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Creating a Business Rules Authoring Tool



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Preface

This master's thesis is the result of almost 8 months of work. After following the Business Rules course by Dr. Stijn Hoppenbrouwers my interest in the concept began to grow. I was already interested in this course from the moment I first heard the name of the course for the first time. But after working with the RuleSpeak concept I was even more interested in this specific part of the course. Now, 1.5 years after following the course I've finished my master's thesis directly related to Business Rules and RuleSpeak

Because of the introduction to the concept of Business Rules and the guidance during the creation of this master's thesis I would like to thank Dr. Stijn Hoppenbrouwers. Without his interest in the concept and his motivation to further develop the concept I wouldn't have been able to write this thesis.

The creation of this thesis was a tough job. After finishing all mandatory courses I started working on it. It's not the first time I've executed such a large project, but it is the first time doing it at the university depending on my own motivation of finishing the thesis and my study. At a few moments in time during the creation of this thesis it was hard to find the motivation of working on the project. Writing pieces of text to, at a later stage, find out the piece was useless isn't satisfying at all. But with help from my relatives I was able to remain focussed on the end goal.

Now it's time for me to start focussing on the next step of my life: A fulltime job to further develop my knowledge and experience. I hope you'll enjoy reading this thesis and using the Business Rules Authoring Tool (BRAT) concept.

Koen Derks

Nijmegen, November 2011

Abstract

With a growing amount of rules in every company and even in every household it's important that these rules have the right meaning and have been written in the right way. There are multiple methods which will help a rule writer to write correct rules. The two most famous sets of guidelines are RuleSpeak and Semantics of Business Vocabulary and Business Rules (SBVR). During this project the set created by Ronald G. Ross in the RuleSpeak method will be used.

In the past year work has started on a grammar for the RuleSpeak method. During this project this grammar has been used to create a tool helping writers of Business Rules write their rules according to this grammar and checking the Business Rules do's and don'ts. Before creating this Business Rules Authoring Tool (BRAT) a literature study has been fulfilled to create a clear view on the concept and have a roadmap of creating correct Business Rules. This roadmap has been used in the BRAT concept.

After testing the BRAT concept some small changes were made to support the user to use the guidance of BRAT and to get a better understanding of the Business Rules concept. These changes led to a second version of BRAT which will be used at the end of November during the 2011-2012 edition of the Business Rules master course at the Radboud University Nijmegen. Besides that the tool and this document will be part of a bigger project to improve and further develop the Business Rules concept and its possibilities.

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1. Introduction

Rules are everywhere. Every business has rules, every store has rules and even every household or relationship has rules. Some of those rules have been written down in a rule book, some of them are based on trust and reasonable thinking. The actual purpose of a rule isn't that clear to everybody, some say it's just to guide people, some say it's not just guidance but they also have the explicit purpose to limit the amount of freedom of people's behaviour.

“Rules are for the obedience of fools and the guidance of wise men.” – Douglas Bader, British World War II pilot

The rules which most people will hear the most about and will experience and feel their whole life are the laws of the government. These laws are famous because of their level of accessibility and the difficulties lots of citizens will experience whilst trying to understand them. The road signs used all over the world are examples which are in a certain way opposite to laws, most of them are easy to understand, but more people are breaking those rules.

The last decade the IT-market has grown. Tasks have been automated, data has been archived in endless amounts of databases and the expectations of pieces of software are exceptionally high. Entire companies are depending mainly on their IT systems to regulate the companies data. To do this it is important to regulate the business, one of the methods to do this are rules, Business Rules. Since the introduction of the RuleSpeak method in 1996 lots of (IT-)projects have applied this method to create greater clarity and consistency in communicating rules. The method was developed by Ronald G. Ross. In 2009 Silvie Spreeuwenberg and Stijn Hoppenbrouwers translated the RuleSpeak method to Dutch. By doing that they've created more interest in the Netherlands leading to interest from the academic field.

With the growing amount of people walking on the earth, the growing amounts of data being archived and the growing amount of possibilities in almost every field clear rules will probably become more important the coming decades. The accessibility of a method like RuleSpeak therefore is important to support businesses in creating a clear and consistent set of rules. The possibilities related to the IT-market are maybe even bigger.

1.1 Research question

With the growing interest in Business Rules and the increasing importance of rules all over the world it seems important to create an accessible method of creating Business Rules. RuleSpeak is one of the most famous sets of guidelines for creating those rules, but actually creating a good set of Business Rules seems to be more difficult than most of us would expect.

This research is focusing on the accessibility and usability of the RuleSpeak guidelines for creating those rules. To find out how to do this the following research question has been formulated as a guideline for the research:

“How can a text-based tool give optimal support whilst creating and/or revising a set of Business Rules and the corresponding glossary?”

In support of the research question above a couple of sub-questions have been formulated.

1. *How does the process that leads to a set of Business Rules look?*
2. *What are the requirements of a correct Business Rule?*
3. *What are the requirements of the definition of a term in the glossary corresponding to the set of Business Rules?*
4. *In which way can the process of creating a to the Business Rules corresponding ORM-model be supported?*

1.2 Method

This research has been divided into two main phases. The first phase is meant to give a clear view on the Business Rules concept, the way it is used and the requirements of using it. This phase will mainly exist of reading all kinds of literature about the research subject and its connected fields. This first phase answers the sub-questions of this research.

The second phase is meant to answer the main question. The answer will partly be given in a textual form, but the biggest part of the answer will be in the form of a proof of concept (PoC). This PoC is a tool which will help users of the tool creating Business Rules and a glossary according to the guidelines of the RuleSpeak method.

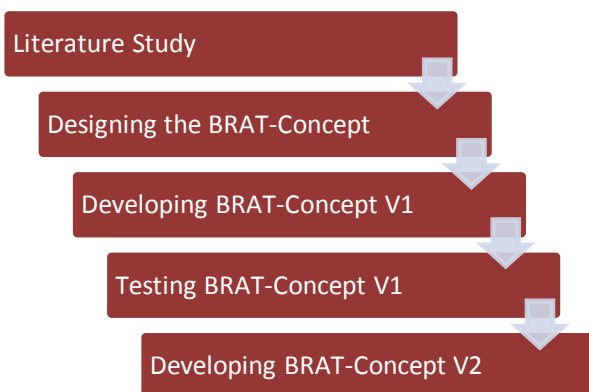


Figure 1: Project setup

This PoC will be windows-based and developed in an iterative process using Visual Studio 2010. The first concept of this tool will be entirely based on the literature study of the first phase. After this first phase tests have been conducted with students from the Radboud University Nijmegen. The results from these tests will be the bases of the changes that will be made in de second concept.

The textual part of this final phase of the research will actually answer the research question in relation to the PoC, concluded with

defining the needed research in the future to further develop the tool and possibly the Business Rule concept as a whole.

1.3 Relevance

In the period from November 2010 till January 2011 I've assisted Dr. Stijn Hoppenbrouwers with the Business Rules master course on the Radboud University Nijmegen. My task during this period was to support the students with the creation of a set of Business Rules, the glossary and an ORM-model. All of this was based on an internal business case, the regulations of the university library. One of the main problems I've been able to address during this period was the problem of creating actually good, new rules. Most rules where 99% the same as the original rule enriched with one of the keywords used in the RuleSpeak method. It will be clear that it's just not that simple and that most students underestimated the task to create rules according to the selected method.

Talking to Dr. Stijn Hoppenbrouwers learned me that this problem was not only a problem with these students but with most of the users of Business Rules. It was actually difficult to create the right rules, using the right method. This is the point where this research started. Since 1996 the concept Business Rules has become more famous. Especially multinational companies often use one of the different flavours of Business Rules. When visiting the Deloitte office in February '11 they also mentioned they are using Business Rules for parts of their business which actually triggered me even more of the importance of good rules according to a proven method.

One of the main areas of attention of the BR methods is the link between IT and Business. The rules should be easy to formalize but also understandable for business people. But when the method is as hard to adapt to as the students mentioned above experienced it is questionable if this link has been created in the right way. Yes, business people understand most BR. Yes, BR are easier to formalize than normal rules. But wouldn't it be nice if business people can actually create BR by themselves? This research will be the next step to reach the point of people from the business creating their own business rules according to the RuleSpeak method.

1.4 Results

The result of this research will consist of the PoC of a tool which will support the user while creating a set of Business Rules and the corresponding glossary. With this concept further development is possible to finalize or improve the tool to be used outside of the Radboud University. The concept of the tool will be tested by a number of students creating a few Business Rules which will be defined further on in this document.

Besides this concept there will also be a textual specification of the best way to support the user and an advice will be given for further research and development in the near future.

On the way to these final results some different subjects will be researched and defined. The first subject will be the concept of Business Rules as a whole. This will be explained in the next chapter. After that the requirements and grammar which will be used whilst creating the PoC will be defined followed by more information about creating a glossary according to the selected method. The last chapter before talking about the actual PoC will be about the possibilities to support users in creating an ORM-model from the created rules and glossary to support the set of rules and create an even better link between business and IT. Unfortunately the part about subtracting an ORM-model could not be used in the actual PoC, the possibilities are too limited to integrate any of them, so, for now, the ORM-modelling remains a job which have to be done with minimum support.

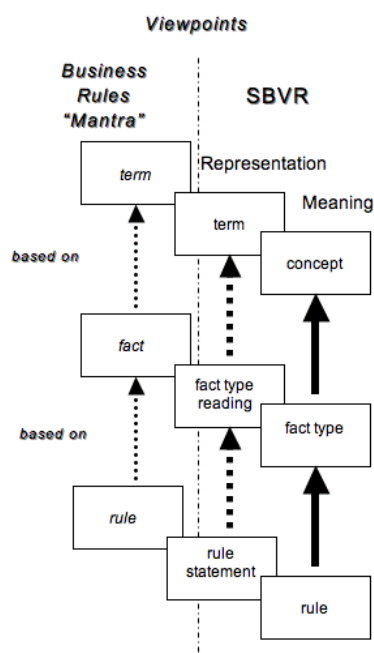
2. The Business Rules Concept

Before starting to explain the concept of Business Rules it's important to define a clear meaning of this term. There are a number of different definitions in the field of Business Rules which are actually used by researchers. The definition below is the one which has been used throughout this research and the development of the Business Rules Authoring Tool – Concept.

“A Business Rule is a statement that defines or constrains some aspect of the business, but it cannot be broken down or decomposed further into more detailed Business Rules.”[1]

Besides the above definition there are many more definitions. One of them is useful to name because of the extra point of view when looked from the business side: *“The rule must be under business jurisdiction. “Under business jurisdiction” is taken to mean that the business can enact, revise, and discontinue the business rule as it sees fit”* [2, 3]. To give the Business Rules concept an even better place in the organization of a company it's important to realize that organizations need policies to act proactively, defensively, and efficiently. Each Business Rule aligns with one or more of these policies to support the business.

Business Rules is a technology which in terms of IT-technologies looks like an old concept, but the method has grown and it looks like Business Rules as a method has more users than ever before. The first important project started in 1993, the project was, and still is, meant to create a method to define and identify rules that define and control a company. One of the main problems was the link between the business and the IT-consultants and technicians. The last two groups tend to write the structure and processes of a company in terms of data and processes. Now I'm not saying that defining this information on that particular way is totally wrong, but the IT-people tend to forget one very important kind of information: The Business Rules, the rules (constraints and conditions) under which the enterprise operates. These rules are frequently not articulated until it is time to convert them into program code. While rules that are represented by the structure and functions of an enterprise have been documented to a degree, others have not been articulated well, if at all. [4]



The Business Rules Group (BRG) is one of the main groups of Business Rules experts. They are trying to spread the knowledge about Business Rules and to create new knowledge to control BR. Their main goal is to close the gap between documented and not-documented BR. To give a representation of the core idea the BRG has about the concept it is best to look at the figure on the left combined with the so called Business Rules 'Mantra' which can be found further on, both the figure and the mantra are coming from the Business Rules Manifesto [5].

The textual version of the 'Mantra' as seen on the left in the figure is: *“Rules build on facts, and facts build on concepts as expressed by terms. Terms express business concepts; facts make assertions about these concepts; rules contain and support these facts”*. [6] In the figure the SBVR is also mentioned. The Semantics of Business Vocabulary and Rules (SBVR) is one of the other flavours of Business Rules which will be explained later on. The figure gives a clear overview of how this SBVR supports the above mentioned

Figure 2: An overview of the Business Rules 'Mantra' and the way SBVR is supporting it.

2.1 Business Rules methods

There are two main types of Business Rules which are defined and broadly used by researchers and companies across the world. Only one of them will be used whilst creating the Business Rules Authoring Tool-concept (BRAT-concept). Before selecting one type and explaining why the choice has been made both types will shortly be discussed below. The main focus is to define the differences between those two. The first one will be the SBVR Structured English [7], the second will be RuleSpeak [8, 9].

2.1.1 Semantics of Business Vocabulary and Business Rules Structured English

This type of Business Rules is creating rules in a semi-natural language. To do this a subset of the English grammar has been created. Within this standard a separation has been made between two fundamental types of rules: Behavioral rules & Definitional rules. These two types are also known as Operational and Structural rules. The whole standard is based on the SBVR documentation. As a result of this all concepts can be expressed in natural language.

Some of the characteristics of this type are:

- Using Prefix notation: Using the prefix notation means that the operators stand in front of the sentence/formula e.g. "+ X Y"
- Selected set of keywords

Instead of writing a few pages about this type it's better to look at some examples of it. Below you'll find some rules converted into rules which meet the requirements of the Semantics for Business Vocabulary and Rules Structured English.

To be defined	Rule according to SBVR Structured English
Driver's license must still be valid at the drop-off date of a rental	It is obligatory that the drop-off date of each rental precedes the expiration date on the driver's license of the customer who reserves the rental.
While a renter has possession of a car, there is a provisional charge to EU-rent against his credit card. This will be replaced by an actual charge at the end of the rental.	It is permitted that a rental is open only if an estimated rental charge is provisionally charged to a credit card of the renter that is responsible for the rental.
A withdrawal can only be made if the account is activated.	It is prohibited that a withdrawal is made from an account which is not active.
Retired employees can't be part of a project.	It is prohibited that a retired employee is assigned to a project.
A customer who places an order of under \$1,000 don't need to be credit checked.	It is prohibited that a credit check is requested if the amount of the order is under \$1,000.

Table 1: Comparing original rules with SBVR Rules

2.1.2 RuleSpeak

The RuleSpeak standard has been created by Ronald G. Ross. This project started in 1996 and 15 years later resulted in a standard in 4 different languages: Dutch, English, Spanish and German. Equal to the method described before it consists of a set of guidelines to create Business Rules.

RuleSpeak was created before the SBVR and in the 90's the method has already been used in a number of companies. This advantage is something that is easy to notice when using both methods. RuleSpeak has been created while constantly thinking about the end-users, the business people. Because of this it has a few more possibilities resulting in rules which are easier to read and understand.

Some of the characteristics of this type of Business Rules are:

- Using Infix notation: Using the infix notation means that the operators stand in-between the sentence/formula e.g. "X + Y"
- Less restrictive than SBVR Structured English
- Concept totally focused on the business

To get a better overview of the RuleSpeak guidelines in practice again a set of original rules with their RuleSpeak equals.

To be defined	Rule according to RuleSpeak
Driver's license must still be valid at the drop-off date of a rental	The drop-off date of a rental must precede the expiration date on the driver's license of the customer reserving the rental.
While a renter has possession of a car, there is a provisional charge to EU-rent against his credit card. This will be replaced by an actual charge at the end of the rental.	A rental may be open only if an estimated rental charge is provisionally charged to a credit card of the renter that is responsible for the rental.
A withdrawal can only be made if the account is activated.	A withdrawal from an account may be made only if the account is active.
Retired employees can't be part of a project.	A retired employee must not be assigned to a project.
A customer who places an order of under \$1,000 don't need to be credit checked.	A credit check need not be requested for an order if the amount of the order is under \$1,000.

