A step-by-step guide to writing rules for BPM and BRE tools

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We Write the Rules of eBusiness[SM]

Rolando Hernandez
M.S. Artificial Intelligence
Founder & CEO, BIZRULES.com

November 2-6, 2003 Nashville, TN

Topics

- Rules vs. Hard-Code
- Business Rules Engine (BRE) Vendors
- Tips and techniques for writing rules for rule engines
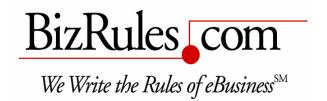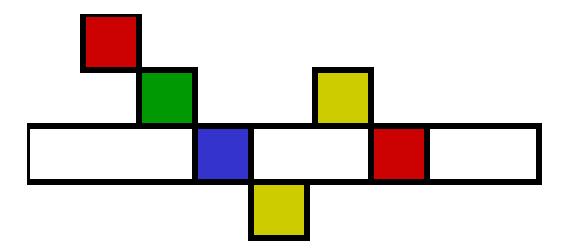- Rules Q&A
- How business rules fit into the Zachman Framework
- There are only three ways to write rules
- SMEs like to work with visual rules representations
- Visual modeling tools for rules & process
- Customer needs & wish list for rules

Rules vs. Hard-Code
(Declarative vs. Procedural)

Procedural Code vs. Declarative Rules…
Is like giving the taxi driver directions instead of an address

- Procedural language

- **Directions (Code)**

  - **Leave the airport complex and go west on Interstate 40**

  - **Proceed to Exit 215 and take Briley Parkway - 155 North**

  - **Go to and exit the parkway at Exit 12**

  - **Turn left at the second traffic light into the Gaylord Opryland complex**

- Declarative statement

- **Address (Data)**

  - **2800 Opryland Drive**

Step-by-step directions vs. a Goal

Procedural vs. Declarative

- A common mistake that many companies make with rules is thinking "procedurally" and programming business rules the same way they did before
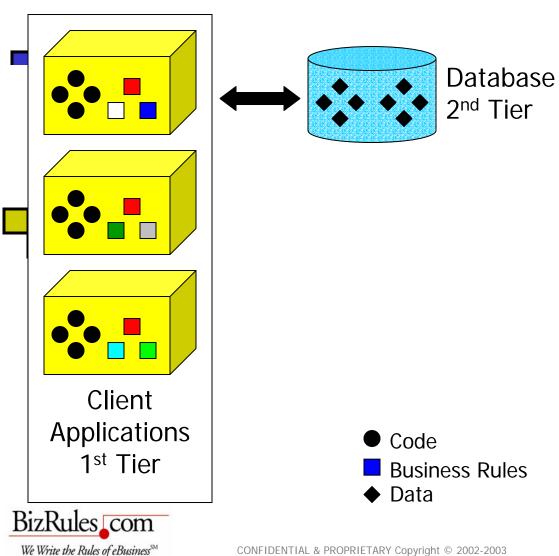
- You must think "declaratively", at a higher level of abstraction, and specify what you want the rules to do

- You need to let the Rule Base Management System (RBMS) decide how, and in what order, to fire rules

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Traditional approach using hard-coded rules

Database
2nd Tier

Client
Applications
1st Tier
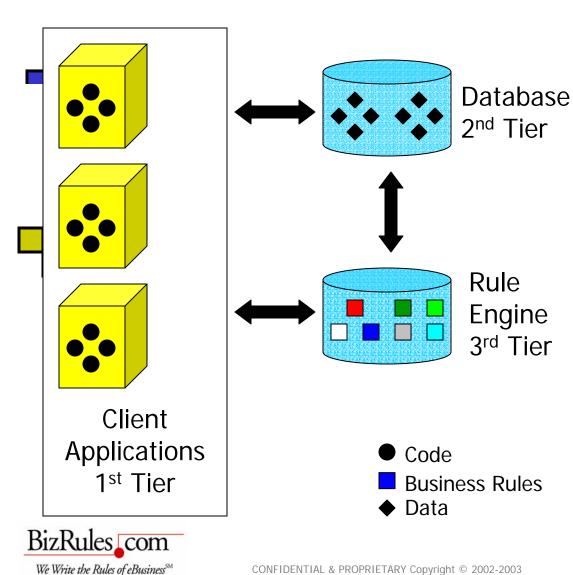
● Code
■ Business Rules
◆ Data

Problems

• Duplicate rules must be coded & maintained in many systems

• Hard to isolate rules from code during maintenance

• Even harder to change and test apps

• **Takes months to change 'hard-coded' business logic**

• **Redundant development & maintenance costs**

Business Rules approach using a rule engine

Benefits

- Shared rules

- Rules coded once

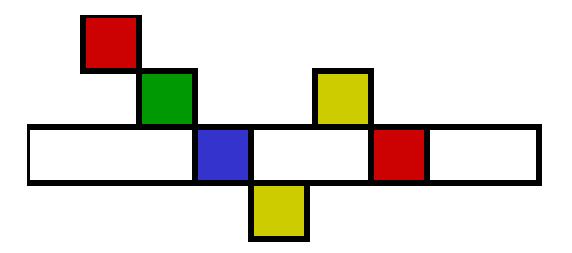- Rules are isolated from code

- Smaller Applications

- Easier to change and test applications

- **Takes days to change business rules → Faster Time to Market**
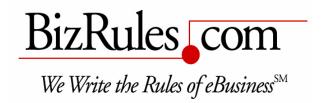
- **Lower Development & Maintenance costs**

Database
2nd Tier

Rule Engine
3rd Tier

Client Applications
1st Tier

● Code
■ Business Rules
◆ Data

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Business Rules Engine (BRE) Vendors

The key point you should remember about BRE vendors is...

- **Figure out how your business works first, then go out and look for an engine that will work for you**

  - There are a lot of great products out there that have been battle-tested and proven over many years...

- **Expert systems, inference engines, and business rules engines have been among the best IT investments companies have made...**

  - Gartner will tell you that AI/Expert Systems have one of the highest ROIs of any IT investment

  - Some of these AI-based business applications have been running over 10 years, and are still in use today

Companies that know how to leverage Rules/AI/ES get huge benefits & rewards

- DUPONT: "For every **$10,000** spent to develop expert systems, we realize **$1 Million** in savings and profits - adding up to over a $1 Billion."

- OSHA: Expert Advisors have been working since 1990's
    - "**Savings to small businesses** from the OSHA Hazard Awareness Advisor alone **total between $40 million and $83 million per year**" according to OSHA". Went live in 1995, still running today. Only changed once...

- AMEX Authorizer's Assistant went live in 1988 –
    - **"System has never been down"**
    - **Authorizes every AMEX credit card transaction worldwide**

- SABRE: Next Generation Travel Technology Platform
    - Rules will "improve developer productivity by **100%**"
    - and "reduce cycle time to update fare requirements (rules) by **75%**"

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Rule Engine Family Tree

Exsys   Exsys

1st Class Fusion   MultiLogic

AICorp KBMS

AION   Trinzic

Platinum Technology

CA / Computer Associates AION

Neuron Data   Blaze Software

Brokat

HNC / Blaze

Fair Isaacs / Blaze

Level 5(84)   Info.Builders(87)   Inso Corp.(96)   Rule Machines Corp.(97)

Brightware   MindBox ARTEnterprise

Inference   eGain

Attar ExpertRule KnowledgeBuilder

SoftLaw Statute Expert

Intellicorp KEE

Haley

Vision Software   Versata

ESI Logist

Corticon

Sapiens

Pega

RulesPower

MSFT ?

IBM ?

Oracle ?

1980   1990   2000
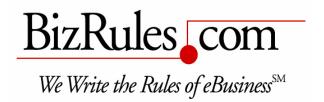
Tips and techniques for writing rules for rule engines

Inventory your rules first, before selecting BRE

- **You need to know what types of rules you have, and your inferencing requirements, in order to determine what BREs meet your requirements**
  - Is inferencing really important?
  - Do you have Data-driven or Goal-driven rules?
  - Do you have forward chaining or backward chaining rules?
  - Do you need the full power of a real inference engine?
  - Or can you get by with a 4GL/5GL application development environment or code generator instead?

