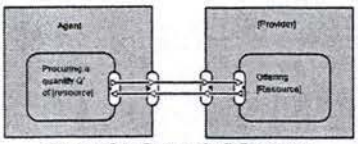
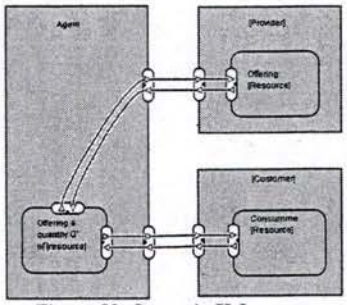
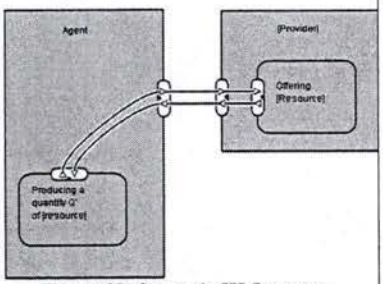
 **Figure 81: Scenario I-Increase procuring resource "To-be Value Model"**	 **Figure 82: Scenario II-Increase procuring resource "To-be Value Model"**	 **Figure 83: Scenario III-Increase procuring resource "To-be Value Model"**

Table 20: Increase procuring resource-Value Model

[22] Enlarge Picture are available in annex I

3.5.9.3 Improving Method

Original Template 1
No original template

Action 1
< increase procuring of, resource $_j$, in, provider $_p$, quantity $_q$, goal $_g$ >

Goal Model transformation algorithm

CHANGE quantity $_q$ in "Possess [quantity $_q$] of [resource $_j$] with q = q + z
CHANGE quantity $_q$ in procuring [quantity $_q$] of [resource $_j$] with q = q + z

Value Model transformation algorithm

CHANGE quantity $_q$ in value exchange for activity $_k$ with q = q + z

3.5.10 Decrease procuring resource

3.5.10.1 Apply the action on the goal Model

Pre condition
• An Agent must procure a quantity Q of [resource] from a provider.
As-Is Model

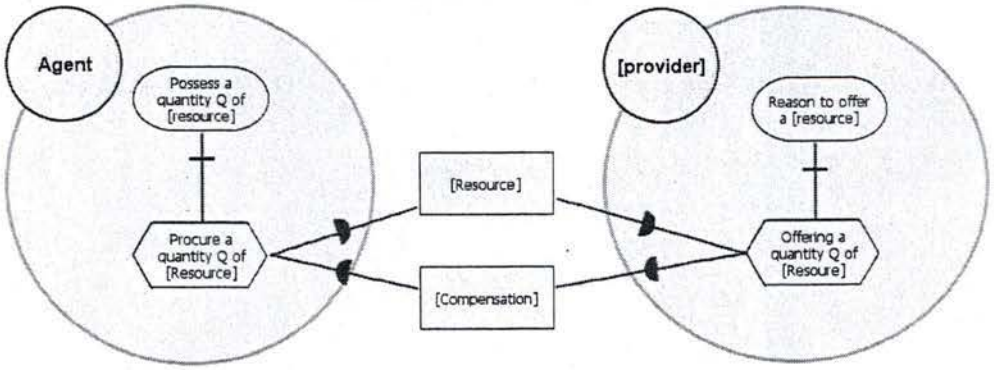


Figure 84: Decrease procuring resource "As-is Goal Model"

To-Be Model

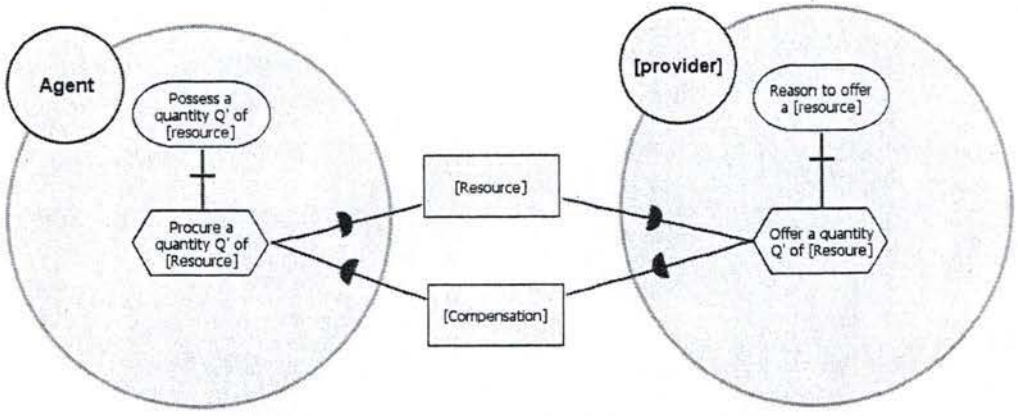


Figure 85: Decrease procuring resource "To-be Goal Model"

Table 21: Decrease procuring resource-Goal Model

3.5.10.2 Apply the action on the value Model

Pre condition
• Agent exist • Procuring a resource from a provider exist

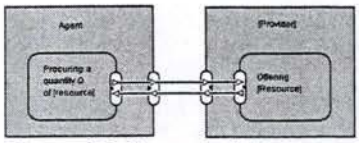
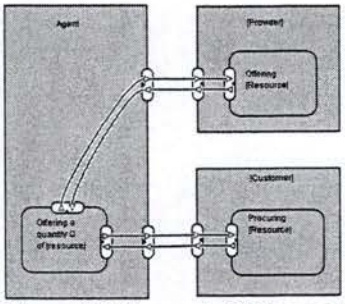
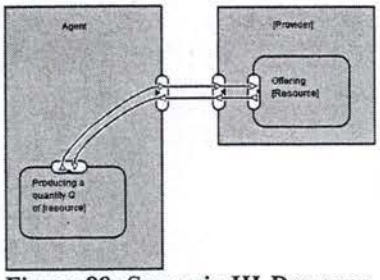
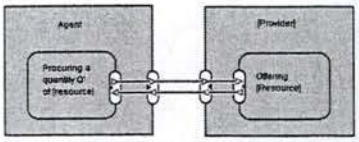
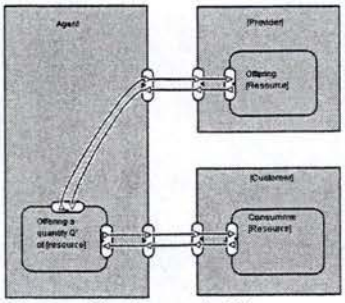
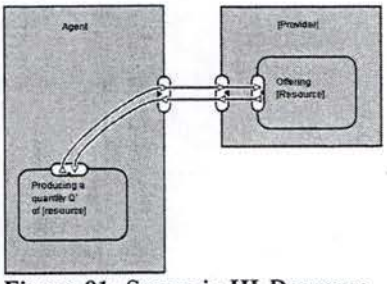
As-is Model		
Scenario I	Scenario II	Scenario III
 **Figure 86: Scenario I-Decrease procuring resource "As-is Value Model"** [23]	 **Figure 87: Scenario II-Decrease procuring resource "As-is Value Model"**	 **Figure 88: Scenario III-Decrease procuring resource "As-is Value Model"**
To-be Model		
 **Figure 89: Scenario I-Decrease procuring resource "To-be Value Model"**	 **Figure 90: Scenario II-Decrease procuring resource "To-be Value Model"**	 **Figure 91: Scenario III-Decrease procuring resource "To-be Value Model"**

Table 22: Decrease procuring resource-Value Model

[23] Enlarge Picture are available in annex I

3.5.10.3 Improving Method

Original Template 1
No original template

Action 1
< decrease procuring of, resource $_j$, in, provider $_p$, quantity $_q$, goal $_g$ >

Goal Model transformation algorithm

CHANGE quantity $_q$ in "Possess [quantity $_q$] of [resource $_j$] with q = q - z
CHANGE quantity $_q$ in procuring [quantity $_q$] of [resource $_j$] with q = q - z

Value Model transformation algorithm

CHANGE quantity $_q$ in value exchange for activity $_k$ with q = q - z

3.5.11 Split a Quantity in to smaller quantity

3.5.11.1 Apply the action on the goal Model

Pre condition	
• A goal Possess of quantity Q of [resource] exists.	
As-Is Model	**To-Be Model**

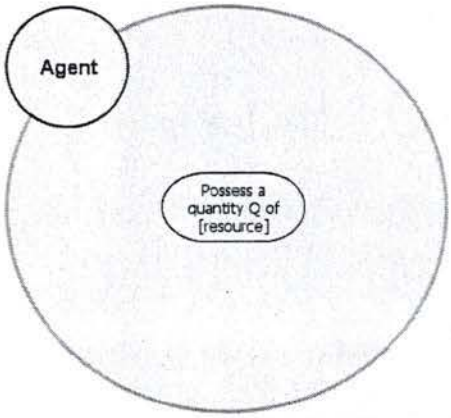
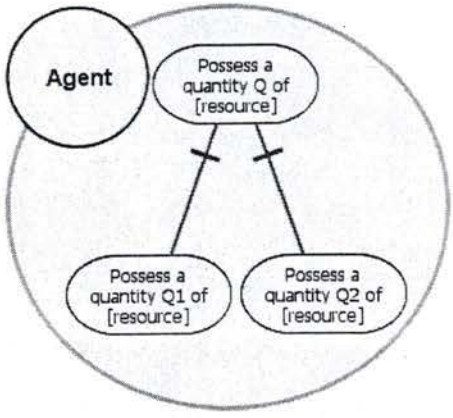

	

Figure 92: Split a Quantity in to smaller quantity "As-is Goal Model"	**Figure 93: Split a Quantity in to smaller quantity "To-be Goal Model"**

Table 23: Split quantity -Goal Model

3.5.11.2 Apply the action on the value Model

No impact

3.5.11.3 Improving Method

Original Template 1
No original template

Action 1
<split quantity, resource $_j$, in, , goal $_g$, quantity $_{q1}$, quantity $_{q2}$ >

Goal Model transformation algorithm

ADD goal g1 "Possess a Quantity Q1 of [resource]"
ADD goal g2 "Possess a Quantity Q2 of [resource]
CONNECT Goal g with g1
CONNECT Goal g with g2

3.5.12 Merge a two quantity in one quantity

3.5.12.1 Apply the action on the goal Model

Pre condition
• A goal "Possess of quantity Q of [resource]" exists. • This goal was split in two smaller quantities. • One sub-quantity can be link to a task "Produce a quantity Q of [resource] or a task "Procuring a quantity Q of [resource] from a provider and the other sub-quantity is not attach to a task "Produce a quantity Q of [resource] or a task "Procuring a quantity Q of [resource] from a provider.
As-Is Model

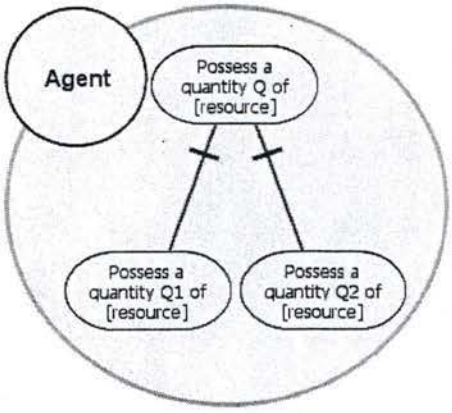



Figure 94: Merge a two quantity in one quantity "As-is Goal Model"

To-Be Model

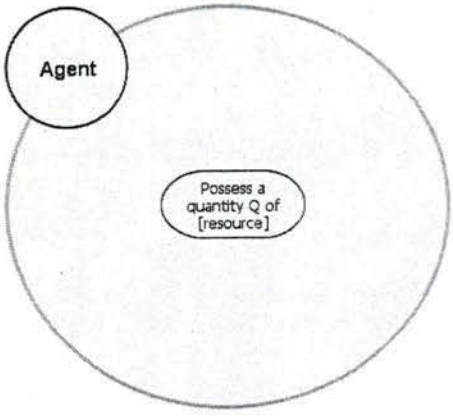



Figure 95: Merge a two quantity in one quantity "To-be Goal Model"

Table 24: Merge quantity -Goal Model

3.5.12.2 Apply the action on the value Model

No impact

3.5.12.3 Improving Method

Original Template 1
No original template

Action 1
<merge quantity, resource $_j$, in, goal $_g$, quantity $_{q1}$, quantity $_{q2}$ >

Goal Model transformation algorithm

```
IF goal g1 "Possess a Quantity Q1 of [resource]" have a task produce or produring THEN
        Taks 1= a task produce or produring
END-IF
IF goal g2 "Possess a Quantity Q1 of [resource]" have a task produce or produring THEN
        Taks 2= a task produce or produring
END-IF
IF task 1 not empty et task 2 not empty THEN
        //Merge Impossible
ELSE
        REMOVE goal g1 "Possess a Quantity Q1 of [resource]"
        REMOVE goal g2 "Possess a Quantity Q2 of [resource]
        IF task 1 not empty THEN
                CONNECT Goal g with task1
        END-IF
        IF task 2 not empty THEN
                CONNECT Goal g with task2
        END-IF
END-IF
```

3.5.13 Need a sub-resource to produce a resource

3.5.13.1 Apply the action on the goal Model

Pre condition
• An agent must produce a quantity Q of [resource].

As-Is Model	To-Be Model

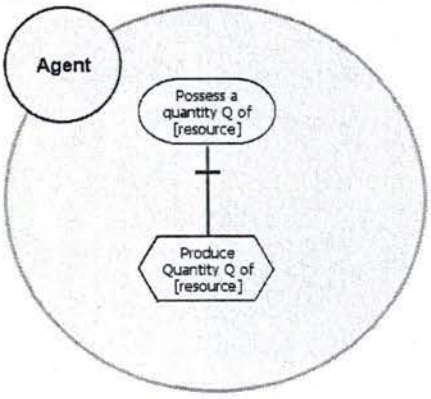
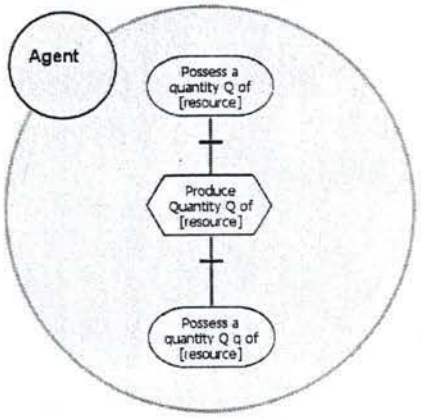

	

Figure 96: Need a sub-resource to produce a resource "As-is Goal Model"	**Figure 97: Need a sub-resource to produce a resource "To-be Goal Model"**

Table 25: Need a sub-resource -Goal Model

3.5.13.2 Apply the action on the value Model

No impact

3.5.13.3 Improving Method

Original Template 1
No original template

Action 1
<Need , ressource $_j$, for, task $_{t1}$, quantity $_{q1}$, resource $_n$>

Goal Model transformation algorithm

IF task t1 Produce quantity $_q$ of [resource $_j$] exist
THEN
ADD goal g1 "Possess [quantity $_{q1}$] of [resource $_j$]
END-IF

3.5.14 No Need a sub-resource to produce a resource

3.5.14.1 Apply the action on the goal Model

Pre condition	
• An agent must produce a quantity Q of [resource]. • A goal "Possess of quantity Q of [resource]"	
As-Is Model	**To-Be Model**

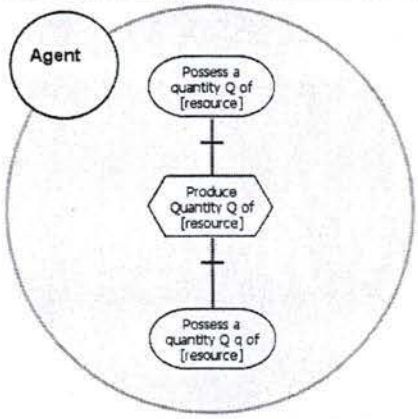
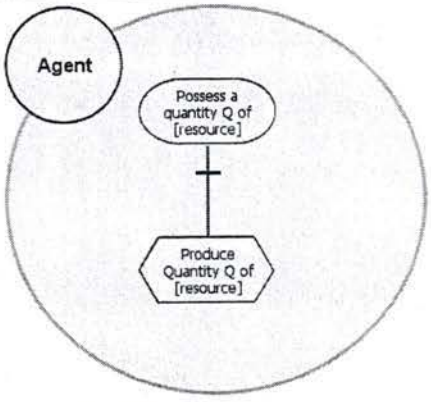

	

Figure 98: No Need a sub-resource to produce a resource "As-is Goal Model"	**Figure 99: No Need a sub-resource to produce a resource "To-be Goal Model"**

Table 26: No Need a sub-resource -Goal Model

3.5.14.2 Apply the action on the value Model

No impact

3.5.14.3 Improving Method

Original Template 1
No original template

Action 1
<No Need , ressource $_j$, for, task $_{t1}$, quantity $_q$, resource $_n$>

Goal Model transformation algorithm

REMOVE RELATION between goal g and Produce a quantity Q of [resource]

IF goal g "Possess a Quantity Q of [sub-resource]" have no task produce or produring THEN
    REMOVE goal g
END-IF

3.5.15 Resource Insourcing

Insourcing of a resource is a composition of several base actions. Insourcing have an impact on the quantity provide by the provider and an impact on the quantity produce by the Agent.

There are 4 cases for the Insourcing.

1° The resource is only provided by a provider and there is no production
After the Insourcing, the resource is only produce by the agent.

Actions executed :

Stop procuring resource
Start producing resource

2° The resource is only provided by a provider and there is no production
After the Insourcing, the resource is provided by a provider and produce by the agent.