Table 2: Comparing original rules with RuleSpeak rules

2.1.3 Selection

The choice has been fairly easy, but not unimportant for this research because of adjusting the BRAT-concept to the selected method of Business Rules. During the research the RuleSpeak method as mentioned above will be used. This choice mainly has been made because of the experience with the RuleSpeak method my supervisor and me have because of the Business Rules master course in the Information Science curriculum. On top of that is the fact that the RuleSpeak method is being used in this year's Business Rules course an important positive aspect for the selection of this method. This way the BRAT-concept can be used by the students.

Besides that the choice between RuleSpeak and SBVR Structured English is not that important in this phase of the research because of the transformation possibilities from one type to the other. Important to be said is the lacking of a tool or even proven method to do this transformation, but both types are trying to do the same thing and the notation of both are in Controlled Natural Language (CNL).

2.2 Reasons for the use of Business Rules

There are multiple reasons for the use of Business Rules by companies. Most companies who use the method are multinational companies. The list below gives an overview on some of the main reasons for the use of Business Rules.

- Multinational companies often keep expanding their company. Lots of them buy other companies or just start a new department within the existing company. As the amount of decisions to be made by employee's growths with the company it is important to have unambiguous rules with a lot of possibilities to automate decisions.
- The separation of Business Rules and the program code of a piece of software will bring new possibilities to adjust Business Rules with a minimum impact on the system as a whole.
- Centralization and collaboration of your business logic.
- Possibilities to reuse enterprise data across multiple applications
- Lower cost of ownership for software development lifecycle when using Business Rules in combination with a Business Rules Management System (BRMS)
- Creating Business Rules, and eventually automating them, will ensure that rules are consistently enforced.

2.3 The users of Business Rules

There are many companies which are using Business Rules in one way or another. To get an overview on the use of the concept a small list has been created with some of the companies using the Business Rules concept:

- Deloitte
- IBM
- Oracle
- Microsoft

As can be seen above large multinational companies are using Business Rules. Most of them do use a BRMS to create rules and maintain them. In most of these companies there are even employees especially held responsible for the BRMS, partly because of the amount of work, but also because of the specific knowledge required to create BR.

Recruiting special employees to create Business Rules or creating/buying software to create/maintain BR are important steps to take for companies who want to use BR. But one thing has remained unsaid so far: BR projects, as many other projects, can only be effective with proper marketing and support of the company's management. With proper support, marketing and funding any company can start using the concept.

2.4 Summary

During this research the concept Business Rule will have the following definition:

“A Business Rule is a statement that defines or constrains some aspect of the business, but it cannot be broken down or decomposed further into more detailed Business Rules.”

Between the most used flavours of BR, SBVR Structured English and RuleSpeak, the choice has been made to use the RuleSpeak guidelines during the project. The choice is mainly based on the experience with this set of guidelines and the possibilities to transform rules from one flavour to another. The most important difference between both flavours is the notation. RuleSpeak uses the infix notation, SBVR Structured English uses the prefix notation.

The main reasons to use one of the BR methods as a company are:

- Larger amount of decisions leads to higher importance of unambiguous rules
- Separation of Business Rules and program code brings new possibilities
- Reuse of data throughout the company

3. The process of creation

To create the BRAT-concept one of the basic elements needed is an overview on the process of creation of Business Rules. This process equals the basic elements of the concept. During this chapter every step of creating Business Rules will be discussed resulting in an overview of the total process.

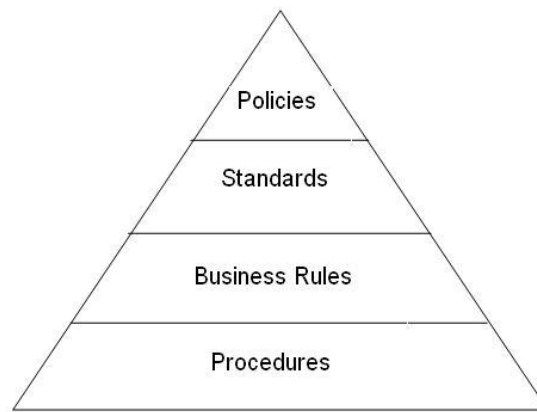
To do this it is important to know the position of Business Rules in the set of guidelines of a company before looking at the real process of creation. After clearing up the position of BR in the guidelines of a company the focus will change to the creation process which will be discussed in this chapter.

Before discussing the subjects mentioned above one important requirement for the entire process needs to be defined. In an article about using the business rules process and creating a set of business rules which can be fit into the existing business and does work together with the business in the right way this requirement has been formulated in a beautiful way. Because I can't describe it any better I've quoted Kimberlea Thompson below:

"A Business Rules process will be consumed by your users if you understand your organization's needs, gather the rules, and link them to your business plan. I love a Reuben sandwich, and the reason I enjoy it so much is because I like the different tastes individually; however, the real joy comes when these layers are assembled and linked together with the Russian dressing and melted cheese. In like manner, much job satisfaction and company benefit can result from a Business Rule process that is executed with the overall business plan in mind." [10]

3.1 Business Rules' position in the set of guidelines

As mentioned above it is important to have a good overview on the position of Business Rules in a company. More especially the position compared to other types of guidelines. Jeffrey Schoemaker did some research for a company supporting the RuleSpeak method to improve their Business Rules editor [11]. He based the following figure on a figure from IsecT Ltd [12]. This figure gives an overview on the position of Business Rules between other types of company guidelines.



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.

Figure 3: Different layers of guidelines

The above figure can also be formulated in a few simple lines of text. Creating the guidelines for a company starts with some basic guidelines; these are supported by detailed rules, which are supported by strict detailed rules which finally lead to a roadmap to execute tasks as an employee. So employees in higher positions in a company have more global descriptions of their tasks, responsibilities and requirements. Lower positions often have completely described roadmaps for their job execution.

3.2 Creating a rule

The creation of a Business Rules is based on a few steps. During the following paragraphs an overview will be given of these steps which needed to be taken to create a Business Rule. As mentioned in the previous chapter the steps and examples will be based on the RuleSpeak method.

The steps and standards mentioned are all focused exclusively on the process to create a rule. The actual grammatical requirements will be discussed in the next chapter.

3.2.1 Use internal knowledge

One of the main problems mentioned before was the link between businessmen and IT consultants. Both are talking in different terms and use different references. Creating Business Rules is not something a company can just hire an (IT) employee for to do so. It's not just the knowledge about the method which is needed, but it's also the knowledge of the company itself.

Not only the rules need to be and will remain under business jurisdiction. But a lot of knowledge that's already available inside the company needs to be used. The BR specialist only needs to combine the available knowledge, and maybe add some new knowledge/rules, with the guidelines formulated by the BR method. As of now business people use natural language to express themselves. System people think and talk in terms of data and, more specifically, data elements [13]. The trick is to combine those two, which can be done using the RuleSpeak guidelines. This can lead to

a semi-formal notation of the rules which can be understood by the business people, but also can be used by system people in an automation project.

3.2.2 Creating new Business Rules VS. Rewriting existing Business Rules

The actual creation of a BR is, combined with the given guidelines which will be explained in the next chapter, a fairly simple task. A roadmap can be created with just a few steps to create a BR. Recent experiences as student assistant taught me that the start point of a project was actually really important. The students that needed to be guided by me needed to translate an existing set of rules to Business Rules using the RuleSpeak method. The fact that they needed to translate existing rules gave lots of problems. That's the reason why a roadmap has been made for both creating new BR and rewriting existing BR.

Creating new Business Rules

Creating new Business Rules is in one way the easiest way to start working with BR when supported with the right guidelines and, maybe, tooling. The positive aspect is the clear mind about the rules. On top of that the creator of the rule is not trying to put all of the available experience in the rule, but just trying to stick to the available knowledge about creating a rule. This leads to the following roadmap of creating a BR.

1. Select a business topic for a rule
2. Make sure to understand what needs to be regulated with the soon to 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.
6. Check if the rule is an actual Business Rule:
 - a. The rule must be actionable (e.g. *"A hard hat must be worn in a construction site"*).
 - b. 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.
 - c. The rule must be expressed in the language of the business.
 - d. The rule must be under business jurisdiction.
 - e. The rule must tend to remove a degree of freedom.

The 5 checks completing the sixth step of the process are important to check the validity of the rule as a Business Rule. [14] The problem of these checks is that it is (almost) impossible to automate the check, so the rules have to be checked manually. It's also important to understand that the above steps are just about creating a rule. After these steps you'll also need to define terms and possibly create a supporting model of the rules. These two parts will be discussed in chapter 5 and 6. Below you'll find a graphic representation of the steps formulated above.

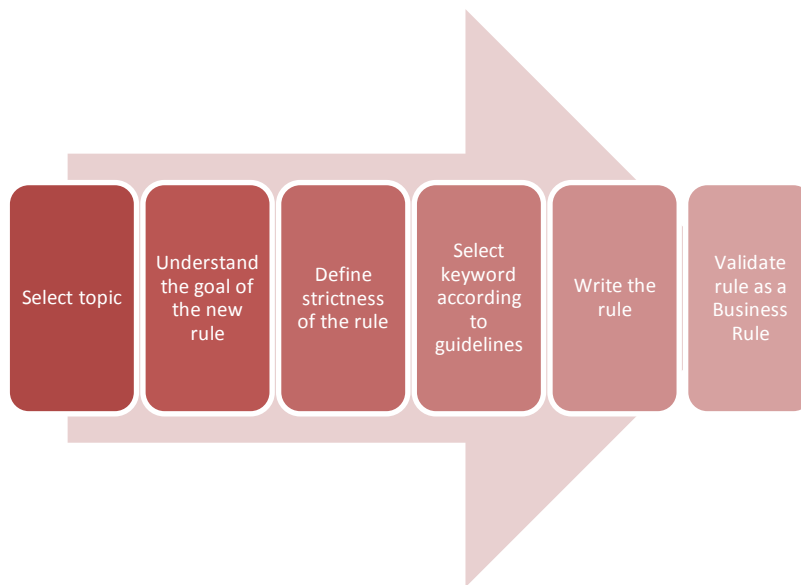


Figure 4: Creating a new Business Rule

Rewriting existing Business Rules

1. Select existing BR
2. Decompose existing BR to atomic BR
3. Evaluate stability of the rule: Fundamental or transient
4. Identify atomic statement as definition of term/fact/constraint/derivation
5. Make sure to understand what needs to be regulated with the soon to be created Business Rule.
6. “Choose” the level of strictness of the rule. Is it just a guideline, or is it supposed to be a rule which needs to be enforced all the time.
7. Select one of the keywords which will fit the level of strictness.
8. Write the rule.
9. Check if the rule is an actual Business Rule:
 - a. The rule must be actionable (e.g. “*A hard hat must be worn in a construction site*”).
 - b. 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.
 - c. The rule must be expressed in the language of the business.
 - d. The rule must be under business jurisdiction.
 - e. The rule must tend to remove a degree of freedom.

3.3 Summary

When starting the process of creating Business Rules as a company it's important not to focus on the BR experts hired from another company. Yes, the BR expert probably has lots of knowledge and experience in creating BR. And yes, the company will need and will use this knowledge and experience. Instead of letting an expert create the rules, the expert should consult the employees of the company when creating the rules and should make sure they follow the guidelines for correct BR. The content of every rule has to come from the business itself. The business and their employees own the knowledge needed to create the right rules. This knowledge combined with knowledge about the guidelines can deliver the right set of Business Rules.

Two different roadmaps have been created to help creating new Business Rules or adjusting existing Business Rules. These roadmaps can be found in 3.2.2.

4. Requirements and grammar

After clearing up the process to create a Business Rule the focus of the research can switch to the looks of a BR. It is kind off easy to create a BR according to the process outlined in the previous chapter. Creating a correct BR following the RuleSpeak guidelines is more difficult. With the first 3 chapters being basic, now it's time to get a better overview on the more detailed guidelines of Business Rules. As a base of the guidelines needed to be implemented in the BRAT-concept this chapter will focus on the requirements and grammar for a correct Business Rule.

After finishing this chapter the parts directly related to RuleSpeak should be clear and on the base of the outlined knowledge in these chapters it should be possible to create a BR which will exactly follow the guidelines outlined by Ronald G. Ross in the RuleSpeak method.

4.1 Requirements of a Business Rule

This part of this chapter will give a clear view on the requirements for a correct BR according to the RuleSpeak method. First a distinction between different types of BR will be made. After that the concepts which can be used in a BR will shortly be named. This will be followed by some basic guidelines which can be used to create and check your BR. When the requirements which are important for creating the BRAT concept have been defined the focus will shift to grammatical requirements.

4.1.1 Structural and Operational rules

In RuleSpeak a distinction has been made between structural and operational rules [15]. Structural rules prescribe criteria for how the business chooses to organize its business semantics. These rules mainly focus on criteria for making the right decisions, derivations or business computations.

Operational rules focus directly on the propriety of conduct in circumstances where willful or uninformed actions can fall outside the boundaries of behavior deemed acceptable. Operational rules can be violated directly.

Most of the rules are easy to divide between these two types. But there are rules which will be more difficult to place under structural or operational rules.

4.1.2 Business Rule types

Besides the above distinction there are four types of BR. Each of these types will be discussed here.

Guideline

This type of BR gives only a warning to the user/reader of the BR. The person executing the rule has freedom of choice in whether or not to follow the rule. The warning is given regarding a circumstance which should or should not be true. This type of rule is also called an advice or a suggested restriction.

Computation

This type of rule is providing an algorithm which will lead to the value of a business term. Usually this type of rule is used to determine whether or not a customer receives discount or a gold status. These rules give a mandatory restriction which can't be denied.

Action enablers

In this type of rule the conditions of the situation will be checked. Based on this check it will or will not initiate another business event or internal activity/process. These rules are mandatory. If the described situation is true they have to be executed.

Inference

These rules also check the conditions of a situation. If these defined conditions are true this type of rule will establish a new fact. One often used example is: *“When a customer has a “Gold”-card the discount on every product will be 15%”*. These rules are again mandatory. If the conditions are true, the rule has to be executed.

4.1.3 Basic guidelines

This part will discuss some basic guidelines which are important while creating and selecting Business Rules. First of all there are 5 checks to know if a rule is actually a Business Rule. These five checks have been named in chapter 3 and can be found again below:

Five checks

Ronald G. Ross has defined 5 checks to check if a rule is actually a Business Rule [4]. These 5 checks are:

- *A BR must be actionable*, an employee who is duly authorized and capable has to know what to do or not to do after reading the rule. No interpretation needs to be required.
- *The rule must be about the business*, a rule must not be about systems supporting the business, or platforms using to implement systems. So, if all systems were thrown away (even paper and pencils) the rule still has to be important to run the business.
- *The rule must be expressed in the language of the business*, a business person must understand a statement or representation of a business rule without significant training or experience in IT or IT-built systems.
- *The rule must be under business jurisdiction*, the business should be able to enact, revise, and discontinue the business rule if they like that. So for example accepted rules for mathematics can't be BR's.
- *The rule must tend to remove a degree of freedom*, a business rule should remove a degree of freedom. If it does not, it's an just a guidelines, in RuleSpeak this is called an advice. If an advice can be written as a rule, then it should be written as a rule.

Separated from implementation

Business Rules are about the business. So it's important to keep the Business Rules and the content of these rules separated from the implementation of processes in the business. [16] BR should be used to guard these processes, not implement them.