- **Use that knowledge to help select the right BRE**

- **Documenting your rules first gives you a head start, so you are ready to code rules when the BRE is installed…**

Bridge the gap between BRE vendors and your SMEs
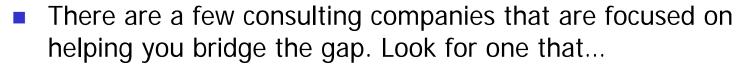
- Companies and SMEs makes the rules

- BRE vendors know how to execute the rules

- But most BRE vendors do not want to learn your business rules nor harvest all your business rules

- There are a few consulting companies that are focused on helping you bridge the gap. Look for one that...
    - Specializes in harvesting & mining for rules
    - Quickly learns your business
    - Speaks your language, communicate well with your SMEs
    - And fully understands your rules and processes
    - Documents business rules in a way that your SMEs can understand

Simplify and modernize

- The best solution is to simplify, redesign, and optimize your rules and processes before you automate them in the rule engine
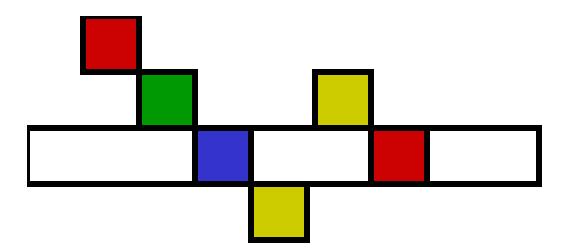
- You do not want to waste money building a new application with 15-year old business rules

- A significant % of your existing rules may be legacy rules that no longer apply

- May also have redundant rules that are no longer necessary
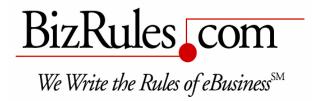
Rules Q&A

Why business rules?

- Applications require very complex business logic, and business is changing faster and faster → need to speed up developer productivity

- **Traditional looping, conditional branching, IF/THEN syntax is designed for controlling program flow, not for processing complex business rules**

- **Database triggers and stored procedures are not "rule engines" and do not provide reasoning, inference, forward chaining, backward chaining, rule chaining, or pattern matching, rule reuse, single/multi-fire rules**

- Business rules embedded in program code is costly & redundant

- Cannot share hard-coded rules across applications

What can business rules do for you?

- Visionary executives see business rules as the **solution for Governance, Time to market, and Downsizing**... Just as they saw Six Sigma as the solution for Quality

- **Transform expert knowledge into electronic assets that increase in value over time**

- **Put management/SME decisions on autopilot**

- Digitize business rules for Legal, Tax, Fin, Acctg, Mktg, Sales, Pricing, Promotions, Billing, Privacy, Ops, Mfg...

What can business rules do for you?

■ Visionary executives see business ~~solution for Governance, Ti~~ and

Tomorrow's Birds of a Feather "Putting your business processes on Autopilot with business rules" will explore the **top 10 things that your CEO /Mgmt need to know about business rules**…

10. Rules are the answer to Enron, Worldcom, and the mutual fund problem
    → **Rules can help you solve Sarbanes-Oxley**

9. Rules can help US become more productive and more cost-effective than India
    → **One Business Rules Author can do the job of X Indian programmers**

8. Rules ROI is so good that many companies refuse to discuss it
    → **Companies don't want competitors to know Rules ROI**

7. **Why is it taking so long for rules to "explode"?**
    → **The same thing happened with Quality, the World Wide Web, etc.**

6. **There are many success stories (AMEX, MOB)**
    and two "failures" I can tell you about (ISPR/CRUISE)
    → **Yet these "failed" projects are awesome examples of the real power of Business Rules!**

Who benefits from business rules?

- **Business people** can finally manage and maintain their own rules

- **IT** has more time to focus on code, applications, architecture, and technology

- **Customers** get more flexible products tailored just for them

- **Shareholder Value** increases as electronic Rulebase/Knowledgebase assets appreciate in value

Why are companies interested in business rules?

- Changes are time-consuming

- Rules are in many different places

- No way to validate changes before they go into effect

- Time-to-market

- Cost

- Quality

Why are companies doing rules?

- **Time to Market + Quality**
  - Take rules out of IT and put them back in the business side where they belong

- **Governance + Alignment**
  - Enable business people to manage and change business rules
  - Ensures staff follow the rules

- **Productivity + New product development**
  - Free up Developers to take on more value added work

= *Revenue* + *Profit* + *Shareholder Value*

How do you get started with business rules?

- Stop hard-wiring rules in every program

- Start storing rules in a centralized Rulebase (BRE) instead

- "Database" your rules

- Integrate business rules into your Enterprise Architecture

- Develop a Business Rules Methodology to manage, document, optimize, and automate business rules

How do we uncover rule sources & methods?

- **SMEs**
  - Expert interviews
    - Rule harvesting methodology
    - Teach back, Pareto, Six Sigma, etc.
    - Teach experts to write business rules → There are only 3 ways to write rules

- **Legacy code**
  - Reverse-engineering tools to extract rules

- **Documentation/Publication/Legislation**
  - Contract, Law, Policy, Procedure, etc.
  - Use a formal & repeatable extraction process model the rules

How do we migrate <u>enterprises</u> to business rules?

- **APPROACH**
  - Create a high-level business map of how the business works
    - Include business units, customers, systems, databases, rulebases
  - Look for opportunities to share rules across divisions & applications
  - Simplify & redesign rules and processes
  - Identify business challenges that are a good fit for business rules applications

- **PREPARE**
  - Methodologies, standards
  - Select one or two applications that are good candidates for initial pilot

How do we migrate legacy __applications__ to business rules?

- APPROACH
  - Start small to prove rules are better (payback/benies)
  - Phased approach
  - Identify bottlenecks and prioritize solutions
  - Start with a system that has lots of rules that can be shared

- PILOT
  - Either BUILD a new program that you were going to develop anyway
    - Develop a rules-based program instead
    - Development costs should be similar or slightly less (0-20%)
    - Maintenance costs should be significantly lower (25-50%)
  - Or, RETROFIT an existing high-cost or high-value program
    - Re-develop a rules-based program instead
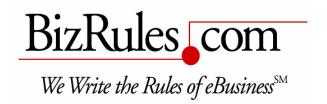
How business rules fit into the Zachman Framework

These examples are from the
BIZRULES® VISION™ Visual Business Rules Methodology

Business Rules align with Enterprise Architecture

- According to John Zachman,

  - Architecture is the only known way to deal with change and complexity

  - Architecture is the only way to ensure that systems work, change, and last

  - Architecture is the only way to ensure that all the parts fit together

  - Architecture is the only way to ensure that parts can be reused and replaced without breaking other parts

Parts and sub-parts

Product	Building	Airplane	Enterprise Information System
Part	Floor Structure Roof	Airframe Tail Wing	Application **Rulebase**
Sub-part	Support column Support beam Truss Wall	Cabin / Cockpit Rudder Flap Landing Gear	**Database** **Program** **GUI** **Rule Sets**
Sub-part	Floor / Ceiling Door Window Bathroom	Instrument Panel Window / Door Seat Wheel	**Database Table** **Component** **Window** **Business Rule / Business Logic**
Sub-part	Doorknob / Hinge Roof tile Carpet Wiring / Outlet	Dials / Switches Glass / Shade Seat Belt / Floating Cushion Tire	**Database Field / Column** **Object** **Button / Menu / Toolbar / Field** **Rule Condition/Action (IF/THEN)**