Actions executed :
Split quantity of resource
Decrease procuring of resource
Start producing resource

3° The resource is provided by a provider and produce also by a the agent
After the Insourcing, the resource is only produce by the agent.

Actions executed :
Stop procuring resource
Merge quantity of resource
Increase Production of resource

4° The resource is provided by a provider and produce also by a the agent

After the Insourcing, the resource is provided by a provider and produce by the agent.

Actions executed :
Decrease procuring resource
Increase Production of resource

Pre condition:
Quantity Z to in source <= Quantity Q

3.5.15.1 Improving Method

Original Template 1
<insource fraction of production of, resource $_j$, in, value activity $_k$>

Action 1
<insource fraction of production of, resource $_j$, in, value activity $_k$, provider $_p$, quantity $_q$, goal $_g$ >

Transformation algorithm

```
IF task procuring [quantity q] of [resource j] exist AND
   task producing [quantity q] of [resource j] not exist
THEN
        IF quantity z = quantity q
        THEN
                CALL < stop procuring, resource j, from, provider p >
                CALL <start producing, resource j, in, value activity k, quantity q, goal g >
        ELSE
                CALL <split quantity, resource j, in, , goal g, quantity q1, quantity q2 >
                CALL <start producing, resource j, in, value activity k, quantity q, goal g >
                CALL < decrease procuring of, resource j, in, provider p, quantity q, goal g >
        END-IF
END-IF

IF task procuring [quantity q] of [resource j] exist AND
   task producing [quantity q] of [resource j] exist
THEN
        IF quantity z = quantity q
        THEN
                CALL < stop procuring, resource j, from, provider p >
                CALL <merge quantity, resource j, in, goal g, quantity q1, quantity q2 >
                CALL < increase production of, resource j, in, value activity k, quantity z, goal g >
        ELSE
                CALL < increase production of, resource j, in, value activity k, quantity z, goal g >
                CALL < decrease procuring of, resource j, in, provider p, quantity q, goal g >
        END-IF
END-IF
```

3.5.16 Resource Outsourcing

Outsourcing of a resource is a composition of several base actions. Outsourcing has an impact on the quantity provide by the provider and an impact on the quantity produce by the Agent.

There are 4 cases for the Outsourcing.

1° The resource is only produce by the agent and the resource is procured by a provider. After the Outsourcing, the resource is procure by a provider

Actions executed :
Stop producing resource
Start procuring resource

2° The resource is only produce by the agent and the resource is procure by a provider. After the Outsourcing, the resource is provided by a provider and produce by the agent.

Actions executed :
Split quantity of resource
Decrease producing resource
Start procuring resource

3° The resource is provided by a provider and produce also by a the agent
After the Outsourcing, the resource is procure by a provider

Actions executed :
Stop producing resource
Merge quantity of resource
Increase procuring resource

4° The resource is provided by a provider and produce also by a the agent
After the Outsourcing, the resource is provided by a provider and produce by the agent.

Actions executed :
Decrease producing resource
Increase procuring resource

Pre condition:
Quantity Z to out source <= Quantity Q

3.5.16.1 Improving Method

Transformation algorithm

```
IF task procuring [quantity q] of [resource j] not exist AND
   task producing [quantity q] of [resource j] exist
THEN
        IF quantity z = quantity q
        THEN
                CALL < stop producing, resource j, in, value activity k >
                CALL <start procuring, resource j, from, provider p, quantity q, goal g >
        ELSE
                CALL <split quantity, resource j, in, , goal g, quantity q1, quantity q2 >
                CALL < decrease production of, resource j, in, value activity k, quantity q, goal g >
                CALL <start procuring, resource j, from, provider p, quantity q, goal g >
        END-IF
END-IF

IF task procuring [quantity q] of [resource j] exist AND
   task producing [quantity q] of [resource j] exist
THEN
        IF quantity z = quantity q
        THEN
                CALL < stop producing, resource j, in, value activity k >
                CALL <merge quantity, resource j, in, goal g, quantity q1, quantity q2 >
                CALL < increase procuring of, resource j, in, provider p, quantity q, goal g >
        ELSE
                CALL < decrease production of, resource j, in, value activity k, quantity q, goal g >
                CALL < increase procuring of, resource j, in, provider p, quantity q, goal g >
        END-IF
END-IF
```

3.6 Action Resume

In this chapter, we have study for each action:

- Different scenario that modify the Goal Model
- Different scenario that modify the Value Model.
- An algorithm that produce the "To-be" Goal model
- An algorithm that produce the "To-be" Value model
- An action signature that shows all attributes required.

Below, we provide a resume of all action's signature.

Offering a resource
<start offering, resource $_j$, to, customer $_i$, quantity $_q$, goal $_g$, value activity $_k$ >
<stop offering, resource $_j$, to, customer $_i$ >

Producing a resource
<start producing, resource $_j$, in, value activity $_k$, quantity $_q$, goal $_g$ >
< stop producing, resource $_j$, in, value activity $_k$ >
< increase production of, resource $_j$, in, value activity $_k$, quantity $_z$, goal $_g$ >
< decrease production of, resource $_j$, in, value activity $_k$, quantity $_q$, goal $_g$ >

Procuring a resource
<start procuring, resource $_j$, from, provider $_p$, quantity $_q$, goal $_g$ >
< stop procuring, resource $_j$, from, provider $_p$ >
< increase procuring of, resource $_j$, in, provider $_p$, quantity $_q$, goal $_g$ >
< decrease procuring of, resource $_j$, in, provider $_p$, quantity $_q$, goal $_g$ >

Manage quantity of resource
<split quantity, resource $_j$, in, goal $_g$, quantity $_{q1}$, quantity $_{q2}$ >
<merge quantity, resource $_j$, in, goal $_g$, quantity $_{q1}$, quantity $_{q2}$ >

Manage need of sub-resource
<Need , ressource $_j$, in, goal $_g$, quantity $_{q1}$, resource $_n$>
<No Need , ressource $_j$, in, goal $_g$, quantity $_q$, resource $_n$>

Change the way to acquired resource
<insource fraction of production of, resource $_j$, in, value activity $_k$, provider $_p$, quantity $_q$, goal $_g$ >
<outsource fraction of production of, resource $_j$, in, value activity $_k$, provider $_p$, quantity $_z$, goal $_g$ >

4 CASE STUDY

In this chapter, we will apply our new method (3) on a study case. This study case will help us to highlight the main differences between the 2 methods (2 and 3) and to propose new improvements. In order to be able to compare both methods, we have decided to keep the same study case as the one used by method 2. This study case concerns the company "Massively Multiplayer Online player (MMOG)" who whishes to propose an online game.

After a brief explanation of this study case in the section4.1 Presentation of the case, we will apply both methods on the study case:

- Method 2 in the section: 4.2 Presentation of the implementation of the Previous Method
- Method 3 in the section: 4.3 Application of the improved method

Finally, we will compare the results and estimate the changes and improvement brought by the new method.

4.1 Presentation of the case

This study case concerns a company working in the field of the online games. This case explains the activity and the goal of the company in a first step. In a second step it tries to foresee changes in the organization of the company who wants to adapt itself to the market. Those steps are explained hereunder.

4.1.1 Presentation of the case

The company "Massively Multiplayer Online player (MMOG)" whishes to propose an online game permitting hundreds of users to play together. The most popular games are: Sony's Star Wars Galaxies, Blizzard's World of Warcraft and Final Fantasy XI.

Several actors are present in this case:

- MMOG is the main actor.
- The access provider (ISP) considered as a service provider.
- And the players, considered as customers.

MMOG creates the content of the games and then sells the CD to its customers. To deal with the game's stories, MMOG has had to associate with an internet service provider.

MMOG offers new online games with a monthly subscription. To be able to play, customers must have an internet connection.

4.1.2 Changes in the organization

The study case describes that in a second step MMOG will modify its goals to adapt itself to the market evolution. Those changes are:

- Change 1: A new goal of MMOG will be the distribution' facility. To reach it, the company foresees to outsource the CD delivery by using the services of a specialized company.
- Change 2: The game content's creation is very expensive. To reduce this cost, MMOG whishes to outsource the game content creation to some players which are professional designers but at lower cost.
- Change 3: The story boarding is also very expensive. The possible solution is to let the player develop these stories themselves.
- Change 4: MMOG wants to offer free trial games to become more popular. MMOG can than increase the number of game's players who used the online game.

4.2 Presentation of the implementation of the Previous Method

In this section, we will explain the result of the Method 2 keeping in mind the explanations given in the section 3.1.

We will first present the first step of the Method 2 which is the goal and business "As-is" model. The goal model (i*) and the value model (e³model) will be described in a separate section.

A second step will explain the changes in the vision of the Company as well as the construction of the "To-be" models as well as the goal model (i*) and the value model (e³model). The start point will be the "As-is" model business on which template's transformations will be applied. After this transformation process, we will obtain a "To-be" value model aligned with the goal model.

4.2.1 As-Is Models

The Method 2can is understood as follows:

The most important **goal** in the MMOG Company is **the economic viability of the company on a long term basis**. This goal is divided in two sub goals: longevity of the game play and the scalability of the infrastructure.
The MMOG creates and distributes content in order to ensure the longevity of the game play. The activity of creation is divided in three sub-activities: story boarding, 3D modeling, game programming and game designing. The distribution of this content may be provided by the hosting service "ISP". The ISP gets a payment for this service. But MMOG Company also distributes the game on CD. This helps to reduce the cost for the customers.

To be able to play with a game each customer needs to buy the CD which contains the client application. He has also to pay for an internet connection to ISP.

The satisfaction of the clients represents a soft goal. As long as the clients are satisfied, the longevity of the game play is ensured. This satisfaction depends mainly on the attractiveness of the game and on the access cost (which must be low).

4.2.1.1 i* Goal Model

The schema hereunder represent the "As-is" Goal Model. We can see the three actors in the different circles (game provider, ISP and Customer) and the exchanges between them (boxes outside the circles).

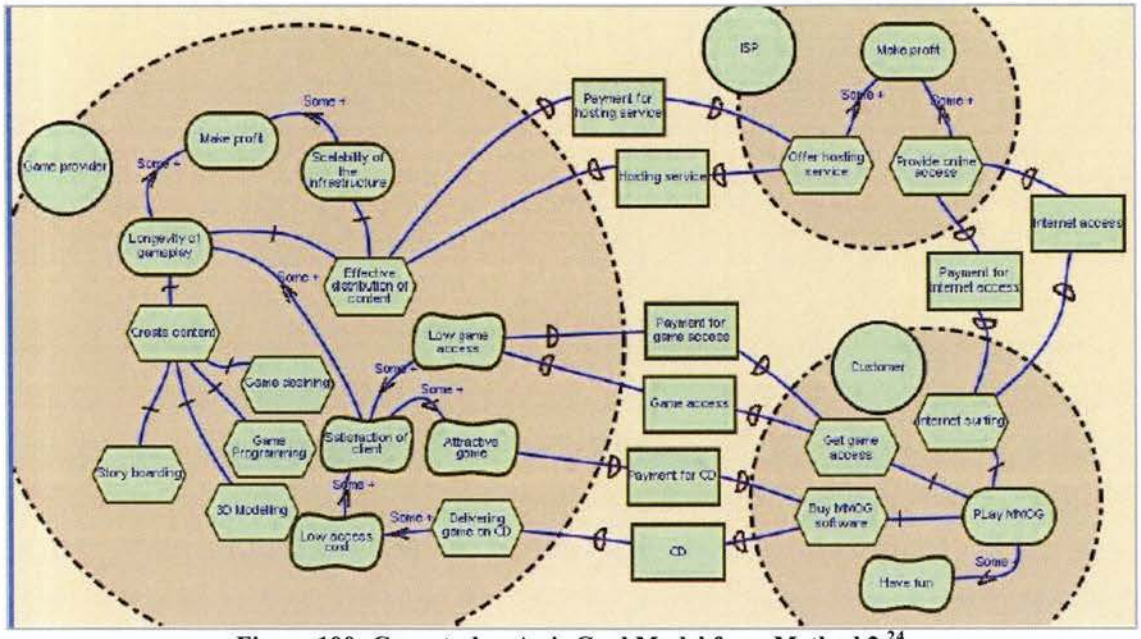


Figure 100: Case study - As-is Goal Model from Method 2 [24]

[24] Pierre Halleux and Ludovic Mathieu, a method to support the alignment of value models and goal models, Faculté de Namur,2008
Enlarge schema in Annex I

4.2.1.2 e³ Value Model

The schema represents the value model and all economic exchanges between the 3 actors.

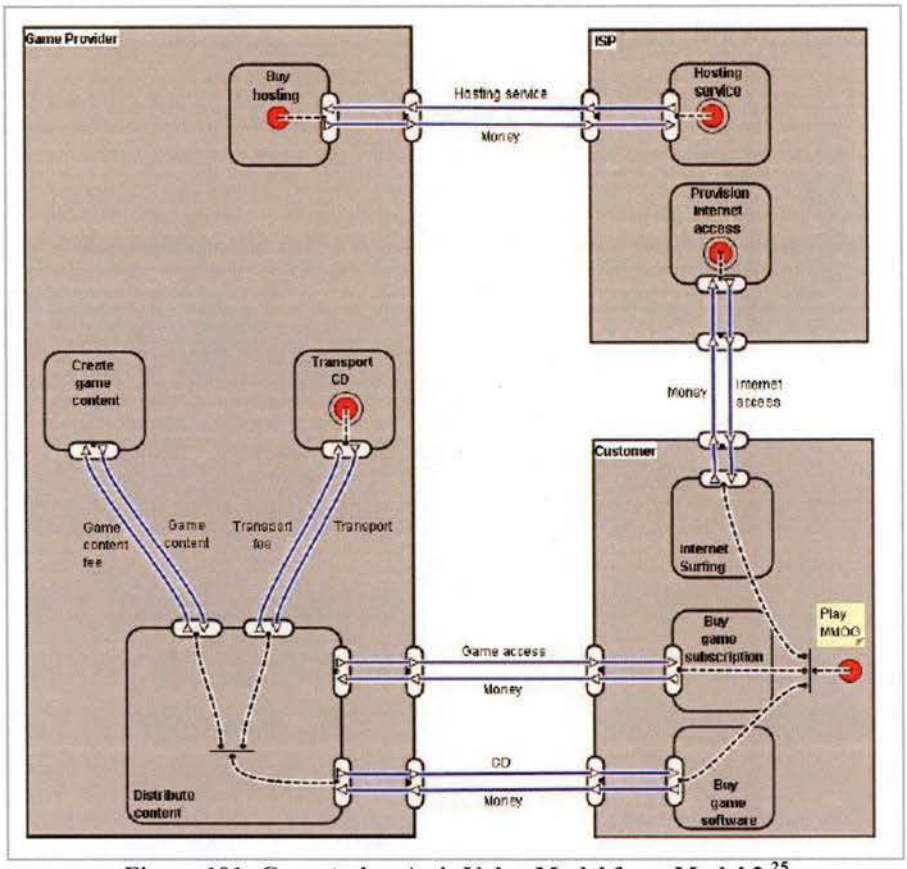


Figure 101: Case study - As-is Value Model from Model 2 [25]

4.2.2 Construction of the To-be Value Model

In the section, we will explain what happens when the company decides to apply some changes in the organization. The goal modeler will adapt the "To-be" goal model (***see Sect.*** *Error! Reference source not found.***:** *Error! Reference source not found.)*

As it has been explained in the presentation of the case, there are several identified means.
Those 4 means are:

- Means 1: Outsource production of CD delivery

[25] Pierre Halleux and Ludovic Mathieu, a method to support the alignment of value models and goal models, Faculté de Namur,2008

- Means 2: Procure Innovative game stories from Customer
- Means 3: Outsource 50% of production of Game content
- Means 4: Offer Free trial games to Customer

Each means will be associated with one template as follows :

The mean 1 is associated to the Template 9
<outsource fraction of production of, resource$_j$, in, value_activity$_k$>

The mean 2 is associated to the Template 3
<start procuring, resource$_j$, from, provider$_p$>

The mean 3 is associated to the Template 9
<outsource fraction of production of, resource$_j$, in, value_activity$_k$>

The mean 4 is associated to the Template 1
<start offering, resource$_j$, to, customer$_i$>

With the rule associate to each template, we can now align the Value model *(see Sect.Error! Reference source not found.: Error! Reference source not found.)*

All templates are represented in the next picture. A template can call some optionals Templates to accomplish the transformation. The next picture makes a resume of all template that are called.

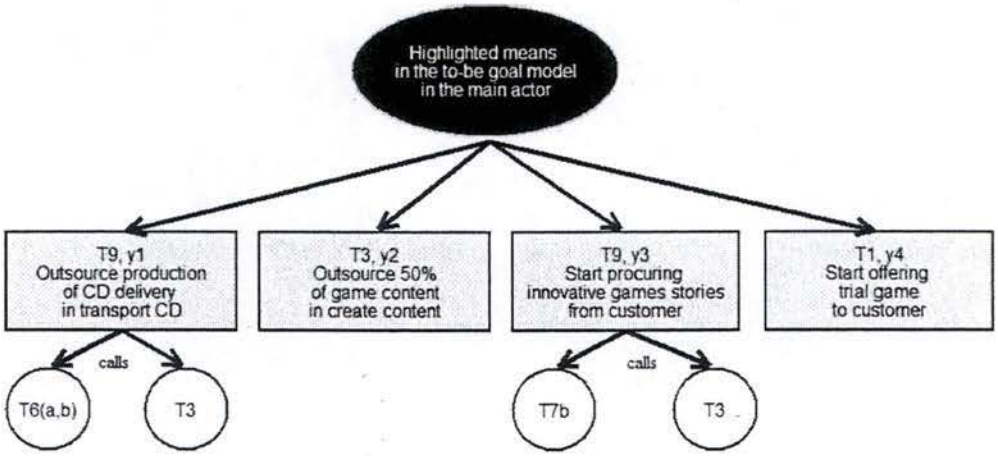


Figure 102: Chaining template in the Method 2 [26]

For i.e.: Outsource the production delivery template call the following optional template T6 and T3:

- T6 is start procuring a resource from a provider
- T3 is stop producing a resource

[26] Pierre Halleux and Ludovic Mathieu, a method to support the alignment of value models and goal models, Faculté de Namur,2008

4.2.2.1 i* Goal Model

New tasks and new goals are in pink in the following picture.

