

Business Rules

Knut Hinkelmann



Learning Objective

- Topic: Influencing and guiding business behavior with business rules
- We do it because enterprises
 - ◆ want to be consistent in their decisions and their behaviour
 - ◆ have to ensure that they are compliant with law and regulations
 - ◆ want to be agile in the adaptation of systems and business processes
 - ◆ want to guide employees on what to do and what not to do
- Objective
 - ◆ You can distinguish different kinds of business rules
 - ◆ are able to define business rules
 - ◆ understand the role of business rules in enterprises

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
- OMG Semantics for Business Vocabulary and Business Rules – SBVR, <http://www.omg.org/spec/SBVR/1.0/PDF>

Business Rules - Definitions

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)

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)

Examples of Business Rules

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™.

Structural and Operative Business Rules

- A first distinction is between
 - ◆ ***Operative*** Business Rules
 - ◆ ***Structural*** Business Rules
- ***Operative*** Business Rules describe *what should be*
 - ◆ Operative Rules can be violated and must be enforced
- ***Structural*** Business Rules are definitional, they describe *what is*
 - ◆ Structural Business Rules cannot be violated, they are always true

Kinds of Structural and Operative Business Rules

There are three ways to phrase each of the the two kinds of Business Rules

- Operative Business Rules describe *what should be*
 - ◆ Obligation Statements
 - ◆ Prohibitive statements
 - ◆ Restrictive Permissive Statements
- Structural Business Rules are definitional, they describe *what is*
 - ◆ Necessity Statements
 - ◆ Impossibility Statements
 - ◆ Restricted Possibility Statement

Operative	Structure
Obligation	Necessity
Prohibition	Impossibility
Restrictive Permission	Restricted Possibility

Obligation Statements

- Many business rules oblige people (or software applications) 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 to make the mandatory situation 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
- Example:

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

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)

Structural Rules: Necessity Statements

- A necessity statement represents a definition, it 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.

Structural Rules: Impossibility Statements

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

It is impossible 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 includes an ingredient if the ingredient is meat or the ingredient 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 includes an ingredient only if the ingredient is not meat or the ingredient is not fish

The Six Business Rules Forms

Operative Rule Form	Operative Rule Example	Structural Rule Form	Structural Rule Example
Obligation statement	<i>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.</i>	Necessity statement	<i>It is necessary that a party is large if the size of the party is at least 8.</i>
Prohibitive statement	<i>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.</i>	Impossibility statement	<i>It is impossible that a vegetarian menu item includes an ingredient if the ingredient is meat or the ingredient is fish.</i>
Restricted permissive statement	<i>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.</i>	Restricted possibility statement	<i>It possible that a vegetarian menu item includes an ingredient only if the ingredient is not meat and the ingredient is not fish.</i>

should be true but can be violated and must be enforced

what should not be by policy

what is permitted

always true by definition, cannot be violated

something that cannot be true by definition

what is possible



Usage of Business Rules

- Part of ***Business Processes***
 - ◆ constraining behaviour in activities
 - ◆ guiding decision making
- Part of ***Software Systems***
 - ◆ Integrity constraints
 - ◆ Automating decision making
- Part of the ***Business Motivation***
 - ◆ derived from Business Policies
 - ◆ governing Strategies
 - ◆ ...

Operative Business Rules

Categories of Operative Business Rules

- The distinction between Obligation, Prohibitive and restrictive Permissive Statement is because of the form
- Another classification can be made because of what the rules express. 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

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 includes an ingredient only if the ingredient is not meat or the ingredient is not fish

- How to react on rule violations is defined by rule enforcement

Rule Enforcement

- An operative business rule has an enforcement level, which indicates the severity of action imposed to put or keep a rule in force
- Example:

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

- ◆ The rule 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

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 are allowed, if the exception is authorized before the rule is violated.
post-justified override	An exception is allowed to the rule if the exception is approved after the violation. If the rule is violated and an exception is not later approved, the violator may be subject to sanction or other consequences.
override with explanation	The rule may be violated as long as the violator provides an explanation
guideline	The rule is a suggestion, but not enforced.

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 than 7 people.