ENTERPRISE ARCHITECTURE - A FRAMEWORK ™

	DATA _What_	FUNCTION _How_	NETWORK _Where_	PEOPLE _Who_	TIME _When_	MOTIVATION _Why_	
SCOPE (CONTEXTUAL) _Planner_	List of Things Important to the Business **TERMS** ENTITY = Class of Business Thing	List of Processes the Business Performs Function = Class of Business Process	List of Locations in which the Business Operates Node = Major Business Location	List of Organizations Important to the Business People = Major Organizations	List of Events Significant to the Business Time = Major Business Event	**MISSION & GOALS** Ends/Means=Major Bus. Goal/ Critical Success Factor	**SCOPE (CONTEXTUAL)** _Planner_
ENTERPRISE MODEL (CONCEPTUAL) _Owner_	e.g. Semantic Model **FACT MODELS** Ent = Business Entity Reln = Business Relationship	**BUSINESS PROCESS MODELS** Proc. = Business Process I/O = Business Resources	e.g. Business Logistics System Node = Business Location Link = Business Linkage	**WORK FLOW MODELS** People = Organization Unit Work = Work Product	e.g. Master Schedule Time = Business Event Cycle = Business Cycle	**GOVERNING RULES** End = Business Objective Means = Business Strategy	**ENTERPRISE MODEL (CONCEPTUAL)** _Owner_
SYSTEM MODEL (LOGICAL) _Designer_	e.g. Logical Data Model **FACT TABLES** Ent = Data Entity Reln = Data Relationship	e.g. Application Architecture Proc .= Application Function I/O = User Views	e.g. Distributed System Architecture Node = I/S Function (Processor, Storage, etc) Link = Line Characteristics	**USER INTERFACE ARCHITECTURE** People = Role Work = Deliverable	e.g. Processing Structure Time = System Event Cycle = Processing Cycle	**BUSINESS RULES MODELS** End = Structural Assertion Means =Action Assertion	**SYSTEM MODEL (LOGICAL)** _Designer_
TECHNOLOGY MODEL (PHYSICAL) _Builder_	e.g. Physical Data Model Ent = Segment/Table/etc. Reln = Pointer/Key/etc.	e.g. System Design Proc.= Computer Function I/O = Data Elements/Sets	e.g. Technology Architecture Node = Hardware/System Software Link = Line Specifications	e.g. Presentation Architecture People = User Work = Screen Format	e.g. Control Structure Time = Execute Cycle = Component Cycle	**RULE DESIGNS** End = Condition Means = Action	**TECHNOLOGY MODEL (PHYSICAL)** _Builder_
DETAILED REPRESEN- TATIONS (OUT-OF- CONTEXT) _Sub- Contractor_	e.g. Data Definition Ent = Field Reln = Address	e.g. Program Proc.= Language Stmt I/O = Control Block	e.g. Network Architecture Node = Addresses Link = Protocols	e.g. Security Architecture People = Identity Work = Job	e.g. Timing Definition Time = Interrupt Cycle = Machine Cycle	**RULE SPEFICICATIONS** End = Sub-condition Means = Step	**DETAILED REPRESEN- TATIONS (OUT-OF CONTEXT)** _Sub- Contractor_
FUNCTIONING ENTERPRISE	e.g. DATA	e.g. FUNCTION	e.g. NETWORK	e.g. ORGANIZATION	e.g. SCHEDULE	e.g. STRATEGY	**FUNCTIONING ENTERPRISE**

Detailed / Formal Rules
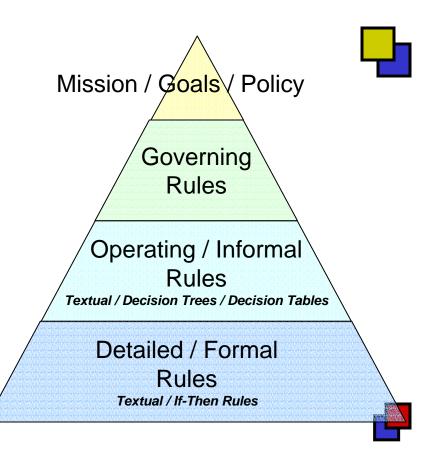
- There is a high-level business goal or policy behind every rule

- Each policy results in one or more Governing Rules

- Each Governing Rule results in one or more Operating Rules

- Each Operating Rule results in one or more Detailed Rules

Mission / Goals / Policy

Governing Rules

Operating / Informal Rules
Textual / Decision Trees / Decision Tables

Detailed / Formal Rules
Textual / If-Then Rules

Rule Building Blocks

- Terms are the business subjects

- Facts always build on Terms

- Rules always build on facts

Terms

Facts

Rules

Be sure to build rules in this order, from top to bottom
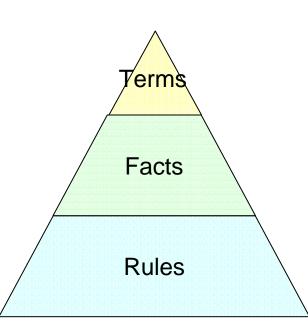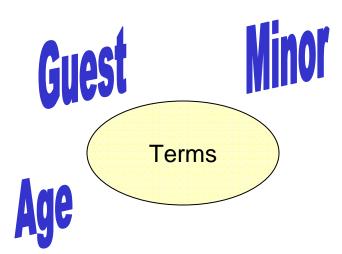
Terms are the business subjects

- Business terms
- Business objects – Not data or system objects
- Word or phrase that has a specific business meaning
- Noun or noun phrase with an agreed upon definition

Guest

Minor

Age

Terms

Facts always build on Terms
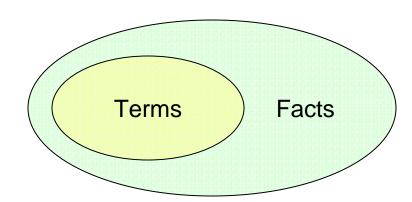
- Express relationship between terms; Association between two or more terms
- Statement connecting terms into sensible, business relevant observations
- Use the word "can" for facts
- Verbs connect the facts
  - Has
  - Is a
  - Type
  - Selects
  - Includes
  - Is Calculated From
  - Is Based On
  - Supplies
  - Requests
  - Approves
  - Records
  - Orders
  - Returns
  - Etc.

A Guest under the Age of 21 years is a Minor

Terms   Facts

Rules always build on facts
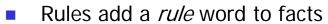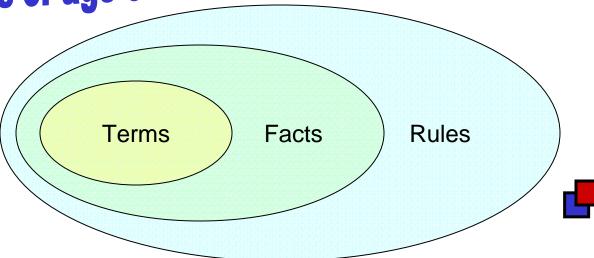
- Rules add a *rule* word to facts
  - Must
  - Should
  - May
  - Not / No
  - Only if
  - If...Then
  - Etc.

A Minor is <u>not</u> allowed to sail alone.

A Minor <u>must</u> be accompanied by an Adult 25 years of age or older in the same stateroom.

Terms   Facts   Rules

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Step 1 – Terms (Row 1 Column 1)

Term	Definition
Adult ½ Rate	Cruise fare for Pax No. 1 & 2
Adult ¾ Rate	Cruise fare for Pax No. 3 & 4
Age	Number of years old
Brand	Type is American Cruise Line, USA Cruise Line
Cabin	Type is Single, Double
Child	TBD
Entertainer	Type of Passenger
Guest	A Passenger on our ship
Infant/Toddler	TBD
Minor	TBD
Pax	Passenger
Pax No. ½	First and second passengers on a booking – The primary passengers
Pax No. ¾	Third and fourth passengers on a booking – The secondary passengers
Rate	Type is Child, Adult, Infant, VIP
Season	Type is High, Low, Holiday
Single Supplement Rate	An additional fee for a single passenger

