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Business Rules

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Literature

This chapter is mainly based on the following literature:

- Bridgeland David M.; Zahavi, Ron (2009): Business Modeling - A Practical Guide to Realizing Business Value. Morgan Kaufman Publishers. Chapter 6

Business Rules - Definitions

A Business Rule is a directive, intended to influence or guide business behavior, in support of Business Policy that has been formulated in response to an Opportunity, Threat, Strength, or Weakness.

(www.**brportal**.org)

A business rule is a statement that defines or constrains some aspect of the business. It is intended to assert business structure or to control or influence the behavior of the business.

(www.**businessrulesgroup**.org)

Business rules may be

- defined as business definitions for business use (to represent policies, practices and procedures), or
- defined as executable business rule statements for use in some ruledriven system, or
- both.

(http://www.**omg**.org/attachments/pdf/PaulHarmonBParticle.pdf)

Examples

Charging for Orders: It is obligatory that a party is charged for a menu item if the party orders the menu item and the menu item is served to the party

Splitting Bills: It is permitted that a server may split a bill only if the party agrees to bill splitting and the bill is split equally.

Greenback Only: It is obligatory that each cash payment employ US currency

No Checks: It is prohibited that a payment employ a personal check

VISA Only: It is permitted that a payment employ a credit card only if the credit card is backed by VISA™.

The Importance of Rules

- Often, business rules are not accessible or even unknown
- When rules are unaccessible or unknown, people (including business developers) make assumptions that might be incorrect of inconsistent which leads to behaviour that is
  - ♦ not effectively focused on common objectives
  - ♦ not capable of easy changes and adaptibility
- Such assumptions lead to behaviour that is not effectively focused on common objectives

(von Halle 2002, p. 4)

Four Principles of the Business Rules Approach

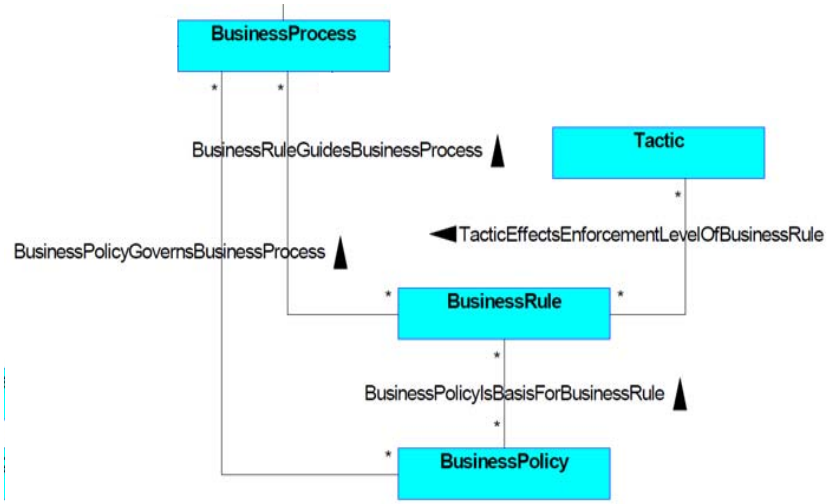
The business needs systems in which rules are …

- … *separated* from other components so that everybody knows *that* they exist
- … *externalized* so everybody knows *what* the rules are
- … *tracable* to their origins and their implementation so everybody knows *where* they come from
- … deliberately *positioned for change* so everybody knows *how to improve* them

(von Halle 2002, p. 4)

Business Rules According to BMM

- Business Rules provide specific, actionable guidance to implement Business Policies.
  - some Business Rules could be automated in software;
  - some are actionable only by people.
- 'Business Rule' participates in the following associations:
  - is derived from Business Policy,
  - may guide Business Processes,
  - may have an enforcement level effected by a Tactic.



Why Business Rules (1)

Some frequently mentioned reasons for Business Rules:

- Motivation: Rational Enterprises
  - ♦ Enterprises should be able to say why they act in a particular way
  - ➢ *Motivated rules are derived from policies and support the achievement of goals and objectives (see BMM)*
- Agility
  - ♦ Changes in business often demand flexible adaptation of business processes and IT systems
  - ➢ *Business Rules can make the dependencies of solutions explicit*
- Regulatory Compliance
  - ♦ More and more enterprises have to ensure that they observe the laws and regulations
  - ➢ *Regulations and laws have an impact on the business rules – which represent guidance for people and requirements for software systems*

Why Business Rules (2)

