Radboud University Nijmegen

Guiding the Business Rules specification process

How can we guide users in the process of business rule specification with RuleSpeak?

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Thesis number: 166 IK

Preface

This master thesis is my final academic step before receiving the Master of Science degree. During the last 2 years I became familiar with the area of Business Rules. It all started with the Business Rules course at Radboud University Nijmegen and continued in the Business Process Design course at Stockholm University.

During these courses, all the tools we used a strongly focused on skilled users. Skilled in both the application and writing the rules. With this background knowledge a perfect subject for this thesis was born.

Right now, one year after starting my master I finished this thesis. Because it all started with his enthusiasm during the course I would like to thank Dr. Stijn Hoppenbrouwers. Certainly also because of his guidance during this thesis project. We didn't have that many meetings, but in our meetings we always had a good discussion which helped me further in the process.

The process of writing a thesis can be hard, also for me. It was all depending on my own motivation to spend time on working on this document. Especially when I started part-time work my focus shifted to the wrong side. I assume the warnings of my girlfriend and family helped. Thanks for helping refocusing.

Now it's time to focus on new challenges, starting a fulltime job an extend my knowledge and experience.

I hoop you will enjoy reading this thesis and playing with the Business Rule Guidance Tool (BRGT).

Jodocus Deunk

June, 2012

Abstract

Rules are everywhere, on campus, traffic rules, laws, games. Also in Businesses there are rules. To maintain and write correct rules users can use a rule editor. The two methods: 'Semantics of Business Vocabulary and Business Rules' (SBVR) and RuleSpeak make it possible to use the tools to write pretty consistent rules because all aspects of the rule itself are available.

Because of the experience with RuleSpeak this method is used for developing a tool guiding the user during the specification process. Current Business Rule editors seems to be developed for more advanced users, where guidance isn't is a big thing.

Before creating this Business Rule Guidance Tool (BRGT) a literature study has been done to create a view on the concepts of Business Rules and the steps in the process of creating a business rule. These steps are then integrated in BRGT. Also literature on the topic of asking questions and guidance is investigated for aspects that can be added to BRGT.

The best way a tool like BRGT can work is working with small steps. With small steps a user can focus on the various problems of creating a rule.

The outcome of this research can be used for further research in guidance and the topic of asking questions, as well as the topic of Business Rules.

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1 Introduction

We all know there are some regulations in our life. Very strict rules or rules based on trust and a reasonable way of thinking. Regulations are often expressed by rules: traffic rules, library rules, university rules and laws: all kind of rules to regulate a specific domain.

1.1 Research question

With the upcoming use of computer systems for regulation in organizations also the manageability of these rule sets became more important. In the beginning of the computer age always technical programmers were needed to implement some rules in a computer system, nowadays, for example because of agility, the business itself wants to be more in control.

Methods like RuleSpeak were introduced to write the rules in a way the business could understand them because they became plain English instead of the programming code written by the technicians. Still, business people can't write the rules themselves without any help of a specialist. Mostly during some interactive sessions with a specialist the business people get used to write rules according to the RuleSpeak standard, but there is no real guidance available as a method.

Koen Derks, a former classmate and Jeffrey Schoenmakers: also an old Radboud student, did some research in Business Rules creation and in the end Koen came-up with the BRAT tool, a Business Rules Authoring Tool. This tool is helping the user with writing a rule according to the RuleSpeak grammar.

Although Koen's tool helped create rules according to the RuleSpeak grammar specification still a lot of knowledge of the RuleSpeak method was needed. Therefore this thesis will focus on the guidance of users during the specification process to end up with a rule created with almost no knowledge of the RuleSpeak method.

How can we guide users in the process of business rule specification with RuleSpeak?

To answer this research question three sub-questions need to be answered.

1. What does the process of business rule specification look like?
2. In which way can instructions or focused questions guide this specification process?
3. Which other kind of guidance are needed to guide the users in the specification process?

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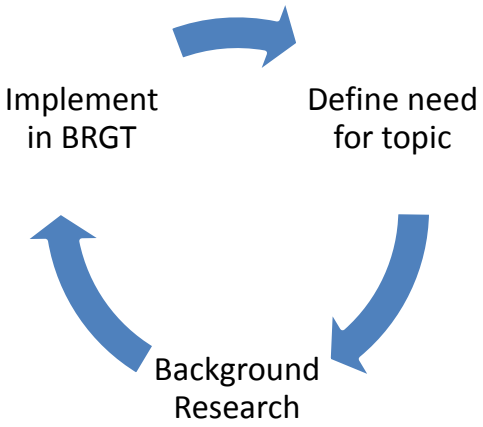
1.2 Method

To answer the research questions the research process can be seen as the diagram on the right.



Not the traditional Waterfall like model is used. By seeing the research process as a circle, fixation on one topic or solution is avoided. Some of the background topics were already clear (focused questions and instructions), but as the project progresses others may needed.

On the other hand the circle can be used as an ongoing process. Hence, some boundaries are needed. These limitation means the focus will be only on the rules and writing the rules. For example terms are included in rules, but no explicit research will be done in this area.

In the end the thesis will provide the outcomes of this research project, including the view on the future work needed in this research area.

1.3 Relevance

In the first meeting with my supervisor Stijn several topics were discusses. One of these topics was Koen Derks ‘s thesis. Because I followed the Business Rules course with him we both mentioned the need for help during the use of the RuleSpeak method.

I still mentioned some need for help during the process. Koen ‘s application did help with writing rules according to the RuleSpeak method but users still need some knowledge about the method.

Talking to my supervisor we concluded some guidance during the specification process would be a next step in transfer the management of rules to the business.

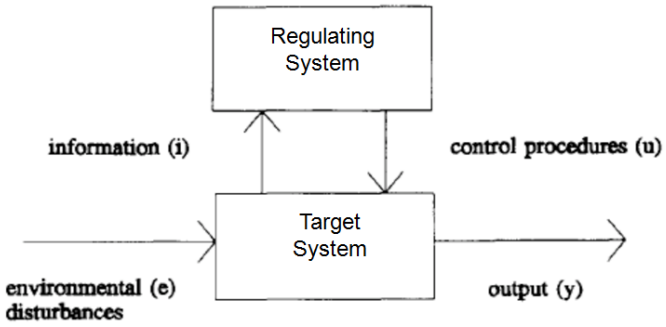
1.4 Results

The result of this research project will be a model for guidance during the specification process and a proof-of-concept where this model will be implemented in. This proof of concept can be used as a test mechanism to verify the model or to optimize it.

Before ending this project with the model and a proof of concept research needs to be done in the area of business rules and how to guide the specification process.