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

Separating Enforcement Levels from Rule Statements (1)

- An operative itself rule does not specify
 - ◆ how strict it has to be followed
 - ◆ who enforces the rule
 - ◆ what happens when it is violated
- The level of enforcement is separated from the rule statement 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

Separating Enforcement Levels from Rule Statements (2)

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

Example: As there are more vegetarians in California than in Texas, the Mykonos management might decide to set the enforcement level for the "2 Vegetarian Entrees" to *strict* for California restaurants and to *override* 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"

What should a Rule say?

- Business Rules should be concerned only with 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
 - ◆ *How* the rule is enforced
 - This will be defined by the enforcement level

Places, People and Time in Business Rules

- Consider the rule

Bonus rule: It is obligatory that during the final quarter, all managers based in Texas receive a bonus.

What does it say about the who, when and where?

Why Business Rules

Software Requirements

- ◆ Capture constraints on behaviour of a system
 - *Business Rules allow for structured representation of constraints which are less ambiguous than text*

Knowledge Management

- ◆ Capturing and preserving knowledge
 - *Business rules are a good form to capture much of the implicit knowledge that organisations want to preserve*

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*

Agility

- ◆ Changes in business demand flexible adaptation of business processes and IT systems
 - *Business Rules represent small entities of knowledge and are easier to change than software systems and business process models*

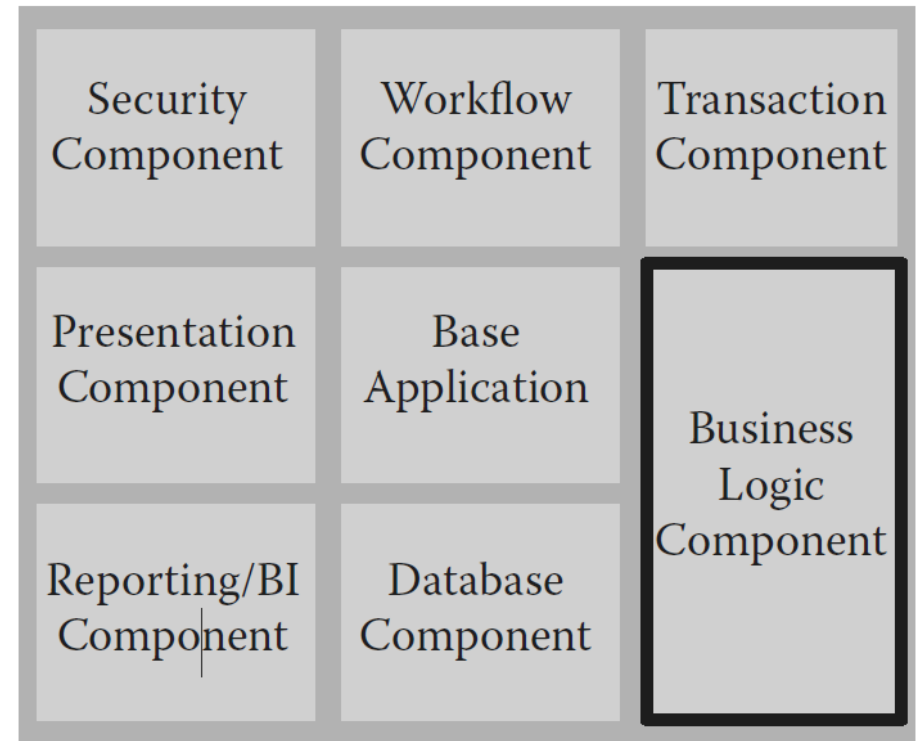
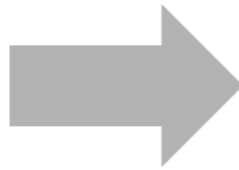
Communication, Training and Learning

- ◆ Guiding employees on what to do and what not to do
 - *When rules are unaccessible or unknown, people (including business developers) make assumptions that might be incorrect. This can lead to inconsistent behaviour that is not effectively focused on common objectives*

Why separate Business Rules: Teasing out the "big ball of mud"



"Big Ball of Mud"



Separated Application Component

Source: Adapted from Ken Orr "Putting Data into SO A," Cutter Consortium, Business Intelligence Vol. 7, No 11.
Taking from B. von Halle, Jeffrey Goldberg "The Decision Model" Chapter 1, p. 5

Where are the Business Rules today?

- Head of people
- Intranet
- Word and Excel
- Business process models
- IT systems
 - ▶ Business Rules are coded in PL/1, Java, PLSQL, code tables, parameter files, database schema, ...