Needs to be precise

A BR needs to be very precise. The four steps below will help with constructing a precise rule [17]:

1. Define all base terms.
2. Identify and define any subsets from these base terms.
3. Rewrite the rule using the more specific well-defined terms.
4. Ensure the same term is used by all rules referencing the same concept.

Gladys S.W. Lam created these steps and completed it with a nice example using the steps. This example can be found below.

Original rule:

“An employee must contact a customer if payment for an invoice is not received after 90 days.”

Step 1: Define all base terms

Employee: A person hired by the company

Customer: An individual or an organization that purchases the company’s goods and services.

Payment: Monetary return in exchange for company’s goods and services.

Invoice: A request for payment.

Department: A division of the company.

Step 2: Identify and define subsets

Full-time employee: An employee who works at least 40 hours per week.

Part-time employee: An employee who works less than 40 hours per week.

Individual customer: A customer that is an individual.

Corporate customer: A customer that is an organization.

Step 3: Rewrite the rule

“A full-time employee from the accounts receivable department must contact the customer if payment for an invoice is not received after 90 days.”

Step 4: Ensure the same term is used by all rules referencing the same concept

An example of another rule using the same terms:

“A part-time employee in the accounts receivable department must not process any cash payment.”

As can be seen in the example above the rule became much more precise and left no room for interpretation. Being precise and leaving no room for interpretation is one of the goals of the concept Business Rules.

4.2 Grammatical requirements of a Business rule

Grammatical requirements are an aspect which has not been developed well in the different BR methods. In the documents RuleSpeak made available, written by Ronald G. Ross, for interested people there are a few tables which have been the base of the grammar which is shown in table 4 [9, 18]. To create a better understanding for the created grammar it's good to take a look at those tables.

Sentence form	Description	Might be used to
... must ...	Indicates that something is mandatory.	Require that certain orders have to be credit-checked.
... must be computed as ...	Indicates that a formula involving some mathematical operation(s) (e.g., sum, multiply, average, etc.) is to be used to compute some result.	Provide a formula to compute a customer's annual order volume.
... must be computed as ... when...	Indicates that a formula involving some mathematical operation(s) (e.g., sum, multiply, average, etc.) is to be used to compute some result when some condition(s) become true.	Provide a formula to compute a customer's annual order volume.
... must be considered ...	Indicates that something is to be classified or derived a certain way.	Express how a circumstance should be evaluated.
... must be considered ... if ...	Indicates that something is to be classified or derived a certain way if some condition(s) hold true.	Express the circumstances under which a customer is a bad credit risk.
... must not be considered ...	Indicates that something is not to be classified or derived a certain way.	Express how a circumstance should not be evaluated.
... must not be considered ... when ...	Indicates that something is not to be classified or derived a certain way if some condition(s) hold true.	Express the circumstances under which a customer is not a bad credit risk.
... must be performed when ...	Indicates that some process or procedure is to be performed when some condition(s) become true.	Reorder stock when the quantity on hand drops below a certain point.
... must not be performed when ...	Indicates that some process or procedure is not to be performed when some condition(s) become true.	Prevent stock being reordered if the stock is too high at a certain point.
... must not ...	Indicates that something is not allowed.	Require that a product is not to be sold to a bad credit risk.
... must not ... if ...	Indicates that something is not allowed if some condition(s) hold true.	Require that a product is not to be sold to a bad credit risk.
... may ... only ...	Indicates that something is	Require that certain orders

	allowed only in certain situations.	have to be credit-checked, but waive the requirement for others.
... may ...	Indicates that something is allowed.	Clarify that any customer is allowed to hold an account.
... need not ...	Indicate that something is not mandatory.	Clarify that certain orders do not have to be credit-checked.

Table 3: RuleSpeak sentence structures

The above table is broadly describing the allowed sentence structures. Table 3 can actually be handed to a group of people which will probably understand the supported sentence forms. But in order to develop the method and the supporting software it's important to get a better view on the actual content supported by these sentence forms. To get this view on the supported sentence forms a RuleSpeak grammar has been formulated based on table 3. The used version of the grammar, table 4, was created by Dr. Stijn Hoppenbrouwers [18].

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 4: RuleSpeak grammar

The meaning of the different terms used in the above table can be found below:

STATE -> any description of a state

NOUNSING -> 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

There have been formulated a few different ways of writing a **SUBJ**. Those ways can be found below:

SUBJ -> a/an NOUNSING (NOUNSING simply stands for singular noun phrase)

SUBJ -> a/an ACOND NOUNSING (ACOND stands for "adjectival condition")

SUBJ -> a/an NOUNSING CONDFN (CONDFN stands for "condition following noun")

A condition can have two forms which will be described below:

COND -> if STATE

COND -> when STATE

There are three ways of writing a **TYPE**. All three of them can be found below:

TYPE -> a/an NOUNSING (I'd rather not have included the indefinite article a/an this way but had to)

TYPE -> a/an ACOND NOUNSING

TYPE -> a/an NOUNSING CONDFN

Creating a BR following the steps named in Chapter 3, the requirements from 4.1 and the grammar from 4.2 should give rules which will follow the RuleSpeak guidelines. Making sure the rules are clear and unambiguous is a process which can only be done by a BR creator or checker. In the next chapter the complementary glossary for the BR will be discussed. Without clear definitions of the business terms it's impossible to create a correct package of BR's

4.3 RuleSpeak Do's and Don'ts

This part is about some general guidelines which may be used whilst creating BR [8]. The do's and don'ts which can be found in the following tables have been formulated by Ronald G. Ross. It's not mandatory to use these guidelines for BR, but they can support the writer in writing correct rules. A selection of these rules will be implemented in the BRAT concept. This selection will be made in chapter 7.

Do/Don't	Description
Business Rules should be non-procedural	Rules should be practicable and in declarative form natural for human communication.
Business Rules should not be inscrutable	The most basic test for a Business Rule Statement is that it can be readily understood by any qualified worker – and always with the same interpretation.
Enforcement and evaluation are separate concerns	Anything pertaining to evaluation or enforcement of a Business Rule should be documented separately from the Business Rule Statement itself. A BR should only express the "What" of a BR.

Table 5: Do's and don'ts about basic guidelines of RuleSpeak

Table 5 is describing a few do's and don'ts about the basic guidelines in RuleSpeak. They are focused on the general content of a to be created rule and have the goal to make sure the new BR should

actually be a BR. Table 6 contains a number of guidelines about some often used words while creating rules. One of the goals of these guidelines is to make sure the rules are as strict as needed

Do/Don't	Description
Omitting a rule keyword is not good	Every Business Rule should include "Must" or "Only". Other phrases or words to indicate that a statement is meant to express a Business Rule should be avoided.
"Can" is not good	A Business Rule should always remove some degree of freedom. With "Can" there's no removal of freedom at all.
Extra words for emphasis are not good	Words and phrases added for emphasis just add clutter. Business Rule Statement should be kept lean and succinct.

Table 6: Do's and don'ts about basic wording in RuleSpeak

Do/Don't	Description
Free form is not good	The form of a Business Rule Statement should follow the form (wordings) of the relevant fact(s). E.g. Fact: "A customer holds an account" leads to rule: "...only if the customer holds an account"
"To have" is often not good	The verb "to have" is imprecise when used to express a relationship between independent concepts.
Missing facts are not good	Omitting relevant facts from a Business Rule Statement inevitable leads to unambiguous Business Rules.

Table 7: Do's and don'ts about writing rules containing facts

The table above handles a type of rules which contains a fact. These rules will often be written by companies. There are a few tips when writing this type of rules which can be found below. The table below can be seen as one of the most important of all the tables in this chapter. In many rules subjects are used/formulated in the wrong way. Using the guidelines in table 8 can help a writer avoiding problems with this topic.

Do/Don't	Description
Starting with "if" is not good	Each Business Rule should start with an appropriate subject. If qualification is necessary, it can be placed at the end of a sentence (e.g. " <i>... must be considered ... if ...</i> ").
Starting with a timeframe is not good	If qualification by some timing criteria is necessary, it can be placed at the end of the sentence.
Plural subjects are not good	A Business Rule applies to the instance level. Certain kinds of ambiguity can be easily avoided simply by placing the subject of the sentence in the singular form.
Actor subjects are frequently not good	A Business Rule Statement indicating an actor as its subject should be scrutinized closely. Does

	the Business Rule really pertain only to that actor? Often, the answer is no.
Non-numeric subjects for numeric thresholds is not good	If a Business Rule establishes a numeric threshold, the subject should be numeric too.
Missing subjects are not good	Business Rule Statement should include a subject. Identifying an appropriate subject is an important step in moving from informal expressions to fuller expressions.
Imperatives are not good	Business Rule Statement must stand on their own so they can be interpreted correctly out of the context.

Table 8: Do's and don'ts about using subjects in rules

Do/Don't	Description
Non-specific qualification is not good	A Business Rule Statement should be as specific as possible. It should guide an employee to do the right thing.
Conjunctions are often not good	Avoid long strings of "and-ed" and "or-ed" conditions. They can be extremely hard to follow. Eliminate all significant conjunctions in a Business Rule Statement following the RuleSpeak guidelines above, using indentation for separate bullet lists as necessary.
"Etc." is not good	"Etc." provides no useful clarification and is not specific.

Table 9: Do's and don'ts to improve readability of rules

As noted before it's difficult to make readable rules for both Business People as IT people, but this is one of the goals of the RuleSpeak method. To support writers in writing readable rules the set of guidelines in table 5 have been formulated. In the table below there are 2 guidelines about agility in RuleSpeak.

Do/Don't	Description
Twosome words are not good	The form of a Business Rule Statement should not involve any word or structure tending to make adding new conditions (or removing existing ones) more difficult. So twosome words should be avoided.
Embedded numbers are often not good	Embedding numbers in a Business Rule Statement makes it difficult to adjust these numbers without adjusting large amounts of rules. Create a separate rule which defines the number, this way the number has to be changed only once when the number needs to be changed.

Table 10: Do's and don'ts about agility in RuleSpeak

Do/Don't	Description
Embedded calculations are not good	Any embedded calculation, explicit or presumed, should be expressed in a separate statement.
Embedded conditions are often not good	Define each condition as a new term and refer to them in a Business Rule Statement. This makes

Explicit mention of processes is usually not good	changing any of them easier. Business Rules should reference states of the business or things within it, rather than processes. In RuleSpeak, states of things are indicated by use of adjectives or past participles.
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Table 11: Do's and don'ts to accommodate re-usability of rules

The final two tables are about making rules re-usable and handling events in the RuleSpeak method. Both set of guidelines are not that important at first, but when wanting to change the set of business rules they will become useful.

Do/Don't	Description
CRUD is not good	"CRUD" stands for create, retrieve/read, update, delete – all system events. A statement containing one of these terms is per definition not expressed purely in business terms, it also uses the imperative form.
"When" is often not good	Using "When" limits a Business Rule Statement to execute a rule only in one certain moment. Most of the time that's not actually the goal to be reached.

Table 12: Do's and don'ts about events in RuleSpeak

4.4 Summary

In the RuleSpeak method there is a distinction between structural and operational rules. The first group is focusing on the way the business organizes its business semantics. The second group is focusing directly on the propriety of conduct in circumstances where willful or uninformed actions can fall outside the boundaries of behavior deemed acceptable. This second group mainly differs from the first group in their strictness. Operational rules can en may be violated by the users of the rules.

Besides the above distinction there are four categories of Business Rules: Guidelines, action enablers, computational and inference. Every type has a different goal. The first named category creates a Business Rule which may also be called an advice, which makes it a suggested restriction. The other three categories will create a Business Rule which will be mandatory to execute when using the set of Business Rules in an organization.

When creating a Business Rule it's important to make sure the content of the rule actually should be a rule. To check whether this is the case Ronald G. Ross [4] formulated five checks which can be found in 4.1.3. When fulfilling all these tests you know for sure the content should be a Business Rule. But there's more, BR should be separated from implementation of the process. They should only focus on guarding the processes. At last BR should also be really precise. The steps formulated by Gladys S.W. Lam [17] could help reaching this goal.

Having the defined a set of requirements regarding the content of a Business Rule it's also important to look at the RuleSpeak grammar of a Business Rule. Table 4 in this chapter contains this grammar which is created by Stijn Hoppenbrouwers based on the RuleSpeak method.

This chapter is concluded with a list of do's and don'ts which will be used in the creation of the BRAT concept. The summary of this list is shown below.

Do's and don'ts

Business Rules should be non-procedural	Free form is not good
Business Rules should not be inscrutable	"To have" is often not good
Enforcement and evaluation are separate concerns	Missing facts are not good
Omitting a rule keyword is not good	Starting with "if" is not good
"Can" is not good	Starting with a timeframe is not good
Extra words for emphasis are not good	Plural subjects are not good
Non-specific qualification is not good	Actor subjects are frequently not good
Conjunctions are often not good	Non-numeric subjects for numeric thresholds is not good
"Etc." is not good	Missing subjects are not good
Twosome words are not good	Imperatives are not good
Embedded numbers are often not good	Embedded calculations are not good
CRUD is not good	Embedded conditions are often not good
"When" is often not good	Explicit mention of processes is usually not good

Table 133: Do's and don'ts summary

5. Creating a glossary

Besides creating a set of Business Rules it is equally important to make sure the used terms are unambiguous. The meaning of terms used in a company is a big problem for lots of companies. On different levels in the company terms have a different meaning. Because of this a business vocabulary is one of the most important elements while making use of the BR concept.

As experienced during the preparation of this project it is difficult to find literature or a method about the creation of a definition for a term. The only usable information which has been found is about the “Genus-differentia definition”. Luckily this type of definition can be used as a guideline while constructing a business vocabulary. One problem which can often be seen when business people are defining terms is that they tend to put too much information in a definition. One of the things the business people tend to do is add constraints to a definition. [19] Unfortunately these two problems can’t be checked, so the given information in BRAT will hopefully be enough to prevent users from making these mistakes.

This chapter will first explain the concept of a Genus-Differentia definition. After this explanation some extra tips and guidelines will be formulated which will be especially about business terms. This chapter will be concluded with a short summary.

5.1 Genus-Differentia definition

A term defined according to the Genus-Differentia, a theory which has been developed by Aristotle in the Posterior Analytics (Tredennick 1960: XIII.96a ff.) , consists of two equally important parts. [20] These two parts together have to be clear and unambiguous to the reader. Those two parts will be discussed below starting with “Genus” followed by “Differentia”. After explaining the two individual building blocks of a definition some examples will be given of easy but clear terms which follow the outlined guidelines.

5.1.1 Genus

The genus part can be seen as the general category under which the term will be positioned. The genus is meant to give a clear view off the field in which the term is operating. As the example in 5.1.3 will explain the genus of a human being according to the ancient Greeks will be “animal”. Or a more recent example, the genus of the new Apple iMac will be “Personal Computers”.

In other words a genus is a term which has already been defined that serves as a portion of the new to be defined definition. As imaginable every definition containing the same genus will be considered as a part/member of that genus. Whilst creating definitions of (business) terms it is possible to use multiple genera in the same definition. While doing that make sure to keep an eye on the definitional demand to be unambiguous.

5.1.2 Differentia

After defining the general category of the term that has to be defined the point has been reached to define the “new” part of the term, the part that hasn’t been defined by the selected genus. Two nice examples to create a clear view on the differentia will be found when defining a rectangle and a rhombus.

A rectangle can be defined as: “A quadrilateral with 4 right angles”. A rhombus can be defined as: “A quadrilateral with all 4 sides having the same length”. Both definitions start off with the genus “a

quadrilateral” after selecting the genus the definition has been completed by adding the unique specification/feature which makes a rhombus and a rectangle different.