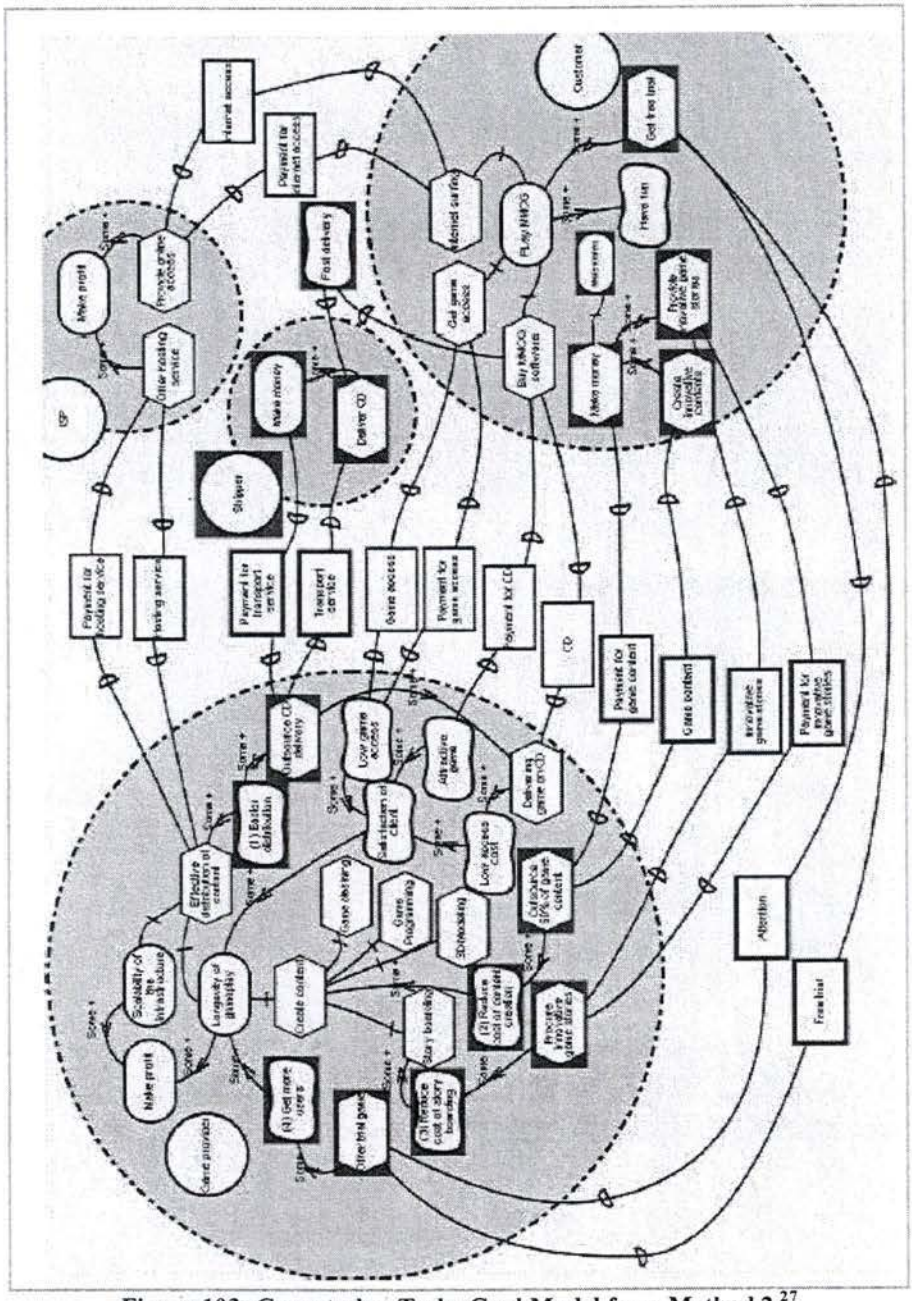


Figure 103: Case study - To-be Goal Model from Method 2 [27]

[27] Pierre Halleux and Ludovic Mathieu, a method to support the alignment of value models and goal models, Faculté de Namur,2008 Enlarge schema in Annex I

Outsource production of CD delivery

- A new actor "Shipper" is created with the responsibility to deliver the CD
- A new task "CD Delivery" is created
- A soft goal "Easier distribution" is created

Procure Innovative game stories from Customer

- A new task "create innovative game story" is created for the customer
- A new task "Procure innovative game story" is created for the main actor
- A resource "innovative game story" is exchanged against compensation between the main actor and the customer
- A soft goal "Reduce cost of game story" is created
-

Outsource 50% of production of Game content

- A new task "create story board" is created for the customer
- A new task "Game content" is created for the main actor
- A resource "Game content" is exchanged against compensation between the main actor and the customer
- A soft goal "Reduce cost of game content" is created

Offer Free trial games to Customer

- A new task "Offer trial game" is created for the main actor
- A new task "Get trial game" is created for the customer
- A resource "Trial game" is exchanged against attention between the main actor and the customer

4.2.2.2 e³ Value Model

The schema explains all economic exchange between actors.
Each object in red represents new changes introduced in the schema.

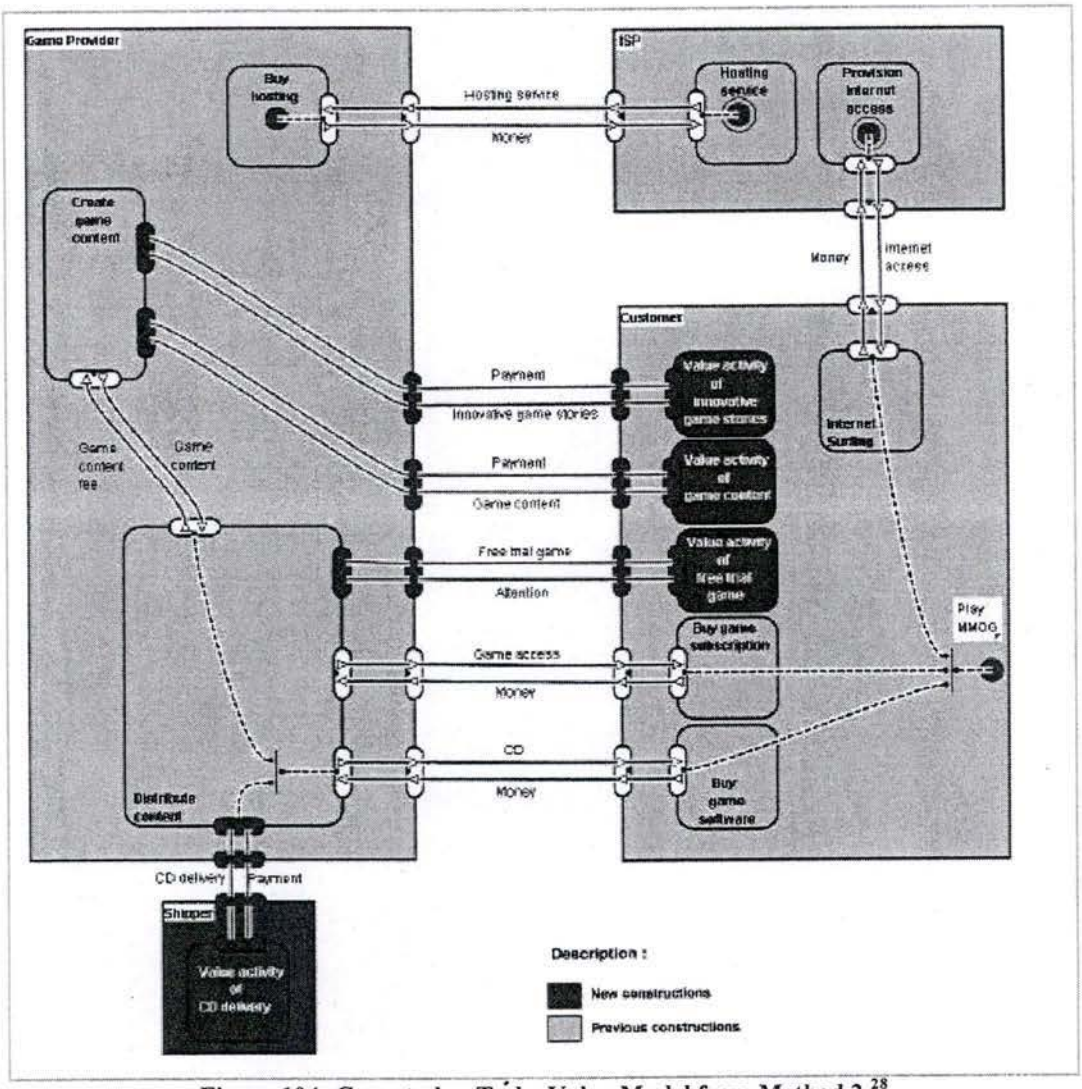


Figure 104: Case study - To-be Value Model from Method 2 [28]

Outsource production of CD delivery

- Add a new actor Shipper with a value activity to deliver CD
- Add a value exchange between Shipper and the main actor

Procure Innovative game stories from Customer

- Add a new value activity "produce innovative game stories" for the customer

[28] Pierre Halleux and Ludovic Mathieu, a method to support the alignment of value models and goal models, Faculté de Namur,2008

- Add a value exchange between Customer and the main actor

Outsource 50% of production of Game content

- Add a new value activity "game content" for the customer
- Add a value exchange between Customer and the main actor

Offer Free trial games to Customer

- Add a new value activity "free trial game" for the customer
- Add a value exchange between Customer and the main actor

4.3 Application of the improved method

This chapter presents the new method (3), the next section present how the as-is model is created. The description of the case study permits to identify several actions.

With these actions, we can apply the goal algorithm to create the as-is goal model and the value algorithm to create the as-is value model.

The following section explains new means and the associated actions. We can also apply the goal algorithm to create the to-be goal model and the value algorithm to create the to-be value model.

Note that the modifications on the goal and value models are done at the same time. It was done in two steps for a better understanding of the logic.

4.3.1 As-Is Models

One objective of this thesis is to be able to construct the goal and value model from an empty situation. The MMOG offers an online gami on a CD. The CD is produced by MMOG. The game content is composed of 4 sub-resources: 3D Modeling, Game Design, Story Board and Game programming

We were able to identify 16 different actions which are:

1. Offering a CD to a customer
2. Start producing a CD.
3. Need Game content for the CD
4. Start producing Game content
5. Need CD Delivery
6. Start producing CD Delivery
7. Need 3D Modeling
8. Start producing 3D Modeling
9. Need Game design
10. Start producing Game design
11. Need Story board
12. Start producing Story board
13. Need Game programming

14. Start producing Game programming
15. Offering game access
16. Start producing access management
17. Need hosting service
18. Start procuring hosting service

Detail of applying the first action Offering a CD to a customer

By applying the action on the goal and value model, we change the "As-is models" to construct new "To-be" Models

The first step change Goal Model

As-is Goal Model

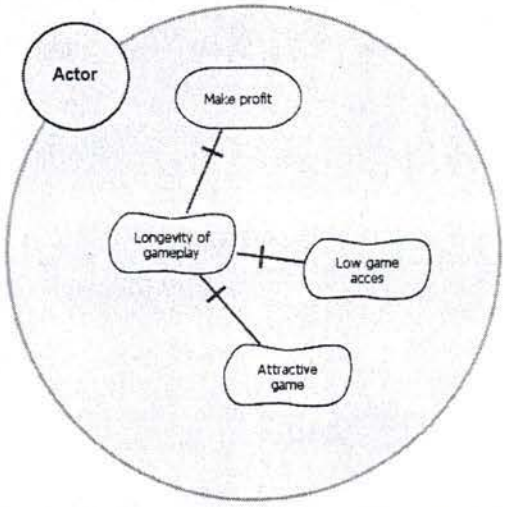


Figure 105: Initial As-is Goal Model (Step1)

To-be Goal Model

Algorithm

<start offering, "CD", to, client, 1000, "Attractive game" , "Distribute content" >
ADD task t1 "offering a [quantity $_q$] of [resource $_j$]
ADD goal g1 "Possess [quantity $_q$] of [resource $_j$]
CONNECT task $_{t1}$ with goal $_{g1}$
CONNECT task $_{t1}$ with goal $_g$
ADD actor [customer $_i$]
ADD task t2 procuring [resource $_j$]
ADD resource r1 for [resource $_j$]
ADD resource r2 for [compensation]
ADD dependency link from task t2 to r1
ADD dependency link from task r1 to t1
ADD dependency link from task t1 to r2
ADD dependency link from task r2 to t2

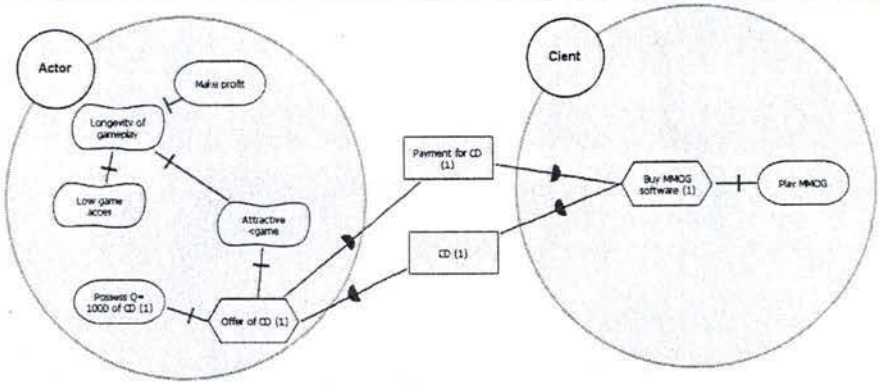


Figure 106: To-be Goal Model (Step1)

The second step change the Value Model

As-is Value Model

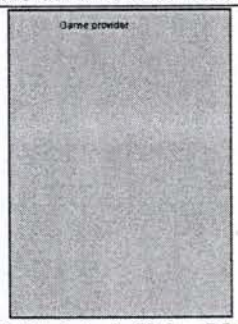


Figure 107: Initial As-is Value Model (Step1)

To-be Value Model

Algorithm

<start offering, "CD", to, client, 1000, "Attractive game" , "Distribute content" >

ADD actor [customer $_i$]

ADD one value activity for [resource $_j$]

ADD one value activity procuring [resource $_j$] for [customer $_i$]

ADD one value exchange for resource $_j$ in new interface from value activity for [resource $_j$] to value activity for [customer $_i$].