- Communicate guidance to company employees
- Specify requirements for application software
- Business rules can be directly executed
- Knowledge Management: capture knowledge
- Training and learning for both recently recruited employees

Structural and Operative Business Rules

- A first distinction is between
  - Operative Business Rules
  - Structural Business Rules
- Operative Business Rules describe *what should be*
  - Obligation Statements
  - Prohibitive statements
  - Restrictive Permissive Statements

  Operative Rules can be violated and must be enforced
- Structural Business Rules are definitional, they describe *what is*
  - Necessity Statements
  - Impossibility Statements
  - Restricted Possibility Statement

  Structural Business Rules cannot be violated, they are always true

Obligation Statements

- Many business rules oblige people (or software application to ensure that something is true. This is expressed by obligation statements.
- Structure of a simple obligation statement:

It is obligatory that	mandatory situation

- Example of an obligation statement:

Greenback Only: It is obligatory that each cash payment employ US currency

- The obligation rules says that the persons (or software applications) have the obligation make the mandatory come true.
  - An obligation statement implicitly acknowledges the possibility that a person (or software application) might attempt not to follow the rule.

Obligation Statements

- In general, obligation statements can include a condition

It is obligatory that	mandatory situation	*if*	condition

- The condition is the scope of when the mandatory situation actually applies
- Examples:

Greenback Only B: It is obligatory that each cash payment employ US currency if the payment amount of the cash payment is at least 20 dollars

Greenback Only C: It is obligatory that each cash payment employ US currency if the cash payment is applied to a bill and the amount of the bill is at least 20 dollars

Both rules have the same mandatory situation „each cash payment emply US currency“ but different conditions

Prohibitive Statements

- Prohibitive statements are meant to prevent a specific situation.

It is prohibited that	banned situation

- Prohibitive statements can have conditions, too.

It is prohibited that	banned situation	*if*	condition

- Examples:

No Checks: It is prohibited that a payment employ a personal check

No Loonies: It is prohibited that a cash payment employ Canadian currency

No Loonies B: It is prohibited that a cash payment employ Canadian currency if the cash payment is applied to a bill and the amount of the bill is at least 20 US dollars

Restricted Permissive Statements

- A restricted permissive statement allows something but restricts the condition under which it is allowed

It is permitted that	permitted situation	*only if*	restriction

- Example:

Euros Allowed: It is permitted that a cash payment employ European Union currency only if the cash payment is applied to a bill and the amount of the bill is at most 100 US dollars

- In contrast to the conditions in obligation and prohibitive statement, which are optional, the restriction in the permissive statement is required (because otherwise the whole rule would be unnecessary)
- A restricted permissive statement is violated, when the permitted situation is true even though the restriction is false.

Categories of Operative Business Rules

A common classification distinguishes 3 categories of rules

- Constraints
  - Rules making assertions that have to be true, they reject any event that would cause a violation to occur
- Inference Rules
  - Rules deriving new information from existing information
- Process Rules
  - Rules enabling, enforcing or preventing actions

Necessity Statements

- A necessity statement represents a definition, is something that remains true.

It is necessary that assured situation

It is necessary that assured situation *if* condition

- Necessity statements express structural business rules that express
  - truth about the world or
  - truth about the way the organisation defines the world
- Examples:

Single Payment Network: It is necessary that a credit card is backed by exactly one payment network

Large Party: It is necessary that a party is large if the size of the party is at least 8.

A necessity statement looks similar to an obligation statement, but in contrast to an obligation statement it cannot be violated and need not be enforced.

Impossibility Statements

- Impossibility statements are structural rules. They state what is always false

It is impossilble that	incorrect situation

- Impossibility statements can have conditions.

It is impossible that	incorrect situation	*if*	condition

- Examples:

Single Payment Network B: It is impossible that a credit card is backed by two payment networks.

Vegetarian Menu Items: It is impossible that a vegetarian menu inlcudes an ingredient if the ingredient is meat or the ingrediant is fish

Restricted Possibility Statements

- A restricted possibility statement is a structural statement describes what can be true under certain conditions

It is possible that	suitable situation	*only if*	restriction

- Example:

Vegetarian Menu Items B: It is possible that a vegetarian menu inlcudes an ingredient only if the ingredient is not meat or the ingrediant is not fish