As noted before it’s important to make sure the combination of a genus and the differentia creates an unambiguous view on the term. To give a better impression on the combination of genus and differentia a list has been created with some example definitions. The list is on the next page.

5.1.3 Example definitions

Before handing a short list of example definitions it’s useful to take a look at the following image which illustrates the concept explained above.

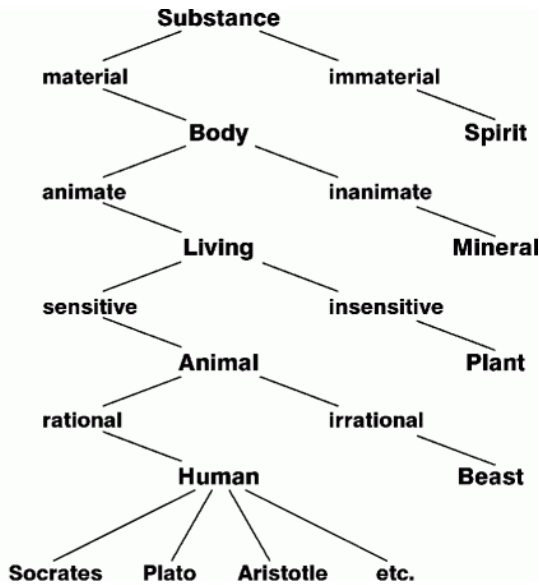


Figure 5: A Porphyrian tree

The image at the left is an illustration of the Genus-Differentia concept. [21] At this point it’s not useful to explain every decision made in the image. But to give a clear view on the concept it is nice to look at the two levels on the bottom of the image.

When looking at a human-being from the viewpoint of the Greeks it would be correct to say that the genus of a human being is an animal. When looking at the features of a human being which are differing them from other animals they would say it’s the rationality of a human. So the definition from this viewpoint would be: “A human being is a rational animal”.

In this definition the human being can be seen as a species from the general category (genus) “Animals”. This type of animals differ themselves from the others by being rational.

Below is a list of some more examples of definitions according to the guidelines. Each of them will be decomposed into a genus and a differentia.

Term	Definition	Genus	Differentia
Rectangle	A quadrilateral with 4 right angles	A quadrilateral	with 4 right angles
Square	A rectangle that is a rhombus	A rectangle	That is a rhombus
Paperweight	A small, heavy object which is placed on papers to prevent them from being scattered	A object	Small, heavy which is placed on papers

Table 14: Example definitions following Genus-Differentia method

5.2 Tips and guidelines for business terms

This paragraph will list a number of extra tips and guidelines to be used whilst creating business terms. While using this list it's important to keep the above part about a genus-differentia definition in mind. This way the best definitions will be created, making the terms used in a specific company clear to every person who is using them.

- A created definition should be self-explanatory. So it's important to check whether a definition isn't obscure, ambiguous, or figurative.
- A definition should not be circular. The definition is circular if the definiendum appears in the definiens.
- A definition should not be too wide/narrow. It should only describe the explicit distinctions between the genus and the specific object to be defined.
- Focus on essential features while defining.
- Avoid figurative or obscure language.
- Be affirmative rather than negative.
- Choose a genus and differentia which are relevant to the context in which the definition is created and used.
 - o E.g. in the context of a library it's totally useless to know that a book is of the genus "thing". It's possible to use the genus "product" or "loanable item" with some extra information on the difference between a book and a magazine, dvd or cd.

5.3 Summary

Creating correct and unambiguous business term definitions is important to support the created BR. The BR will only work in the correct way when supported by the right term definitions. It's difficult to restrain the content of a definition because of the huge amount of different terms and definitions. But there are a few things to keep in mind while writing the definitions.

First it's important to work according to the genus-differentia definition guidelines. These guidelines describe how a definition consists of two major parts. First the genus part, which will provide the reader with the general category for the definition. For example: A human is a type of animal (according to the ancient Greeks). Second is the differentia part which will describe the aspects which makes this specific type different from the type the general category describes. For example: A human is a rational animal (again according to the ancient Greek).

Besides that it's important to keep the guidelines listed in 5.2 in mind whilst creating the definitions.

6. From rules to models

To create an optimal link between the businessmen and the IT people it's a useful add-on to have all rules and terms defined in a model. Modelling is often used to get the best overview on every aspect of a project. Modelling creates a link between the available data types, the connections between all this data and creates a bridge between the company and the IT consultants/employees. This chapter will give an overview on possibilities to transform Business Rules into a model to support the stakeholders of a Business Rules project in the best way possible.

6.1 SBVR2OCL

The University of Birmingham is creating tools to transform different kinds of language into another language or a model. At the moment they are still developing the tooling but it looks promising. Until now they've created multiple versions of the tool. The most interesting for this research is definitely the SBVR2OCL tool [22]. This tool transforms an SBVR Business Rule to Object Constraint Language constraints (OCL) with respect to a Unified Modelling Language (UML) class model using the Model Drive Architecture (MDA) technology.

Having done a correct transformation it's easy to create the actual UML model. From this point on it's not that hard to actually create a database based on the beginning set of SBVR Business Rules. SBVR2OCL is an interesting piece of work which can help in the near future. Unfortunately at this point in time there's no way to automatically and correctly transform Business Rules in the RuleSpeak method to a model.

The past years lots of tools have been developed to automate software development or parse natural language to another language. None of them seem to be useful for this project at this point in time. On top of that it's important to remain focussed on the business, creating models of the created business rules will not help business people at all. It's only a tool to help IT people understand the business people.

6.2 Term types

The transformation from Business Rules to models will not be implemented in the BRAT concept. Because of the focus on the process of creating Business Rules following the RuleSpeak method it's not useful to add this transformation at this point in time.

A small step which can be easily be made to at least help in the process of translating rules in to a model is some extra defining of the used terms. Models like ORM exist of a few different types of objects. To let BRAT make the first step to help the user create a model an adjustment has been made after conducting some tests. In the final version every term has to be defined with an actual definition and a term type. For the term types a choice should be made by the user between: Relation, Object type and Other. It's just a small step towards models, but it lets the user at the least think about the model and will actually help at the time the model is created

6.3 Summary

At this point in time there is no useful way to transform Business Rules following the RuleSpeak guidelines to a model. There is one tool helping to transform SBVR Business Rules in the transformation process, but it's simply not usable for RuleSpeak. Besides that it's important to remain focussed on the business people, models are just a tool to help IT people understand business people which is not the goal of this research.

7. BRAT concept phase I

In this chapter all information of the first six chapters will be combined to create a first version of the BRAT concept. This first phase exists of multiple parts leading to a working PoC. The first part will define the requirements for the BRAT. These requirements have been formulated in consultation with Dr. Stijn Hoppenbrouwers. After clearing up the requirements the first step will be made towards an actual tool. First there will be a model which gives an overview on the setup of the tooling, afterwards the screenshots of the actual first version of BRAT will be discussed and there will be some basic information about the database which will support the tool.

7.1 Requirements

There are only a few requirements for the BRAT concept. One of the goals of the concept it to keep it simple, stupid (KISS). It's not the goal to deliver a fancy tool which will sell only because of its looks. It's not even a goal to sell at all. The only goal is to create a concept which will help to create correct Business Rules according to the grammar and guidelines discussed in chapter 2, 3, 4, 5 and 6.

To do this the following requirements have been formulated:

Requirement	Description
Create Business Rules	The main requirement of BRAT is the possibility to create Business Rules according to the RuleSpeak method. Creating a Business Rule from an existing rule will not be implemented in BRAT.
Create vocabulary	It should be possible to create a vocabulary within BRAT. To support this it's obligatory to allow editing and deleting of definitions.
Flexibility in creating a set of BR and vocabulary	The user should be able to create BR and the complementary vocabulary in a flexible way.
Helping users	The users of BRAT should be supported in using the RuleSpeak method. To do this a guidance function is needed.
Multiple users	This concept will possibly be used during the 2011-2012 edition of the Business Rules course at the Radboud University Nijmegen to support the students. To do this, multiple users have to be supported by BRAT.
Print project	The user should be able to print the (final) document they've created.

Table 145: BRAT requirements

7.2 The setup

This part will be about the setup of the BRAT concept. The model shown below will show the setup of the tool. Again it's a really simple setup to support the goal described before.

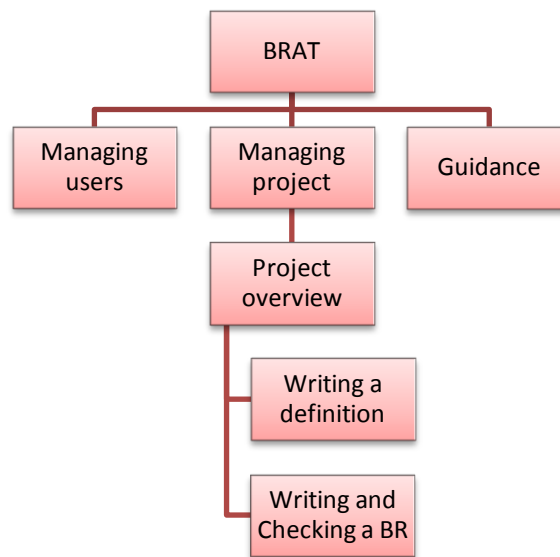


Figure 6: Setup of the BRAT-concept

While discussing the actual first version of BRAT in the next part all the blocks above will be defined more specifically. At this point it's the most important to have a clear view on the setup of the tool.

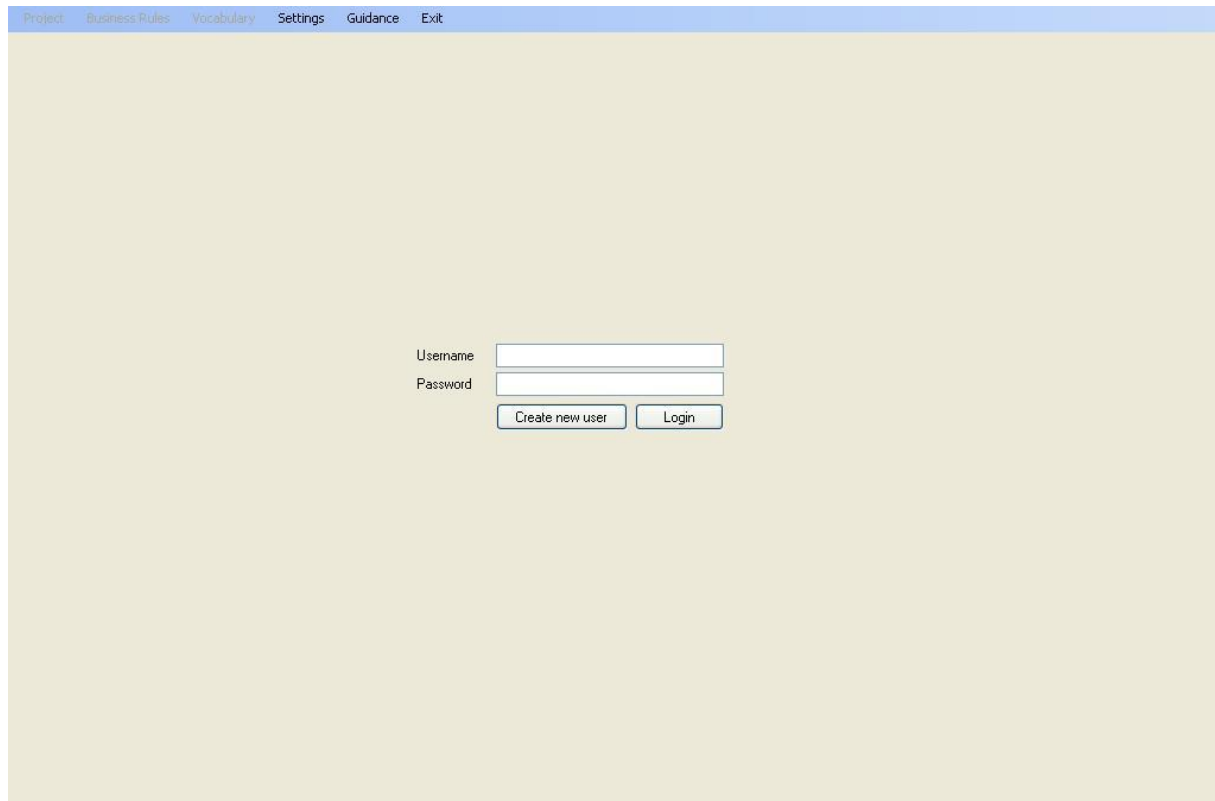
7.3 Screenshots

The requirements and setup as described in 7.1 and 7.2 lead to a graphical representation of the BRAT concept. This representation will be given in the form of screenshots of the first version of BRAT. Each screen which is used in the concept will be shown as a screenshot. Besides these screenshots there's also a short description describing the actions which the user can do while in this part of the BRAT concept.

7.3.1 Start

The start screen is the simplest screen of the tool. The screen has a menu which will be disabled except for the "Settings", "Guidance" and "Exit" buttons. The user has four possibilities while being in the start screen:

- Enter the credentials of the existing user and login by clicking the login-button.
- Click Settings -> Create new user will give the possibility to create a new account for the tool to login with. It's also possible to click the "Create new user"-button.
- Click the Guidance-button while allow to user to get some extra information about BRAT and the Business Rules concept to help working with BRAT.
- Click the Exit-button will close the tool.



The screenshot shows the BRAT start screen. At the top, there is a blue navigation bar with the following menu items: Project, Business Rules, Vocabulary, Settings, Guidance, and Exit. The main content area has a light beige background. In the center, there is a login form consisting of two text input fields. The first field is labeled 'Username' and the second is labeled 'Password'. Below these fields are two buttons: 'Create new user' and 'Login'.

Figure 7: BRAT start screen

7.3.2 Managing users

The user management is kept as simple as possible. It's only been created because of the usage in the Business Rules course in the first semester of the new college year. Logging into the BRAT concept will only be possible with the users own credentials. In the previous screenshot the user could have chosen to create a new user account. By doing this the screen which can be seen below will be opened.

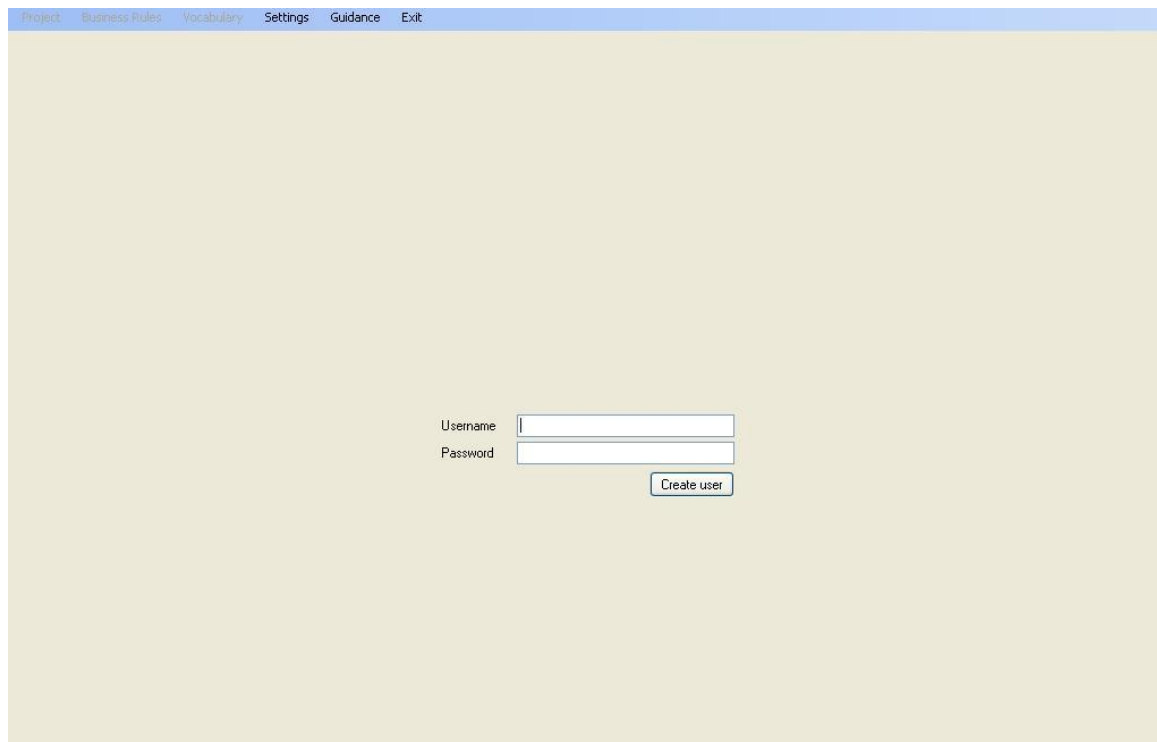


Figure 8: Creating a new user

The screen above is almost identical to the first screen with only two differences:

- The goal of the screen, creating a new user
- The login button has been changed to “Create user”-button

7.3.3 Managing project

The managing project part is the first screen which will be shown when the user has logged in. It has two main functionalities.