Step 2 - Facts

- A Guest under the Age of 21 years IS A Minor

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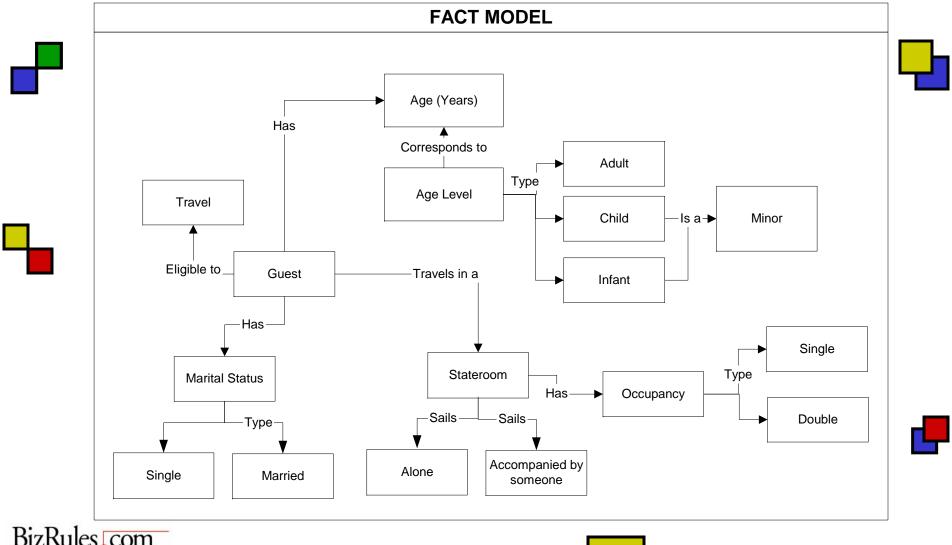
Step 3 - Fact Model (Row 2 Column 1)
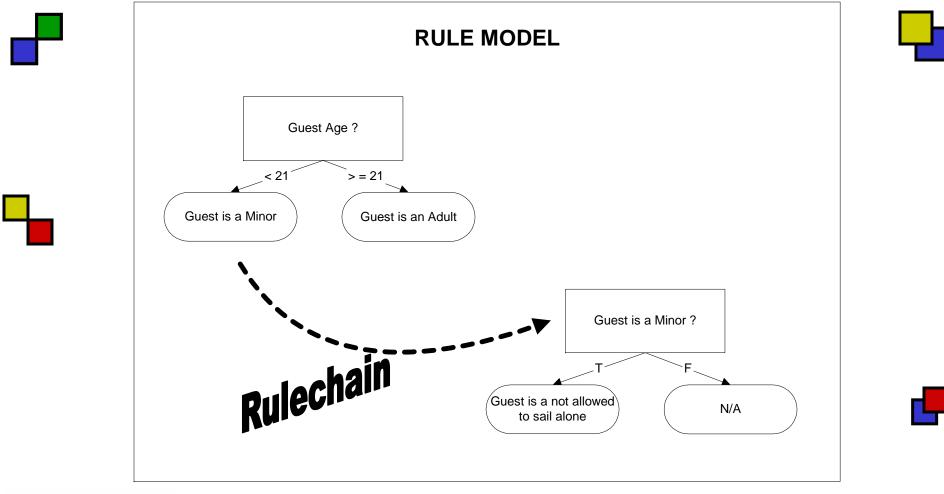
■ A "conceptual" model of the business

FACT MODEL

Diagram boxes and relationships:

- Guest **Has** Age (Years)
- Age Level **Corresponds to** Age (Years)
- Age Level **Type** Adult, Child, Infant
- Child **Is a** Minor
- Guest **Eligible to** Travel
- Guest **Travels in a** Stateroom
- Guest **Has** Marital Status
- Marital Status **Type** Single, Married
- Stateroom **Has** Occupancy
- Occupancy **Type** Single, Double
- Stateroom **Sails** Alone
- Stateroom **Sails** Accompanied by someone

Step 4 - Business Rule Model (Row 3 Column 6)

- A "logical" model of the business rules

RULE MODEL

Guest Age ?

< 21   > = 21

Guest is a Minor   Guest is an Adult

Rulechain

Guest is a Minor ?

T   F

Guest is a not allowed to sail alone   N/A

Governing Rule *(Row 2 Col 6)*

- Federal law prohibits minors from sailing alone.

Operating/Informal Rules *(Row 3 Col 6)*

- Minor guests are not allowed to sail alone.
- The only exception to this policy will be in the case of married guests.

Formal/Detailed Rules *(Row 4 Col 6)*

- A Minor <u>must</u> be accompanied by a parent, grandparent or guardian 25 years of age or older in the same stateroom.
- Infants <u>must</u> be at least four months old to be eligible to travel.
- Married guests traveling together will be allowed to sail even <u>if</u> they are Minors. Proof of marriage will be required at the time of embarkation.

Fact

- A Guest under the Age of 21 years is a Minor.

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There are only three ways to write rules

There are only three ways to write rules
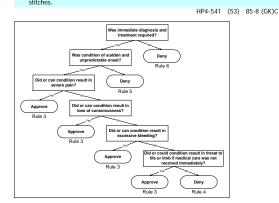
- Words – Textual rules

- Pictures – Decision trees

- Charts – Decision tables

EMERGENCY CARE DETERMINATION   **SH4BBC5**

A condition qualifies for emergency care if services are required to provide an immediate diagnosis and treatment for a condition of unpredictable onset which has the capability, or is perceived to have the capability, to produce severe pain, loss of consciousness, excessive bleeding or becomes a threat to life or limb if medical care is not received immediately.

Qualified emergency care would include, but is not limited to; penetrating wound such as a knife or gunshot wound; foreign body in the throat; burns involving blisters over a large area of the skin; displaced limbs; head injuries accompanied by drowsiness, vomiting, confusion, blurred vision or bleeding from the ears or throat; sudden or severe continuous chest pain; sudden breathing difficulty; sudden loss of vision or hearing; persistent or sudden bleeding from the nose, mouth or vomiting of blood; seizure occurring for the first time or recurrent frequent seizures unresponsive to current medication; suspected or confirmed overdose of drugs accidentally or intentionally; suspected or confirmed swallowing or breathing of poisonous substance; or unconsciousness.
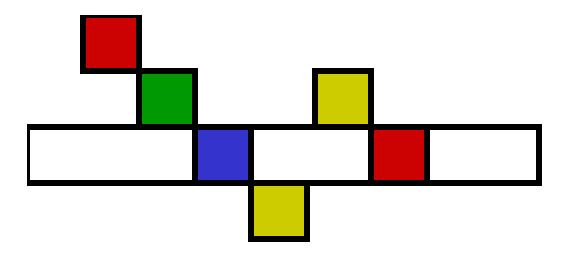
Qualified emergency care does not include; colds, sore throat or flu; arthritis that is recurrent; chronic less severe pain such as earache, headache, sore "pulled muscles" or indigestion; small bruises or scrapes of the skin; insect bites; or wounds not requiring stitches.

HP4-541 (53) 85-8 (GK)C

HMO RULE BOOK	R6	R5	R3	R3	R3	R3	R4
EMERGENCY CARE DETERMINATION RULES							
IF							
Was immediate diagnosis and treatment required?	N	Y	Y	Y	Y	Y	Y
Was condition of sudden and unpredictable onset?	-	N	Y	Y	Y	Y	Y
Did or can condition result in severe pain?	-	-	Y	N	N	N	N
Did or can condition result in loss of consciousness?	-	-	-	Y	N	N	N
Did or can condition result in excessive bleeding?	-	-	-	-	Y	N	N
Did or could condition result in threat to life or limb if medical care was not received immediately?	-	-	-	-	-	Y	N
THEN							
Emergency Care Determination Decision is	DENY	DENY	APPROVE	APPROVE	APPROVE	APPROVE	DENY

Textual Business Rule

EMERGENCY CARE DETERMINATION   SH4BBC5

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Qualified emergency care does not include; colds, sore throat or flu; arthritis that is recurrent; chronic less severe pain such as earache, headache, sore "pulled muscles' or indigestion; small bruises or scrapes of the skin; insect bites; or wounds not requiring stitches.

HP4-541   (53)   85-8 (GK)C

Decision Tree

Is Condition In Inclusion List ?

Is Condition In Exclusion List ?

Yes

Yes

Approve

Deny

Rule 1

Rule 2

Inclusion List = (Chest Pain, Head wound, etc…)

Exclusion List = (Cold, Insect bites, etc..)

Decision Tree

Was immediate diagnosis and treatment required?

Yes →

No → **Deny**
Rule 6

Was condition of sudden and unpredictable onset?

Yes →

No → **Deny**
Rule 5

Did or can condition result in severe pain?

Yes → **Approve**
Rule 3

No →

Did or can condition result in loss of consciousness?

Yes → **Approve**
Rule 3

No →

Did or can condition result in excessive bleeding?

Yes → **Approve**
Rule 3

No →

Did or could condition result in threat to life or limb if medical care was not received immediately?