2 Business Rules, the concept

There has always been a need for regulation of systems; therefore De Leeuw introduced the Control Paradigm, which added a Regulation System to the Target System (De Leeuw, 1979).



Business Rules are one of the mechanisms to regulate this system and have their roots in Artificial Intelligence. They can be seen as analogues to sports: a sports game consists of terms, facts, rules and procedures. Looking at businesses you can see the similarity (Ross R. G., My Story: To Play the Game You Need Rules) . Also within businesses these elements are visible. Therefore doing business can be compared with playing games. Like in sports games business rules are used to influence the behavior of the business (Ross R. G., 2003).

Systems analysts have been working for a long time on describing businesses in terms of structure of data, and use of data. With the introduction of Business Rules there was a way to handle constrains on this data (Hay & Anderson Healy, 2000). Mostly rules where forgotten or seen as informal. During the design period of a system, rules were not integrated but put in the programming code, so in one of the final stages of the project. Also, rules concerning business processes are documented often, but general rules are not formally written down. (Ross R. G., 2005)

Over time two methods became more and more popular: SBVR (Semantics of Business Vocabulary and Business Rules) and RuleSpeak. This chapter is not meant as a deep archive with a complete description of the two methods, but will focus on the main concepts and differences between the two mentioned methods.

The fundamentals of the Business Rules Approach are collected in the Business Rules Manifesto. These fundamentals are translated in several languages and are a result of all the work the Business Rules Group (BRG) did since the 1980's. (Ross R. G., 2003) (OMG, 2008)

The BRG came up with 10 articles describing what a business rule should do. Beside these 10 articles alse the Business Rule Mantra needs to be mentioned: *"Rules build on facts, facts build on concepts as expressed by terms".*

Article 1: Primary Requirements, Not Secondary
Article 2: Separate From Processes, Not Contained In Them
Article 3: Deliberate Knowledge, Not A By-Product
Article 4: Declarative, Not Procedural
Article 5: Well-Formed Expression, Not Ad Hoc
Article 6: Rule-Based Architecture, Not Indirect Implementation
Article 7: Rule-Guided Processes, Not Exception-Based Programming
Article 8: For the Sake of the Business, Not Technology
Article 9: Of, By and For Business People, Not IT People
Article 10: Managing Business Logic, Not Hardware/Software Platforms

2.1 Definitions

There is no one definition of what a business rule is. Only the Business Rules Group has already two definitions, one from a business perspective and one for the information system perspective. But generally the Business Rules Group says:

"A business rule is a statement that defines or constrains some aspect of the business. It is intended to assert business structure or to control or influence the behavior of the business. The business rules which concern the project are atomic ~ that is, they cannot be broken down further." (Hay & Anderson Healy, 2000)

With the two additions for the different perspectives:

From a business perspective	*"it pertains to any of the constraints that apply to the behavior of people in the enterprise, from restrictions on smoking to procedures for filling out a purchase order."*
From an information system perspective	*"it pertains to the facts which are recorded as data and constraints on changes to the values of those facts. That is, the concern is what data may or may not be recorded in the information system."*

The definition of the Object Management Group (OMG) is a bit smaller and says: *"… a rule that is under business jurisdiction".* Where Business Jurisdiction is explained as *"Under Business jurisdiction" is taken to mean that the business can enact, revise, and discontinue the business rule as it sees fit"* (Ross R. G., 2005)

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The definition of a business rule I will use during my thesis project is the definition of the Business Rules Group:

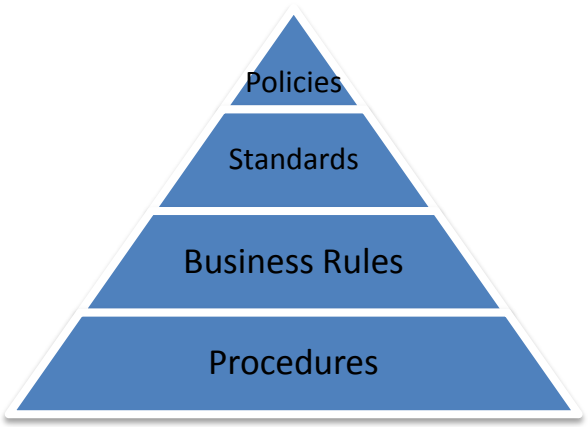
"A business rule is a statement that defines or constrains some aspect of the business. It is intended to assert business structure or to control or influence the behavior of the business. The business rules which concern the project are atomic ~ that is, they cannot be broken down further."

But because I think Business Rules should always come from the business side I'll use the definition of the OMG as an addition on the Business Rules Group definition.

"… a rule that is under business jurisdiction."

2.2 Business Rules in the organization

Not only rules are regulating the businesses organization, there are also policies, standards and procedures. In his thesis Jeffrey Schoenmaker (Schoenmaker, 2010) did some research and positioned the Business Rules in a company with the use of a small model, based on a security policy model (The ISO27k FAQ).



With the following definitions for the terms:

Policies	Guidelines which create and support the company's philosophy
Standards	Detailed rules describing the execution of the policies
Business Rules	Strict rules limiting the freedom of action to meet the requirements described in the standards
Procedures	Detailed steps to implement and execute the formulated Business Rules

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So Business Rules are positioned between the Business standards and Procedures meaning they (Business Rules) are written with the Business Standards in mind and shaping the procedures of the business.

One of the main problems in businesses is the link between business people and IT people. Both are talking in their own terms and use different references. Although there is IT involved in creating business rules companies can't just hire an (IT) employee with business rule experience. Besides the knowledge of business rule also the knowledge of the company itself is needed in the specification process.

2.3 Semantics of Business Vocabulary and Business Rules

In 2008 the Object Management Group (OMG) introduced the Semantics of Business Vocabulary and Business Rules (SBVR), a standard for Business Rules. According to the Business Rules Community there are three basic elements in the name, namely Semantics, Business Vocabulary and Business Rules (BRCommunity, 2005).

Semantics of Business Vocabulary and Business Rules (SBVR) is a basis for creating business rules in a semi-natural language. To realize this, a subset of the English grammar has been taken. SBVR has two fundamental rule types: behavioral rules and definitional rules, also known as operational and structural rules. (OMG, 2008)

Because SBVR has also part of formal logics in it, a rule is always a proposition. This formal logics is not meant for business people but for discussing the semantic structures underlying business communications of concepts, facts, and rules. An example concerning this: "*a typical business person does not tend to talk about quantifications, but he expresses quantifications in almost every statement he makes. He doesn't tend to talk about conjunctions, disjunctions, logical negations, antecedents and consequents, but these are all part of the formulation of his thinking. The vocabulary in this clause is for talking about these conceptual devices that people use all the time"* (OMG, 2008).