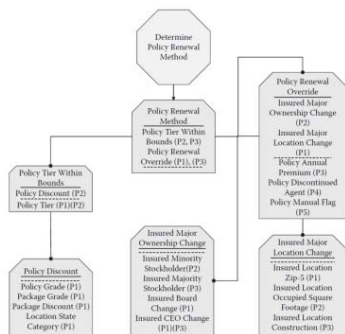
Goals:

- Visibility of Business Logic (Business Rules)
- Maintainability of Business Logic (Business Rules)

Notations for Business Rules

It is obligatory that each driver of a rental is qualified.

Decision table:



Printer troubleshooter

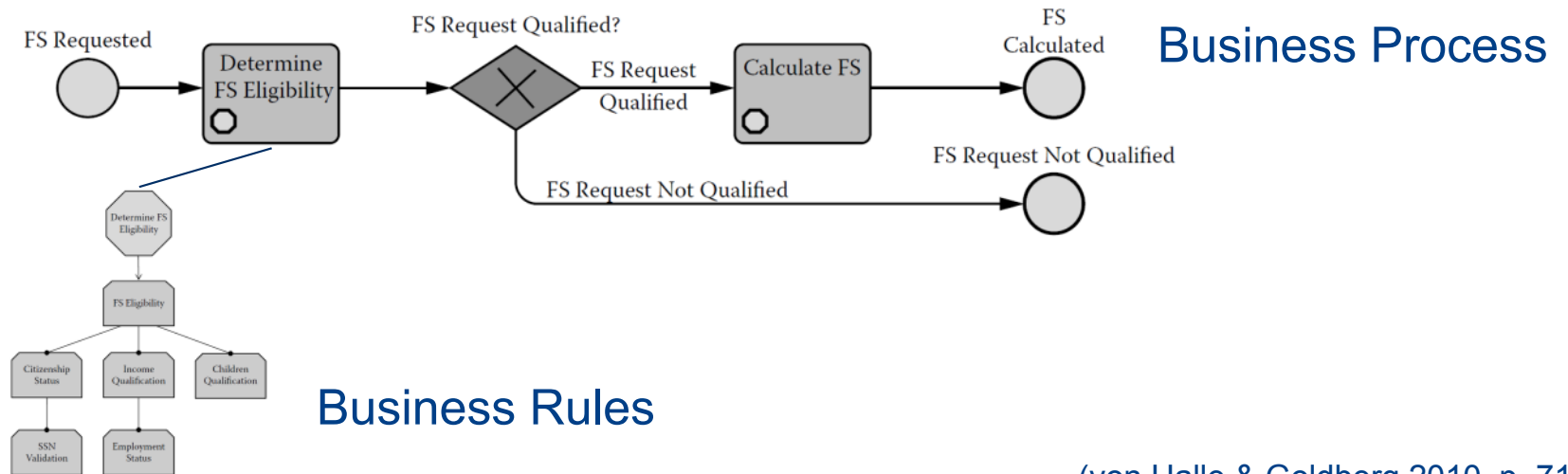
		Rules							
Conditions	Printer does not print	Y	Y	Y	Y	N	N	N	N
	A red light is flashing	Y	Y	N	N	Y	Y	N	N
	Printer is unrecognised	Y	N	Y	N	Y	N	Y	N
Actions	Check the power cable			X					
	Check the printer-computer cable	X		X					
	Ensure printer software is installed	X		X		X		X	
	Check/replace ink	X	X			X	X		
	Check for paper jam		X		X				

Decision tree:

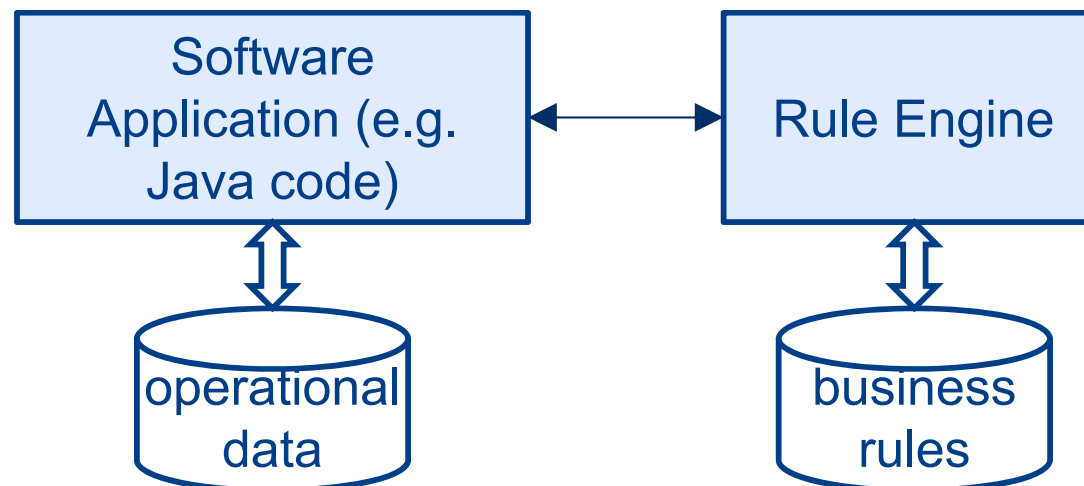


- Decision Rules can be represented, for example, in
 - ◆ SBVR Structured English/Rule Speak
 - ◆ Decision Tables
 - ◆ Decision Trees
- A catalogue or list of textual business rule statements is hard to manage
- Declarative decision models are more adequate for management of business (decision) rules.

Separating Business Rules from Process Models and Software Systems



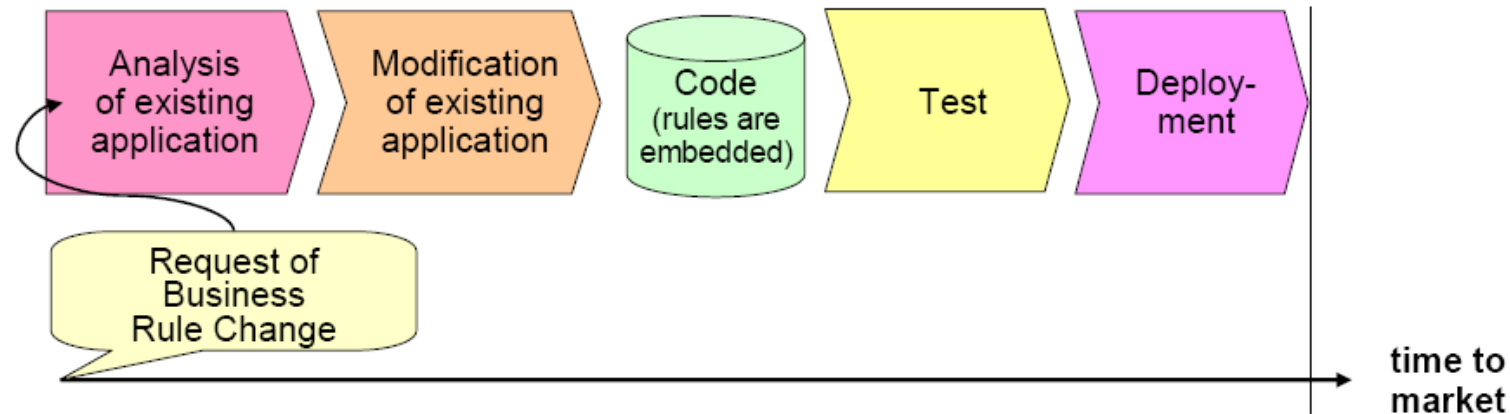
(von Halle & Goldberg 2010, p. 71)