Yes → **Approve**
Rule 3

No → **Deny**
Rule 4

> Every branch/node in a decision tree is a rule

Decision Table

HMO RULE BOOK	R6	R5	R3	R3	R3	R3	R4
EMERGENCY CARE DETERMINATION RULES							
IF							
Was immediate diagnosis and treatment required?	N	Y	Y	Y	Y	Y	Y
Was condition of sudden and unpredictable onset?	-	N	Y	Y	Y	Y	Y
Did or can condition result in severe pain?	-	-	Y	N	N	N	N
Did or can condition result in loss of consciousness?	-	-	-	Y	N	N	N
Did or can condition result in excessive bleeding?	-	-	-	-	Y	N	N
Did or could condition result in threat to life or limb if medical care was not received immediately?	-	-	-	-	-	Y	N
THEN							
Emergency Care Determination Decision is	DENY	DENY	APPROVE	APPROVE	APPROVE	APPROVE	DENY

A more formal textual business rule: English IF/THEN Rules

Rule 5

If   Immediate Diagnosis and treatment was required
And Condition was not of Sudden and Unpredictable Onset
Then

    Emergency Care Determination Decision is Deny

Rule 6

If   Immediate Diagnosis and treatment was not required
Then

    Emergency Care Determination Decision is Deny

Rule 3

If   Immediate Diagnosis and treatment was required = Yes
And Condition was of Sudden and Unpredictable Onset = Yes
And (Condition Did or Can Result in Severe Pain = Yes
    Or Condition Did or Can Result in Loss of Consciousness = Yes
    Or Condition Did or Can Result in Excessive Bleeding = Yes
    Or Condition Did or Can Result in Threat to life or limb if medical
       care was not received immediately = Yes)
Then

    Emergency Care Determination Decision is Approve

Rule 4

If   Immediate Diagnosis and treatment was required
And Condition was of Sudden and Unpredictable Onset
And Condition Did or Can Result in Severe Pain = No
And Condition Did or Can Result in Loss of Consciousness = No
And Condition Did or Can Result in Excessive Bleeding = No
And Condition Did or Can Result in Threat to life or limb if medical
       care was not received immediately = No
Then

    Emergency Care Determination Decision is Deny

Backward Chaining allows complex problems to be broken into small modules. Starting with the highest-level description of the rules that solve the problem allows a working system to be produced very quickly. If the questions it asks are not at the appropriate level for the intended system user, rules could be added to derive the information from simpler questions.

This shows the rules in the system and how individual rules call other blocks of rules.

```
IF
        The customer should receive priority
        service
THEN
        Elevate to top level support staff and call
        within 4 hours
```

Rulechain

```
IF
        The customer purchases are over $250,000
        per year
THEN
        The customer should receive priority service

IF
        The customer works for a Partner company
THEN
        The customer should receive priority service

IF
        The customer's company has significant
        growth potential
THEN
        The customer should receive priority service
```

```
IF
        The company is a Fortune 100
        company
THEN
        The customer's company has
        significant growth potential

IF
        The company has been a
        customer for many years
THEN
        The customer's company has
        significant growth potential
```

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Credit Rules

If CustomerHasPurchasedInLastTwoMonths
and CustMeetsPurchaseRequirements
then CustomerIsPreferred

Rule 2

if CustomerIsPreferred
and PurchasesWithCreditCard
then GiveCreditOnOrder

Rule 1

Rulechain

if CustomerMadeNoReturns
and MadePurchase > MinimumAmt
then CustMeetsPurchaseRequirements

Rule 3

Insurance Rules

if PaymentIsDenied
OR PremiumNotPaid
  then SendDenialLetter

Rule 1

if DoctorVisited is NOT Primary
  then PaymentIsDenied

Rule 2

Rulechain

if OfficeVisit is PostOperative
  then PaymentIsDenied

Rule 3
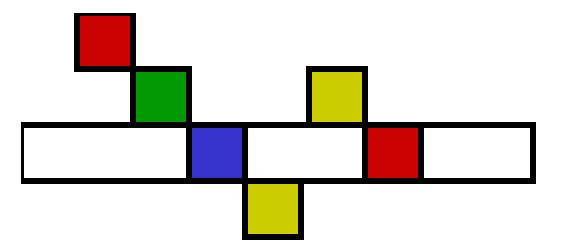
if TodaysDate - LatestSurgeryDate < 30
  then OfficeVisit is PostOperative
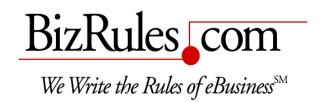
Rule 4
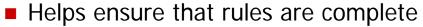
SMEs like to work with visual rules representations (i.e. decision trees and decision tables)

Advantages of using decision trees and decision tables

- Easy to spot gaps or missing rules
  - Helps ensure that rules are complete

- Easy to spot wrong rules
  - Helps ensure that rules are correct

- Simplifies complex rules and procedures

- Shows a collection of related rules
  - Makes it easy for SME's to review and approve all related rules together at the same time
  - It is difficult and time-consuming to review more than one English rule at a time

Advantages of using decision trees and decision tables (continued)

- Helps improve communication between Business and IT staff

- Decision Trees show rule branches, paths, and relationships in one diagram

- Decision Tables show rule paths and relationships in one table

- Makes it easier to modify rules without "breaking" other rules

- A picture is worth a thousand words

The most complex rule book on the planet

- Size / Scope metrics?
    - # of rules
    - # of concurrent users
    - # of rule changes per year
    - # of pages of legislation

- How does the Internal Revenue Service explain their most complex rules, so that millions of taxpayers can understand them?

Department of the Treasury
Internal Revenue Service

Publication 596
Cat. No. 15173A

Earned Income Credit (EIC)

For use in preparing **2002** Returns

ARE YOU ELIGIBLE

?

Look inside f

What To Do
Here Fro

SCHEDULE EIC
(Form 1040A or 1040)

Department of the Treasury
Internal Revenue Service

Earned Income Credit
Qualifying Child Information

1040A
1040
EIC

Complete and attach to Form 1040A or 1040 only if you have a qualifying child.

OMB No. 1545-0074

2002

Attachment
Sequence No. **43**

Name(s) shown on return: Cynthia and Jerry Grey

Your social security number: 333 : 00 : 5555

Before you begin: See the instructions for Form 1040A, line 41, or Form 1040, line 64, to make sure that (a) you can take the EIC and (b) you have a qualifying child.

⚠️ **CAUTION**
- If you take the EIC even though you are not eligible, you may not be allowed to take the credit for up to 10 years. See back of schedule for details.
- It will take us longer to process your return and issue your refund if you do not fill in all lines that apply for each qualifying child.
- Be sure the child's name on line 1 and social security number (SSN) on line 2 agree with the child's social security card. Otherwise, at the time we process your return, we may reduce or disallow your EIC. If the name or SSN on the child's social security card is not correct, call the Social Security Administration at 1-800-772-1213.

Qualifying Child Information	Child 1		Child 2	
	First name	Last name	First name	Last name
1 Child's name If you have more than two qualifying children, you only have to list two to get the maximum credit.	Kirk	Grey	Susanne	Grey
2 Child's SSN The child must have an SSN as defined on page 44 of the Form 1040A instructions or page 46 of the Form 1040 instructions unless the child was born and died in 2002. If your child was born and died in 2002 and did not have an SSN, enter "Died" on this line and attach a copy of the child's birth certificate.	123 00 5678		987 00 4321	
3 Child's year of birth	Year 1 9 9 4 *If born after January 1, 1984, skip lines 4a and 4b; go to line 5.*		Year 1 9 9 6 *If born after January 1, 1984, skip lines 4a and 4b; go to line 5.*	
4 If the child was born before January 2, 1984— **a** Was the child under age 24 at the end of 2002 and a student?	☐ Yes. *Go to line 5.* ☐ No. *Continue*		☐ Yes. *Go to line 5.* ☐ No. *Continue*	
b Was the child permanently and totally disabled during any part of 2002?	☐ Yes. *Continue* ☐ No. *The child is not a qualifying child.*		☐ Yes. *Continue* ☐ No. *The child is not a qualifying child.*	
5 Child's relationship to you (for example, son, daughter, grandchild, niece, nephew, foster child, etc.)	son		daughter	
6 Number of months child lived with you in the United States during 2002 ● If the child lived with you for more than half of 2002 but less than 7 months, enter "7". ● If the child was born or died in 2002 and your home was the child's home for the entire time he or she was alive during 2002, enter "12".	12 months *Do not enter more than 12 months.*		12 months *Do not enter more than 12 months.*	

TIP You may also be able to take the additional child tax credit if your child (a) was under age 17 at the end of 2002, (b) is claimed as your dependent on line 6c of Form 1040A or Form 1040, **and** (c) is a U.S. citizen or resident alien. For more details, see the instructions for line 42 of Form 1040A or line 66 of Form 1040.