Characteristics of SBVR are (OMG, 2008):

- Using Prefix notation: this means the operators stand in front of the sentence or formula. Example: " +X Y"
- Selected set of Keywords: a limited set of keywords is available

2.4 RuleSpeak

In 1996 Ronald G. Ross started a project which resulted in the RuleSpeak standard. This set of guidelines is now available in English, Spanish, German and Dutch (Business Rule Solutions). RuleSpeak is developed for end-users, easy to notice in their slogan "let the business people speak rules!" Therefore the rules written using the RuleSpeak guidelines are a bit easier to read and understand.

The constructions of SBVR Structured English can be used in RuleSpeak, but RuleSpeak embeds equivalent keywords within the propositions themselves (mix fix).

In RuleSpeak there is a distinction between structural rules and operative rules. These are viewed as follows (Ross R. G., 2005):

- *Structural rules* prescribe criteria for how the business chooses to organize ("structure") its business semantics. Such rules express criteria for correct decisions, derivations, or business computations. Structural rules supplement definitions.
- *Operative business rules* focus directly on the propriety of conduct in circumstances (business activity) where willful or uninformed actions can fall outside the boundaries of behavior deemed acceptable. Unlike structural rules, operative rules can be violated *directly*.

Characteristics of RuleSpeak are (OMG, 2008):

- Using Infix notation: this means the operators stand in-between the sentence or formula. Example: "X + Y"
- Essence by definitions, boundaries by rules
- Concept completely focused on the business

2.5 Comparing SBVR and RuleSpeak

Main difference between SBVR and RuleSpeak is the difference in bounding the way terms are expressed. RuleSpeak is more business oriented and keeps the description of terms open to the user, while SBVR is more delimited.

The difference in the rules themselves is displayed in the table below:

Modal claim type	Statement form	SBVR Structured English keywords	RuleSpeak keywords
obligation formulation	'obligate statement' form	it is obligatory that p	r must s
obligation formulation embedding a logical negation	'prohibitive statement' form	it is prohibited that p	r must not s
	'restricted permission statement' form	it is permitted that p only if q	r may s only t
permissibility formulation	'unrestricted permission statement' form	it is permitted that p	r may s r need not s
Necessity formulation	'necessity statement' form	it is necessary that p	r always s
necessity formulation embedding a logical negation	'impossibility statement' form	it is impossible that p	r never s
	'restricted possibility statement' form	It is possible that p only if q	r can s only t
Possibility formulation	'unrestricted possibility statement' form	it is possible that p	r sometimes s r can s

(OMG, 2008, p. 345)

2.6 Choice for a Business Rules standard

In this chapter three movements are discussed. Before continuing with discussing the separate parts a business rule, first we need to choose the method we'll use in the further process.

During the further process of this research RuleSpeak will be used as a method. Although the methods are close to each other, the choice for one method was rather easy.
The choice for RuleSpeak is mainly based on the experience with the RuleSpeak method by me personally and my supervisor. Also the application Koen Derks developed within in thesis project is based on the RuleSpeak method. Extending his functionality choosing another method would be a bit suboptimal.

Choosing a specific method for this research is not limiting further research because transformation between SBVR and RuleSpeak is possible.

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3 Business Rules, the specification process

Now we know what a business rule is and what different kind of methods are out there. This chapter provides more information on the specification process and the requirements on a good business rule according to the chosen method: RuleSpeak.

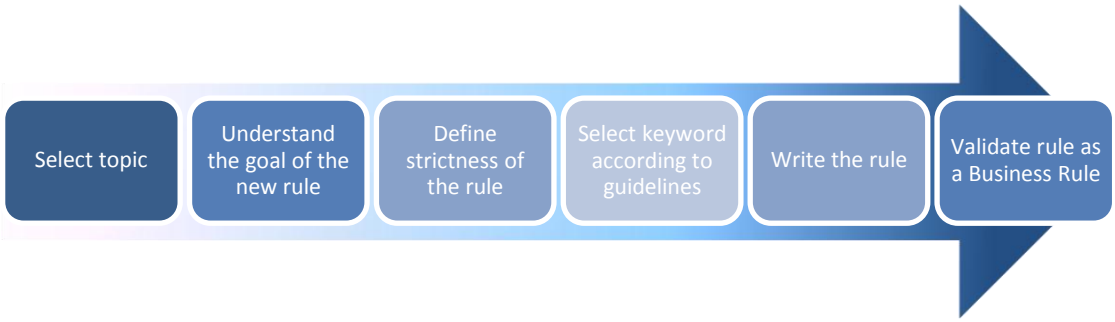
3.1 Creating a new Business Rule

Starting with Business Rules writing your own rules (guided with the needed guidelines and tooling) is the easiest way to get into it. Because there is no background knowledge yet, the rules will be written in a clear way and as a writer you're not aware of the complex possibilities.

Koen Derks (Derks, 2011) wrote in his thesis about the process of creating a business rule, party based on his experience during his work as a student assistant in the Business Rules course he came up the following steps:

1. Select the topic for the rule
2. Make sure to understand what needs to be regulated with the soon be created Business Rule
3. Evaluate stability of the rule: Fundamental or transient
4. Select one of the keywords which will fit the level of strictness
5. Write the rule

Koen also made a graphical representation of these steps:



After writing the rule the rule must be validated. Ronald G. Ross made a list (Ross R. G., 2007) of criteria for a rule making it a business rule:

1. The rule must be actionable (e.g. *"A hard hat must be worn in a construction site"*).
2. The rule must be about the business, not about either a knowledge/data-recording system that supports the business, or a platform used to implement such a system.
3. The rule must be expressed in the language of the business.
4. The rule must be under business jurisdiction.
5. The rule must tend to remove a degree of freedom.

With only the steps and validation of the criteria you're not done yet. You also need to define the used terms and maybe there is also a need for a model expressing the rules.

3.2 Requirements on a Business Rule

What are the requirements on a Business Rule according to the RuleSpeak method? There are some distinctions made and 4 types of rules have been defined.

Besides this there is some information provided by Business Rule Solutions, a Business Rule Technique Company. These do's and don'ts will also be discussed in this paragraph. I end this chapter by shortly mention the grammar of a Business Rule. More information on that can be found in the thesis of Koen Derks (Derks, 2011).

The main distinction in RuleSpeak is between structural and operative rules. Operational rules can be violated directly because they focus on the propriety of conduct in circumstances where actions are outside boundaries accepted by the organization. Structural rules focus on criteria for making decision, derivations or computations by prescribing the way businesses choose to organize their business semantics.

Another distinction of RuleSpeak rule types is guidelines, computations, action enablers and inference (Halle, 2001).