The Six Business Rules Forms

should be true but can be violated and must be enforced

what should not be by policy

what is permitted

Operative Rule Form	Operative Rule Example	Structural Rule Form	Structural Rule Example
Obligation statement	*It is obligatory that each cash payment employ US currency if the cash payment is applied to a bill and the amount of the bill is at least 20 dollars.*	Necessity statement	*It is necessary that a party is large if the size of the party is at least 8.*
Prohibitive statement	*It is prohibited that a cash payment employ Canadian currency if the cash payment is applied to a bill and the amount of the bill is at least 20 dollars.*	Impossibility statement	*It is impossible that a vegetarian menu item includes an ingredient if the ingredient is meat or the ingredient is fish.*
Restricted permissive statement	*It is permitted that a cash payment employ European Union currency only if the cash payment is applied to a bill and the amount of the bill is at most 100 dollars.*	Restricted possibility statement	*It possible that a vegetarian menu item includes an ingredient only if the ingredient is not meat and the ingredient is not fish.*

always true by definition, cannot be violated

something that cannot be true by definition

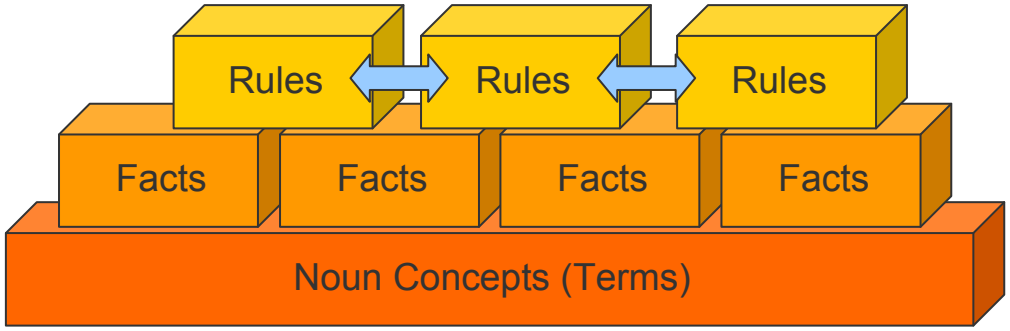
what is possible

All starts with terms and facts

„The work that results in successful business rule discovery, analysis, modeling, and implementation all starts with term and fact identification and term-fact modeling.

[…] business terms are words and phrases that have meaning to business people in the context where those terms are used.

Facts are combinations of business terms that describe what business people know about their business.“



Oscar Chappel: Term–Fact Model

Quelle: Oscar Chappel: Term–Fact Modeling, the Key to Successful Rule-Based Systems.
URL: http://www.brcommunity.com/b250.php

Noun Concepts

- Just like any sentence, business rules contain nouns
  - words or word phrases describing persons, places, things, or abstract ideas
- The meaning of a noun is called a *noun concept*
- Every noun concept used in a rule must be defined in a business rule model
  - If a term is a common term, the definition can be taken from a dictionary
  - For specific terms you can create your own definitions

Noun Concepts - Examples

- Definition of a Noun concept

> ***cash payment***
> *Definition:* ***payment*** *that employs* ***cash***

  - ♦ A cash payment is a specialisation; any payment that employs cash is a cash paymen

- Two noun concept definition from a dictionary

> ***payment***
> *Definition: an amount paid*
> — American Heritage Dictionary of the English Language, Fourth Edition

> ***cash***
> *Definition: money in the form of bills or coins; currency*
> — American Heritage Dictionary of the English Language, Fourth Edition

Noun Concepts and Structural Rules

- A noun concept can be detailed with a structural rule
- Structural Rules cannot be violated and thus can be used as definitions
- Example: The following rule can be regarded as a definition of the noun concept „separated party“: A separated party mus be seated at two or more tables, otherwise it is not a separated party

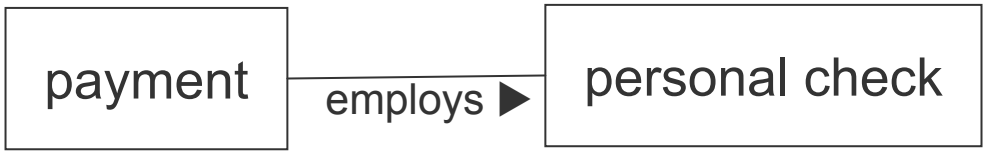
Parties 1: It is necessary that a separated party is seated at two or more tables

Fact Types

- Fact types characterize the way noun concepts may be related.
- Fact types can be visualized as fact-type diagrams
- A fact type can be used in many rules
- Example:
  - The following diagram says that any rule that includes the noun concept payment and the noun concept personal check can relate those two noun concepts via the verb employs