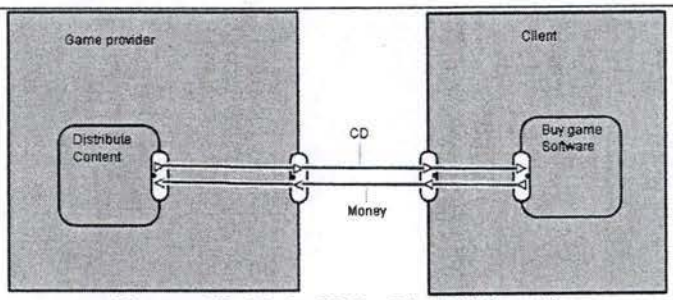


Figure 108: To-be Value Model (Step1)

4.3.1.1 Apply transformation on Goal Model

1 Starting offering resource: Offering a CD to a customer <start offering, "CD", to, client, 1000, "Attractive game" , "Distribute content" > **ADD** task t1 "offering a [quantity $_q$] of [resource $_j$] **ADD** goal g1 "Possess [quantity $_q$] of [resource $_j$] **CONNECT** task $_{t1}$ with goal $_{g1}$ **CONNECT** task $_{t1}$ with goal $_g$ **ADD** actor [customer $_i$] **ADD** task t2 procuring [resource $_j$] **ADD** resource r1 for [resource $_j$] **ADD** resource r2 for [compensation] **ADD** dependency link from task t2 to r1 **ADD** dependency link from task r1 to t1 **ADD** dependency link from task t1 to r2 **ADD** dependency link from task r2 to t2
2 Start producing resource: Start producing a CD <start producing, "CD", in, "create game content", 1000, "Possess a CD" > **ADD** task $_{t1}$ producing [quantity $_q$] of [resource $_j$] **CONNECT** task $_{t1}$ with goal $_{g1}$
3 Need a sub-resource: Need Game content for the CD <Need , "CD", for, "Offer CD", 2, "Game content"> **ADD** goal g1 "Possess [quantity $_{q1}$] of [resource $_j$] **CONNECT** task $_{t1}$ Produce quantity $_q$ of [resource $_j$] with goal $_{g1}$
4 Start producing resource: Start producing Game content <start producing, "Game content", in, "create game content", 2, "Possess Game content" > **ADD** task $_{t1}$ producing [quantity $_q$] of [resource $_j$] **CONNECT** task $_{t1}$ with goal $_{g1}$
5 Need a sub-resource: Need CD Delivery <Need , "Game content", for, "Produce Game content", 1, "CD Delivery"> **ADD** goal g1 "Possess [quantity $_{q1}$] of [resource $_j$] **CONNECT** task $_{t1}$ Produce quantity $_q$ of [resource $_j$] with goal $_{g1}$
6 Start procuring resource: Start producing CD Delivery <start producing, "CD Delivery", in, "CD Delivery", 1, "Possess CD Delivery" > **ADD** one value activity $_k$ producing [quantity $_q$] of [$_j$

ADD one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.producing a quantity Q of [resource $_x$]
7 Need a sub-resource: Need 3D Modeling <Need , "Game content", for, "Produce Game content", 1, "3D Modeling"> **ADD** goal g1 "Possess [quantity $_{q1}$] of [resource $_j$] **CONNECT** task $_{t1}$ Produce quantity $_q$ of [resource $_j$] with goal $_{g1}$
8 Start producing resource: Start producing 3D Modeling <start producing, "3D Modeling", in, "3D Modeling", 1, "Possess 3D Modeling" > **ADD** task $_{t1}$ producing [quantity $_q$] of [resource $_j$] **CONNECT** task $_{t1}$ with goal $_{g1}$
9 Need a sub-resource: Need Game design <Need , "Game content", for, "Produce Game content", 1, "Game design"> **ADD** goal g1 "Possess [quantity $_{q1}$] of [resource $_j$] **CONNECT** task $_{t1}$ Produce quantity $_q$ of [resource $_j$] with goal $_{g1}$
10 Start producing resource: Start producing Game design <start producing, "Game content", in, "Game design", 1, "Possess Game design" > **ADD** task $_{t1}$ producing [quantity $_q$] of [resource $_j$] **CONNECT** task $_{t1}$ with goal $_{g1}$
11 Need a sub-resource: Need Story board <Need , "Game content", for, "Produce Game content", 5, "Story Boarding"> **ADD** goal g1 "Possess [quantity $_{q1}$] of [resource $_j$] **CONNECT** task $_{t1}$ Produce quantity $_q$ of [resource $_j$] with goal $_{g1}$
12 Start producing resource: Start producing Story board <start producing, "Story board", in, "Story board", 5, "Possess Story board" > **ADD** task $_{t1}$ producing [quantity $_q$] of [resource $_j$] **CONNECT** task $_{t1}$ with goal $_{g1}$
13 Need a sub-resource: Need Game programming <Need , "Game content", for, "Produce Game content", 1, "Game Programming"> **ADD** goal g1 "Possess [quantity $_{q1}$] of [resource $_j$] **CONNECT** task $_{t1}$ Produce quantity $_q$ of [resource $_j$] with goal $_{g1}$
14 Start producing resource: Start producing Game programming <start producing, "Game Programming", in, "Game Programming", 1, "Possess Game Programming" > **ADD** task $_{t1}$ producing [quantity $_q$] of [resource $_j$] **CONNECT** task $_{t1}$ with goal $_{g1}$

15 Starting offering resource: Offering game access
<start offering, "Game access", to, client, 1, "Low game access" , "Distribute Content">

ADD task t1 "offering a [quantity $_q$] of [resource $_j$]
ADD goal g1 "Possess [quantity $_q$] of [resource $_j$]
CONNECT task $_{t1}$ with goal $_{g1}$
CONNECT task $_{t1}$ with goal $_g$

ADD actor [customer $_i$]
ADD task t2 procuring [resource $_j$]

ADD resource r1 for [resource $_j$]
ADD resource r2 for [compensation]
ADD dependency link from task t2 to r1
ADD dependency link from task r1 to t1
ADD dependency link from task t1 to r2
ADD dependency link from task r2 to t2

16 Start producing access management
<start producing, "Game access", in, "Distribute Content", 1, "Possess access management" >

ADD task $_{t1}$ producing [quantity $_q$] of [resource $_j$]
CONNECT task $_{t1}$ with goal $_{g1}$

17 Need a sub-resource: Need hosting service
<Need , Game access, for, "Produce access management", 1, "Hosting service">

ADD goal g1 "Possess [quantity $_{q1}$] of [resource $_j$]
CONNECT task $_{t1}$ Produce quantity $_q$ of [resource $_j$] with goal $_{g1}$

18 Start procuring resource: Start procuring hosting service
<start procuring, "Hosting service", from, "ISP", 1, "Possess Hosting service" >

ADD task t1 procuring [quantity $_q$] of [resource $_j$]
CONNECT task $_{t1}$ with goal $_g$

IF [provider $_p$] not exist **THEN**
    ADD actor [provide r $_p$]
END-IF
ADD goal g1 "Reason to provide a [resource]
ADD task t2 providing [quantity $_q$] of [resource $_j$] for actor [provide r $_p$]

ADD resource r1 for [resource $_j$]
ADD resource r2 for [compensation]

4.3.1.2 i* Goal Model

After having identified all actions, we have applied the algorithm provided for each of them on an empty Goal model. We have created this schema that represents the "As-is" goal model.

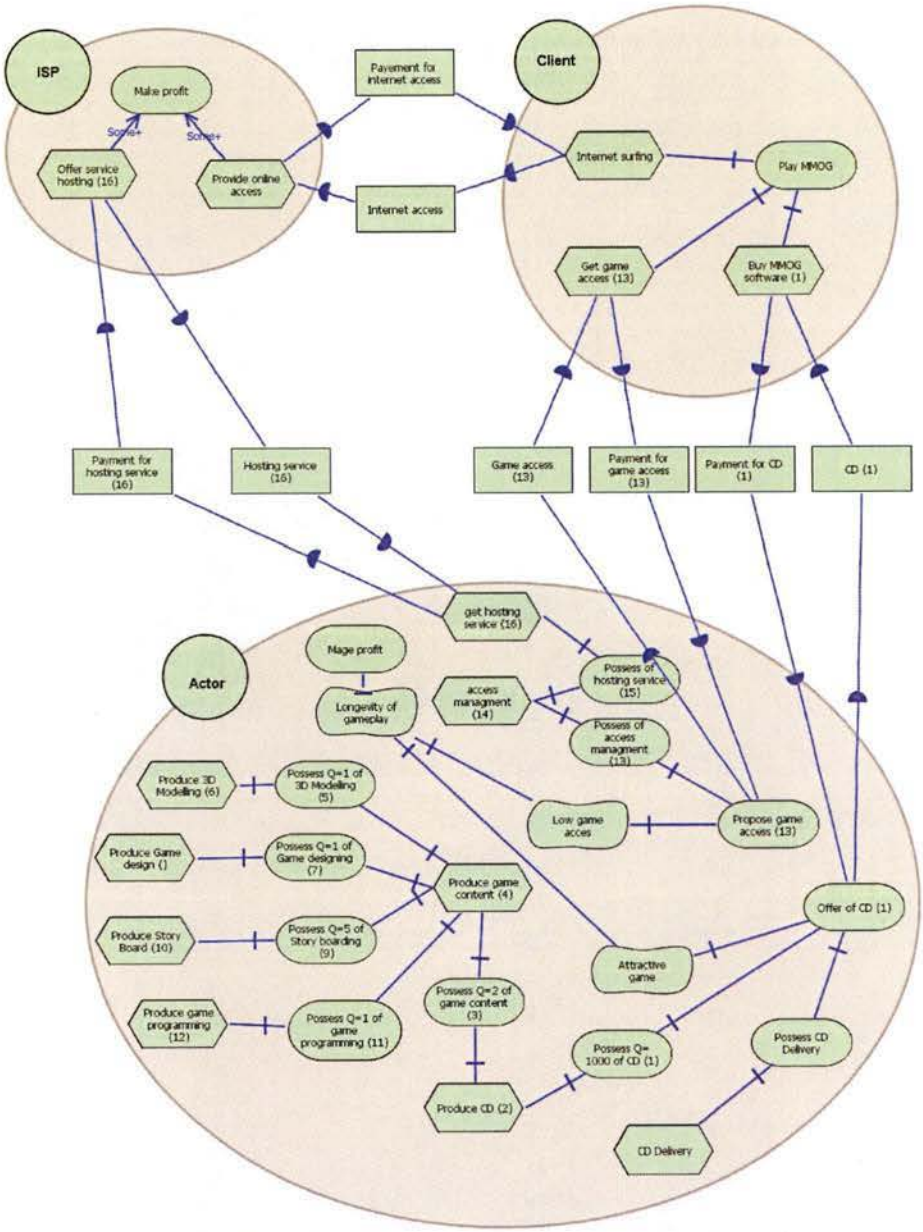


Figure 109: Case Study - As-is Goal Model from Method 3

4.3.1.3 Apply transformation on Goal Model

1 Starting offering resource : Offering a CD to a customer <start offering, "CD", to, client, 1000, "Attractive game" , "Distribute content" > **ADD** actor [customer $_i$] **ADD** one value activity for [resource $_j$] **ADD** one value activity procuring [resource $_j$] for [customer $_i$] **ADD** one value exchange for resource $_j$ in new interface from value activity for [resource $_j$] to value activity for [customer $_i$].
2 Start producing resource: Start producing a CD <start producing, "CD", in, "create game content", 1000, "Possess a CD" > **ADD** one value activity $_k$ producing [quantity $_q$] of [$_j$ **ADD** one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.offering a quantity Q of [resource]
3 Need a sub-resource: Need Game content for the CD <Need , "CD", for, "Produce CD", 2, "Game content">
4 Start procuring resource: Start producing Game content <start producing, "Game content", in, "create game content", 2, "Possess Game content" > **ADD** one value activity $_k$ producing [quantity $_q$] of [$_j$ **ADD** one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.producing a quantity Q of [resource $_x$]
5 Need a sub-resource: Need CD Delivery <Need , "Game content", for, "Produce Game content", 1, "3D Modeling">
6 Start procuring resource: Start producing CD Delivery <start producing, "CD Delivery", in, "CD Delivery", 1, "Possess CD Delivery" > **ADD** one value activity $_k$ producing [quantity $_q$] of [$_j$ **ADD** one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.producing a quantity Q of [resource $_x$]
7 Need a sub-resource: Need 3D Modeling <Need , "Game content", for, "Produce Game content", 1, "3D Modeling">
8 Start procuring resource: Start producing 3D Modeling <start producing, "3D Modeling", in, "3D Modeling", 1, "Possess 3D Modeling" > **ADD** one value activity $_k$ producing [quantity $_q$] of [$_j$ **ADD** one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.producing a

quantity Q of [resource $_x$]
9 Need a sub-resource: Need Game design <Need , "Game content", for, "Produce Game content", 1, "Game design">
10 Start producing resource: Start producing Game design <start producing, "Game content", in, "Game design", 1, "Possess Game design" > **ADD** one value activity $_k$ producing [quantity $_q$] of [$_j$ **ADD** one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.producing a quantity Q of [resource $_x$]
11 Need a sub-resource: Need Story board <Need , "Game content", for, "Produce Game content", 5, "Story Boarding">
12 Start producing resource: Start producing Story board <start producing, "Story board", in, "Story board", 5, "Possess Story board" > **ADD** one value activity $_k$ producing [quantity $_q$] of [$_j$ **ADD** one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.producing a quantity Q of [resource $_x$]
13 Need a sub-resource: Need Game programming <Need , "Game content", for, "Produce Game content", 1, "Game Programming">
14 Start producing resource: Start producing Game programming <start producing, "Game Programming", in, "Game Programming", 1, "Possess Game Programming" > **ADD** one value activity $_k$ producing [quantity $_q$] of [$_j$ **ADD** one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.producing a quantity Q of [resource $_x$]
15Starting offering resource : Offering game access <start offering, "Game access", to, client, 1, "Low game access" , "Distribute Content"> Add Actor [customer $_i$] **ADD** one value activity procuring [resource $_j$] for [customer $_i$] **ADD** one value exchange for resource j in new interface from value activity for [resource $_j$] to value activity for [customer $_i$].
16 Start producing access management <start producing, "Game access", in, "Distribute Content", 1, "Possess access management" > **ADD** one value activity $_k$ producing [quantity $_q$] of [$_j$ **ADD** one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.producing a quantity Q of [resource $_x$]
17 Need a sub-resource: Need hosting service <Need , Game access, for, "Produce access management", 1, "Hosting service">
18 Start procuring resource: Start procuring hosting service

<start procuring, "Hosting service", from, "ISP", 1, "Possess Hosting service" >

ADD Actor [provider $_p$]
ADD one value activity for procuring [quantity $_q$] of [resource $_j$]
ADD one value activity offering [resource $_j$] for [provider $_p$]
ADD one value exchange for resource j in new interface from value activity for procuring [quantity $_q$] of [resource $_j$] to value activity offering [resource $_j$] for [provider $_p$].
ADD one value exchange for resource j in new interface from value activity offering [resource $_j$] for [customer $_i$] to value activity for procuring [quantity $_q$] of [resource $_j$]

4.3.1.4 e³ Value Model

As we did in the previous section, we have identified all actions, and than we have applies the algorithm provide for each of them on an empty Value model. We have created the following schema that represents the "As-is" value model.

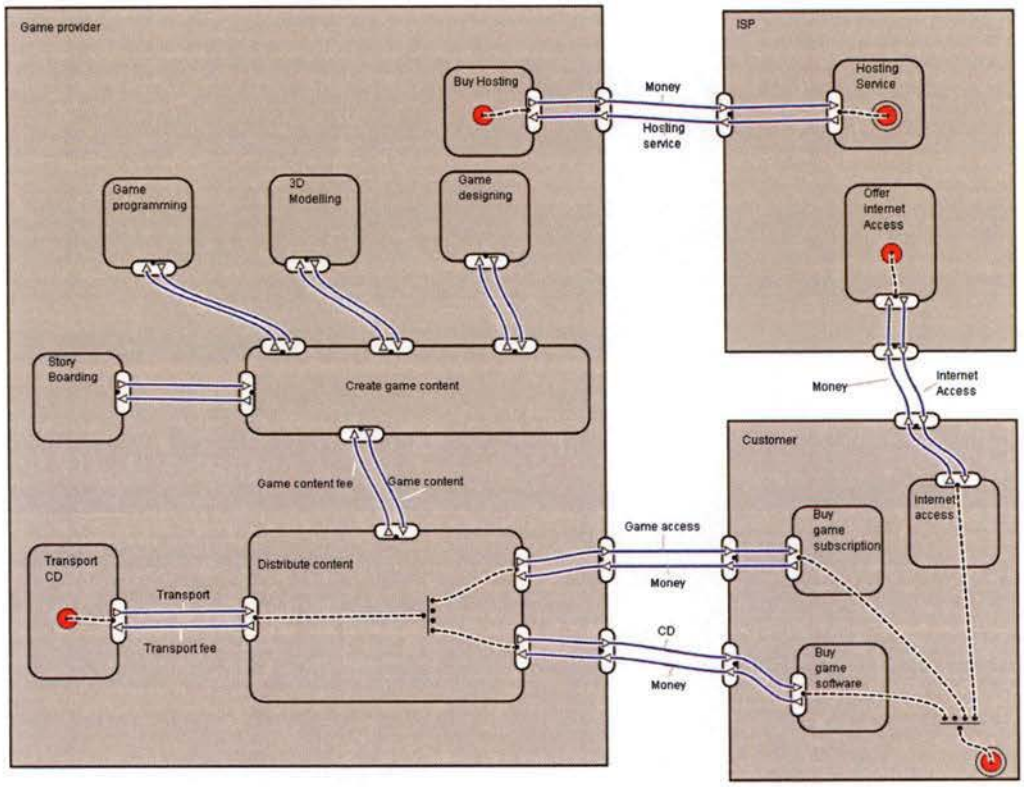


Figure 110: Case Study - As-is Value Model from Method 3

4.3.2 Construction of the To-be Models

To understand the construction of the "To-be" Model, we must keep in mind the following information:

The four **new goals** for the MMOG company in the to-be value model are:

1. Easier distribution of the CD,
2. Reduction of the cost of content creation,
3. Reduction of the cost of story boarding,
4. Increase of the number of customers.

To achieve these new goals, the game provider will perform the following **means**:

Means 1: Outsource CD delivery,
Means 2: Outsource 50% of game content,
Means 3: Procure innovative game stories,
Means 4: Offer a trial game.

One **action** will be associated with each mean.

Action 1: Outsource CD Delivery
Action 2: Outsource 50% game content
Action 3: Procure innovative game stories,
Action 4: Offer trial game

4.3.2.1 Apply transformation on Goal Model

Keeping the previous information in mind, we will apply the transformation on the Goal model. The algorithm associated with each action is presented in the figure hereunder. The transformation will be applied on the "As-is" Goal Model and we will be able to construct the "To-be" Goal Model.