1. Guideline: The person executing the rule has freedom of choice in whether or not to follow the rule.
2. Computation: This rule gives a formula for calculation which will lead to a business decision.
3. Action enablers: The conditions of the situation will be checked with this rule. Based on the check other business events will be initiated.
4. Inference: This rule also checks the conditions, instead of events, new facts will be introduced.

3.2.1 Do's and don'ts

Based on Business Rules Solutions came up with the do's and don'ts for setting up proper business rules (Business Rule Solutions, 2009).

1. Business Rules Statements should be non-procedural
2. Business Rules should be not be inscrutable
3. Enforcement and evaluation are separate concerns
4. Omitting a Rule Keyword is not good
5. "Can" is not good
6. Extra words for emphasis are not good
7. Free form is not good
8. "To have" is often not good
9. Missing Facts are not good
10. Starting with "if" is not good
11. Starting with a timeframe is not good
12. Plural subjects are not good
13. Actors subjects are frequently not good
14. Non-numeric subjects for numeric thresholds is not good
15. Missing subjects are not good
16. Imperatives are not good
17. Non-specific qualification is not good
18. Conjunctions are often not good
19. "Etc." is not good
20. Twosome words are not good
21. Embedded numbers are often not good
22. Embedded calculations are not good
23. Embedded conditions are often not good
24. Explicit mention of processes is usually not good
25. CRUD is not good
26. "When" is often not good

3.2.2 Grammatical requirements

In the documents describing the RuleSpeak sentence forms some example tables of the allowed RuleSpeak sentence forms are given (Ross R. , 2009). These tables can be used by people who will probably understand the sentence forms. In order to have a software application understand the sentence forms a more abstract version is needed.

Based on table 2 of the RuleSpeak Sentence Forms document Stijn Hoppenbrouwers made a version (Hoppenbrouwers S. , 2011) describing the sentence forms in a shorter, more computer technical way.

First part	Keyword(s)	Second part	Keyword(s)	Third part
SUBJ	May	STATE		
SUBJ	Need not	STATE		
SUBJ	Need not	STATE	if	COND
SUBJ	MUST	STATE		
SUBJ	MUST	STATE	when	COND
SUBJ	Must be computed as	COMP		
SUBJ	Must be computed as	COMP	when	COND
SUBJ	Must be considered	TYPE		
SUBJ	Must be considered	TYPE	if	COND
SUBJ	Must be performed when	COND		
SUBJ	MUST NOT	STATE		
SUBJ	MUST NOT	STATE	if	COND
SUBJ	MUST NOT be computed as	COMP		
SUBJ	MUST NOT be computed as	COMP	when	COND
SUBJ	MUST NOT be considered	TYPE		
SUBJ	MUST NOT be considered	TYPE	when	COND
SUBJ	MUST NOT be performed when	COND		
SUBJ	May	STATE	only if	COND

Table: RuleSpeak grammar

Some explanation of the shortenings this table is needed:

Shortening	Description

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Shortening	Description
STATE	Any description of a state: • a/an NOUNSING • a/an ACOND NOUNSING • a/an NOUNSING CONDFN
NOUNCING	Any singular noun phrase
ACOND	Any adjective phrase expressing a specific state or property of the “NOUNSING” relevant as a condition
CONDFN	Any STATE description applying to the “NOUNSING”
COMP	Any expression of a computation
SUBJ	• a/an NOUNSING (NOUNSING simply stand for singular noun phrase) • a/an ACOND NOUNSING (ACOND stands for “adjectival condition”) • a/an NOUNSING CONDFN (CONDFN stands for “condition following noun”)
COND	• if STATE • when STATE

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4 Guiding the specification process

Now we know what Business Rules are, what they look like and in short what the process looks like. In this chapter the process itself and guiding during this process, is the main subject. This chapter starts with answering the question 'What's guidance?'. After that more is said about the guidance in current tools. This chapter ends with some examples how a tool can guide during the specification process.

4.1 Helping

As guiding is the topic of this thesis, first we take a look at the definition of guiding. Where guiding can be used in many ways, this thesis uses the following definition (Van Dale, 2002), translated from the Dutch 'leiden': "*in een bepaalde richting of toestand brengen"* as a foundation:

> *Bring into a particular direction or state.*

This definition speaks about a particular direction or state: the outcome of the guidance and or the Business Rule itself. Because this definition says nothing about helping I would like to change this definition to:

> *Help to bring into a particular direction or state.*

Now the question rises what 'help' can be in this context. In the first chapter I argued that for some cases, interactive group sessions with a facilitator are still needed to help write the rules according to a standard like the RuleSpeak method.

Bostrom, Anson and Clawson (Bostrom, Anson, & Clawson, 1993) define these group sessions as:

> *a meeting is an interaction that utilizes a set of resources (people, technology) to transform the group's present problem state into its desired future state (accomplishing specific meeting outcomes) through a series of action steps (agenda).*

When building a tool to guide the specification process the tool should be able to help during these sessions. Because the process of writing rules often is an individual process, we disregard group sessions and focus on individual guidance. More on the group sessions can be found in "Fostering self-direction in participatory process design" (Prilla & Nolte, 2010).

Still, all aspects mentioned by Bostrom, Anson and Clawson are needed to accomplish the outcome: a set of resources, a problem state and its desired future state and a series of action steps.

In a guidance tool these needs can be translated into:

A set of resources	The user of the guidance tool.
A problem state	(Unstructured) rules in the organization.

Its desired future state	Current Business rules according to the RuleSpeak method.
Series of action steps	A set of procedures, questions and instructions.

4.2 Rule editors

Several editors are currently helping organizations manage their business rules. These so called Business Rule Management Systems (BRMS) are focusing on defining, deploying, monitoring and maintaining the complexity of decision logic used by operational systems within organizations.

These rule editors mainly focus on entering data and therefore they require a high level of knowledge about the used rule standard. Although these systems pretend to be the solution for domain experts, these experts need to have special skills to work with these tools.

In 2005, Graham (Graham, 2005) made a detailed comparison of the most used BRM systems: Blaze Advisor from Fair Isaac Inc., JRules from ILOG SA and HaleyAuthority from Haley Systems Inc. In the comparison he reviewed the applications from both a business and a technical perspective. With a decision table the reader can make an easy comparison.

Graham concludes with saying that none of the applications can be used without an initial training. So besides the training for the Rule language there is also training needed to get started with the tools.

Also Hoppenbrouwers, van Bommel and Jarvinen (Hoppenbrouwers, Bommel, & Jarvinen, 2008) observed that current modeling tools are mostly experts-oriented editors. Support of a 'way of working' may not be needed or even by experts wanted because they know the drill and are aware of the output.