- Opening an existing project
- Creating a new project.

The box on top of the screen shows the existing projects which can be opened by double clicking on one of them. If the user wants to start a new project or there are no existing projects for the logged in user a project can be created by entering a project name and description on the bottom half of the screen. The actual creation of the project will be done by clicking the “Create project”-button. The newly created project will then be available in the list.

The information of a project which can be entered has been kept simple in order to make the tool accessible and because of the focus on the creation of Business Rules, not managing the content of the tool.

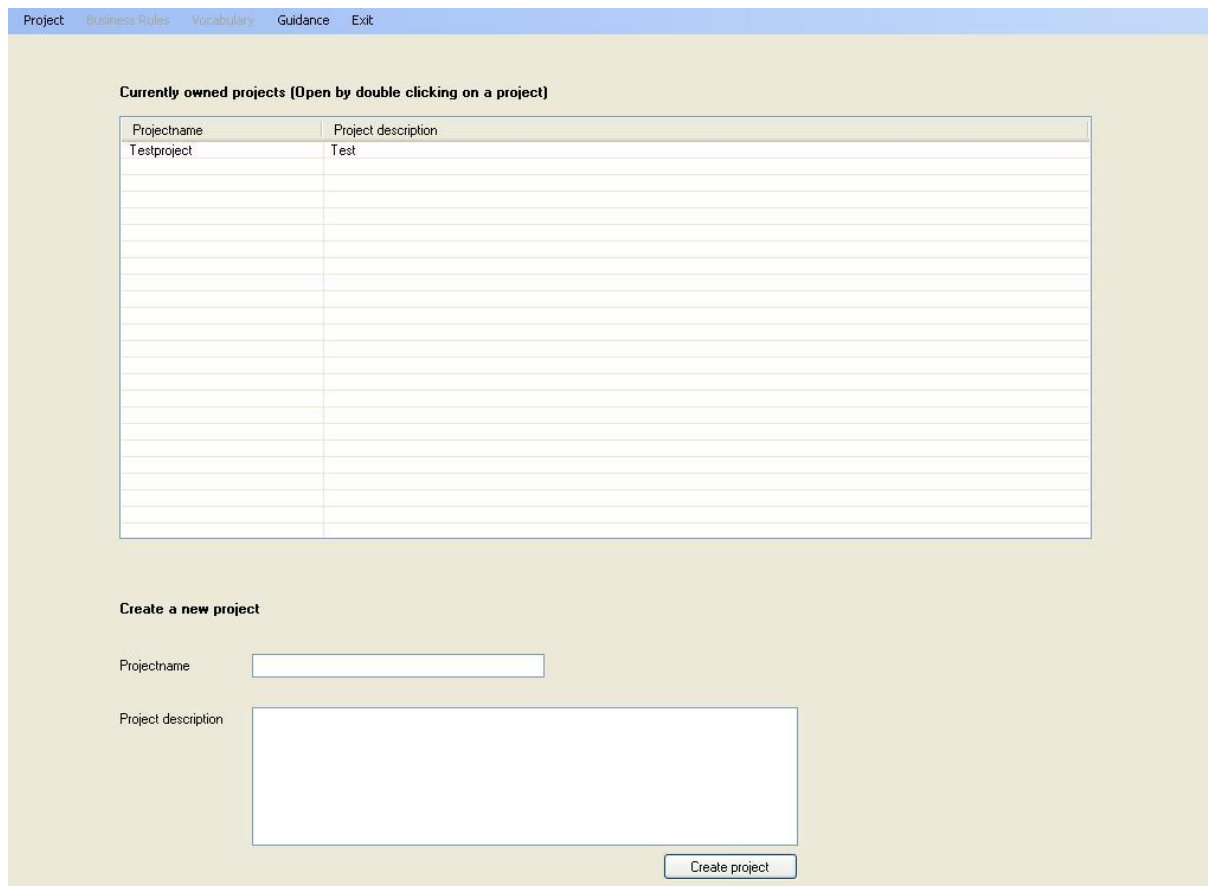


Figure 9: Managing and creating projects

7.3.4 Writing and checking a Business Rule

The figures shown on the next pages are about the actual writing of the Business Rules. There are two possibilities of creating a new Business Rule. The user can create a BR as a beginner or as a more advanced user of Business Rules. The beginning users will be getting a slightly easier method of creating Business Rules. The two screens of creating a BR can be divided into several parts. These parts are listed below and will each be described afterwards.

- Choose operational status
- Choose Business Rule type
- Possible sentence structure
- Creating the Business Rules
- Business Rule report
- Vocabulary

7.3.4.1 Choose operational status

In chapter 4 of this document different types of rules have been explained. The first, most general choice which has to be made is the operational status of the BR. The choice is between Structural or Operational. A small recap of chapter four teaches us that structural rules prescribe criteria for how the business chooses to organize its business semantics. These rules mainly focus on criteria for making the right decisions, derivations of business computations. Operational rules focus directly on the propriety of conduct in circumstances where willful or uninformed actions can fall outside the boundaries of behavior deemed acceptable. Operational rules can be violated directly.

This choice only has to be made whilst creating a Business Rule as a beginner (shown in figure 10).

7.3.4.2 Choose Business Rule type

In chapter 4 there's also a part about different types of Business Rules. The choice is between a guideline, action enabler, inference or computation. Once again this choice only has to be made whilst creating a rule as a beginner (figure 10). The difference between those types can be found in 4.1.2.

7.3.4.3 Possible sentence forms

In chapter 4 of this document there are multiple tables about the grammar of Business Rules. The tables 3 and 4 are about the actual sentence forms which are accepted according to the RuleSpeak method. To guide the user in the right direction they have to make a choice for one of the sentence forms from this table. Each form will be shown on the left of the screen. The other parts discussed below will be greyed out until a sentence form has been chosen.

7.3.4.4 Creating the Business Rules

After choosing one of the sentence forms the user will be able to create a Business Rule. The sentence form will already be in the text box leaving a number of spots open for the user to fill in. If the user finds out he/she needs another sentence form he/she can just select another form and the keywords will be changed.

7.3.4.5 Business Rule report

After creating a Business Rule the user will be able to check his/her rule according to the different types of limitations and tips discussed in chapter 4. This check will hand the user a report with possible errors and improvements for the created Business Rule. While creating a rule as a beginner the report will show up as a pop-up because of the limited space on screen. Advanced users will be shown a report on the bottom of the screen.

Most of the checks for guidelines have been automated. The non-automated checks will be handed to the user as tips in the help file. All checks are just to help the user following the guidelines of the concept, no errors doesn't mean the rule is actually good, it just means the rule passed all automated guidelines. After finishing a Business the user will be able to save his BR and, if they want, continue/change it the next time they log in.

Below is a list of the checks which have been automated in BRAT, descriptions of these checks can be found in chapter 4:

- Omitting a rule keyword is not good
- "Can" is not good
- Extra words for emphasis are not good
- "To have" is often not good
- Starting with "if" is not good
- Starting with a timeframe is not good
- Actor subjects are frequently not good
- Conjunctions are often not good
- "Etc." is not good
- Twosome words are not good
- Embedded numbers are often not good

- CRUD is not good
- "When" is often not good

7.3.4.6 Vocabulary

Creating a Business Rule also means filling the vocabulary of the project. By saving a Business Rule lots of words used in the rule will be added to the vocabulary. A list of words has been created to make sure the user won't have to define function words.

The screenshot shows the 'Business Rules' tab in the software interface. The 'Create your Business Rule' section is active, featuring several input fields and a dropdown menu. The 'Choose Business Rule operation area' section has 'Structural' selected. The 'Choose the Business Rule type' section has 'Inference' selected. The 'Structure' dropdown menu is open, showing three options: 'Indicates that something is not allowed. Might be used to: Require that a product is not to be sold to a bad credit ris', 'Indicates that something is to be classified or derived a certain way. Might be used to: Express the circumstances u', and 'Indicates that something is not to be classified or derived a certain way. Might be used to: Express the circumstance'. The 'Create your Business Rule' section has two input fields for the subject and type of the rule, and a large text area for the rule itself. At the bottom, there are three buttons: 'Return to project overview', 'Check Business Rule', and 'Save Business Rules'.

Figure 10: Creating a Business Rule as a beginner

Project Business Rules Vocabulary Guidance Exit

Select a sentence structure

Structure	Structure
...must ...	Indicates that something is mandatory. Might be used for: Requiring that certain orders have to be credit checked.
...must be computed as	Indicates that a formula involving some mathematical operation(s) is to be used to compute some result. Might be used to: F
...must be considered ... If ...	Indicates that something is to be classified or derived a certain way if some condition(s) hold true. Might be used to: Express:
...must be performed when...	Indicates that some process or procedure is to be performed when some condition(s) become true. Might be used to: Reord
...must not...	Indicates that something is not allowed. Might be used to: Require that a product is not to be sold to a bad credit risk.
...may...only...	Indicates that something is allowed only in certain situations. Might be used to: Require that certain orders have to be credi
...may...	Indicates that something is allowed. Might be used to:Clarify that any customer is allowed to hold an account.
...need not ...	Indicates that something is not mandatory. Might be used to:Clarify that certain orders do not have to be credit-checked.
...need not...if	Indicates that something is not mandatory when some condition(s) are true. Might be used to:Clarify that certain orders do n
...must...when...	Indicates that something is mandatory when some condition(s) are true. Might be used for: Requiring that certain orders hav
...must be computed as...when...	Indicates that a formula involving some mathematical operation(s) is to be used to compute some result: when some conditio

Create your Business Rule

Fill in the first part of the Business Rule regarding the subject of the rule

 must not

Fill in the second part of your Business Rule regarding the state (of the subject)

Your Business Rule

Fill in the textbox below only if a list of possibilities (bulletlist) is needed.
Enter one possibility per line.

Check Business Rule Save Business Rule

Check report

Error

Return to project overview

Figure 11: Creating a Business Rule as an advanced user

7.3.5 Writing a definition

To create a new definition the following screen has been created. On the left of the screen there will be a list containing every (un)defined word which has been used in the current project. When selecting a term the right part of the screen will be filled and enabled giving the user to possibility to define a new term or edit an existing definition. The user can save it by hitting the “Save term” button and can also delete terms by selecting a term and clicking the “Delete term”-button.

When selecting a term in the list the user will be shown in which Business Rules the term has been used. The choice to show the user this information has been made to give the user a better understanding of the context in which he has used this word(s).

Project Business Rules Vocabulary Guidance Exit

Select term to be defined/changed

Term	Definition
withdrawal from	
account	
made	
active.	

Term account

Definition

Save term

Tips for creating a definition
A good definition is based on the Genus-Differentia principle. Below you can find some tips and an explanation of this principle

Genus:
The genus part has to be seen as the general category in under which the term will be positioned. The genus is meant to give a clear view off the field in which the term is operating.

Differentia:
After defining the general category of the term that has to be defined the point has been reached to define the "new" part of the term, the part that hasn't been defined by the selected genus. Two nice examples to create a clear view on the differentia will be found when defining a rectangle and a rhombus.

A rectangle can be defined as: "A quadrilateral with 4 right angles". A rhombus can be defined as: "A quadrilateral with all 4 sides having the same length". Both definition start off with the genus "a quadrilateral" after selecting the genus the definition has been completed by adding the unique specification/feature which makes a rhombus and a rectangle different.

As noted before it's important to make sure the combination of a genus and the differentia creates an unambiguous view on the term. To give a better impression on the combination of genus and differentia a list has been created with some example definitions. The list is on the next page.

-A created definition should be self-explanatory.
So it's important to check whether a definition isn't obscure, ambiguous, or figurative.

Delete term

The selected term has been used in the following Business Rules

Business Rule
a withdrawal from an account may be made only if the account is active. []

Return to projectoverview

Figure 12: Writing a definition

7.3.6 Project overview

This screen shows an overview over the current project. On top of the screen the project name and description are given, followed by two lists. The first list shows all BR created in this project. The buttons below the list also gives the user the possibility to edit or delete rules from this set.

Below the list of created rule there's a list of (un)defined terms. As an add-on to export the entire project two buttons have been added. One will create a text file containing all rules and terms. The other one will create an Microsoft Excel file containing the rules and terms.

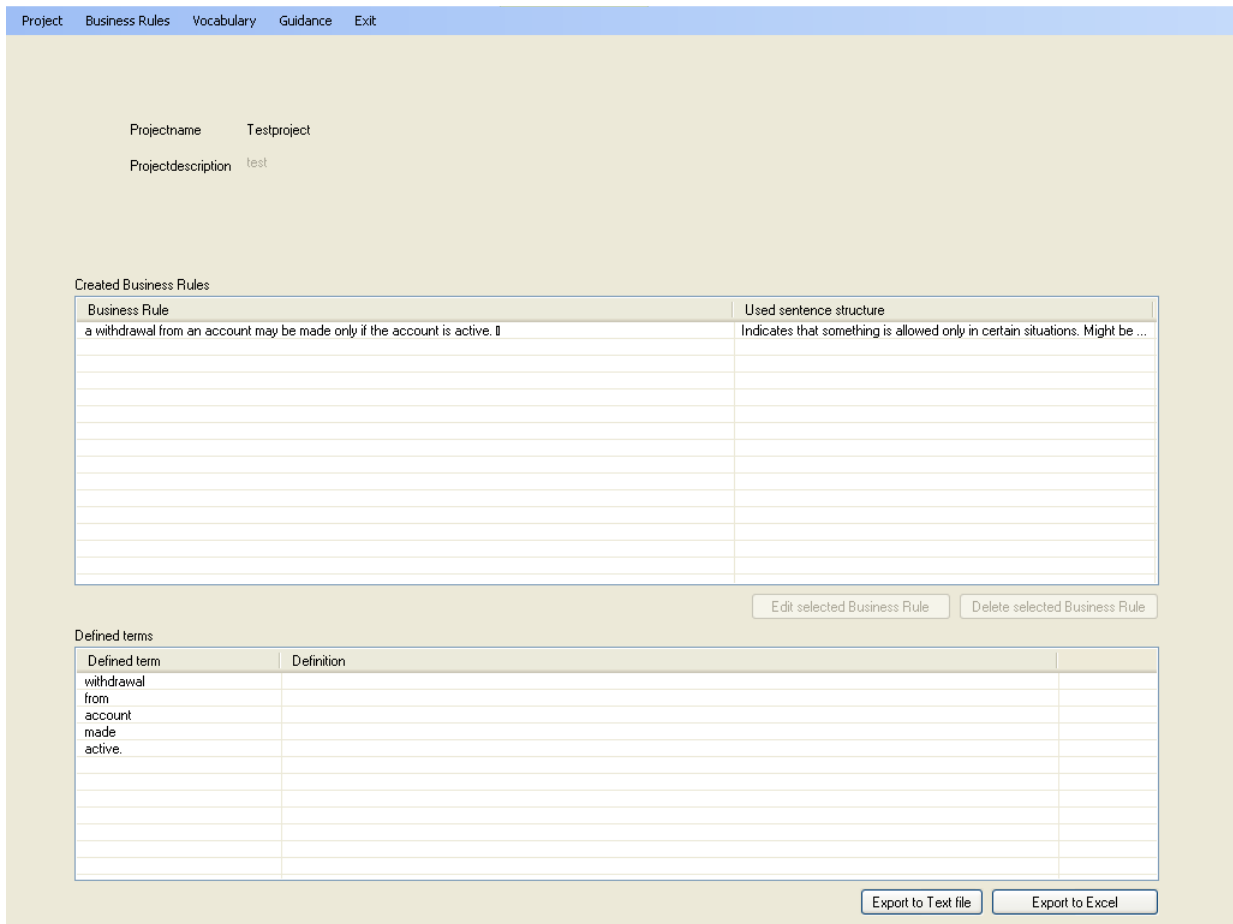


Figure 13: Project overview screen

7.3.7 Guidance

There will be a guidance function available which will guide the user to the most important steps and which will explain choices which have been made while developing BRAT. On top of that the function will contain the tips and guidelines which can be used to create business rules and/or define terms. This way the user will be optimally supported whilst creating their project.