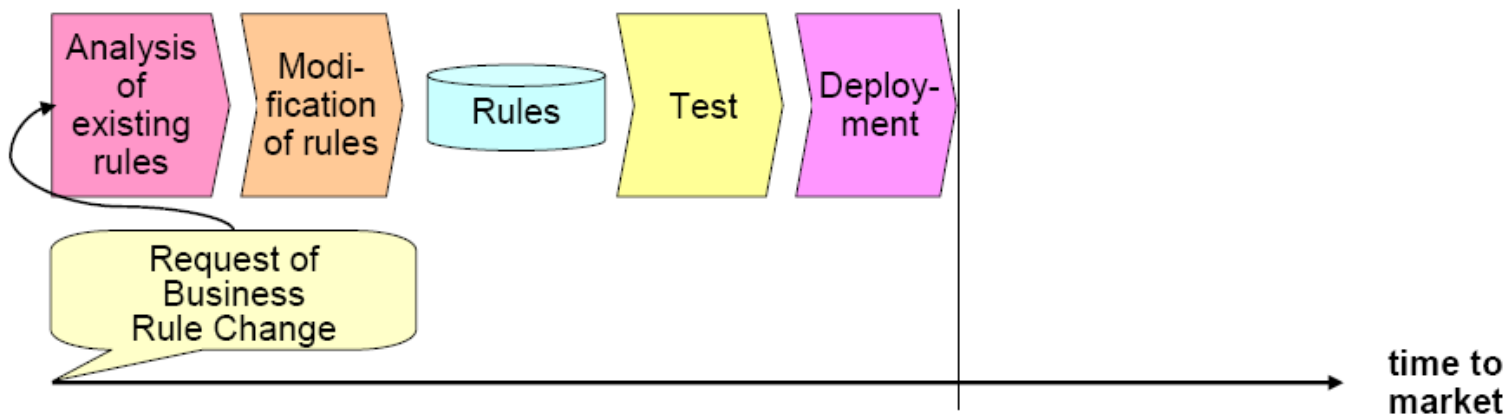
Business Rules and Software Validation

Assumption: An existing BR has to be changed

Option 1: Rules are embedded in application software



Option 2: Rules are managed and executed via a BRE (code remains unchanged)