4.3 Pre-defined procedures

Prilla and Nolte (Prilla & Nolte, 2010) found out during their research in process design: "*flexibly applying predefined procedures leads to better results"*. Also Andersen and Richardson (Andersen & Richardson, 1997) found out splitting procedures into small micro-procedures lead to a more flexible meeting and improves the outcome.

Also Hoppenbrouwers and Wilmont (Hoppenbrouwers & Wilmont, 2010) presented some theoretical notions that are helpful in understanding why modeling performed by novice modelers can usually be best broken down in sub-tasks.

Although the research of Prilla and Nolte is focusing on participatory process design the concept of splitting tasks into micro-procedures can also be applied to this project.

Splitting procedures into smaller parts can easily combined with focus questions, because focus questions are also used to narrow the total process down to smaller parts or focus on smaller parts. Right now we call them process steps.

Koen Derks (Derks, 2011) defined the following steps of the specification process:

1. Select the topic for the rule
2. Make sure to understand what needs to be regulated with the soon be created Business Rule
3. Evaluate stability of the rule: Fundamental or transient
4. Select one of the keywords which will fit the level of strictness
5. Write the rule

While converting the steps into a wizard kind of application I found out that Koen 's steps are not easily transferable to guided steps, especially when focusing on the novice user.

Therefore I changed the list of steps and came up with the following ones:

1. Select the main item for the rule
2. Converting the main item into a subject
3. Choose the relevant rule-type
4. Write the statement
5. Optional: add (a) condition(s) or qualification(s)
6. Define the new terms

4.3.1 Select the main item

Selecting the main item of the rule means focusing on the subject of the rule. Because the main item has no restrictions in any way it's an easy way to write what the rule is about. No knowledge of RuleSpeak is needed for this. The input can be used in further steps or recognizing the rule afterwards.

4.3.2 Converting main item into subject

In the first step a main item for the rule is provided. Now the second step is to convert the not restricted input of the main item into a valid subject according to the RuleSpeak method.

The RuleSpeak documentation (Ross R. , 2009) provides some restrictions on the subject. In this step the user is asked to perform checks on these restrictions and also the application itself is checking some of them.

Checks made by the applications are for example:

Check for:	Input	Check	Return
Number	$input	If $input in ('one', 'two',..)	False
Number	$input	If $input in (1,2,3,…)	False
Singularity	$input	If lastlettersof($input) == 's' OR 'es'	False

4.3.3 Choose relevant rule-type

The outcome of this step is the second column of the sentence structure table (Hoppenbrouwers S. , 2011): the first keyword(s).

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Most Business Rules are using the keyword 'MUST': the common rule. Besides this common rule there are 4 more specific rule-types: 'Guidelines', 'Definitions', 'Computations' and 'Procedures'.

Rule-type	Keyword(s)	Example rule
Common-rule	"MUST"	"An order" MUST have a promised shipment date.
Guideline	"MAY"	"An item" MAY be returned if some proof of purchase is provided.
Definition	"MUST be considered as"	"A customer" MUST be considered high-risk if the outstanding balance exceeds €500,- on each of their last three successive invoices.
Computation	"MUST be computed as"	"A product's cost" MUST be computed as the sum of the cost of all products' components.
Procedure	"MUST be performed … when"	The procedure 'Send-Advance-Notice' MUST be performed for an order when the order is shipped.

4.3.4 Write the statement

With use of the given input from the previous steps a question will be asked on the rule statement. The answer of this question will be the body of the rule: the statement (second part of the structure table (Hoppenbrouwers S. , 2011)).

Example:

Subject	Rule-type	Example question
A shipment	Definition	What should be the case for "A shipment"?

4.3.5 Optional: add (a) condition(s) or qualification(s)

Most of the rules include some qualification indicating the circumstances under which they apply. It's possible that the user already submitted the condition in their statement field. If so, he's able to mark the condition.

Some business rules only apply a some point(s) in time or under certain conditions. Therefore multiple conditions can be added to the rule.

4.3.6 Define terms

Last step of the process is to define the used terms that are not yet defined. Terms already defined in earlier rules are filled in already and can't be changed at this moment.

Because terms can consist of multiple words the user is able to combine words to one term.

4.4 Questions

We now know we need to narrow down focus and split the rules into smaller parts. But what kind of questions can we ask in the mentioned steps? The area of asking questions is an extensive one, and time is limited. Therefore not a total research is performed on the topic of asking questions but only some small parts are used in this thesis.

In the area of asking questions the WH-questions topic raises pretty quick, but as Ertseschik-Shir (Erteschik-Shir, 1986) argues: only in a small number of cases the Wh-words help to focus in questions, for example echo questions. Because in the process of understanding the input in the BRGT application needs to be verified some of the WH-words can be used. Verification of answers can be done with the Echo questions.

> *We use echo questions either because we did not fully hear or understand what was said, or because its content is too surprising to be believed (Erteschik-Shir, 1986)*

Overview of the WH-words used to inquire about specific information:

When?	Time
Where?	Place
Who?	Reason
How?	Manner
What?	Object/Idea/Action

Which (one)?	Choice of alternatives
Whose?	Possession
Whom?	Person (objective formal)
How much?	Price, amount (non-count)
How many?	Quantity (count)
How long?	Duration
How often?	Frequency
How far?	Distance
What kind (of)?	Description

Because only a question word like a WH-word is not enough to form a question-sentence, I was looking for more background on the question-sentence topic. In a session with my supervisor Stijn Hoppenbrouwers we discussed this and ended up with a table describing the building blocks of a question sentence.

G	Main question & utility
Q	Question & Scope
F	Description of answer
E	Example

4.5 Summary

This chapter started with defining what guidance is. From the definition of Van Dale (Van Dale, 2002) guidance is defined as:

> *Help to bring into a particular direction or state.*

In the second section of this chapter current rule editors are quickly analyzed for the way how they implemented guidance. Both the conclusion of Hoppenbrouwers (Hoppenbrouwers & Wilmont, 2010) and Graham (Graham, 2005) is that the current tools are designed for users who are (highly) skilled in Business Rules.

Prilla and Nolte (Prilla & Nolte, 2010) found out that splitting advanced tasks into smaller steps lead to a more flexible process and improves the outcome. Based on the research of Koen Derks the steps of the specification process are defined and explained. The process consists of 6 steps, starting with selecting a main item for the rule and ending with defining the unknown terms.

This chapter ends with a small section on how questions should be formulated. WH question words where raising very quick when searching for background information. Research of Ertseschik-Shir (Erteschik-Shir, 1986) concluded that WH questions are only useful in a small amount of situations: Echo-questions. Because understanding what the input during the specification is and use this input in further questions WH-words can be useful.

5 BRGT

In the previous chapters we have seen some ways to guide the Business Rule Specification Process. The Business Rules Specification Process Guidance Tool (BRGT) is developed as a concept tool to show how guidance can take place during the specification process.