The function will also contain some of the information from this document regarding the concept of Business Rules and the RuleSpeak method. The guidance file will work the same way the normal windows-help function works.

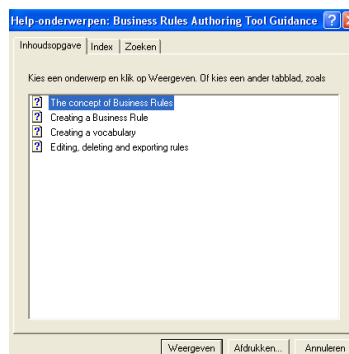


Figure 14: The BRAT help file

7.4 Database

There is a fairly simple database connected to the BRAT concept. The design of the database is shown below. It's a Microsoft Access-database supporting the requirements discussed in 7.1 and the wireframes in 7.3.

7.4.1 Database design

The database design for the BRAT concept is shown below. The design has been kept as simple as possible. It's containing all project and user data needed to run the BRAT. The only thing needed to actually use the concept besides what's in this model is a set of checks to locate improvements and errors.

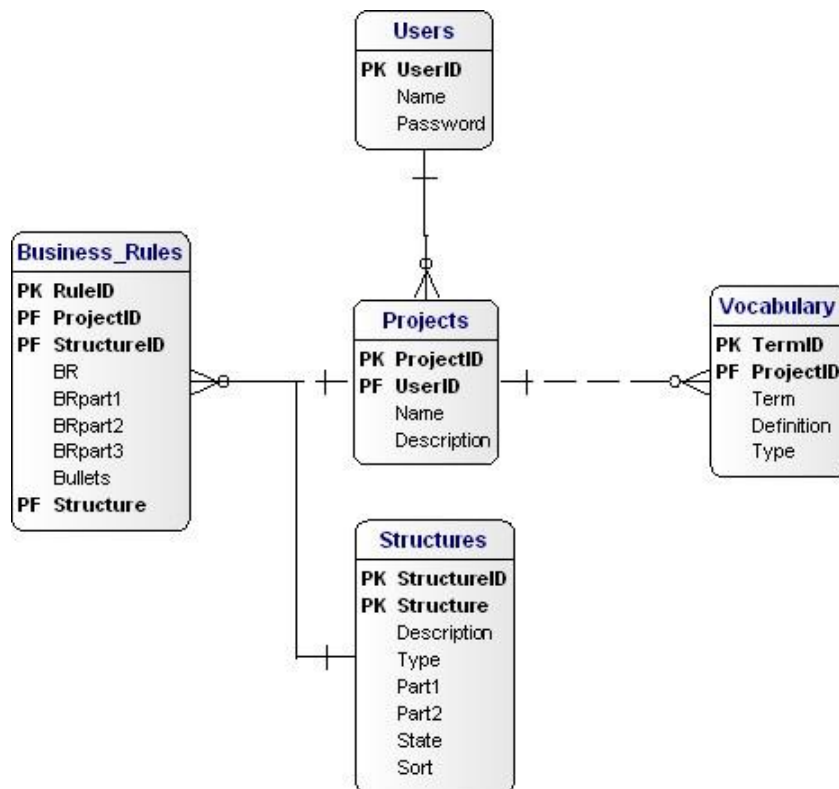


Figure 15: Database design BRAT

7.5 Summary

The Business Rules Authoring Tool (BRAT) consists of a set of useful screens. This chapter gives a clear view on the setup of BRAT and gives a first view on the requirements, lay-out, usability and database of BRAT.

The figure below is showing the setup of BRAT. As can be seen the tool is kept simple to hold focus on the actual creation of Business Rules according to the grammar from chapter 4.

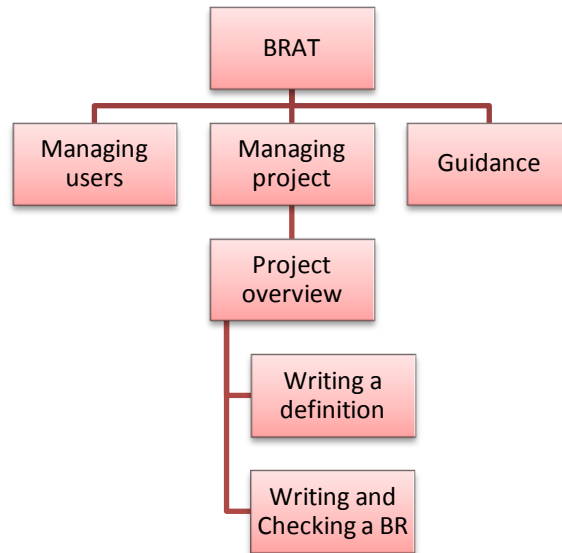


Figure 16: Setup of the BRAT-concept

The first screens of the lay-out can be seen earlier in this chapter. One of them is shown below to give a first impression. This screenshot is followed by the database design which will be the bases of the database supporting BRAT. This set of models and figures helped while creating the tool.

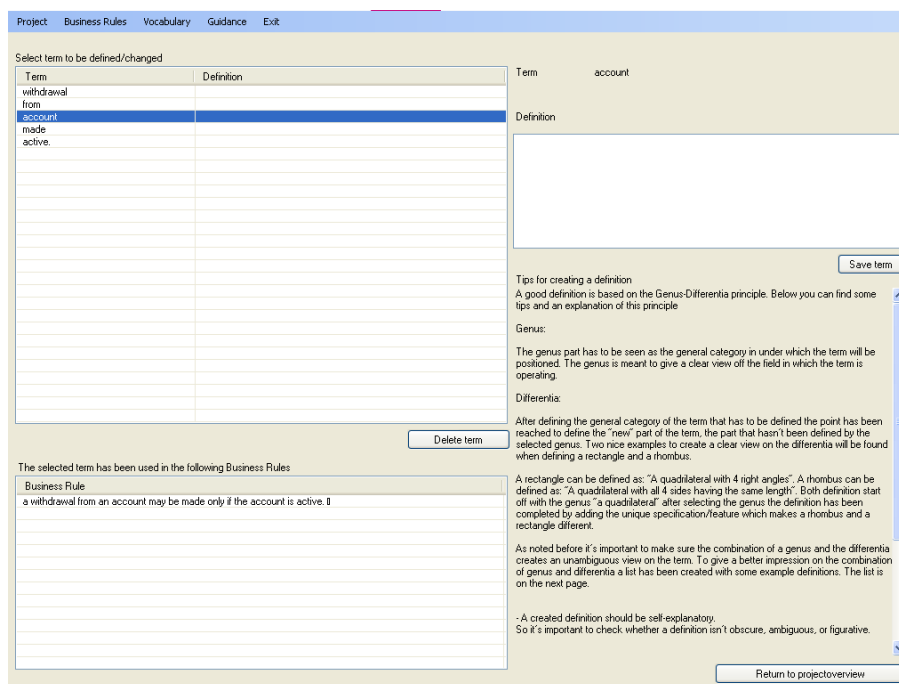


Figure 17: Screenshot of writing a definition screen

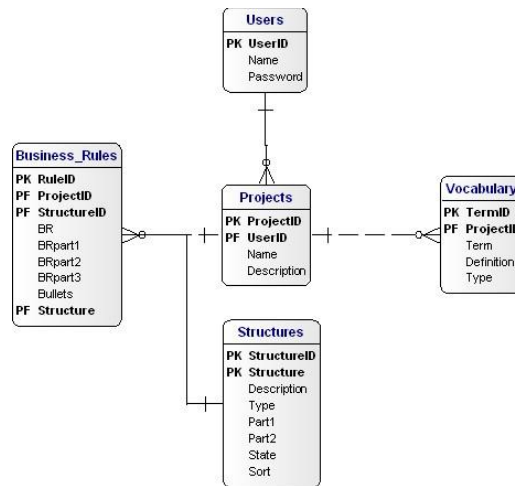


Figure 18: Database design BRAT

8. Testing the BRAT concept

When the first version of the BRAT concept was finished a number of people have been selected to test the concept by executing a series of test cases. The first part of this chapter will give a clear view on these created test cases. The second part will contain the test results followed by a conclusion in the form of a list of adjustments for the second phase of the development of the BRAT concept.

8.1 Test cases

The test cases used to test the BRAT concept are shown below. There are six test cases testing the most important features of the concept. Every test case is tested by four users. Every one of them has at least a small amount of experience in manually writing Business Rules. The choice for experienced users of Business Rules is made to make sure the tests are focussed on the concept combined with BRAT, not focussed on understanding the concept.

8.1.1 Creating a user and login

This test case will test the ability of BRAT and the users of BRAT to create a new user. A fairly simple test case to make sure users are able to take the first step before starting a project.

Test case 1: Create a new user account	
Unit to test	New user
Assumptions	BRAT is installed and works correctly on the test system.
Test data	Username: Users own name Password: Users own password
Steps to be executed	Open "New user"-screen Fill in the blank fields Create the new user
Expected result	A new user account has been created which can be used to login to BRAT.

Table 15: Test case 1

This second test is an even simpler case. The user has to login to the BRAT system using the newly created account from test case 1.

Test case 2: Login with the newly created user account	
Unit to test	Login
Assumptions	BRAT is installed and works correctly on the test system.
Test data	Username: Users own name Password: Users own password
Steps to be executed	Open BRAT Fill in the blank fields on the login page
Expected result	The user has logged in and sees the main screen. An overview of current projects of this user and the ability to create a new project.

Table 16: Test case 2

8.1.2 Creating a new project and open the project

Before actually starting to work with the concept Business Rules the user has to create a project and open the created project. This test case will test the functionality of this part of BRAT.

Test case 3: Create a new project and open the created project

Unit to test	Create new project, Owned projects, Project overview
Assumptions	BRAT is installed and works correctly on the test system. The user has logged in to BRAT.
Test data	Project name: Library Project description: A set of Business Rules containing the rules of the Radboud University Library translated into Business Rules.
Steps to be executed	Fill in the project information Create the project Open the project
Expected result	The user has created a project and opened the project. The user is now ready to start creating Business Rules.

Table 17: Test case 3

8.1.3 Create and check a Business Rule and define the used terms

The fourth test case will be about one of the main functionalities of the BRAT concept. It will test the creation of a Business Rule as a beginner. After fulfilling this test case the first Business Rule has to be created.

Test case 4: Create and check a Business rule as a beginner

Unit to test	Create a Business Rule as a beginner
Assumptions	User has logged in and opened a project.
Test data	Create the following rules: <ul style="list-style-type: none"> - An item must be classified as lendable to be borrowed. - A library item must be on loan to be reserved by a visitor - A person must have access to the library to be able to consult library materials.
Steps to be executed	Choose operation area Choose Business Rule type Choose sentence structure Fill in blanks Check created Business Rule Adjust rule Save rule
Expected result	A BR has been created with no important errors/guidelines denied. There may be errors left open after the rule has been saved as the errors are just guidelines/tips.

Table 18: Test case 4

The test case below has the same goal as the one above. The only difference is that this time the BR has to be made using the advanced-screen. These two test cases are giving a clear view of the guidance which will be given by the beginner screen.

Test case 5: Create and check a Business rule as an advanced user

Unit to test	Create a Business Rule as an advanced user
Assumptions	User has logged in and opened a project.
Test data	Create the following Business: <ul style="list-style-type: none"> - The potential borrower must have library privileges. - The borrower must pay the replacement cost of the borrowed item if the borrowed item has been damaged or lost
Steps to be executed	Choose sentence structure Fill in blanks Check created Business Rule Adjust rule Save rule
Expected result	A BR has been created with no important errors/guidelines denied. There may be errors left open after the rule has been saved as the errors are just guidelines/tips.

Table 19: Test case 5

After the creation of some Business Rules it's time to write some definitions of the terms used in the created Business Rules. The user also has to decide whether or not a term has to be defined. After this test case a small project is finished containing two Business Rules and a list of defined terms.

Test case 6: Define the used terms from the created Business Rules

Unit to test	Defining terms
Assumptions	User has logged in, opened a project and created at least one Business Rule.
Test data	Define all useful terms in the term list, remove the terms which do not need to be defined.
Steps to be executed	Open terms definition screen Select term to be defined Fill in the blank fields Save term (Step 2 – 4 repeating until every term is defined)
Expected result	The terms used in the created Business Rule(s) have been defined. A small project is finished.

Table 20: Test case 6

8.2 Test results

The results after conducting the tests are shown below. The results have been divided per test case.

8.2.1 Creating a user and login

There are two small test cases containing a part of the creation of a user and the logging into the system. Each test case was executed by four people. The results are shown below.

8.2.1.1 Test case 1

User	Subject	Description
Tester 1	Actual result	New user account is created.
	Pass/Fail	Pass
	Comments	-
Tester 2	Actual result	Account 'jodocus' created with password 'test'
	Pass/Fail	Pass
	Comments	Quick process, I expected a messagebox saying 'account created' or something like that.
Tester 3	Actual result	New user Menno made.
	Pass/Fail	Pass
	Comments	-
Tester 4	Actual result	Account successfully created.
	Pass/Fail	Pass
	Comments	Feedback of successful creation would be better.

Table 21: Results test case 1

8.2.1.2 Test case 2

User	Subject	Description
Tester 1	Actual result	Logged in with the created user and see the main screen with the overview and ability to create new project.
	Pass/Fail	Pass
	Comments	Double click at empty projectname raises exception.
Tester 2	Actual result	Logged in
	Pass/Fail	Pass
	Comments	-
Tester 3	Actual result	User Menno logged in.
	Pass/Fail	Pass
	Comments	-
Tester 4	Actual result	Succesfully logged in
	Pass/Fail	Pass
	Comments	-

Table 22: Results test case 2

8.2.2 Creating a new project and open the project

There is one small test case containing a part of the creation/opening of a project. The test case was executed by four people. The results are shown below.