Fact Types and Rules

The same fact type can be used in many rules



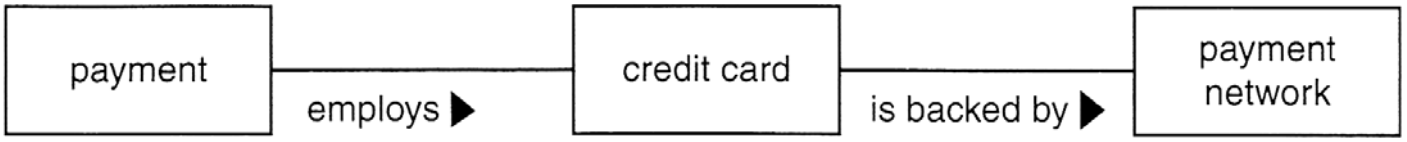
Potential Rule	Interpretation
It is obligatory that a payment employ a personal check.	For that odd restaurant that requires all payments be made in personal checks.
It is permitted that a payment employ a personal check only if the personal check is drawn on a local back.	A personal check is acceptable if another condition holds: the check is local.
It is obligatory that a customer be photographed if the customer makes a payment and the payment employs a personal check.	For the careful restaurant that wants to collect forensic evidence from customers who might bounce checks.

Multiple Fact Types

- A business rule can be build on more than one fact type
- Example:
  - The rule VISA Only is build on two fact types

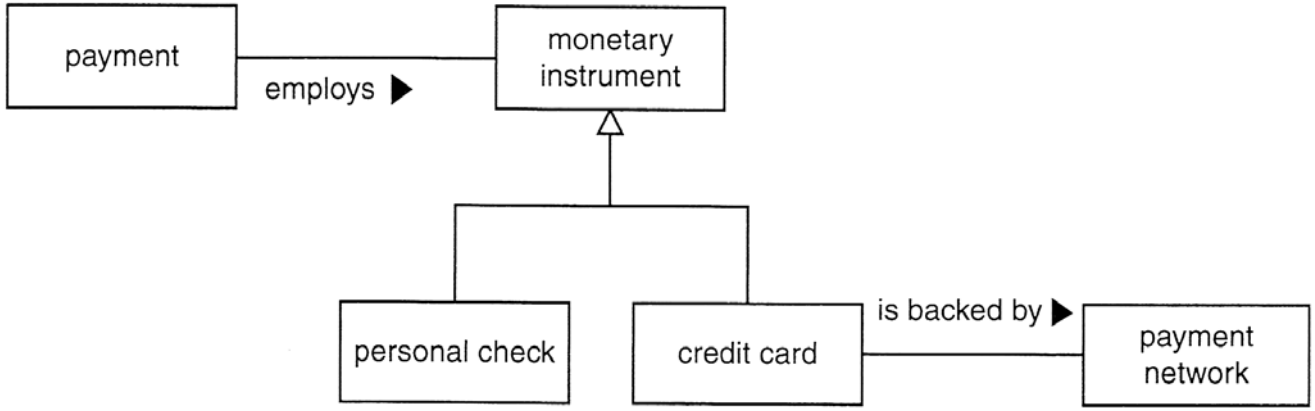
> **VISA Only:** It is permitted that a payment employ a credit card only if the credit card is backed by VISA™.

  - Fact Types can be combined into one diagram



Fact Type Diagrams

- The following fact type diagram contains fact types for several rules
- It consists of noun concepts, verbs and a specialisation



- Note the correspondence of fact type diagrams to UML class diagrams:
  - noun concepts correspond to classes
  - verbs correspond to associations

Fact Type Consistency

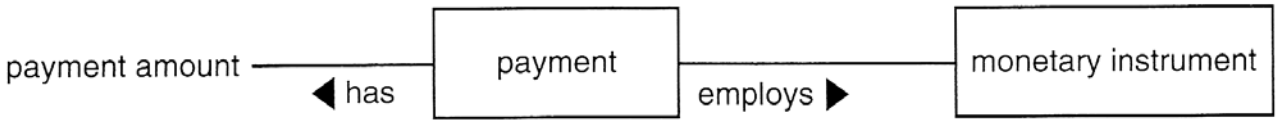
- Business rules should be easy to understand and written precisely – avoiding misinterpretation as fas as possible.
- Therefore the business rules of an organisation should use a coherent set of fact types
- For example, no two different verbs should be used to name the same association between noun concepts
- Also, fact types can also be defined, too, in a business rules model.