For Paperwork Reduction Act Notice, see Form 1040A or 1040 instructions.

Cat. No. 13339M

Schedule EIC (Form 1040A or 1040) 2002

Decision tables

What is the EIC?

The earned income credit (EIC) is a tax credit for certain people who work and have earned income under $34,178. A tax credit usually means more money in your pocket. It reduces the amount of tax you owe. The EIC may also give you a refund.

Can I Claim the EIC?

To claim the EIC, you must meet certain rules. These rules are summarized in *Table 1.*

Table 1. **Earned Income Credit in a Nutshell**

First, you must meet all the rules in this column.	Second, you must meet all the rules in *one* of these columns, whichever applies.		Third, you must meet both the rules in this column.	
Chapter 1. Rules for Everyone	Chapter 2. Rules If You Have a Qualifying Child	Chapter 3. Rules If You Do Not Have a Qualifying Child	Chapter 4. Figuring and Claiming the EIC	
1. You must have a valid social security number. (See page 5.) 2. Your filing status cannot be "Married filing separately." (See page 6.) 3. You must be a U.S. citizen or resident alien all year. (See page 6.) 4. You cannot file Form 2555 or Form 2555–EZ (relating to foreign earned income). (See page 6.) 5. Your investment income must be $2,550 or less. (See page 6.) 6. You must have earned income. (See page 8.)	7. Your child must meet the relationship, age, and residency tests. (See page 10.) 8. Your qualifying child cannot be used by more than one person to claim the EIC. (See page 14.) 9. You cannot be a qualifying child of another person. (See page 15.)	10. You must be at least age 25 but under age 65. (See page 17.) 11. You cannot be the dependent of another person. (See page 17.) 12. You cannot be a qualifying child of another person. (See page 18.) 13. You must have lived in the United States more than half of the year. (See page 18.)	14. Your adjusted gross income (AGI) must be less than: •$33,178 ($34,178 for married filing jointly) if you have more than one qualifying child, •$29,201 ($30,201 for married filing jointly) if you have one qualifying child, or •$11,060 ($12,060 for married filing jointly) if you do not have a qualifying child. (See page 19.)	15. Your earned income must be less than: •$33,178 ($34,178 for married filing jointly) if you have more than one qualifying child, •$29,201 ($30,201 for married filing jointly) if you have one qualifying child, or •$11,060 ($12,060 for married filing jointly) if you do not have a qualifying child. (See page 20.)

Decision Table

Table 17–1. What Is Your Maximum Capital Gain Rate?

IF your net capital gain is from ...	THEN your maximum capital gain rate is ...
Collectibles gain	28%
Gain on qualified small business stock equal to the section 1202 exclusion	28%
Unrecaptured section 1250 gain	25%
Other gain,[1] and the regular tax rate that would apply is 27% or higher	20%
Other gain,[1] and the regular tax rate that would apply is lower than 27%	8% or 10%[2]

[1] Other gain means any gain that is not collectibles gain, gain on qualified small business stock, or unrecaptured section 1250 gain.

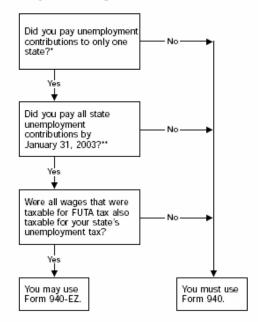[2] The rate is 8% only for qualified 5-year gain.

Form 940-EZ

Department of the Treasury
Internal Revenue Service (99)

Employer's Annual Federal Unemployment (FUTA) Tax Return

OMB No. 1545-1110

2002

► See separate instructions for Form 940-EZ for information on completing this form.

T	
FF	
FD	
FP	
I	
T	

You must complete this section. ►

Name (as distinguished from trade name) — Calendar year

Trade name, if any

Address and ZIP code — Employer identification number

Answer the questions under **Who May Use Form 940-EZ** on page 2. If you cannot use Form 940-EZ, you must use Form 940.

A — Enter the amount of contributions paid to your state unemployment fund. (see separate instructions) . . . ► $

B — (1) Enter the name of the state where you have to pay contributions . . . . ►

(2) Enter your state reporting number as shown on your state unemployment tax return ►

If you will not have to file returns in the future, check here (see Who Must File in separate instructions) and complete and sign the return. ► ☐

If this is an Amended Return, check here (see Amended Returns on page 2 of the separate instructions) . . . . ► ☐

Part I — Taxable Wages and FUTA Tax

1	Total payments (including payments shown on lines 2 and 3) during the calendar year for services of employees	1
2	Exempt payments. (Explain all exempt payments, attaching additional sheets if necessary.) ►	2
3	Payments of more than $7,000 for services. Enter only amounts over the first $7,000 paid to each employee. (see separate instructions)	3
4	Add lines 2 and 3	4
5	Total taxable wages (subtract line 4 from line 1)	5
6	FUTA tax. Multiply the wages on line 5 by .008 and enter here. (If the result is over $100, also complete Part II.)	6
7	Total FUTA tax deposited for the year, including any overpayment applied from a prior year	7
8	Balance due (subtract line 7 from line 6). Pay to the "United States Treasury." If you owe more than $100, see Depositing FUTA tax in separate instructions.	8
9	Overpayment (subtract line 6 from line 7). Check if it is to be: ☐ Applied to next return or ☐ Refunded ►	9

Part II — Record of Quarterly Federal Unemployment Tax Liability (Do not include state liability.) Complete only if line 6 is over $100.

Quarter	First (Jan. 1 – Mar. 31)	Second (Apr. 1 – June 30)	Third (July 1 – Sept. 30)	Fourth (Oct. 1 – Dec. 31)	Total for year
Liability for quarter					

Third Party Designee — Do you want to allow another person to discuss this return with the IRS (see instructions page 5)? ☐ Yes. Complete the following. ☐ No

Designee's name ►

Phone no. ► ( )

Personal identification number (PIN) ►

Under penalties of perjury, I declare that I have examined this return, including accompanying schedules and statements, and, to the best of my knowledge and belief, it is true, correct, and complete, and that no part of any payment made to a state unemployment fund claimed as a credit was, or is to be, deducted from the payments to employees.

Signature ► — Title (Owner, etc.) ► — Date ►

For Privacy Act and Paperwork Reduction Act Notice, see separate instructions. ▼ DETACH HERE ▼ — Cat. No. 10983G — Form **940-EZ** (2002)

Form 940-EZ(V)

Department of the Treasury
Internal Revenue Service

Form 940-EZ Payment Voucher

Use this voucher only when making a payment with your return.

OMB No. 1545-1110

2002

Complete boxes 1, 2, and 3. Do not send cash, and do not staple your payment to this voucher. Make your check or money order payable to the "United States Treasury." Be sure to enter your employer identification number, "Form 940-EZ," and "2002" on your payment.

1 — Enter your employer identification number.

2 — **Enter the amount of your payment.** ► | Dollars | Cents |

3 — Enter your business name (individual name for sole proprietors).

Enter your address.

Enter your city, state, and ZIP code.