8.2.2.1 Test case 3

User	Subject	Description
Tester 1	Actual result	Project details entered and successfully created.
	Pass/Fail	Pass
	Comments	-
Tester 2	Actual result	Project created and opened
	Pass/Fail	Pass
	Comments	-
Tester 3	Actual result	Project made.
	Pass/Fail	Pass
	Comments	The open project button falls under the task-bar (probably due to low screen resolution 1366x768 [Problem solved by moving the taskbar])
Tester 4	Actual result	Successfully created and entered the new project.
	Pass/Fail	Pass
	Comments	-

Table 23: Results test case 3

8.2.3 Create and check a Business Rule and define the used terms

There are three test cases containing a part of the creation of a Business Rule and the process of defining used terms. Each test case was executed by four people. The results are shown below.

8.2.3.1 Test case 4

User	Subject	Description
Tester 1	Actual result	Business Rule created.
	Pass/Fail	Pass
	Comments	Unclear in the test case that I had to use the menu to create the business rule.
Tester 2	Actual result	Rules are created
	Pass/Fail	Pass
	Comments	<p>Couldn't see whether check report delivers errors or just a guideline/tip.</p> <p>After creating the rule: <i>"Right now there are a lot of terms defined, without a definition. Isn't it possible that not all terms are terms on itself..? For example: 'on' and 'loan' are defined separate, but belong to each other: together they are a term isn't it?"</i></p>
Tester 3	Actual result	3 Business Rules made.
	Pass/Fail	Pass
	Comments	-

Tester 4	Actual result	Business Rules created.
	Pass/Fail	Pass.
	Comments	-

Table 24: Results test case 4

8.2.3.2 Test case 5

User	Subject	Description
Tester 1	Actual result	Advanced rule created, altered and saved successfully.
	Pass/Fail	Pass
	Comments	
Tester 2	Actual result	Business Rules are created.
	Pass/Fail	Pass
	Comments	Getting an error when using quotes " around a words.
Tester 3	Actual result	2 advance Business Rules made.
	Pass/Fail	Pass.
	Comments	-
Tester 4	Actual result	Business Rules created.
	Pass/Fail	Pass.
	Comments	Advanced mode is much quicker than the easy mode to create rules. This way has my preference.

Table 25: Results test case 5

8.2.3.3 Test case 6

User	Subject	Description
Tester 1	Actual result	Term altered
	Pass/Fail	Pass
	Comments	Unclear that I had to use the menu.
Tester 2	Actual result	Terms have a definition.
	Pass/Fail	Pass
	Comments	There is no check on the definition of the terms, so I can say whatever I want about them...
Tester 3	Actual result	All terms are defined.
	Pass/Fail	Pass
	Comments	-
Tester 4	Actual result	Terms are all defined without any problem.
	Pass/Fail	Pass
	Comments	-

Table 26: Results test case 6

8.3 List of adjustments

The test results of the previous part were translated into a number of adjustments for the second version of the BRAT concept. Not every comment has been translated into an improvement. The comments which haven't been translated into an adjustment are listed in 8.3.2. This list is shown below and has been used to develop the final version of the concept.

8.3.1 The list of improvements

Improvement	Description
Combining easy and advanced view	To make sure the user will be offered the best possible guidance by BRAT the easy and advanced ways of creating a Business Rule need to be combined.
Using different terms in BRAT	Some terms make the concept of Business Rules combined with BRAT less accessible, easier terms and descriptions will improve the accessibility.
Term types	Adding a term type with each definition will be the first step for the user to create an ORM-model.
Easier description	Descriptions of terms related to the Business Rules concept should be better understandable to guide the user in the best way.
Business Rules check should be (partially) automated	Manual checking of a Business Rule will be a step many users will probably not use. Automating the checks will make the user check the results more often, hopefully leading to better Business Rules.
More obvious menu and extra buttons to access most important functions	The conducted tests ruled out that the way of starting to create a new rule and defining a term wasn't that obvious. To stimulate the accessibility the menu needs to be more obvious to use and some extra buttons need to be added to guide to important functions without using the menu.
Feedback after creating account	After creating a new account the user didn't get any feedback. In the second version the user will get a message of successfully creating a new account.
Technical errors	All technical errors found by the testgroup where fixed in the second version.

Table 27: List of improvements after user tests

8.3.2 Not adjusted comments

Comment	Reason
Checking definition	Checking a definition seems impossible at this point. Not only BRAT is mainly focussed on creating the actual Business Rules, also it's not possible to do a good check of created definitions. There are no real guidelines like the

ones for a BR and there are just too many different ways to define a term. For now BRAT only gives some guidance in the form of giving the user some theory about a good definition.

Table 28: Not adjusted comments from user tests

8.4 Summary

The main functionalities of the first version of the Business Rules Authoring Tool has been tested by 4 users. Every user executed 6 test cases and the results were written down. Every tester was also asked to add extra comments after executing a test case. These tests finally led to a list of possible improvements for the second version of BRAT. The final list of adjustments is shown below. In 8.3 descriptions of every adjustment have been added.

Improvement
Combining easy and advanced view
Using different terms in BRAT
Term types
Easier description
Business Rules check should be (partially) automated
More obvious menu and extra buttons to access most important functions
Feedback after creating account
Technical errors

Table 29: Summarized list of improvements

9. BRAT concept phase II

This chapter will have the final version of the BRAT concept as a result. This chapter will differ from chapter 7. Not every screenshot will be discussed again. This time the list of adjustments created in chapter 8 has defined the content. This list of the improvements which will be made in the concept can be found in chapter 8.3. Each of these improvements will be discussed in this chapter and the actual adjustments made in the BRAT concept will be shown in the screenshots

9.1 Combining easy and advanced view

To make sure the user will be offered the best possible guidance by BRAT the easy and advanced ways of creating a Business Rule need to be combined. The functionality of both ways of creating a Business Rule need to be preserved, but the user needs the possibility to choose which help is needed. The easy and advanced view will help in the beginning, but after a couple of business rules the user will not use the easy view anymore because he/she thinks the creation is easy and clear. Combining the views will stimulate the user to make a few choices instead of skipping steps to quickly create rules.

Below is a screenshot of the new screen to create a Business Rule. As can be seen both views have been combined. When opening the screen the list of sentence structures you will be shown. The user has the possibility to directly select the wanted sentence structure. When making choices in the top part of the screen the list of possible sentence structures will become shorter and the user will be guided to the best possibility.



Figure 19: Opening screen of creating a new Business Rule

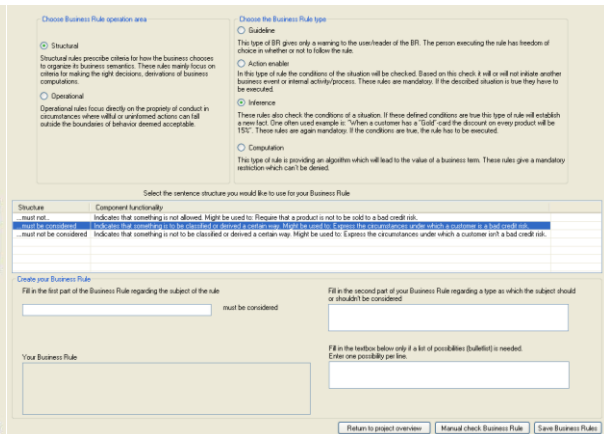


Figure 20: Creating a Business Rule using maximum guidance

9.2 Using different terms in BRAT

A few terms throughout the BRAT concept seemed to be unclear. Terms used in labels throughout the entire concept didn't actually describe the shown or needed information in the right way. Because of this these terms have been changed. A list of the changed terms is shown below. There are no screenshots shown because the wrong and corrected terms are spread throughout the entire concept.

Old term	New term
Structure	Component functionality
Error	Suspected pattern misuse

Table 30: Changed terms in the concept

9.3 Term types

During the creation of this document the option has been researched to let BRAT translate the Business Rules into an ORM model. Finally it seemed impossible at this point in time to automatically

translate the rules into a model and even to do the biggest part of the translation. As for now the user has to create the model manually, a small possibility to help the user has been handed during the tests and conversations about the first concept discussed in chapter 7. By labelling the terms in the term list as 'Relation', 'Object type' or 'Other' the first step to create a ORM-model can be implemented into BRAT. The screenshot below shows this adjustment. On the right of the screen the term can be defined and a term type needs to be selected. This way the user will start thinking about the model and can easily make the first steps of creating the actual model.

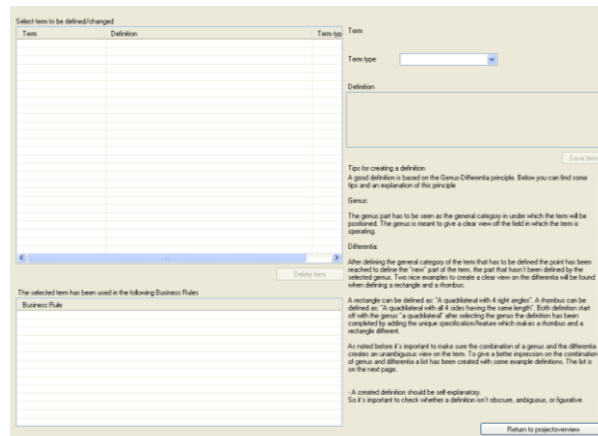


Figure 21: Defining a term including term type

9.4 Easier descriptions

In the concept some terms directly related to the Business Rules concept have been used combined with their definition. In the first version the definition from the Business Rules Manifesto were used to explain the terms, but after testing the first concept those definitions seemed not that clear to all users. Looking at the tool from the users point of view made me write new better understandable definition which, combined with the guidance function of BRAT, should make the terms clear to the future users. Below is a list of the old and new definitions used in the Business Rules Authoring Tool.

Term	Old description	New description
Structural	Structural rules prescribe criteria for how the business chooses to organize its business semantics. These rules mainly focus on criteria for making the right decisions, derivations of business computations.	Structural rules are rules helping to organize the business semantics. These rules are focussed on general situations which can be described as standard circumstances. E.g. derivations of business computations.
Operational	Operational rules focus directly on the propriety of conduct in circumstances where wilful or uninformed actions can fall outside the boundaries of behaviour deemed acceptable.	Operational rules are rules helping the business to act correctly in circumstances where actions can fall outside the boundaries of acceptable behaviour.
Action enabler	In this type of rule the conditions of the situation will be checked. Based on this check it will or will not initiate another business event or internal activity/process. These rules are mandatory. If the described situation is true they have to be executed.	This type of rule is supposed to check whether a specific situation needs to enable a follow up business event, activity or process. These rules are mandatory.
Inference	These rules also check the conditions of a situation. If these defined	This type of rule is supposed to check whether (a number of) conditions are

conditions are true this type of rule will establish a new fact. One often used example is: “When a customer has a “Gold”-card the discount on every product will be 15%”. These rules are again mandatory. If the conditions are true, the rule has to be executed.

true. Passing the check will establish a new fact. E.g. A person is a member of a club after passing al checks.

Computation

This type of rule is providing an algorithm which will lead to the value of a business term. These rules give a mandatory restriction which can't be denied.

This type of rule explains how to compute the value of a business term. They can't be denied.

Table 31: Changed descriptions in the concept

9.5 Business Rules check should be (partially) automated

This adjustment has some of the same reasons as the adjustment discussed in 9.1. Extra steps and choices which have to be made by the user will stimulate the user to think for themselves and skip one or more steps in the creation of a Business Rule. Checking if the created Business Rule follows (most of the) guidelines outlined in the Basic RuleSpeak guidelines is one of those steps which can easily be skipped. Automatically checking the created rule should stimulate the user to fix missteps during the creation of a rule. After leaving of the textboxes of a Business Rule the checks will be done. If there are guidelines which aren't followed a red button will be shown on the bottom of the screen. Clicking the button will directly show the results of the check.

Figure 22: After leaving a textbox the Business Rule will be automatically checked

9.6 More obvious menu and extra buttons to access most important functions

During the tests it became clear that it wasn't that obvious to use the menu's on top of the screen. Besides creating a better visible menu I've added a few extra buttons to use the most important features without using the menu. Below the new menu is shown.

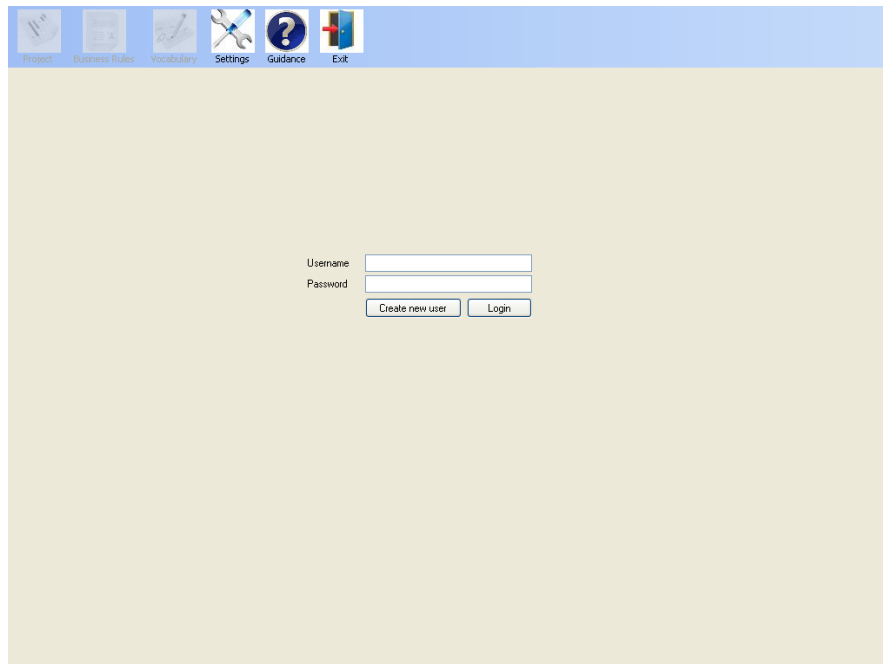


Figure 23: New menu style

The extra added buttons are:

- Create new business rule at project overview screen
- Define terms at project overview screen

9.7 Feedback after creating new account

This is actually a small change but it does provide the user with some extra feedback. Below is a screen showing the specific message box.

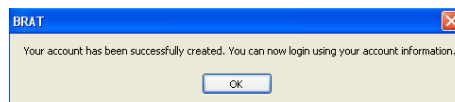


Figure 24: Added message box

9.8 Technical errors

Some small technical errors showed up while testing BRAT. All the errors where not obstructive while using BRAT. In the second version they were all fixed.

9.9 Summary

After conducting tests with a limited number of semi-experienced Business Rules users in chapter 8 a number of adjustments were supposed to be made. In this chapter the solutions to the following adjustments have been discussed:

- Combining easy and advanced view
- Using different terms in BRAT
- Term types
- Easier descriptions
- Business Rules check should be (partially) automated
- More obvious menu and extra buttons to access most important functions
- Feedback after creating new account
- Technical errors

To see the final result it's best to just use the second version of the BRAT concept. The second version can be found on the CD added in the back of this document.

10. Conclusion

This chapter will finalize this thesis. First the sub-questions formulated at the start of this project will be answered. Followed by the answer to the main research question. This chapter will conclude with some possibilities for future work in the area of Business Rules.

10.1 Evaluation of sub-questions

To answer the main research question four sub-questions were formulated while formulating this entire project. Each one of those questions will be answered below.

10.1.1 How does the process that leads to a set of Business Rules look?

While creating a Business Rule it's important to keep in mind that it's the goal to let the business create and work with the rules. To support this goal the internal knowledge of the business needs to be used at all time. On top of that it's important to remember that the rules will remain under business jurisdiction at all time. So the creation of a Business Rule is actually about combining internal knowledge, adding knowledge/rules and following the guidelines formulated by the Business Rule method.

The actual creation of a Business Rule seems to follow a number of steps. These steps will be the same for every rule. If the user wants to edit an existing rules there are some small differences from the regular roadmap. Both roadmaps will be shown below.