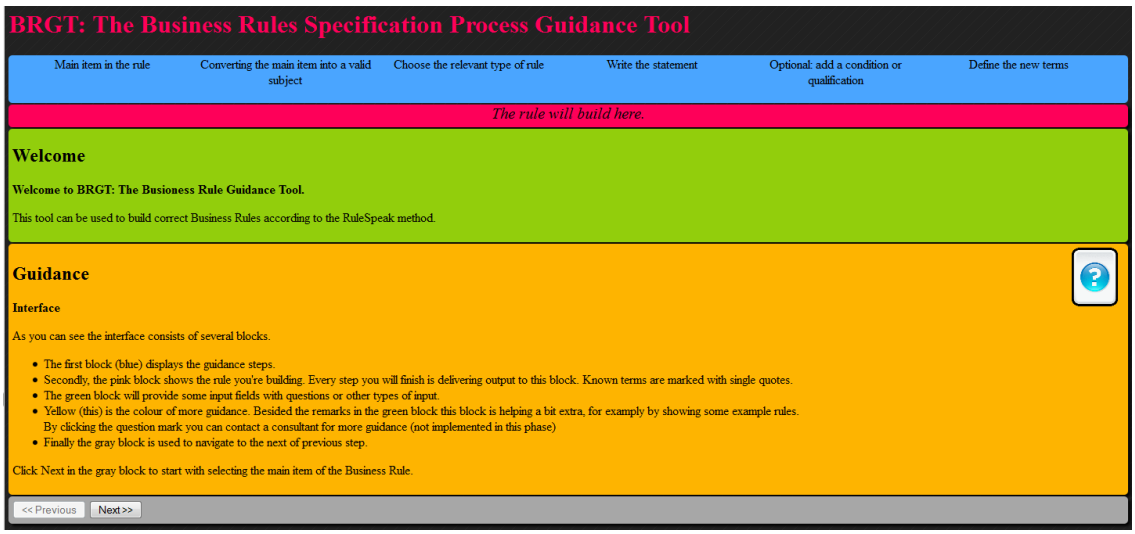
The whole idea behind BRGT is that users should not need to care about the grammar but can focus on the content of the rule.

BRGT can be found on the CD in Appendix III, and by typing the following URL in your web browser: http://thesis.dataintegratie.com/

5.1 The wizard

The conclusion (Prilla & Nolte, 2010) and (Hoppenbrouwers & Wilmont, 2010) concerting splitting up of procedures in micro-steps led to a wizard-like structure in the BRGT application.

The steps in the wizard are partly adopted from Koen Derks 's (Derks, 2011) steps. In the application these steps are located in the top (blue bar) to show the user where in the process he is.



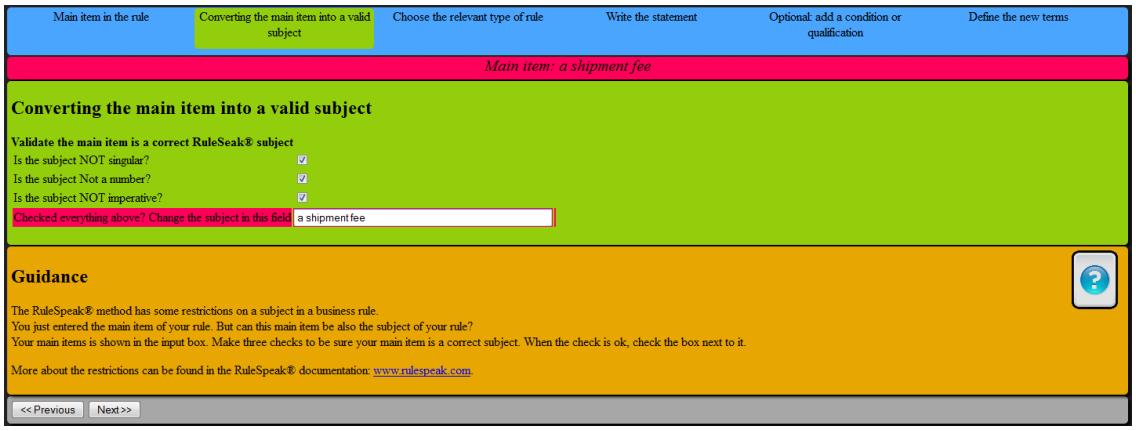
By placing the user focus on the rule itself and not on the grammar the flow in the application is pretty strict. By letting the users check their input and give the possibility to optimize their input the strict lines are still usable.

Checking the input is done in several steps. Two examples: validating the main items and entering a condition.

5.1.1 Validating the main item

The user entered a main item for the rule in the first step. Second step is converting this main item into a valid RuleSpeak subject. Three items should be checked by the user:

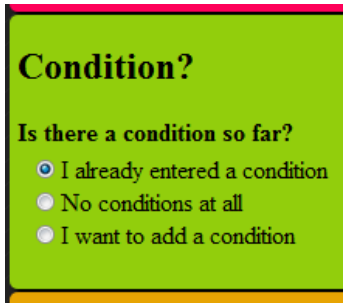
- Is the subject NOT singular?
- Is the subject NOT a number?
- Is the subject NOT imperative?



Let the user check his/her input makes the user more aware of the RuleSpeak method and no large databases need to be maintained, for example with all singular words in the English language.

5.1.2 Enter a condition

Because the user is not an expert in Business Rules yet, a user can enter a condition in the state. At some point in the wizard the user is asked if he already entered a condition or wants to add one. If the user thinks he entered a condition already he can select it. In the end the rule looks the same, but now the application can also recognize the text as a condition. This can help the user or application in future use.