Outsource CD Delivery <outsource fraction of production of, "CD Delivery", in, "Transport CD"" , "Shipper", 1000, "Easier distribution" > CALL < stop producing, resource $_j$, in, value activity $_k$ > CALL <start procuring, resource $_j$, from, provider $_p$, quantity $_q$, goal $_g$ >
< stop producing, resource $_j$, in, value activity $_k$ > **REMOVE** task $_{t1}$ producing [quantity $_q$] of [resource $_j$]

<start procuring, resource $_j$, from, provider $_p$, quantity $_q$, goal $_g$ >

ADD task t1 procuring [quantity $_q$] of [resource $_j$]
CONNECT task $_{t1}$ with goal $_g$
ADD actor [provide r $_p$]

ADD goal g1 "Reason to provide a [resource]
ADD task t2 providing [quantity $_q$] of [resource $_j$] for actor [provide r $_p$]

ADD resource r1 for [resource $_j$]
ADD resource r2 for [compensation]

Outsource 50% game content
<outsource fraction of production of, "game content", in, "Create Game content" , "client", 1, "Possess Game content" >

CALL < increase procuring of, resource $_j$, in, provider $_p$, quantity $_q$, goal $_g$ >
CALL < decrease production of, resource $_j$, in, value activity $_k$, quantity $_q$, goal $_g$ >

< increase procuring of, resource $_j$, in, provider $_p$, quantity $_q$, goal $_g$ >

CHANGE quantity $_q$ in "Possess [quantity $_q$] of [resource $_j$] with q = q + z
CHANGE quantity $_q$ in procuring [quantity $_q$] of [resource $_j$] with q = q + z

< decrease production of, resource $_j$, in, value activity $_k$, quantity $_q$, goal $_g$ >

CHANGE quantity $_q$ in "Possess [quantity $_q$] of [resource $_j$] with q = q - z
CHANGE quantity $_q$ in producing [quantity $_q$] of [resource $_j$] with q = q - z

Procure innovative game stories,
<outsource fraction of production of, "Game story", in, "Game cotent" , "Client", 5, "Possess Game story">

CALL < stop producing, resource $_j$, in, value activity $_k$ >
CALL <start procuring, resource $_j$, from, provider $_p$, quantity $_q$, goal $_g$ >

< stop producing, "Game story", in, value activity $_k$ >

REMOVE task $_{t1}$ producing [quantity $_q$] of [resource $_j$]

<start procuring, resource $_j$, from, provider $_p$, quantity $_q$, goal $_g$ >

ADD task t1 procuring [quantity $_q$] of [resource $_j$]
CONNECT task $_{t1}$ with goal $_g$
ADD actor [provide r $_p$]

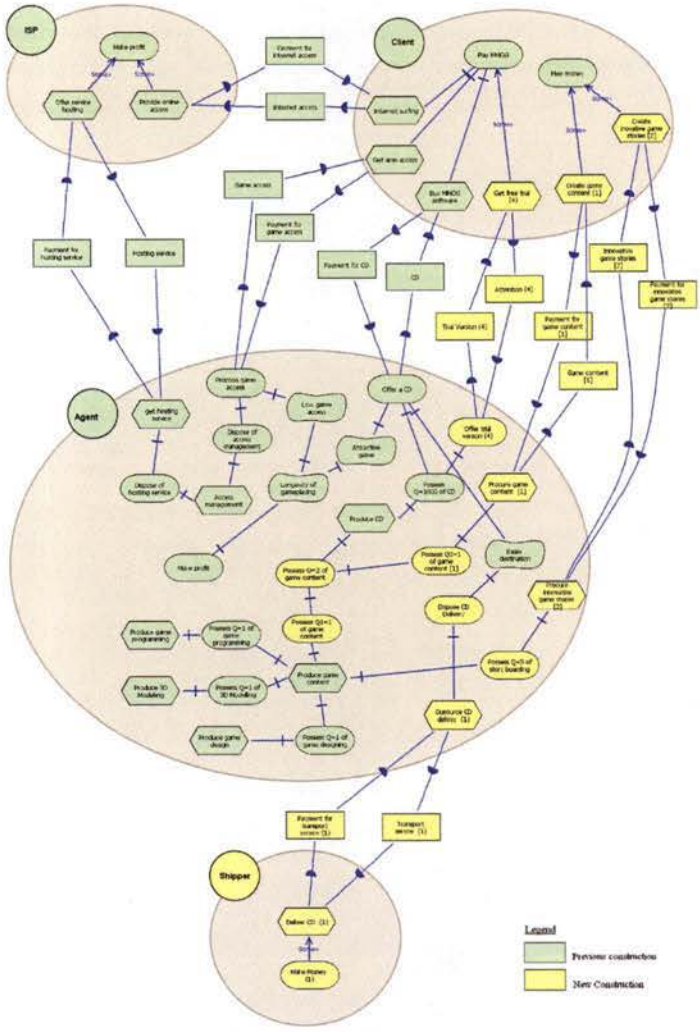
ADD goal g1 "Reason to provide a [resource]
ADD task t2 providing [quantity $_q$] of [resource $_j$] for actor [provide r $_p$]

ADD resource r1 for [resource $_j$]
ADD resource r2 for [compensation]

Offer trial game
<start offering, "Trial game", to, "Client", 100, "More User" , "Distribute Content" >

ADD task t1 "offering a [quantity $_q$] of [resource $_j$]
CONNECT task $_{t1}$ with goal "Possess [quantity $_q$] of [resource $_j$]
CONNECT task $_{t1}$ with goal $_g$
ADD task t2 procuring [resource $_j$]
ADD resource r1 for [resource $_j$]
ADD resource r2 for [compensation]
ADD dependency link from task t2 to r1
ADD dependency link from task r1 to t1
ADD dependency link from task t1 to r2
ADD dependency link from task r2 to t2

4.3.2.2 i* Goal Model



The algorithm in the previous section modifies the "As-is" goal Model.
Several new elements are added on the model to construct the "To-be" value Model
In order to help the reader, each value activities contain a number that represent the mean number.
A enlarge schema is available in Annex I

Figure 111: Case Study - To-be Goal Model from Method 3

4.3.2.3 Apply transformation on value Model

In this section, we will keep the same methodology as section 4.3.2.2 and we will describe the algorithm associate with each action. We will be able to highlight the transformation that will be applied on the "As-is" Value Model to construct the "To-be" Value Model.

Outsource CD Delivery <outsource fraction of production of, "CD Delivery", in, "Transport CD"" , "Shipper", 1000, "Easier distribution" > CALL < stop producing, resource $_j$, in, value activity $_k$ > CALL <start procuring, resource $_j$, from, provider $_p$, quantity $_q$, goal $_g$ >
< stop producing, resource $_j$, in, value activity $_k$ > **REMOVE** value activity $_k$ producing [quantity $_q$] of [resource $_j$]
<start procuring, resource $_j$, from, provider $_p$, quantity $_q$, goal $_g$ > **ADD** Actor [provider $_p$] **ADD** one value activity for procuring [quantity $_q$] of [resource $_j$] **ADD** one value activity offering [resource $_j$] for [provider $_p$] **ADD** one value exchange for resource j in new interface from value activity for procuring [quantity $_q$] of [resource $_j$] to value activity offering [resource $_j$] for [provider $_p$].
Outsource 50% game content <outsource fraction of production of, "game content", in, "Create Game content" , "client", 1, "Possess Game content" > CALL < increase procuring of, resource $_j$, in, provider $_p$, quantity $_q$, goal $_g$ > CALL < decrease production of, resource $_j$, in, value activity $_k$, quantity $_q$, goal $_g$ >
< increase procuring of, resource $_j$, in, provider $_p$, quantity $_q$, goal $_g$ > **CHANGE** quantity $_q$ in value exchange for activity $_k$ with q = q + z
< decrease production of, resource $_j$, in, value activity $_k$, quantity $_q$, goal $_g$ > **CHANGE** quantity $_q$ in value exchange for activity $_k$ with q = q - z
Procure innovative game stories, <outsource fraction of production of, "Game story", in, "Game cotent" , "Client", 5, "Possess Game story"> CALL < stop producing, resource $_j$, in, value activity $_k$ > CALL <start procuring, resource $_j$, from, provider $_p$, quantity $_q$, goal $_g$ >

< stop producing, "Game story", in, value activity $_k$ > **REMOVE** value activity $_k$ producing [quantity $_q$] of [resource $_j$]
<start procuring, resource $_j$, from, provider $_p$, quantity $_q$, goal $_g$ > **ADD** one value activity for procuring [quantity $_q$] of [resource $_j$] **ADD** one value activity offering [resource $_j$] for [provider $_p$] **ADD** one value exchange for resource j in new interface from value activity for procuring [quantity $_q$] of [resource $_j$] to value activity offering [resource $_j$] for [provider $_p$].
Offer trial game <start offering, "Trial game", to, "Client", 100, "More User" , "Distribute Content" >

4.3.2.4 e³ value Model

The algorithm in the previous section modifies the "As-is" value Model. Several new Value activity are added on the model to construct the "To-be" value Model
In order to help the reader, each value activities contain a number that represent the mean number

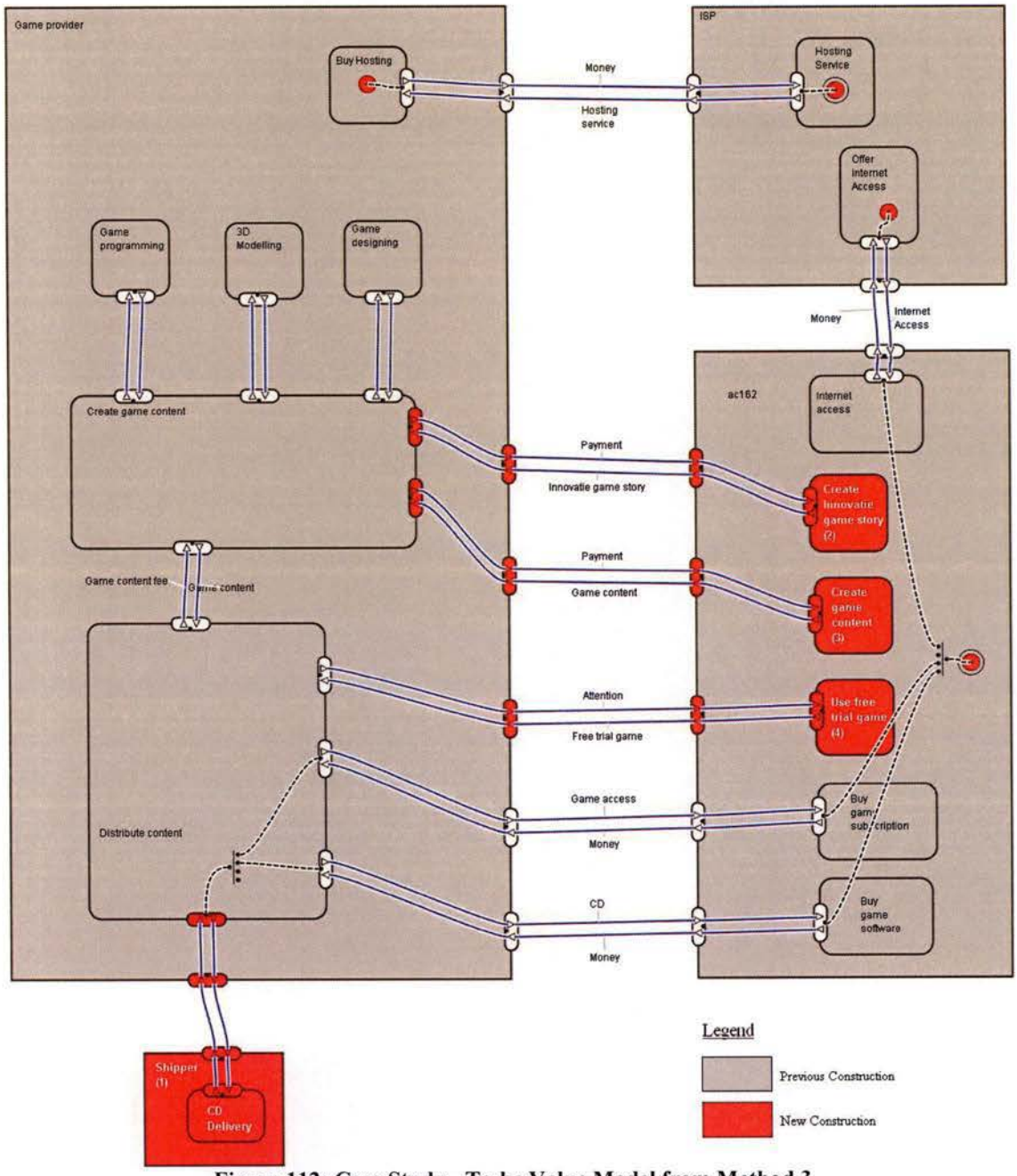


Figure 112: Case Study - To-be Value Model from Method 3

4.4 Comparison of both methods results

In the section 4.2 and 4.3, we have applied both methods on the same case study. We can now compare the result of these both methods.

As already explained, the Method 2 contains some weaknesses (see point 3.3.2. Weaknesses of the previous methodology). We will review each of them and try to find an adequate solution.

1. **<u>There is no mention of the fact that a resource production can request the use of other resources.</u>**

The Method 2 has not foreseen the use of more than one resource. The new method (3) has created two new actions which will allow the use of several resources. Indeed if the method wants to stick to economical world it was important to create a method taking this into account.

Method 2	Method 23

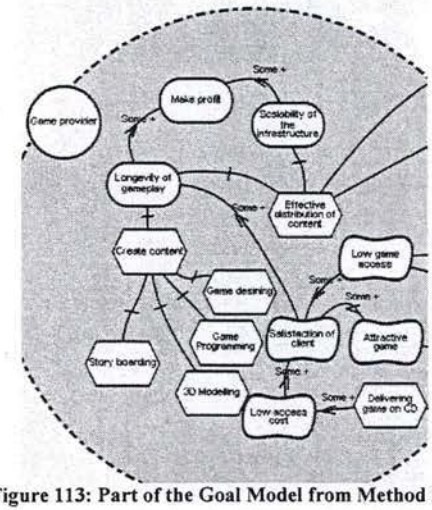
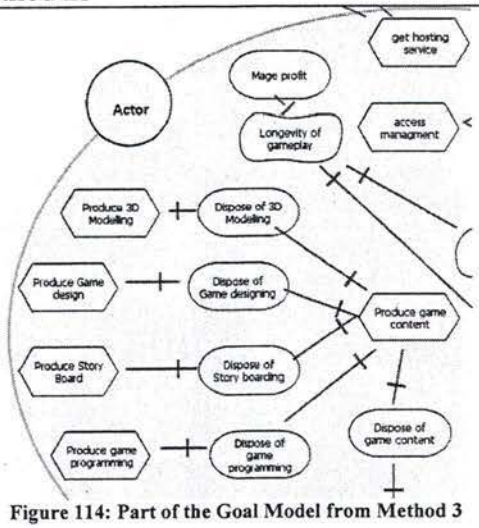

	

Figure 113: Part of the Goal Model from Method 2 [29]	**Figure 114: Part of the Goal Model from Method 3**

A comparison of the two methods is illustrated here above. In this case study, to produce a game content, 4 resources are mandatory:

- Produce 3D Modeling
- Produce Game design
- Produce Story Board
- Produce game programming

[29] Pierre Halleux and Ludovic Mathieu, a method to support the alignment of value models and goal models, Faculté de Namur,2008

In method 2, even if this information was already available, the method could not take it into account because no templates have been created for this purpose. As explained before, the new method has created new actions in order to be able to integrate this information in the model. These actions are:

<Need , ressource $_j$, in, goal $_g$, quantity $_{q1}$, resource $_n$>
<No Need , ressource $_j$, in, goal $_g$, quantity $_q$, resource $_n$>

This has created the adequate goals in regard of each mandatory resource. For example, as it can be seen in the figure, in order to produce a 3D modeling, the goal "Possess 3D modeling" has been inserted. This goal may now help producing game content.

2. **<u>There is a recurrence in the templates. Templates call them mutually and that can create some ambiguous situations.</u>**

The method 2 has only created 9 templates but sometimes it is unclear to know which template must be used and there is some overlapping. It may create ambiguous situations. This may be illustrated by the following example:

If the organization wants to in source the production of a resource, two different templates could be used in the method 2:

Template4: <stop procuring, resource j, from, provider p>
[(stop offering resource j to customer i) XOR (start producing resource j in value activity k)]

or

Template 8: <insource fraction of production of, resource j, in, value activity k>
(start producing resource j in value activity k XOR increase production of resource j in value activity k)
AND (stop procuring resource j from outsourcer o)

It could be difficult to know which the best and what will be impacted in the organization if one template is chosen instead of the other.

The method 3 tries to propose more actions but with a narrower impact. This may help the organization to better understand each impact linked to each action.

3. **<u>There are some missing actions to cover all the cases.</u>**

Some important actions were missing in the Method 2, as for example the opportunity to merge quantity. The Method 3 has taken it into account and has added several actions that were missing in the Method 2. Those are:

<Need , ressource $_j$, in, goal $_g$, quantity $_{q1}$, resource $_n$>
<No Need , ressource $_j$, in, goal $_g$, quantity $_q$, resource $_n$>

<split quantity, resource $_j$, in, goal $_g$, quantity $_{q1}$, quantity $_{q2}$ >
<merge quantity, resource $_j$, in, goal $_g$, quantity $_{q1}$, quantity $_{q2}$ >

< increase procuring of, resource $_j$, in, provider $_p$, quantity $_q$, goal $_g$ >
< decrease procuring of, resource $_j$, in, provider $_p$, quantity $_q$, goal $_g$ >

4. **The templates application allows only an action on the value model, but there is no procedure to align, in one time, goal and value models.**

The template introduced by Method 2 updated the Value Model only. The goal modeler could only change the Goal Model and the rule attaches to the template modifying the Value Model. This increases likelihood to have errors in the process of alignment.

Hereunder we have chosen an example of the rule associates to the template offering a resource to a client to illustrate the problem:

Rules associated to template 1:

Primary action:

a. IF actor customer i is not present THEN add the actor customer i.
b. Add one value exchange for resource j (in an existing or new interface) from the principal actor to customer i.