The creation of a new Business Rule is in one way the easiest way to start working with the concept when supported with the right guidelines and possible some kind of tool. The positive aspect is the clear mind about the rules. On top of that the creator of the rule is not trying to put all of the available experience in the rule, but just trying to stick to the available knowledge about creating a rule. This leads to the following roadmap of creating a BR.

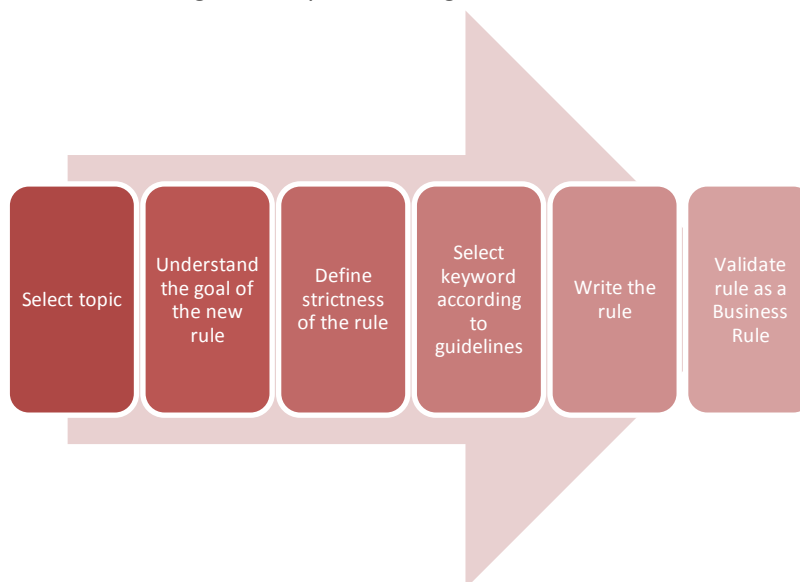


Figure 25: Creating a new Business Rule

As can be seen the final step of the roadmap is the validation of the created Business Rule. This validation exists of five main checks:

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.

After creating a Business Rule following the above steps it's important to make sure the used terms are well defined. Just the Business Rule will not be useful in all cases without defined terms.

As said before there are some small differences when editing an existing rule. The roadmap for editing a rule is listed below.

1. Select existing BR
2. Decompose existing BR to atomic BR
3. Evaluate stability of the rule: Fundamental or transient
4. Identify atomic statement as definition of term/fact/constraint/derivation
5. Make sure to understand what needs to be regulated with the soon to be created Business Rule.
6. "Choose" the level of strictness of the rule. Is it just a guideline, or is it supposed to be a rule which needs to be enforced all the time.
7. Select one of the keywords which will fit the level of strictness.
8. Write the rule.
9. Check if the rule is an actual Business Rule:

10.1.2 What are the requirements of a correct Business Rule?

There are multiple requirements of a correct Business Rule. First there are a few choices which have to be made to define the possible sentence structures. After that there's a list of possible sentence structures which are allowed in the RuleSpeak method.

The first choices which have to be made is the operational area of the rule. At this point there are two possibilities: Structural and Operational. The first is about the organization of the business semantics were the second is about the propriety of conduct in circumstances where willful or uninformed actions can fall outside the boundaries of behavior deemed acceptable.

After choosing the operational area it's important to select the type of rule which needs to be created. The choice is between: Guideline, Computation, Inference and Action enabler. Each of those types are linked to a different set of sentence structures.

Now before talking about the actual grammatical requirements there's one more requirement for a correct Business Rule. Business Rules are about the business. So it's important to keep the Business Rules and the content of these rules separated from the implementation of processes in the business. BR should be used to guard these processes, not implement them.

There are multiple tables in chapter 4 containing information about the grammatical requirements. The table below [18] is a summarized version of all grammatical requirements discussed in that chapter.

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 32: RuleSpeak grammar

To support all of the above requirements there's an extra list of do's and don'ts regarding the RuleSpeak method. Every one of them has been described in chapter 4. Below is a summarized list.

Do's and don'ts

Business Rules should be non-procedural	Starting with "if" is not good
Business Rules should not be inscrutable	Starting with a timeframe is not good
Enforcement and evaluation are separate concerns	Plural subjects are not good
Omitting a rule keyword is not good	Actor subjects are frequently not good
"Can" is not good	Non-numeric subjects for numeric thresholds is not good
Extra words for emphasis are not good	Missing subjects are not good
Free form is not good	Imperatives are not good
"To have" is often not good	Twosome words are not good
Missing facts are not good	Embedded numbers are often not good
Non-specific qualification is not good	Embedded calculations are not good
Conjunctions are often not good	Embedded conditions are often not good
"Etc." is not good	Explicit mention of processes is usually not good
CRUD is not good	"When" is often not good

Table 33: RuleSpeak do's and don'ts

10.1.3 What are the requirements of the definition of a term in the glossary corresponding to the set of Business Rules?

There's no actual method to support a user while creating definitions of terms. There is however the famous "Genus-differentia definition". This method splits every definition in two parts. The first part, the 'Genus', is about the general category under which the term will be positioned. It is meant to give

a clear view off the field in which the term is operating. For example the genus of the new Apple iMac will be “Personal Computers”.

In other words a genus is a term which has already been defined that serves as a portion of the new to be defined definition. As imaginable every definition containing the same genus will be considered as a part/member of that genus.

The Differentia part is about the ‘new’ part of the term. The genus has defined the general category, but as it is a new term which needs to be defined there’s supposed to be some differences between the general category and the specific term. These differences need to be defined in the second part of the definition.

10.1.4 In which way can the process of creating a to the Business Rules corresponding ORM-model be supported?

It’s difficult to support the creation of an ORM-model which needs to be extracted from the created Business Rules. There’s a lot of context in the Business Rules which needs to be translated. At this point in time there are no useful plug-ins or software packages which support the translation of Business Rules to a ORM-model.

The University of Birmingham does have an interesting piece of technique called SBVR2OCL. This package is able to translate a SBVR Business Rule into Object Constraint Language constraints (OCL) with respect to a Unified Modelling Language (UML) class model using the Model Drive Architecture (MDA) technology. Having done this translation the creation of a UML model isn’t that hard anymore. Unfortunately this technique is not ready for RuleSpeak and ORM at this time leaving us with a small piece of extra information in the Business Rules Authoring Tool closing the gap between Business Rules and ORM a little bit. This extra information is the addition of a term type to every term. These term types are linked to the concepts from the ORM method and lets the user think about the model in an early stage and it will actually help the user to create the actual ORM model quicker.

10.2 Answering the research question

After answering every sub-question and summarizing this thesis it’s time to formulate an answer to the main research question. The main question as formulated in the beginning of this projects was as follows:

“How can a text-based tool give optimal support whilst creating and/or revising a set of Business Rules and the corresponding glossary?”

Optimal support is difficult to achieve, maybe it’s even impossible to achieve because of the different preferred levels of guidance of the possible group of users. There is however a possibility to define some guidelines to help creating tools which will guide the user through the process of creating a set of Business Rules. First of all it’s my opinion and experience that the user should get a limited amount of possible structures of a Business Rule. Yes, a limited number of possible structures could make it difficult to create every rule following the RuleSpeak guidelines, but creating a structure for every situation will not guide the user in the right direction and on top of that there is a bigger chance of rules which do not fulfil the need of the business and will not guide the business to the right place.

The second subject of this conclusion seems obvious, keep IT away from the Business Rules. IT can actually help the business in a lot of ways, it can even help to create a tool like BRAT. But trying to combine IT and Business Rules while creating the set of Business Rules seems not such a good idea. It actually limits the user and the method and stimulates thinking system wise, not business wise. As an

Information Science student I can see the system thinking in a lot of software, having the goal to create a model actually has its influence on the rules which will be created. They will be, maybe even just a little bit, adjusted to fit the modelling method. Users may not notice that in the beginning, but the focus on that specific end result will definitely influence the process.

Making Business Rules accessible and understandable is also a big part of supporting the creation of a set of Business Rules and the corresponding glossary. Using difficult terms is not mandatory in any Business Rules tool, describing terms is mandatory to actually help users. The actual terms can still remain in the tool and will even help experienced user to work faster, but explanations of terms will make sure the tool is accessible to almost everybody.

After having defined some basic subjects to help the users it's time to focus on the tooling itself. I think KISS is one of the main abbreviations when talking about the tooling. KISS has multiple meanings a few of them are: "Keep It Simple, Stupid!", "Keep It Short and Simple" and "Keep It Simple and Straightforward". The method itself is hard enough to understand, so why bother the user with long lists of choices and hours of work before even understanding the tool which needs to be used. A limitation of possibilities and choices to be made will push the user in the right direction. The BRAT concept is based on this thought. Creating a Business Rule can be done in two steps, selecting a sentence structure, filling the blanks. That's the shortest way of creating a BR. The longest roadmap has four steps: Selecting the operational area, selecting the Business Rule type, selecting the sentence structure and finally filling the blanks. The user is also able to only use a part of the guidance. For example he can select the operational area and then immediately select the wanted sentence structure. I could have given the user 10 maybe even 20 small questions guiding them to an actual Business Rule, but it will take too much time to create an individual Business Rule and on top of that the user will not see what he/she is doing. To me, the guidance BRAT is offering may, for some users, be a bit difficult in the beginning but it will be all the guidance they need to quickly create a rule and getting to understand the used method. For the extra guidance which, in some cases, maybe needed there is the guidance function which will give some extra help and explanation of all steps.

So to sum up *"How can a text-based tool give optimal support whilst creating and/or revising a set of Business Rules and the corresponding glossary?"*:

- Limited number of choices to be made
- Limited number of possibilities per choice
- Dividing IT and business.
- Accessible and understandable information
- Freedom in the order of making choices

10.3 Possible future works

To make the concept of Business Rules, no matter what method, accessible to every business it's important to develop the concept. Doing this means lots of research remains to be done. Some of the possible future works regarding development of the concept and conducting research will be discussed below.

Starting with the development of the concept in general a few subjects were not developed enough. The whole question about translating rules into models is actually not supporting the goal of the concept, in contrary, models like ORM are mainly used by technical employees. Businessmen will most likely not understand the biggest part of those models. The goal to automatically create a model from a set of rules therefore is actually only about the IT perspective, not the business

perspective. Furthermore there are possibilities to further develop the grammar of RuleSpeak. The version of the grammar used in this thesis is limited, but in my opinion a limited grammar also has its benefits. One of the main problems in creating Business Rules seems to be the grammar used by businessmen. They tend to create rules which are not strict and leave room for own thoughts. A limited grammar may feel as a restriction, but in the end the rules, and the business, will benefit from this limited possibilities and a stricter set of rules. Nevertheless developing the grammar can lead to an improvement of the concept.

The Business Rules Authoring Tool created during this project is just a concept. It's one way of supporting a user in the creation of Business Rules, but further development of this concept tool is needed to make is actually useful for businesses and even different ways of supporting the users will be possible. Further research is the best way of supporting the users, more advanced checks of created Business Rules and implementation of Business Rules in different software packages will be useful in the future. The checks in the BRAT concept are all focused on the grammatical part of the Business Rule, an interesting feature for tools will be checks of the actual content of a rule and the consistency between the whole set of rules.

The concept of Business Rules has developed a lot since the introduction, but more development is needed to make to concept more mainstream and more accessible to non-IT users.

Glossary

Term	Definition
Business Rule (BR)	A Business Rule is a statement that defines or constrains some aspect of the business, but it cannot be broken down or decomposed further into more detailed Business Rules.
Business Rule statement	A declarative statement of structure or constraint which the business places upon itself or has placed upon it.
Category	A class of things whose meaning is more restrictive than, but otherwise compliant with, some other class of things. [22]
Common term	Words in everyday language using their commonly-accepted meaning e.g car, city etc. They are taken as axiomatic to avoid writing circular definitions.
Fact	An assertion of two or more terms. Note that while not all terms need to be reflected in some fact. Each business term recorded must be used in one or more facts.
Formal rule statement	An expression of a Business Rule in a specific formal grammar.
Glossary	Defined business terms.
Infix notation	Using the infix notation means that the operators stand in-between the sentence/formula e.g. "X + Y"
Policy	A general statement of direction for an enterprise.
Prefix notation	Using the prefix notation means that the operators stand in front of a sentence/formula e.g. "+ X Y"
Structural assertion	A statement that something of importance to the business either exists as a concept of interest or exists in relationship to another thing of interest.
Vocabulary	Defined business terms.

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Appendix A – Code sample

Below is a code sample of the first version of the BRAT concept. This sample contains the code to export the Business Rules and vocabulary to a Microsoft Excel or text file.

```
Private Sub createpdf_Click(sender As System.Object, e As System.EventArgs)
Handles createpdf.Click

If rulelist.Items(0).SubItems.Count > 1 And ermlist.Items(0).SubItems.Count
> 1 Then
    Dim ExcelObj As Object
    Dim ExcelBook As Object
    Dim ExcelSheet As Object
    Dim i As Integer

    ExcelObj = CreateObject("Excel.Application")
    ExcelBook = ExcelObj.WorkBooks.Add
    ExcelSheet = ExcelBook.WorkSheets(1)

    With ExcelSheet
        .cells(1, 1) = "Rule nr."
        .cells(1, 2) = "Business Rule"

        For i = 0 To rulelist.Items.Count - 1
            .cells(i + 2, 1) = i + 1
            .cells(i + 2, 2) = rulelist.Items(i).SubItems(2).Text
        Next

        Dim rules, rules2 As Integer

        rules = rulelist.Items.Count + 3
        rules2 = rules + 2

        .cells(rules, 1) = "Term nr."
        .cells(rules, 2) = "Term"
        .cells(rules, 3) = "Definition"
        .cells(rules, 4) = "Term type"

        For i = 0 To termlist.Items.Count - 1
            .cells(i + rules, 1) = i + 1
            .cells(i + rules, 2) = termlist.Items(i).SubItems(1).Text

            If termlist.Items(i).SubItems.Count > 2 Then
                .cells(i + rules, 3) = termlist.Items(i).SubItems(2).Text
                .cells(i + rules, 4) = termlist.Items(i).SubItems(3).Text
            End If

        Next
    End With

    ExcelObj.Visible = True

Else
    MsgBox("An export to Excel can only be made if there are rules/terms
defined")
End If

End Sub
```

```

Private Sub exporttext_Click(sender As System.Object, e As
System.EventArgs) Handles exporttext.Click

If rulelist.Items(0).SubItems.Count > 1 And
Termlist.Items(0).SubItems.Count > 1 Then
    Using sw As New IO.StreamWriter("Projectoverview.txt")

        Dim line As String
        Dim i As Integer

        line = "Created Business Rules" + vbCrLf + vbCrLf

        For i = 0 To rulelist.Items.Count - 1
            line &= rulelist.Items(i).SubItems(2).Text + vbCrLf
        Next

        line = line + vbCrLf + vbCrLf + "Defined terms" + vbCrLf +
vbCrLf

        For i = 0 To termlist.Items.Count - 1
            If termlist.Items(i).SubItems.Count = 2 Then
                line &= termlist.Items(i).SubItems(1).Text + " - " +
vbCrLf
            Else
                line &= termlist.Items(i).SubItems(1).Text + " - " +
termlist.Items(i).SubItems(2).Text + " - " +
termlist.Items(i).SubItems(3).Text + vbCrLf
            End If
        Next

        sw.WriteLine(line)

        MsgBox("A text file has been saved in your installation folder")

    End Using
Else
    MsgBox("An export to a text file can only be made if there are
rules/terms defined")
End If
End Sub

```

Appendix B – Business Rules Authoring Tool

Below a disc has been added containing the digital version of this document and the final version of the BRAT concept.