Fact Type Properties

- Consider the following rule:

> **One Monetary Instrument:** It is prohibited that a payment employ more than one monetary instrument if the amount of the payment is less tha $50.

- This rules is build on two fact types
  - payment employs monetary instrument
  - payment has payment amount
- A payment amount is special: it is a property of a payment: Without a payment there is no payment amount.
- It could be a convention, to use a specifc verb „has“ to indicate properties and to distinguish them from other associations.



Enforcement

- A rule does not specify
  - how strict it has to be followed
  - who enforces the rule
  - what happens when it is violated
- Example:

> **Greenback Only:** It is obligatory that each cash payment emply US currency

  - It can be strictly enforced with severe penalties (strict constraint) or be merely a recommendation (guideline)
  - It can be enforced by the servant or by the restaurant manager

Enforcement Level

- A Business Rule has an enforcement level, which indicates the severity of action imposed to put or keep a rule in force
- The level of enforcement is separated from the rule itself
- Negative Example:

> **Nonrule 3:** It is obligatory that each menu include at least two vegetarian entrees, unless an exception is authorized in advance by Mykonos Headquarters

- Positive Example

> **2 Vegetarian Entrees:** It is obligatory that each menu include at least two vegetarian entrees
>
> *Enforcement level*: pre-authorized

Examples of Enforcement Levels

The following tables from the Business Motivation Model shows possible ranges of enforcement levels from “strictly enforced” to “guideline”

Value	Meaning
strictly enforced	If the rule is violated, the penalty is always applied..
deferred enforcement	Strictly enforced, but enforcement may be delayed — e.g., waiting for resource with required skills.
pre-authorized override	Enforced, but exceptions allowed, with prior approval for actors with before-the-fact override authorization.
post-justified override	If not approved after the fact, you may be subject to sanction or other consequences.
override with explanation	Comment must be provided when the violation occurs
guideline	Suggested, but not enforced.

Separating Enforcement Levels from Rules

- Advantages of separating enforcement levels from rules:
  - enforcement level of a rule usually change more often than the rule itself
  - a rule can have different enforcement levels for different parts of the organisation

    Example: As there are mor vegetarians in California than in Texas, The Mykonos management might decide to set the enforcement to strict for California restaurants and to overreice for restaurants in Texas.
- Enforcement levels influence behaviour rather than control it
  - A strictly enforced constraint that is violated means "Error"
  - A guideline that is violated means "Warning"

Rule Violations

- A business rule is said to be violated, when an event or state occurs that should not, according to the rule.
- An operative rule can be violated – a structural rule can not
- Examples:

No Checks: It is prohibited that a payment employ a personal check

Vegetarian Menu Items B: It is possible that a vegetarian menu inlcludes an ingredient only if the ingredient is not meat or the ingrediant is not fish

- Enforcement levels influence behaviour rather than control it
  - A strictly enforced constraint that is violated means "Error"
  - A guideline that is violated means "Warning"

Directly Enforceable Rules

- A rule is directly enforceable if someone who sees some behavior can decide whether the rule is violated
- Example:
  - This rule is not directly enforceable

    Nonrule 1: It is obligatory that the gratuity is at least 15% if the gratuity is applied to a bill and the bill is incurred by a party and the party is large.

  - This rule is directly enforceable

    Large party gratuity: It is obligatory that the gratuity is at least 15% if the gratuity is applied to a bill and the bill is incurred by a party and the party is greater tha 7 people.

Alternatively, the noun concept large party could be defined as a party with 7 or more people

What should a Rule say?

- Business Rules should be concerned only withh the conditions that must apply in a defined state
- In particular, a business Rule should define what should be the case and should **not** prescribe
  - *Who* invokes the rule
    - This is usually described in a use case or a process description
  - *When* the rule is executed
    - This is usually described in a business event, use case or a process description
  - *Where* the rule executes
    - This will be defined in the design
  - *How* the rule is implemented
    - This will be defined in the design

Levels of Expression

- For expressing rules there is a trade-off between acessibility of business meaning and desirable automation
- Rules can be expressed on various levels:

Informal: natural language statements within a limited range of patters, e.g.

> It is obligatory that a credit account customer is at least 18 years old

Technical: Combining structured data references, operators and constraint natural language, e.g.

```
CreditAccout
  self.customer.age >= 18
```

Formal: statements conforming a more closely defined syntax with particular mathematical properties, e.g.

```
{X, Y, (customer X) (creditAccount Y) (holder X,Y)
  ==> (ge (age X) 18)
```

(Morgan 2002, p. 63)