Secondary action:

c. Add a new value exchange from customer i to the principal actor (as compensation for the resource j offered by the principal actor).
Connect the new value exchanges to an existing or new value activity of resource j within the customeri.
d. IF start using THEN connect to the existing value activity k to the new value exchange.
e. ELSE IF (start producing AND ¬ Prev(T5))THEN call T5.
σ = {T5.resourcej/T 1.resourcej, T5.valueactivityk/T 1.valueactivityk}
f. ELSE IF (start procuring AND ¬ Prev(T5)) THEN Call T3.
σ = {T3.resourcej/T 1.resourcel, T3.providerp/T 1.providerp, T3.valueactivityk/T 1.value activity k}

The method 3 provides actions that modify both models. The alignment becomes, thus, more secure. We have developed a new algorithm for the Goal Model and an algorithm for the Value Model to avoid the problem linked to the process of Method 2:

Goal Model transformation algorithm

IF goal g1 "Possess [quantity $_q$] of [resource $_j$]
THEN
    ADD task $_{t1}$ producing [quantity $_q$] of [resource $_j$]
    CONNECT task $_{t1}$ with goal $_{g1}$
END-IF

Value Model transformation algorithm

ADD one value activity $_k$ producing [quantity $_q$] of [$_j$
IF value activity offering a quantity Q of [resource $_j$] **THEN**
    ADD one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.offering a quantity Q of [resource]
END-IF

IF parent of Possess a quantity of [resource $_j$] is produce a [resource $_x$] THEN
ADD one value exchange for resource $_j$ in new interface from value activity $_k$ to value activity.producing a quantity Q of [resource $_x$]
END-IF

5. **<u>In several templates, a notion of quantity is present, but it is not enough developed in the Method 2.</u>**

Even if the method 2 has introduced several templates that deal with resource quantities it has not been properly defined. An example will illustrate this problem: if we decrease a fraction of the production with a quantity equal to the quantity produced before the change, the decrease will have the same result as stop produce a resource. This could create ambiguous behavior.

The template that allows to decrease a fraction of production in Method 2 is:.
<decrease fraction of production of, resource j, in, value activity k>

In order to procure a solution to this weakness, we have, first, introduced a notion of quantity in several actions. So when an action is called, the modeler must provide the quantity. But we have also added some strong constraints that restrict the use of actions with uncorrected quantity. This has reduced the ambiguous behavior that existed in the Method 2.

The action to be used to decrease a fraction of production is:
< decrease production of, resource $_j$, in, value activity $_k$, quantity $_q$, goal $_g$ >

We can use e³value to calculate with more precision the exchange between actors. At this stage, we know the quantity exchange. The next step will be to modify the model and add the price of this resource. With this improvement, we are able to calculate the compensation exchange between actors. The organization will have more information to evaluate his business. That is a major advantage for the organization !

5 CONCLUSION

Nowadays, the economic situation is really difficult and risky for all companies. In this environment, each company must be able to clearly define its strategic vision. Each company needs specific tools to take adequate decision and to adapt itself to the changing World. Specific tools will help the company to represent its strategic vision and also to describe the economical exchanges between all actors. Those tools are crucial and interface as well as alignment between them is mandatory for a good management. Moreover with globalization and the increasing complexity of the economical world it will become even more crucial.

In our thesis, we focused on those specific tools which are the Goal model and the Value model and particularly on the alignment between them.

In the second Chapter, we explained how the i* model helps the company to express its strategic vision and how the e³value model could describe the economical exchange between the actors linked to the company.

This analysis has been followed, in Chapter 3, by a presentation of a specific alignment method. This method (2) is based on a previous Method (1) which has also been briefly explained. Based on a deep analysis of those two methods, we were able to identify weaknesses and to propose some first improvements.
Some developments of the Method 3 were to create new actions. We have decided to develop 3 new ones dealing with 3 business concept: Offering a resource, producing a resource and procuring a resource. Some actions have not been created such as "Action increase offer" and "decrease offer". This is a first limitation of scope. At this stage it is important to underline 2 other scope limitations of the different methods which are that the model works only with one specific actor. It means that, all actions are decided and implemented by one actor only without any interaction with the other. And also that a resource can be procured by only one provider.

In a last step and in order to check the new method proposed the chapter 4 focuses on a study case. We applied the method 2 and 3 to a same study case, the company MMOG. After a comparison of the results we were able to draw some conclusions.

5 main weaknesses were identified in Method 2 and were explained in the Chapter 4, section 4.4. The new Method 3 was able to propose a solution for 4 of them. But one remains open. In fact, the management of quantities remains unsolved in the model 3. We decided to create a basic mechanism in order to bring a first part of solution but it could still be improved by the creation of 2 new actions " increase offer" and "decrease offer". . Two actions were out of scope and where not been developed. That is the major reason why we have not propose a complete solution

A set of actions was developed to deal with 3 business concept. For us, this list of action is exhaustive. New actions can be added if more business concepts are developed in a future work

For each action, we have provided two algorithms that permit to align the goal and the value model. The alignment of Goal Model and Value Model are based on algorithm that are written in pseudo code, it means that it explain the logic but there is no implementation to validate all this logic. Developing a tool that helps users to synchronize these models can be done in the future.

The method 3 could further be improved by the creation of new actions (such as "increase and decrease offer") or by removing the scope limitation. This improvement would complete the work done in the method 3.
Moreover it could be interesting to open the method to more than one actor. Nowadays a company must take all specific actors into account when taking a decision. In those methods, the system focuses only on one main actor without taking into account the needs of other actors. Taking more than one actor into account would need to identify the relations between all actions and all actors.
And finally, developing a tool to help users during the alignment would be the most valuable improvement of this thesis because it would transform this theoretical work into a real practical management tool.
This could be the subject for another study.

BIBLIOGRAPHY

[1] B. Andersson, A. Edirisuriya, T. Ilayperuma, M. Bergholtz, P. Johannesson, and J. Zdravkovic. On the alignment of goal models and value models. REA-25. A Celebration
of the REA Enterprise Model, Geerts, G., University of Delaware. Department of Accounting and MIS. 2007, http://www.aisvillage.com/rea25/program.html.

[2] Pierre Halleux and Ludovic Mathieu, a method to support the alignment of value models and goal models, Faculté de Namur,2008

[3] Claire LOBET-MARIS,. Michaël PETIT,Stéphane SANDRON, Business Modeling, Faculté de Namur

[4] Jaap Gordijn & Hans Akkermans, Modeling networked value constellations with *e3value*,
VUA Free University Amsterdam (NL)

[5] Wei Feng, Jon Atle Gulla and Darijus Strasunskas1 , Comparative analysis of process and value perspectives for insight in business cooperation, Norwegian University of Science and Technology

[6] e³ value, http://www.e3value.com/

[7] I* website, http://www.cs.toronto.edu/km/istar/

[8] I* wiki, http://istar.rwth-aachen.de/tiki-view_articles.php

[9] Jaap Gordijn, Eric Yu and Bas van der Raadt. E-Service Design using i* and e³value Modeling , May/June 2006

[10] Jaap Gordijn and Hans Akkermans, Designing and Evaluating E_Business Models, Free University Amsterdam , July 2001

[11] Eric Yu, Strategic Actors Modeling for Requirements Engineering -the i* framework, University of Toronto, 2005

List of Figures

List of Tables

List of Appendices

Annex I : **Enlarge Schema**

Enlarge Schema: Value model -Start offering

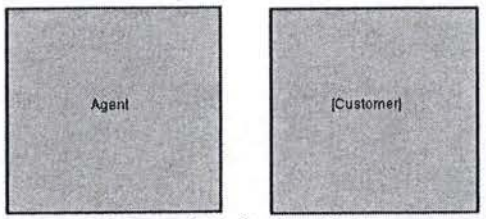
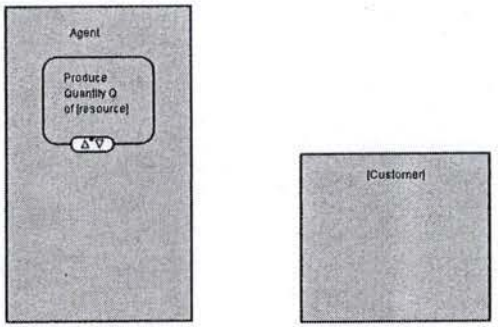
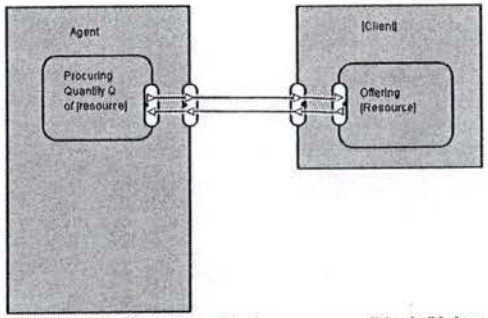


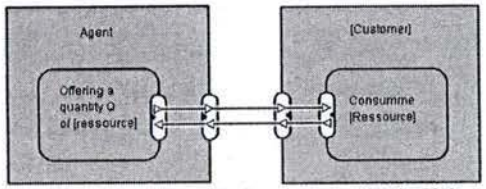
Figure 115: Scenario I - Starting offering resource "As-is Value model"



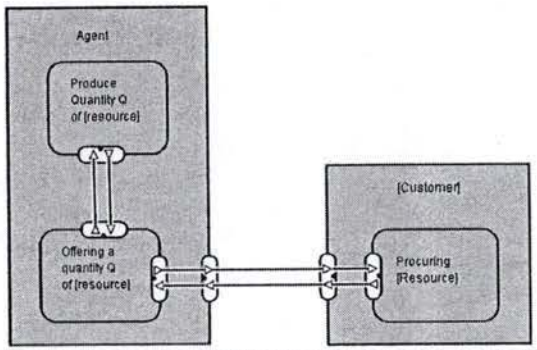
Scenario II - Starting offering resource "As-is Value model"



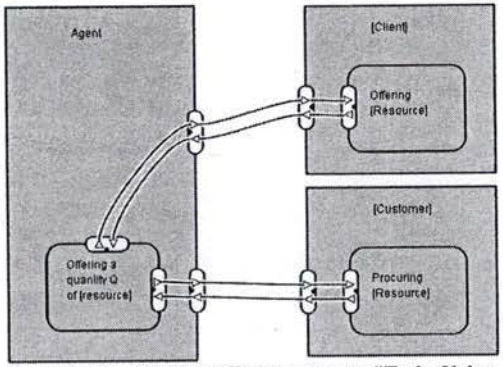
Scenario III - Starting offering resource "As-is Value model"



Scenario I - Starting offering resource "To-be Value model"

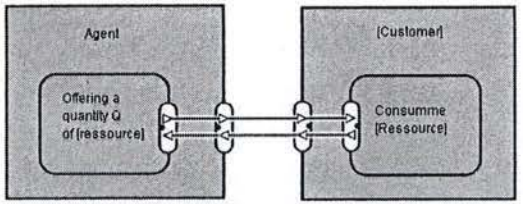


Scenario II - Starting offering resource "To-be Value model"

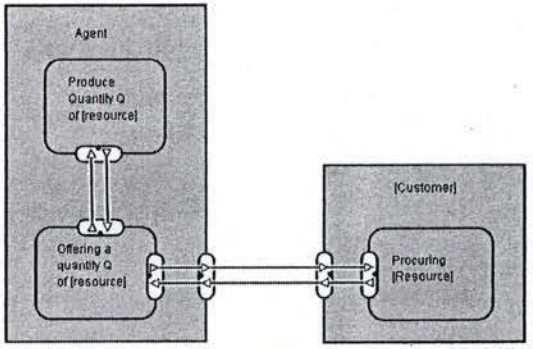


Scenario III - Starting offering resource "To-be Value model"

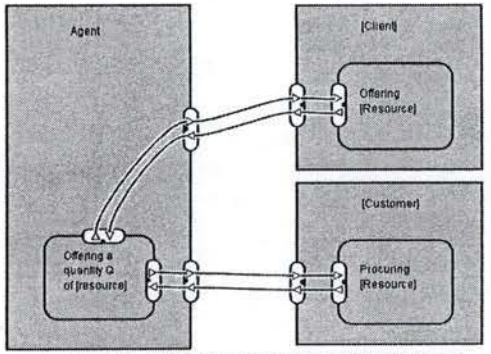
Enlarge Schema: Value model -Stop offering



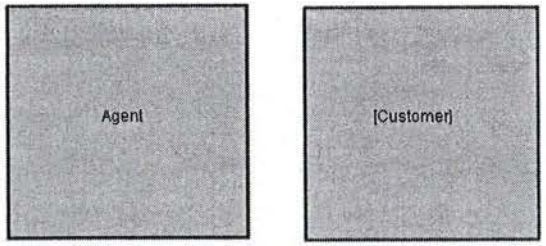
Scenario I - Stop offering resource "As-is Value Model"



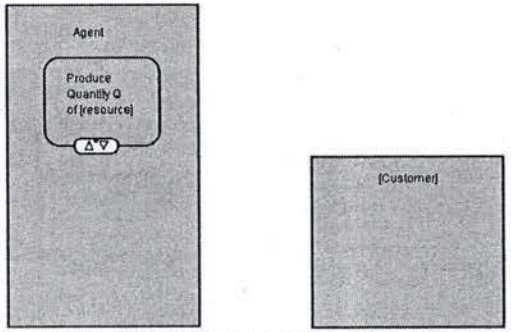
Scenario II - Stop offering resource "As-is Value Model"



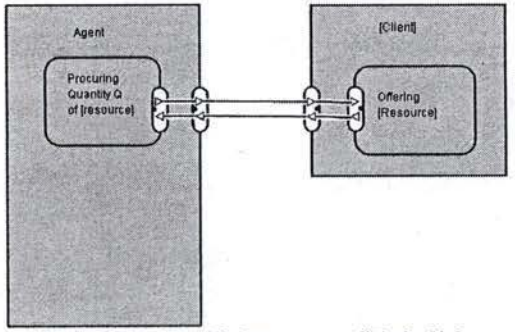
Scenario III - Stop offering resource "As-is Value Model"



Scenario I - Stop offering resource "To-be Value Model"

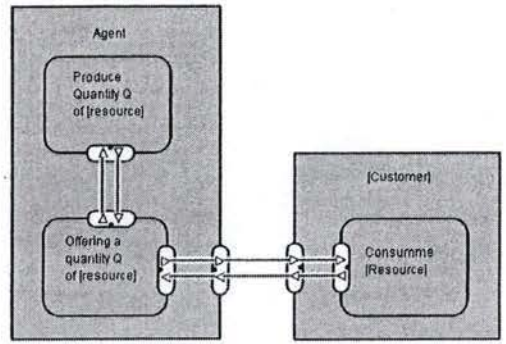


Scenario II - Stop offering resource "To-be Value Model"

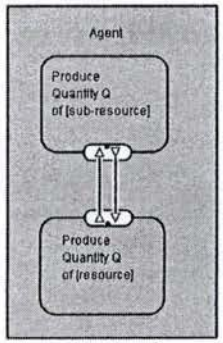


Scenario III - Stop offering resource "To-be Value Model"

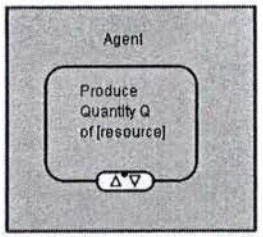
Enlarge Schema: Value model -Increase production of resource



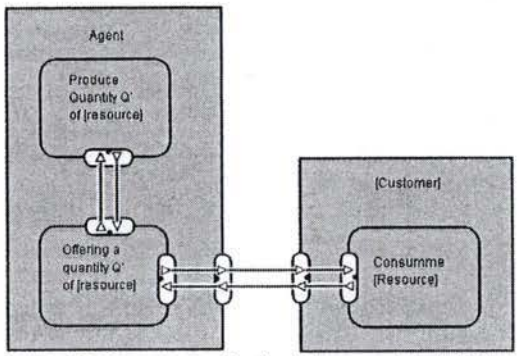
Scenario I-Increase production of resource "To-be Value Model"



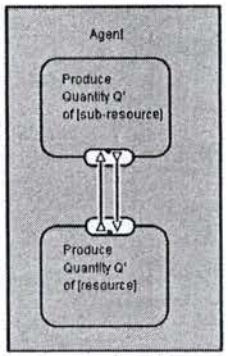
Scenario II-Increase production of resource "To-be Value Model"



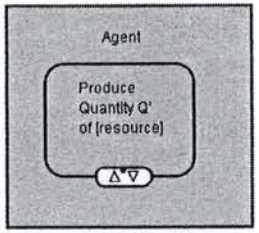
Scenario III-Increase production of resource "To-be Value Model"



Scenario I-Increase production of resource "As-is Value Model"

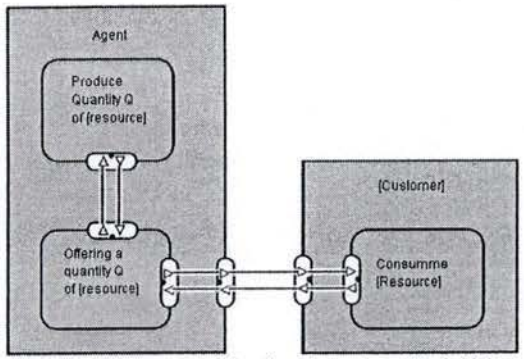


Scenario II-Increase production of resource "As-is Value Model"

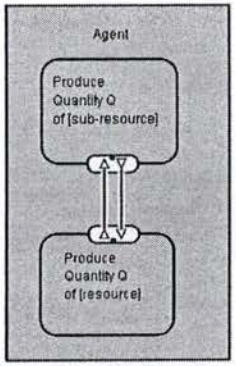


Scenario III-Increase production of resource "As-is Value Model"