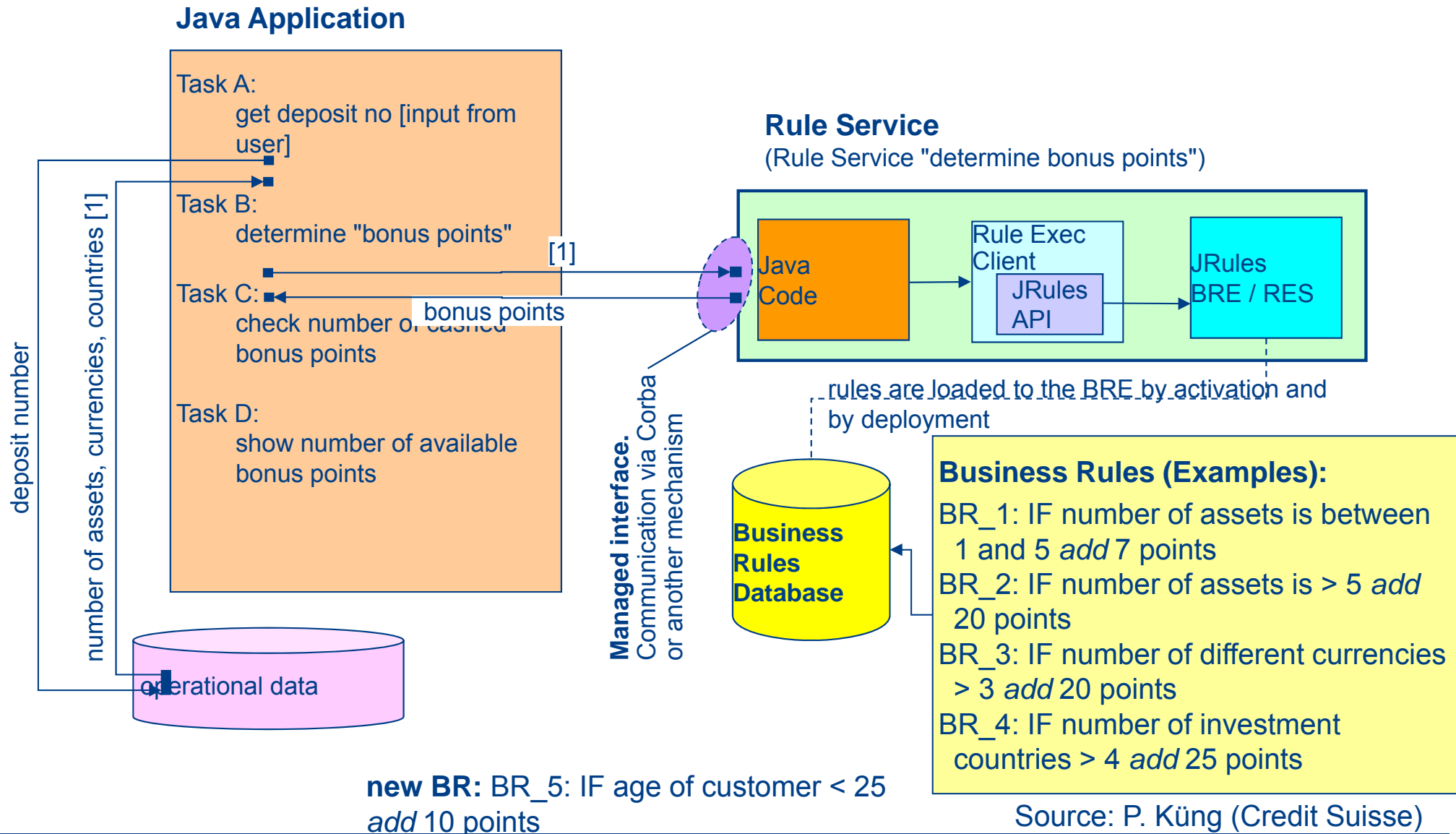


Source: P. Küng (Credit Suisse)

- ## BRE-based application



Interaction between Java Code, BRE-based Rule Service, and BR Database (a simplified example)



Source: P. Küng (Credit Suisse)

Structural Rules

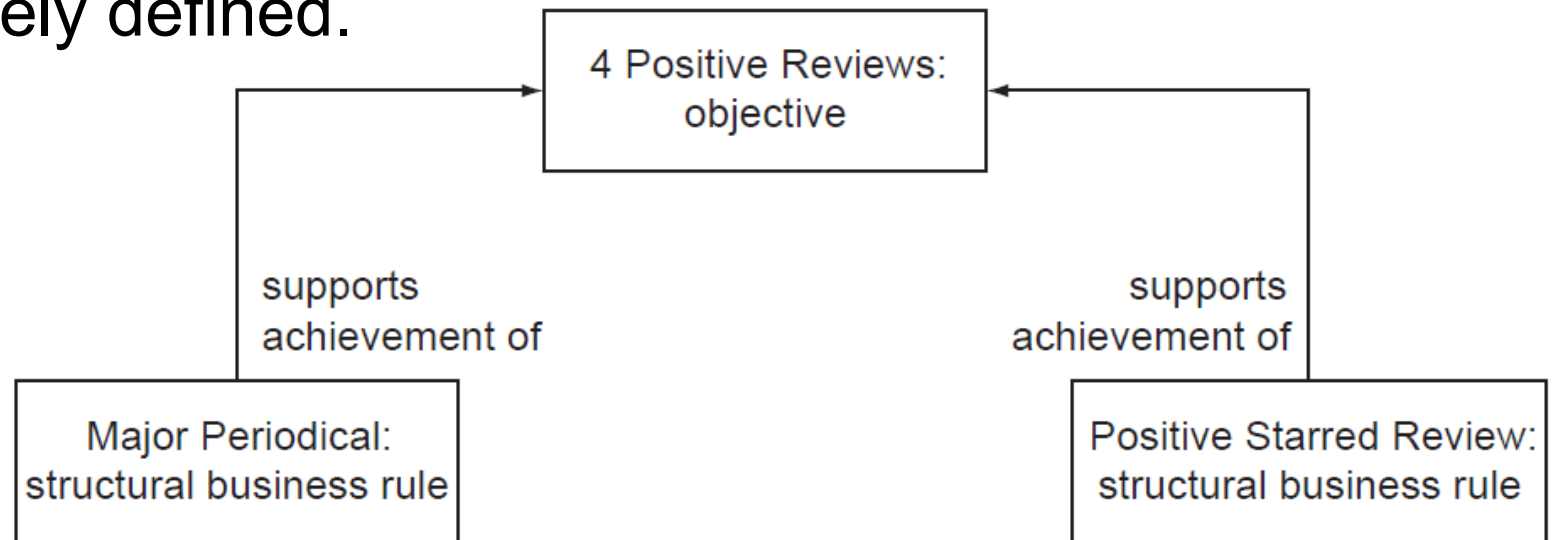
Concepts and Structural Rules

- 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 must 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

Structural Results and Desired Results

- Structural rules can help to define the terms.
- An objective is too vague to measure if the terms it uses are not precisely defined.