Who May Use Form 940-EZ

The following chart will lead you to the right form to use—

Did you pay unemployment contributions to only one state?* — No →

Yes ↓

Did you pay all state unemployment contributions by January 31, 2003?** — No →

Yes ↓

Were all wages that were taxable for FUTA tax also taxable for your state's unemployment tax? — No →

Yes ↓

You may use Form 940-EZ. | **You must use Form 940.**
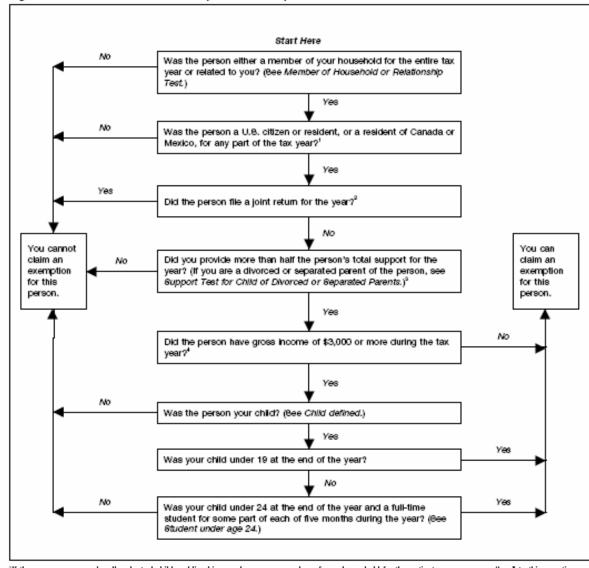
* Do not file Form 940-EZ if—
● You owe FUTA tax only for household work in a private home. See Schedule H (Form 1040).
● You are a successor employer claiming a credit for state unemployment contributions paid by a prior employer. File Form 940.

**If you deposited all FUTA tax when due, you may answer "Yes" if you paid all state unemployment contributions by February 10, 2003.

Figure 3–A. Can You Claim an Exemption for a Dependent?

Start Here

Was the person either a member of your household for the entire tax year or related to you? (See *Member of Household or Relationship Test.*) — No → — Yes ↓

Was the person a U.S. citizen or resident, or a resident of Canada or Mexico, for any part of the tax year?[1] — No → — Yes ↓

Did the person file a joint return for the year?[2] — Yes → — No ↓

Did you provide more than half the person's total support for the year? (If you are a divorced or separated parent of the person, see *Support Test for Child of Divorced or Separated Parents.*)[3] — No → — Yes ↓

Did the person have gross income of $3,000 or more during the tax year?[4] — No → You can claim an exemption for this person. — Yes ↓

Was the person your child? (See *Child defined.*) — No → — Yes ↓

Was your child under 19 at the end of the year? — Yes → You can claim an exemption for this person. — No ↓

Was your child under 24 at the end of the year and a full-time student for some part of each of five months during the year? (See *Student under age 24.*) — Yes → You can claim an exemption for this person. — No →

You cannot claim an exemption for this person.

[1] If the person was your legally adopted child and lived in your home as a member of your household for the entire tax year, answer "yes" to this question.
[2] If neither the person nor the person's spouse is required to file a return, but they file a joint return only to claim a refund of tax withheld, answer "no" to this question.
[3] Answer "yes" to this question if you meet the multiple support requirements under *Multiple Support Agreement.*
[4] Gross income for this purpose does not include income received by a permanently disabled individual at a sheltered workshop. See *Disabled dependents.*

Figure 3–B. Support Test for Children of Divorced or Separated Parents

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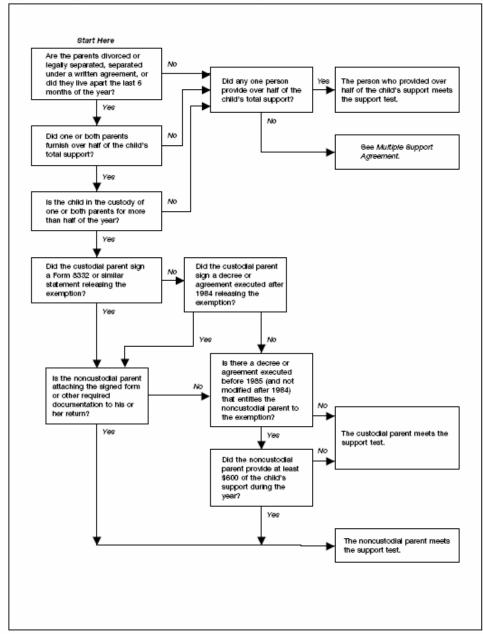
Figure 5–A. Do You Have To Pay Estimated Tax?

Start Here

Will you owe $1,000 or more for 2003 after subtracting income tax withholding and credits from your total tax? (Do not subtract any estimated tax payments.)

→ Yes →

Will your income tax withholding and credits be at least 90% (66-2/3% for farmers and fishermen) of the tax shown on your 2003 tax return?

→ No →

Will your income tax withholding and credits be at least 100%* of the tax shown on your 2002 tax return?

Note: Your 2002 return must have covered a 12-month period.

→ No →

(Box 1) No ↓

(Box 2) Yes ↓

(Box 3) Yes ↓

You are NOT required to pay estimated tax.

You MUST make estimated tax payment(s) by the required due date(s).

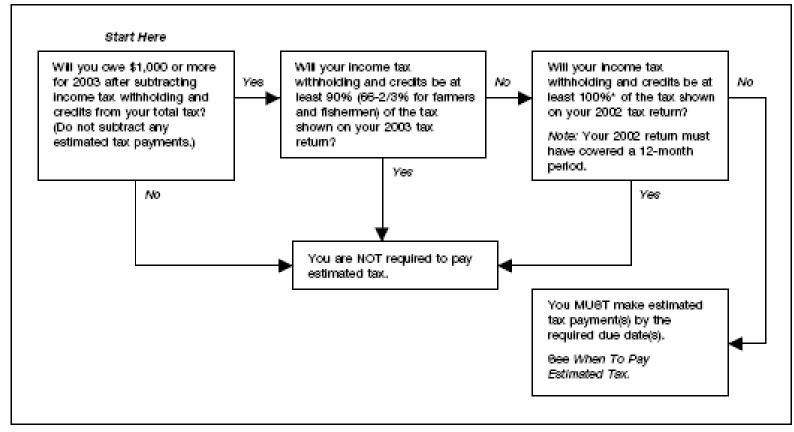*See When To Pay Estimated Tax.*

* 110% if less than two-thirds of your gross income for 2002 and 2003 is from farming or fishing and your 2002 adjusted gross income was more than $150,000 ($75,000 if your filing status for 2003 is married filing a separate return).

Figure 19–B. Qualifying Moves Within the United States (Non-Military)[1]

Start Here

Was your move closely related to a new or changed job location?[2] — **No** → YOUR MOVE DOES NOT QUALIFY

↓ Yes

Is your new main job location at least 50 miles farther from your FORMER HOME than your old main job location was? — **No** → YOUR MOVE DOES NOT QUALIFY

↓ Yes

Are you an employee? — **No** → Are you self-employed? — **No** → YOUR MOVE DOES NOT QUALIFY

↓ Yes (employee) / ↓ Yes (self-employed)

Did you or will you work full time as an employee for at least 39 weeks in the first 12 months after you arrived in the new area?[3, 4] — **No** → (to NOT QUALIFY)

Did you or will you work full time as an employee or a self-employed person for at least 78 weeks in the first 24 months (which includes 39 weeks in the first 12 months) after you arrived in the new area? — **No** → YOUR MOVE DOES NOT QUALIFY

↓ Yes / ↓ Yes

YOUR MOVE DOES QUALIFY. You may be able to deduct your moving expenses.

[1] Military persons should see *Members of the Armed Forces* for special rules that apply to them.

[2] Your move must be closely related to the start of work at your new job location. See *Related to Start of Work*.