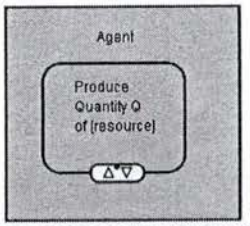
Enlarge Schema: Value model –Decrease production of resource



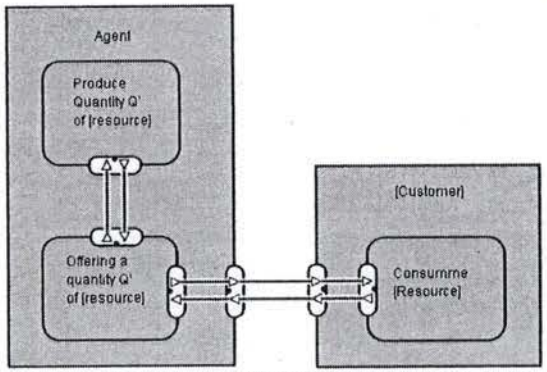
Scenario I-Decrease production of resource "As-is Value Model"



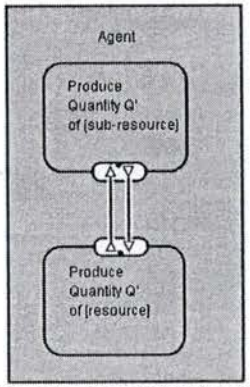
Scenario II-Decrease production of resource "As-is Value Model"



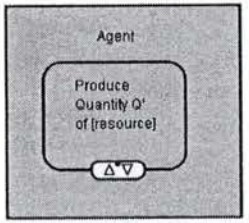
Scenario III-Decrease production of resource "As-is Value Model"



Scenario I-Decrease production of resource "To-be Value Model"

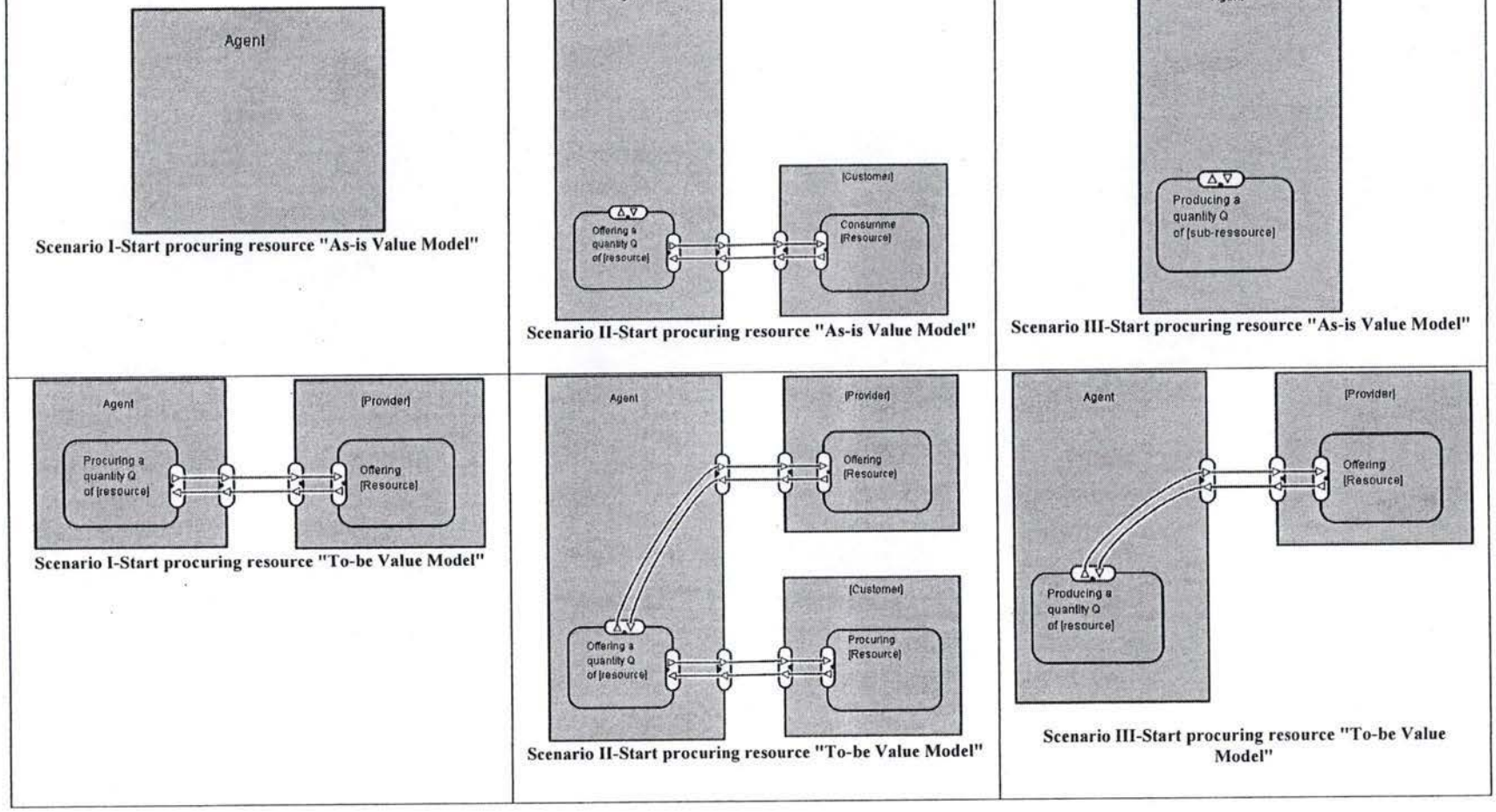


Scenario II-Decrease production of resource "To-be Value Model"

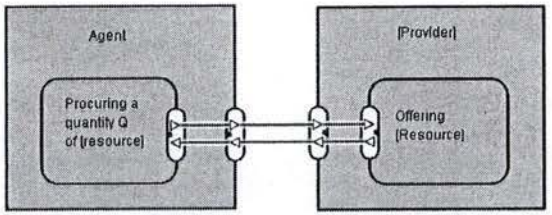


Scenario III-Decrease production of resource "To-be Value Model"

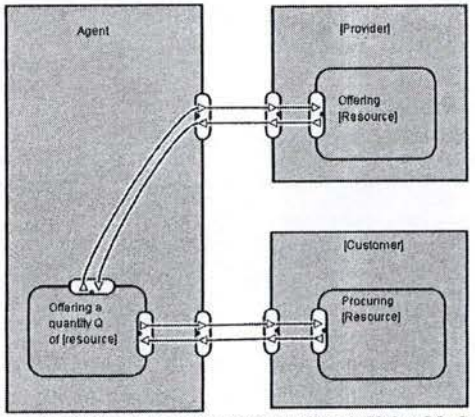
Enlarge Schema: Value model –Start procuring resource



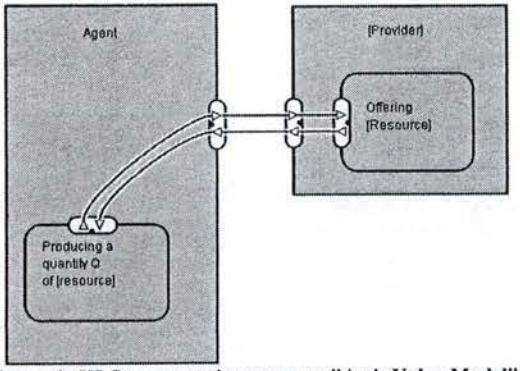
Enlarge Schema: Value model –Stop procuring resource



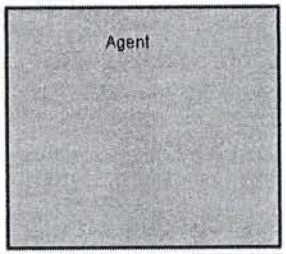
Scenario I-Stop procuring resource "As-is Value Model"



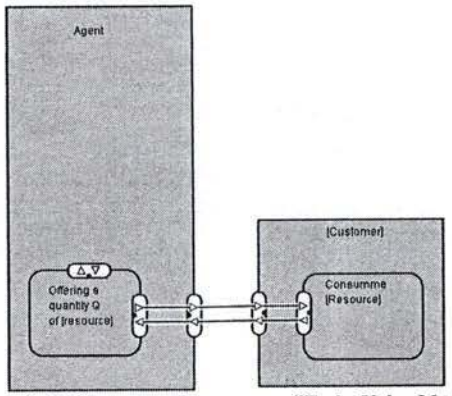
Scenario II-Stop procuring resource "As-is Value Model"



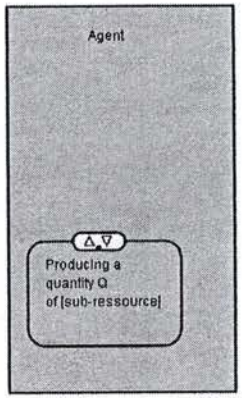
Scenario III-Stop procuring resource "As-is Value Model"



Scenario I-Stop procuring resource "To-be Value Model"

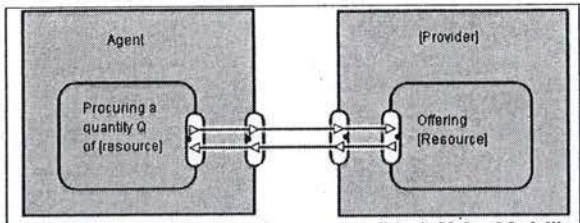


Scenario II-Stop procuring resource "To-be Value Model"

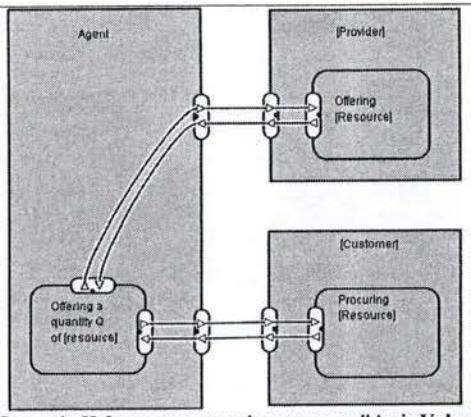


Scenario III-Stop procuring resource "To-be Value Model"

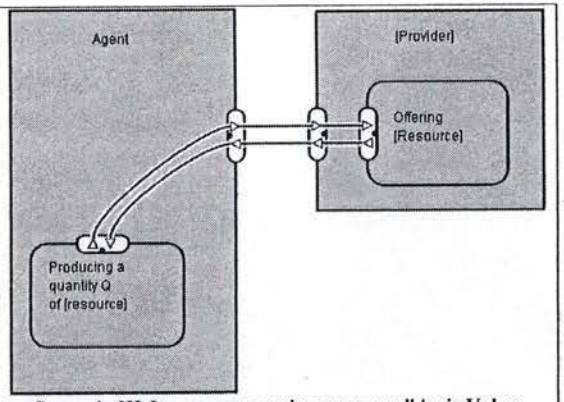
Enlarge Schema: Value model –Increase procuring resource



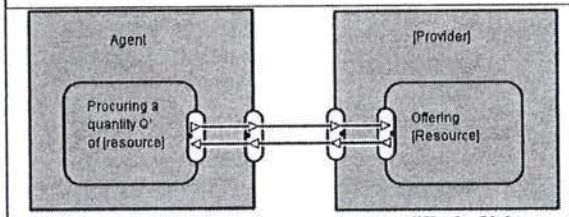
Scenario I-Increase procuring resource "As-is Value Model"



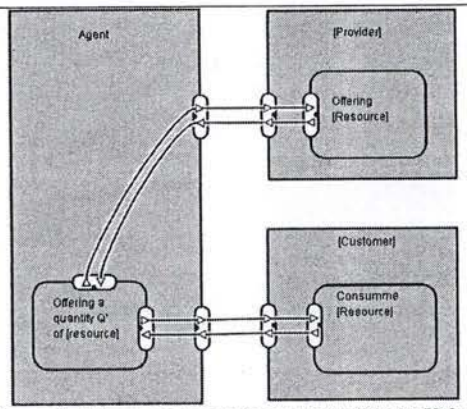
Scenario II-Increase procuring resource "As-is Value Model"



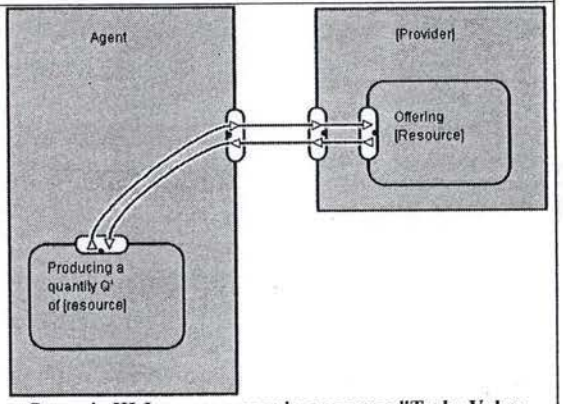
Scenario III-Increase procuring resource "As-is Value Model"



Scenario I-Increase procuring resource "To-be Value Model"

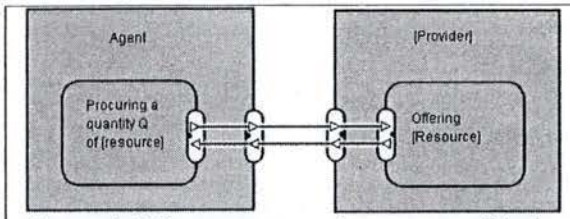


Scenario II-Increase procuring resource "To-be Value Model"

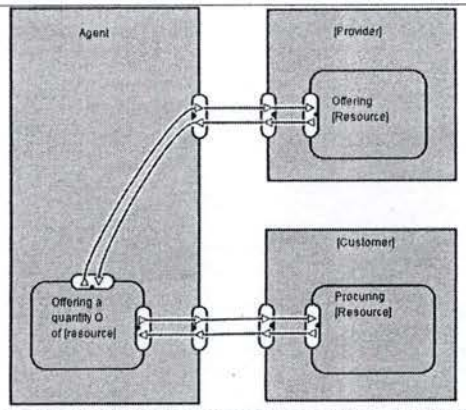


Scenario III-Increase procuring resource "To-be Value Model"

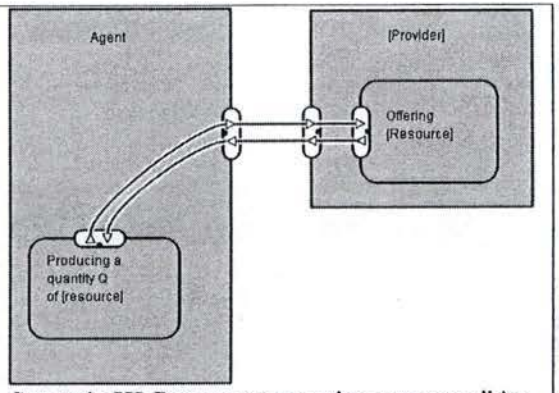
Enlarge Schema: Value model –Decrease procuring resource



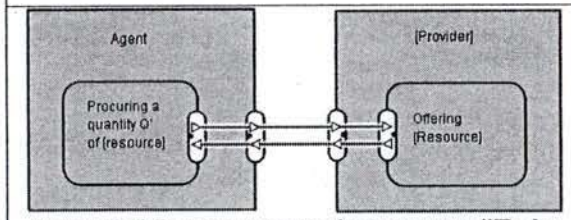
Scenario I-Decrease procuring resource "As-is Value Model"



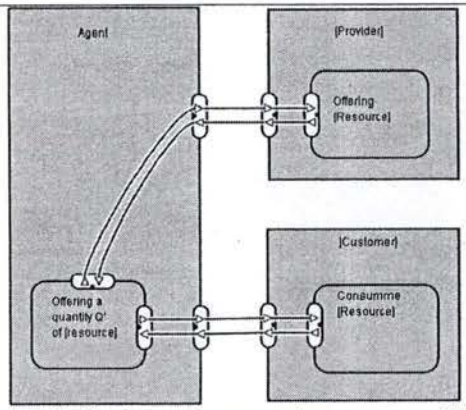
Scenario II-Decrease procuring resource "As-is Value Model"



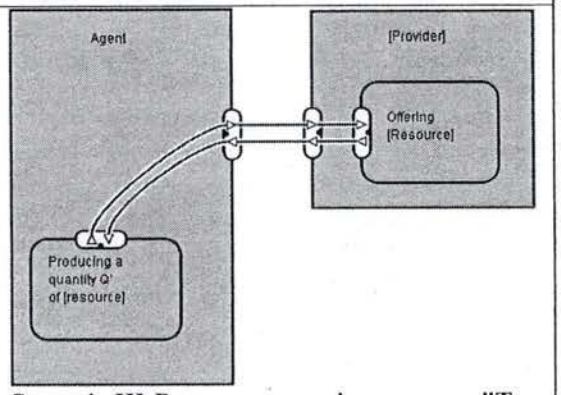
Scenario III-Decrease procuring resource "As-is Value Model"



Scenario I-Decrease procuring resource "To-be Value Model"