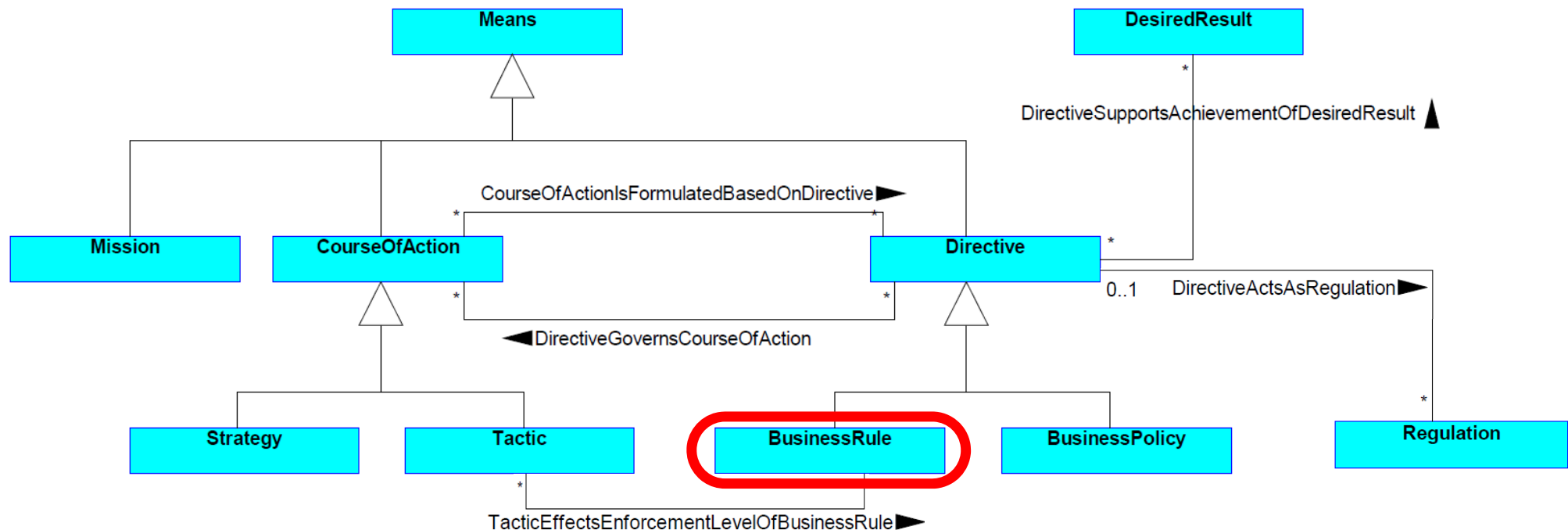
Major Periodical: It is necessary that a periodical is major if the periodical has a circulation and the circulation is at least 50,000.

Positive Starred Review: It is impossible that a review is positive if the review uses a five-star scale and the review has fewer than three stars.