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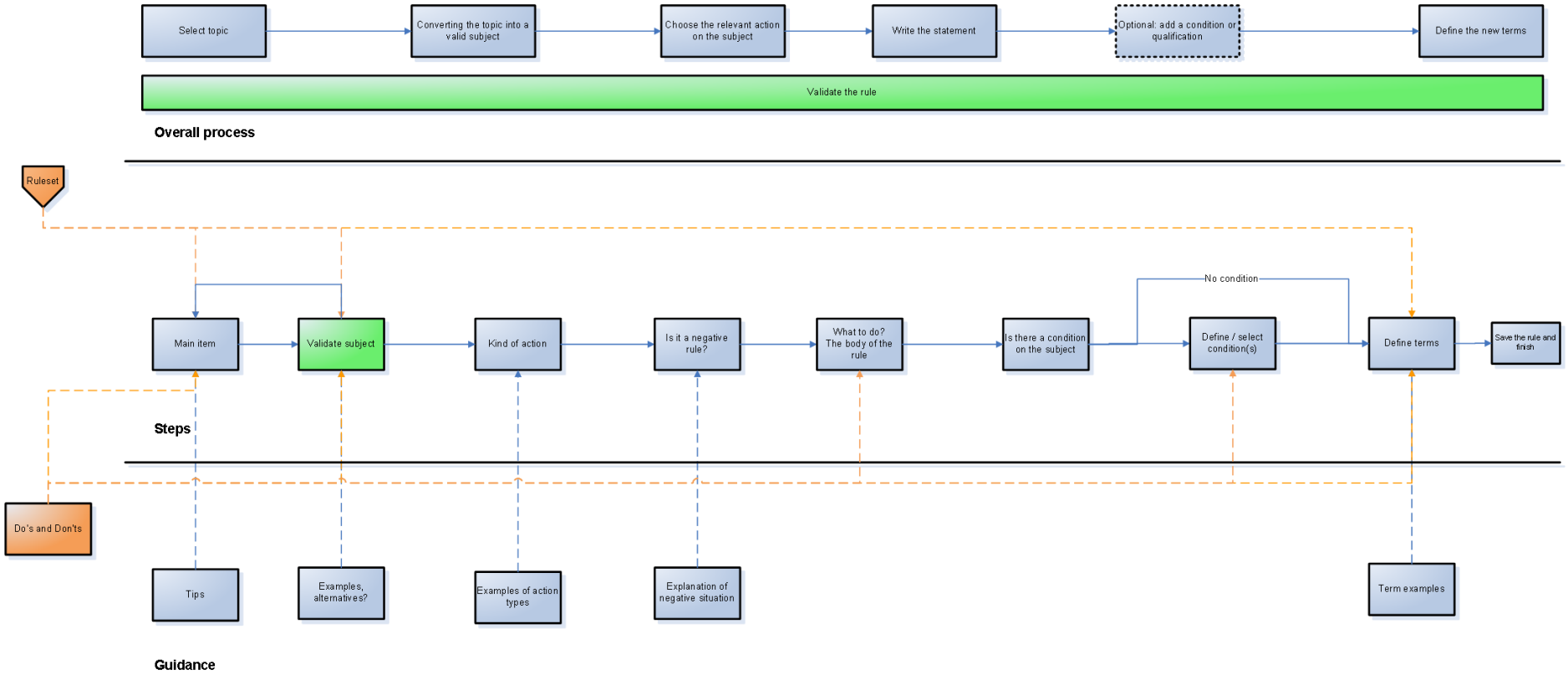
5.2 The setup

This model represents the wizard of the BRGT application.



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5.3 Application software and database

The application is written in PHP code in combination with a MySQL database. Appendix Code contains an example of the code.

The database contains two groups of data: application and rule data.

To make the wizard application flexible, steps, questions and fields are loaded in the database and built up dynamically in the application.

The final rule is saved in a rule table. Because a rule can have multiple conditions, the conditions are stored in a separate table.

By using the items defined in Hoppenbrouwers ‘s grammar table, the database can always be used by other applications very easily.

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6 Conclusion

This chapter is the final chapter of this thesis. With the answers of the sub-questions, which are formulated in the beginning of this project, the main research question of this thesis project can be answered. This chapter will complete with possible future work in the area of guiding the Business Rule specification process.

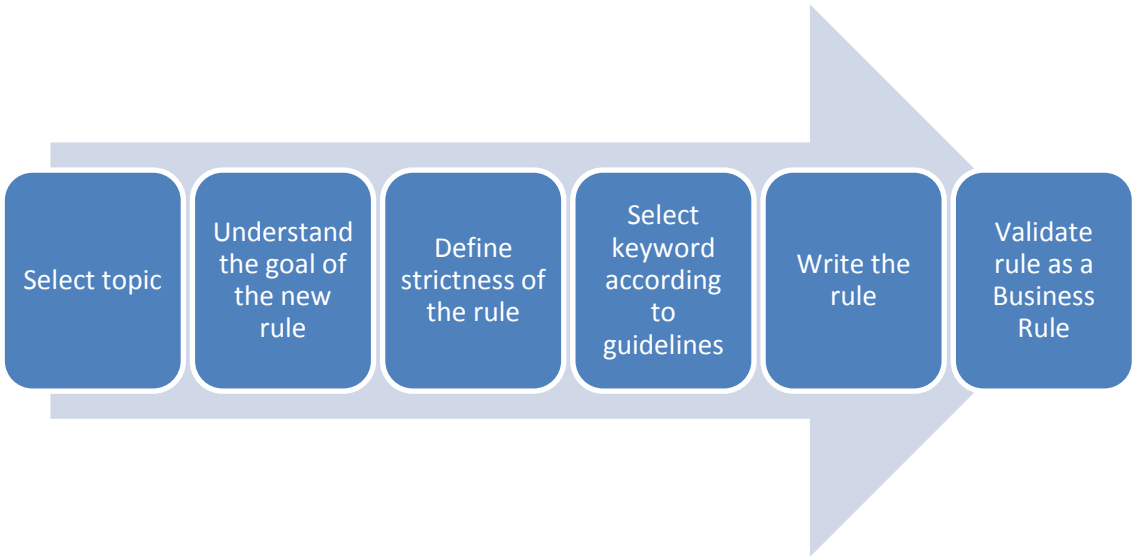
6.1 Sub-questions

By answering the sub-questions the main question can also be answered. The sub-questions are formulated in the beginning of the project.

6.1.1 What does the process of business rule specification look like?

Before anything can be said on the guidance during the Business Rule specification process, first the specification process itself should be clear.

During his master thesis project Koen Derks (Derks, 2011) defined the so called road map of creating a Business Rule. This road map consists of 6 steps, drawn as one arrow and are designed for a user that has a typical rule authoring tool.



As Prilla and Nolte concluded: splitting advanced tasks into smaller steps lead to a more flexible process and improves the outcome. By analyzing Koen Derks his proof-of-concept the process is then divided into the following (small) steps:

1. Select the main item for the rule
2. Converting the main item into a subject
3. Choose the relevant rule-type
4. Write the statement
5. Optional: add (a) condition(s) or qualification(s)
6. Define the new terms

6.1.2 In which way can instructions or focused questions guide this specification process?

Both Hoppenbrouwers and Wilmont (Hoppenbrouwers & Wilmont, 2010) and Prilla and Nolte (Prilla & Nolte, 2010) conclude that splitting complex processes into smaller task is better, especially when the user is a novice modeler. Therefore the model of Koen is taken and translated into a wizard where the user is guided during the specification process. Each step in the wizard contains a question which is formulated with the already given input. All answers together are used by the wizard to build the correct Business Rule.