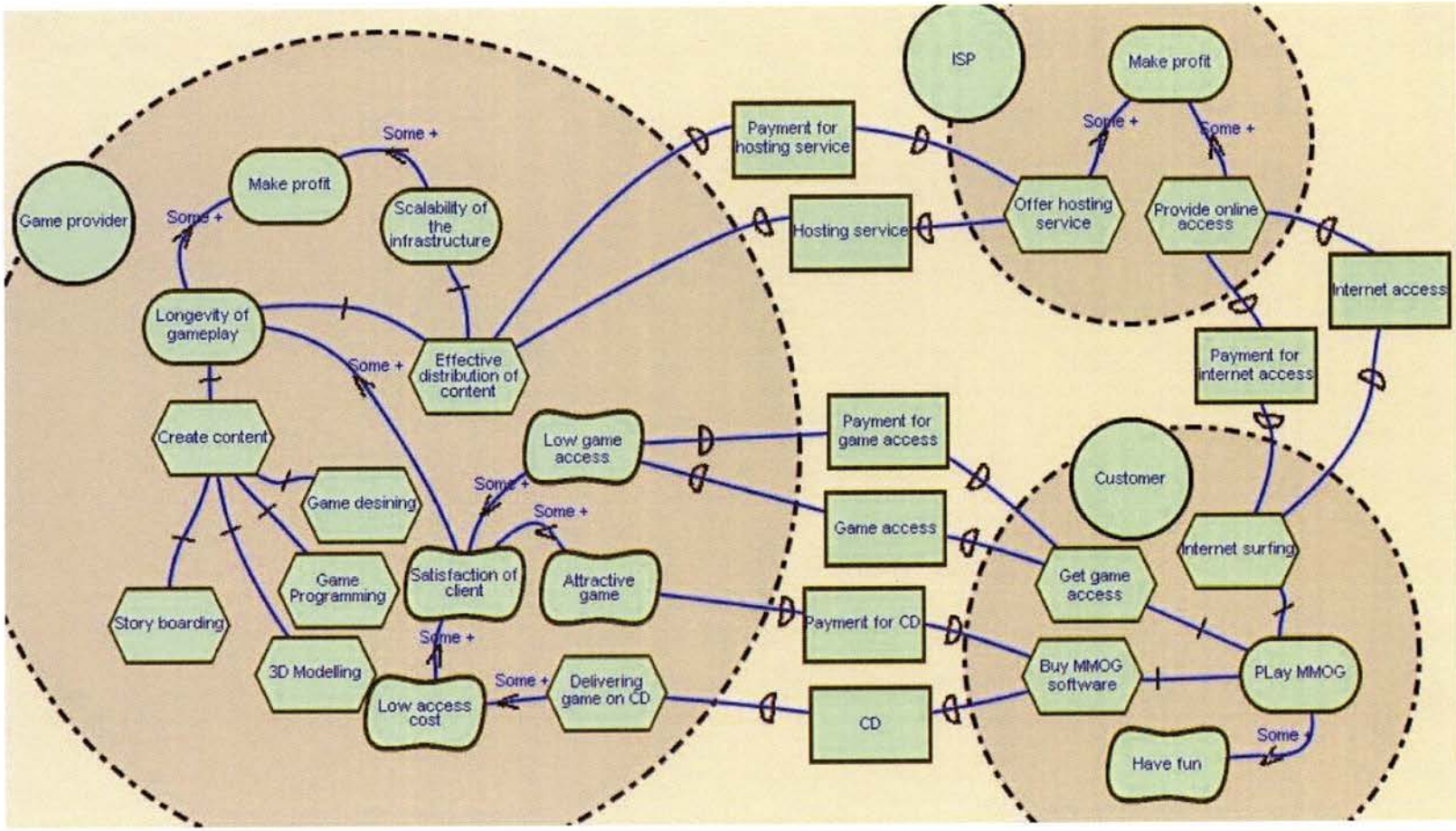


Scenario II-Decrease procuring resource "To-be Value Model"

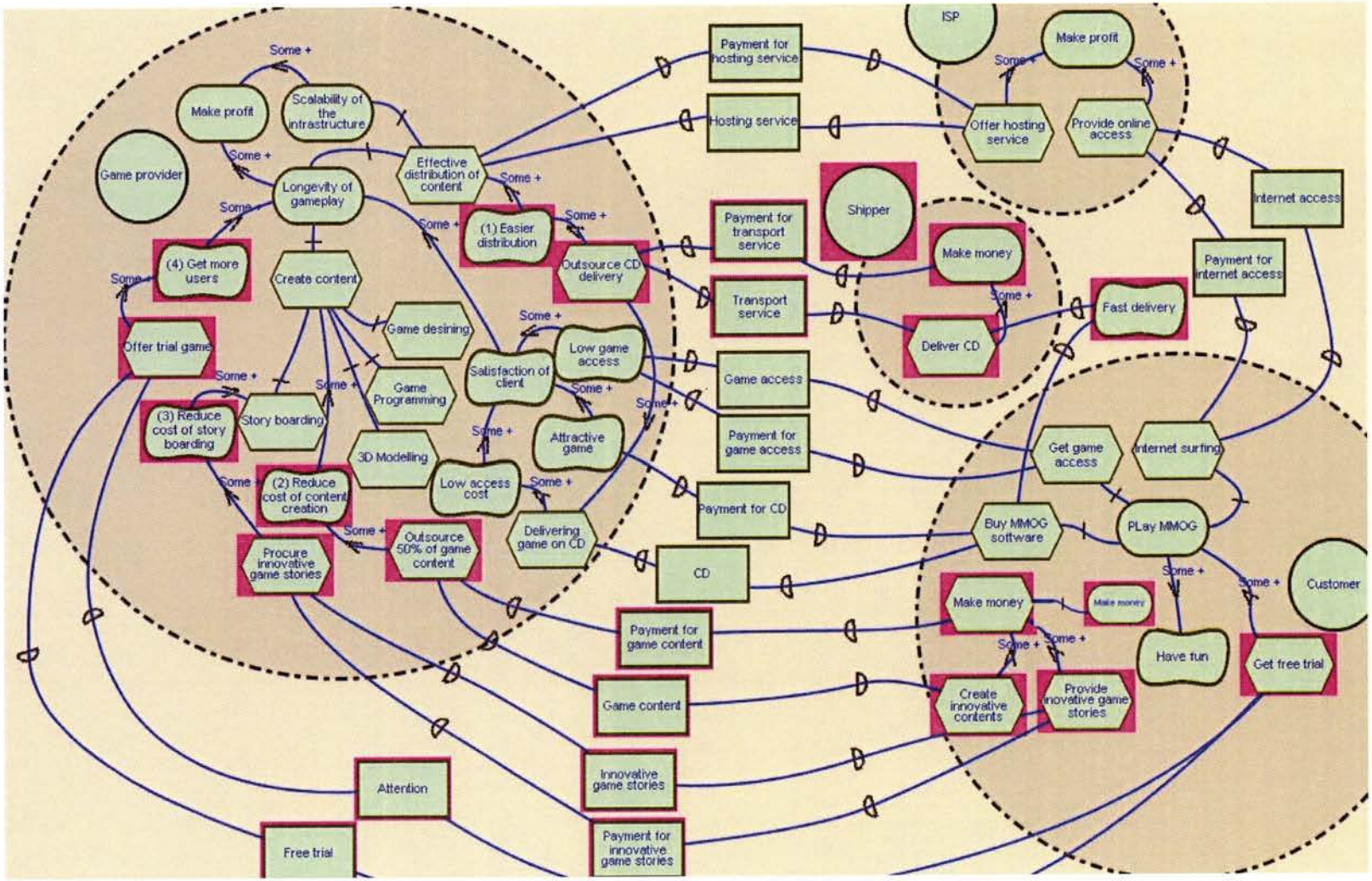


Scenario III-Decrease procuring resource "To-be Value Model"

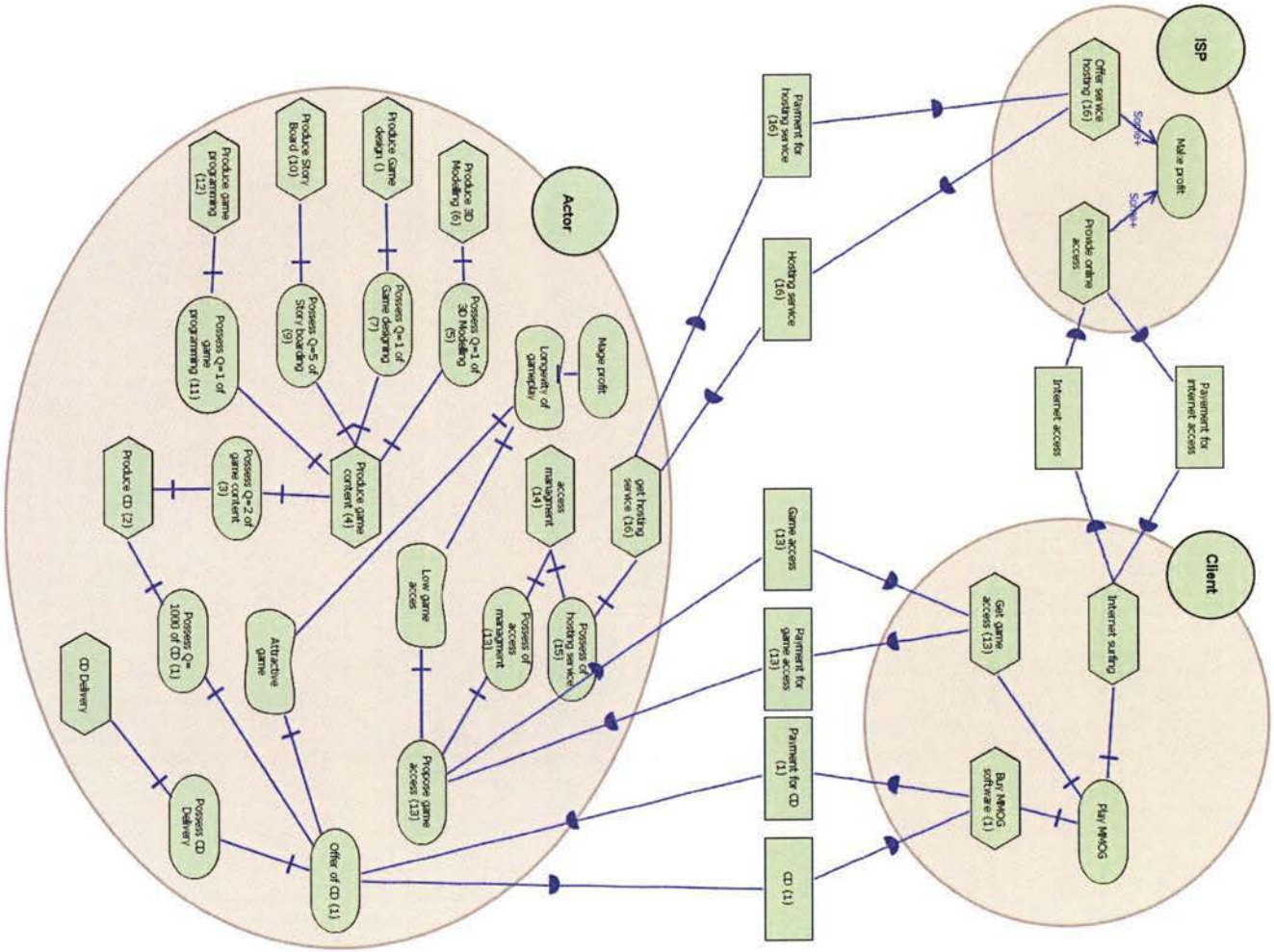
Enlarge Schema: Case Study - Method 2: "As-is" Goal Model



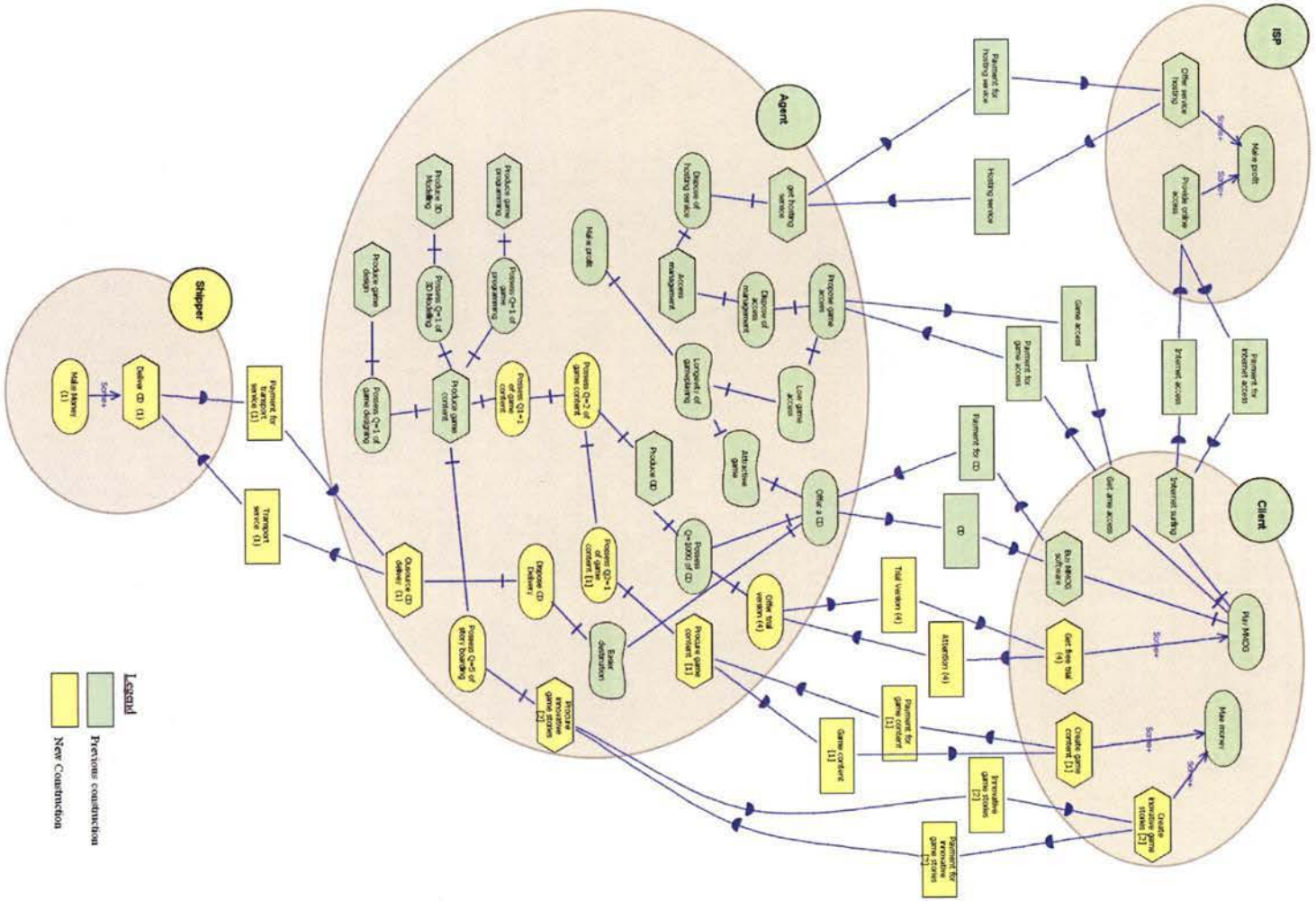
Enlarge Schema: Case Study - Method 2: "To-be" Goal Model



Enlarge Schema: Case Study - Method 3: "To-be" Goal Model



Enlarge Schema: Case Study - Method 3: "To-be" Goal Model



Annex II: **Definition from previous thesis** [30]

Business model: the business model describes the"what"of the organization. This kind of model represents the value propositions, the goods and services, the values exchanges, etc. between the actors. Some of the possible frameworks used for business modelling are Resource-Event-Agent

Compensation: resource which is given in a value exchange. Most of the time this resource will be financial.

Goal model: the goal model expresses the "why" of the organization. It clarifies the interests,the goals and the strategies of the different actors situated in its environment. Many frameworks can be used to represent the strategic objectives, the needs, the goals, etc. to be achieved by an organization. Some of the possible frameworks used for goal modelling are Tropos [7], KAOS [26], the Business Motivation Model (BMM) [30], i? [31], and the SWOT Analysis [19].

Means: "...A Means represents any capability or instrument that may be used to achieve Ends. Means may be differently categorized. When formulated as a course of action, a means describes the realizations of desired goals..." For the example given in the definition of "An end" (providing a leading customer service), then a means for this means can be "hire experienced customer service personnel". Usually, some goals will be situated at a high abstract level. In this case, it is necessary to refine them into subgoals which can be supported by means. By proceeding this way, it is possible to construct a goal tree.
I

Principal agent: a single enterprise concerned by strategic changes on its business. The model is drawn in order to represent its business and relations with its environment.

Rule: a rule is an operationalization of an associated template. Its goal is to transform a business model (given as input). A rule removes (or adds) elements from (or into) the business model according to its associated template. A rule has two parts: the primary and the secondary action. The primary action is based on the compulsory part of the associated template. It draws on the model what the template aims to do. The secondary action represents the information contained in the optional part. For each element situated into the optional part of a template, a matching fragment (piece of the rule) is present inside the rule to apply these changes on the business model.

Resources: good or service.

Template: a template is the translation of a means in terms of business model notions. Each template is divided in one compulsory part and one optional part. The first part or compulsory part of a template expresses what this template aims to do. The second part or optional part expresses the different possibilities to satisfy the compulsory part. This part is denoted as optional because the way to solve the compulsory part is not always known by the goal modeler.

---

[30] Pierre Halleux and Ludovic Mathieu, a method to support the alignment of value models and goal models, Faculté de Namur,2008

Value model: synonym of business model.

Annex III : **Definition from this thesis.**

Action : a template is the translation of a means in terms of business model notions. An action provide a first algorithm construct the "To-be" Goal Model by using the "As-is" Goal Model. An action provide a second algorithm construct the "To-be" Value Model by using the "As-is" Value Model.