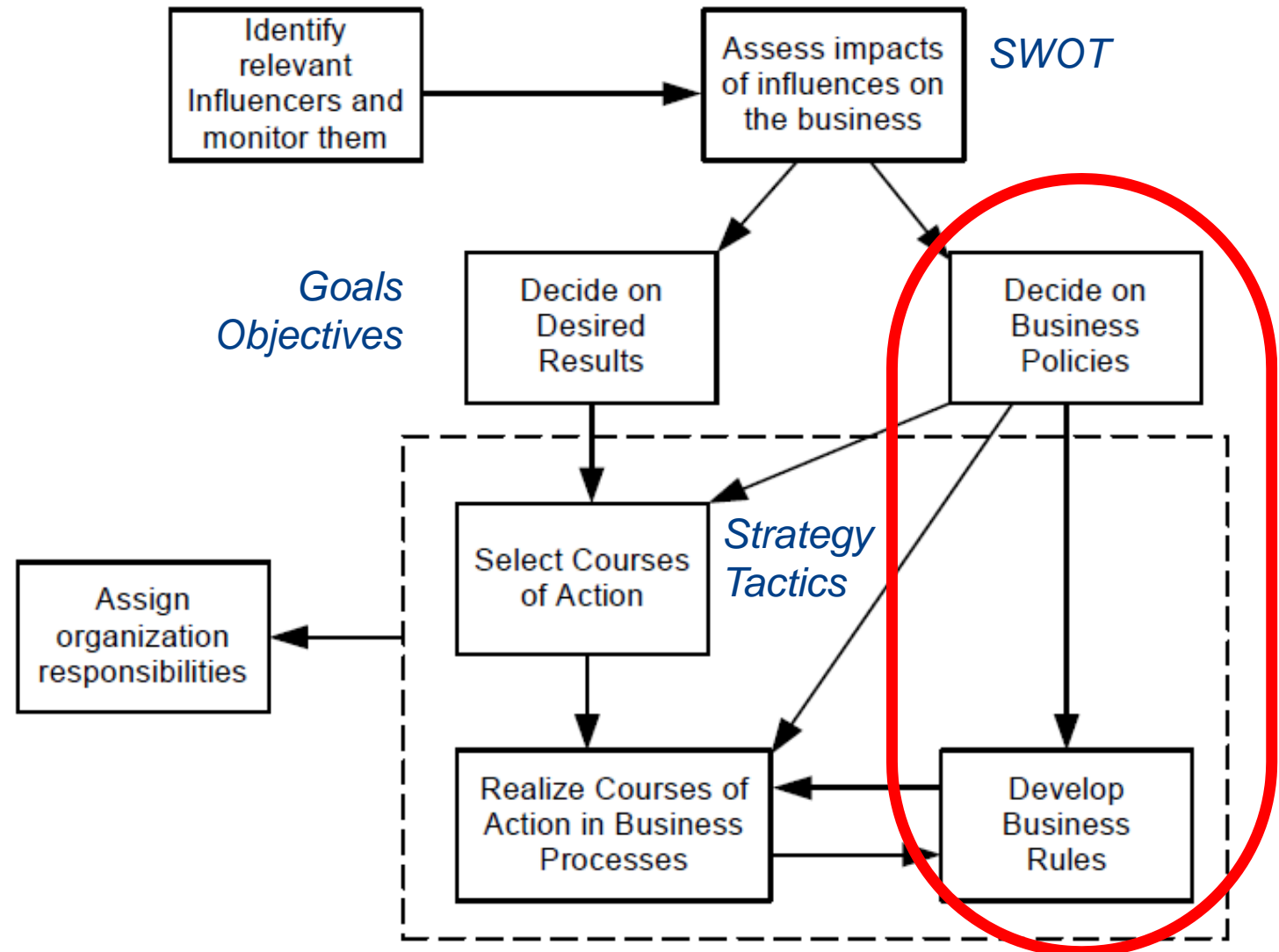
Business Rules in the Enterprise Architecture

Business Rules in the Business Motivation Model

- Directives indicate how the Courses of Action should, or should not, be carried out—they *govern* Courses of Action.
- Example: the Business Rule “Pizzas may not be delivered beyond a radius of 30 miles” governs the Strategy “Deliver pizzas to the location of the customer's choice.”
- Directive includes two concepts: Business Policy and Business Rule



Logical Progression Through the Business Motivation Model



(OMG-BMM 2010, p. 17)

Distinguishing Business Policy and Business Rule

- Compared to a Business Rule, a **Business Policy** tends to be
 - ◆ less structured, less discrete, and not focused on a single aspect of governance or guidance.
 - ◆ less compliant with standard business vocabulary, and less formally articulated.
- In contrast to a Business Policy, a **Business Rule**
 - ◆ is highly structured and is carefully expressed in terms of standard vocabulary.
 - ◆ should be discrete and atomic; that is, represent only a single aspect of governance or guidance .
- Some Business Rules could be automated in software; some are actionable only by people.
- An operative Business Rules must be directly enforceable, Business Policies in general are not directly enforceable.

Examples of Business Policy (and Rules)

Source	Business Policy
EU-Rent	<p>Depreciation of rental cars must be minimized.</p> <p>Compare the (non-actionable) Business Policy with related (actionable) Business Rules:</p> <ul style="list-style-type: none"> <i>The Car assigned to a Rental must be: at the time of assignment, of the available Cars in the requested Car Group, the one with the lowest mileage.</i> <i>A Rental cannot be extended by phone if the Car's odometer reading is greater than (next service mileage – 500).</i>
EU-Rent	<p>Rental payments must be guaranteed in advance.</p> <p>Compare with Business Rule based on this policy:</p> <ul style="list-style-type: none"> <i>A provisional charge for the estimated cost of the Rental must be made against a valid credit card held by the Renter before the Car is handed over.</i>
EU-Rent	Rentals must comply with relevant laws and regulations of all countries to be visited.
Pizza Company	Safety in the kitchen, and in the streets, comes first.
e-Business Company	A business representative will personally contact each customer who makes a complaint.