The way questions are asked is very important in these steps. Questions should always contain certain elements: the main question and utility, a question and scope, a description of the answer and an example. Not always all elements can be put in one question, but one should always aim for as much as possible. This will make a question more understandable and the output more predictable.

6.1.3 Which other kind of guidance's are needed to guide the users in the specification process?

Pretty early during this thesis project the focus became the novice modeler: a user that is not familiar with both the tool and the modeling language. Therefore the application BRGT is focusing on the content of a business rule: where does the user want to write a rule about? The number of grammar questions is minimized.

Besides focusing on the content of the rule also the use of already given information is guiding the user. Easy functions like an autocomplete on the rule 's subject or terms are helping the user choosing the right words.

6.2 Research question

Now all sub-questions are answered and summarized, the main research question of this thesis can be answered. The main question of this thesis was as follows:

How can we guide users in the process of business rule specification with RuleSpeak?

Everyone has a different level of knowledge about the business rules specification process. Therefore its maybe hard to define one what to guide users during this process. Nevertheless this research also delivered a guidance tool where some basic aspects of guidance are rooted in.

First, in a complex process, users, and especially novel modeling users, are helped to solve the problem by splitting the process into smaller tasks. These small tasks need to be fulfilled first before the whole process can be finalized.

Second, by focusing on the content of the rule instead of the grammar the users first only has to think about what to say with the rule and not how to solve the grammar issues. This leads to some limitations for the more advanced users, but these users also need some other kind of guidance. The novice modelers can almost see the effect of their choices to the business rule real-time. Although the BRGT tool is not meant for learning the syntax of a specific Business Rule method, the user can see the effect of their choices and learn from it.

At last the use of autocomplete functions helps users choosing the right words for parts of a rule like the subject or terms.

The BRGT concept tool is based on the thought of splitting complex processes and focusing on the content of a rule. In the end the user will walk through five or six steps. By seeing the result of their input the user is able to learn from its input so in the future strict guidance like the BRGT wizard is not needed anymore.

A sum-up of:

How can we guide users in the process of business rule specification with RuleSpeak?

- Splitting the specification process into small steps
- Focus on the content of the rule, not the grammar
- Formulate clear (focused) questions
- Use already given input

6.3 Future work

This thesis resulted in a proof-of-concept tool (BRGT) where users are guided while specifying Business Rules. This guidance in BRGT is mostly implemented by asking questions. Other kinds of guidance like doing exercises or playing a game can also be linked to specifying Business Rules.

BRGT is development as a proof-of-concept and only for specifying rules and terms in these rules. This concept can be extended with linking terms, condition and rules to each other, which will result in a more business-proof application.

In the area of asking questions there is also some work to do. A lot of research is done in questionnaires, but not in how a question can really focus or guide the questioned person.

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I. Appendix A – Code preview BRGT

The complete code of the application is provided on a CD. Nevertheless it can be interesting to see a bit of the code of the application in this document.

The code below is used to determine the rule action. As said in the section on choosing the relevant rule-type there are four options:

1. Computation
2. Guideline
3. Procedure
4. Consideration

Code:

```
function generateruletype($ruletype,$negative){
   switch($ruletype){
      case 'Computation':
         $output = 'MUST be computed as';
         if ($negative == true){ $output = 'MUST NOT be computed as';}
         break;
      case 'Guideline':
         $output = 'may';
         if ($negative == true){ $output = 'Need NOT';}
         break;
      case 'Procedure':
         $output = 'MUST BE performed';
         if($negative == true){ $output = 'MUST NOT BE performed';}
         break;
      case 'Consideration':
         $output = 'MUST be considered as';
         if ($negative == true){ $output = 'MUST NOT be considered as';}
         break;
      case 'Common':
         $output = 'MUST';
         if ($negative == true){ $output = 'MUST NOT';}
         break;
      }
   return $output;
}
```


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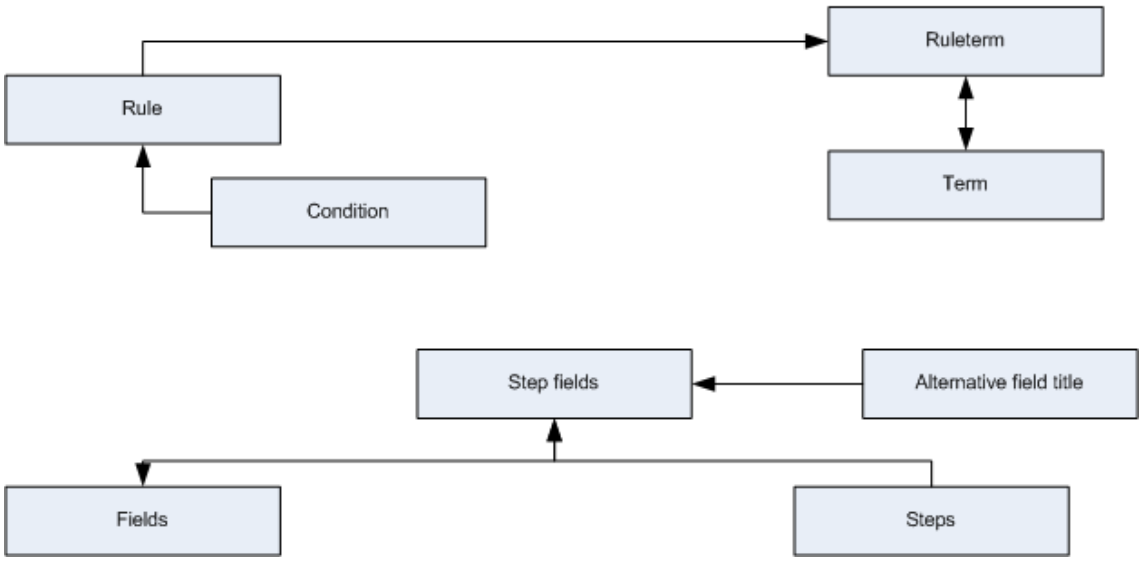
II. Appendix B – Database overview

The database consists of 8 tables. In the database there are two sections: the first one if for the rules, terms and conditions. The second section is for the application itself: steps, fields and texts. This appendix contains an overview of how the tables are related. The database is also available on the CD.



From the database the user can extract an XML file with his/her rules. This XML file has the following structure:

```
<rule set>
    <email></email>
    <rule>
            <id></id>
            <subject></subject>
            <rule type></rule type>
            <state></state>
            <conditions>
                <condition>
                    <id></id>
                    <condition body></condition body>
                </condition>
            </conditions>
    </rule>
    <rule>
        …
    </rule>
    ….
</rule set>
```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III. Appendix C – BRGT

Below a disc has been added containing the code and database of the BRGT concept. BRGT can also be found on: http://thesis.dataintegratie.com/

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