[3] If you deduct expenses and do not meet this test later, you must either file an amended tax return or report your moving expense deduction as other income. See *Time test not yet met*.
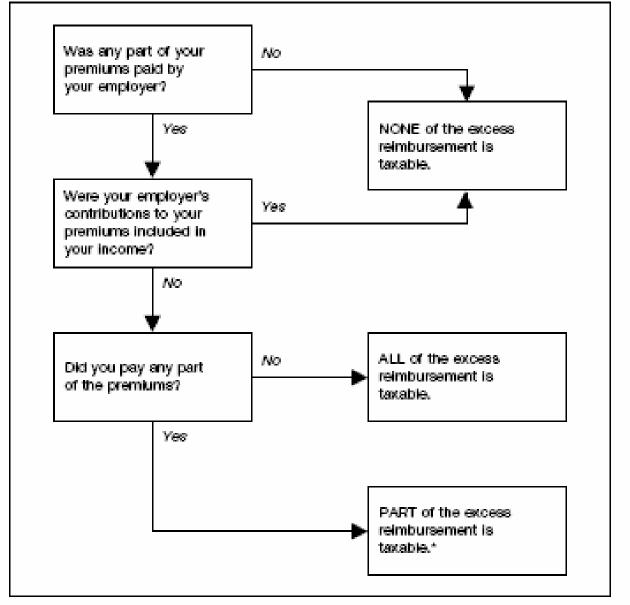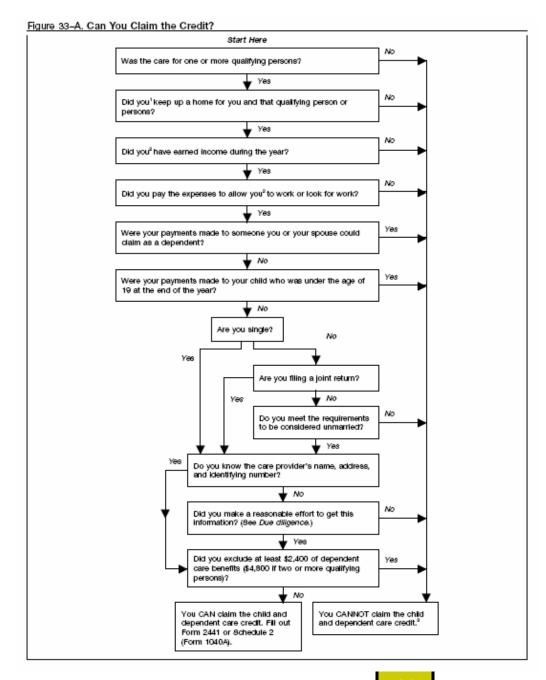
[4] If you become self-employed during the first 12 months, answer YES if your combined time as a full-time employee and self-employed person equals or will equal at least 78 weeks in the first 24 months (including 39 weeks in the first twelve months) after you arrived in the new area.

Figure 23–A. Is Your Excess Medical Reimbursement Taxable?

*See *Premiums paid by you and your employer* in this chapter.

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Figure 33–A. Can You Claim the Credit?

Start Here

Was the care for one or more qualifying persons? — No →

↓ Yes

Did you[1] keep up a home for you and that qualifying person or persons? — No →

↓ Yes

Did you[2] have earned income during the year? — No →

↓ Yes

Did you pay the expenses to allow you[2] to work or look for work? — No →

↓ Yes

Were your payments made to someone you or your spouse could claim as a dependent? — Yes →

↓ No

Were your payments made to your child who was under the age of 19 at the end of the year? — Yes →

↓ No

Are you single?

— Yes ↓   — No →

Are you filing a joint return?

— Yes ↓   — No ↓

Do you meet the requirements to be considered unmarried? — No →

↓ Yes

Do you know the care provider's name, address, and identifying number?

— Yes   ↓ No

Did you make a reasonable effort to get this information? (See *Due diligence*.) — No →

↓ Yes

Did you exclude at least $2,400 of dependent care benefits ($4,800 if two or more qualifying persons)? — Yes →

↓ No

You CAN claim the child and dependent care credit. Fill out Form 2441 or Schedule 2 (Form 1040A).

You CANNOT claim the child and dependent care credit.[3]

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Visual modeling tools for rules & process

Visio

VEHICLE HISTORY REPORTS
RL1 - MONEY BACK GUARANTEE TERMS AND CONDITIONS

Has Purchaser, or Household member, received a refund within last 12 months ?

Yes → Purchaser does **NOT** qualify for a full refund

No → Was Claim made within 30 days of purchase ?

Yes → Did Purchaser buy Unlimited Reports ?

No → Purchaser does **NOT** qualify for a full refund

Yes → Was Claim made prior to running two (2) or more Reports ?

No → Purchaser **qualifies** for a full refund

Yes → Purchaser **qualifies** for a full refund

No → Purchaser does **NOT** qualify for a full refund

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These cruise rules show backward chaining

EXAMPLE: Expense report application
You could use production rules…

If datetime
And Grade is Director
Then Expenses is Pass

If datetime
And Grade is Senior_Manager
And Hotel is A
Then Expenses is Reject

If datetime
And Grade is Senior_Manager
And Hotel is B
And Department is Accounts
Then Expenses is Pass

Or procedural languages…

```
Function Expenses_tree () As String
     Call datetime      'Procedure
StartofGrade:
     Call Grade_attribute         'Attribute
     If (Grade = "Director") Then
              Expenses = "Pass"   'Outcome
              Expenses_tree = "Pass"
              Call Expenses_outcome_Pass  'Outcome
              Call Claims_tree       'Forward chain
     ElseIf (Grade = "Senior_Manager") Then
              Call Hotel_tree        'Backchain
              If (Hotel = "A") Then
                       Expenses = "Reject"'Outcome
                       Expenses_tree = "Reject"
                       Call Expenses_outcome_Reject            'Outcome
```
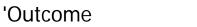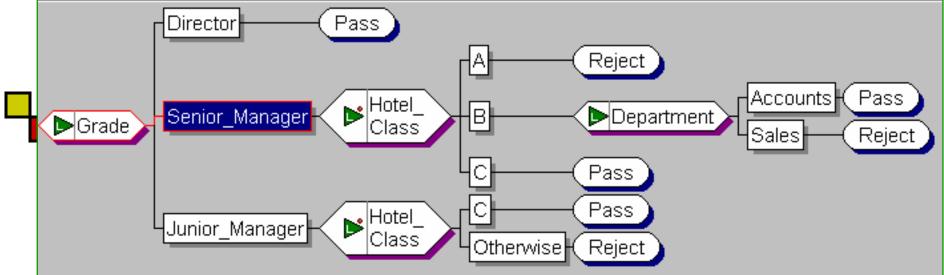
But why not see a picture of the application business rules instead?

Review Expense Report
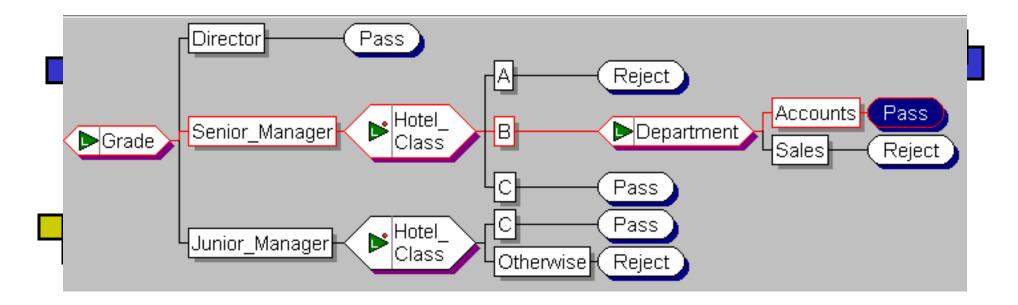
Graphical Knowledge Representation

If Grade is Senior Manager,
And Hotel is Class B,

And Department is Accounts

Then Pass the Expense Claim
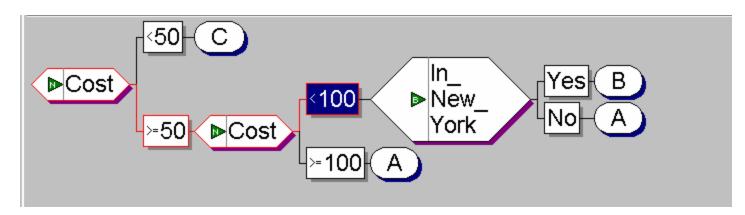
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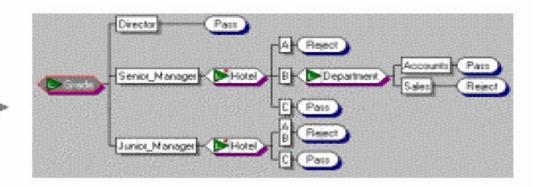# And drill down to see how Hotel Class is derived (example of backward chaining)

Hotel_Class
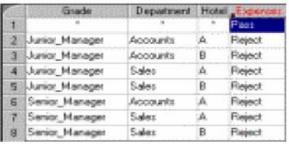
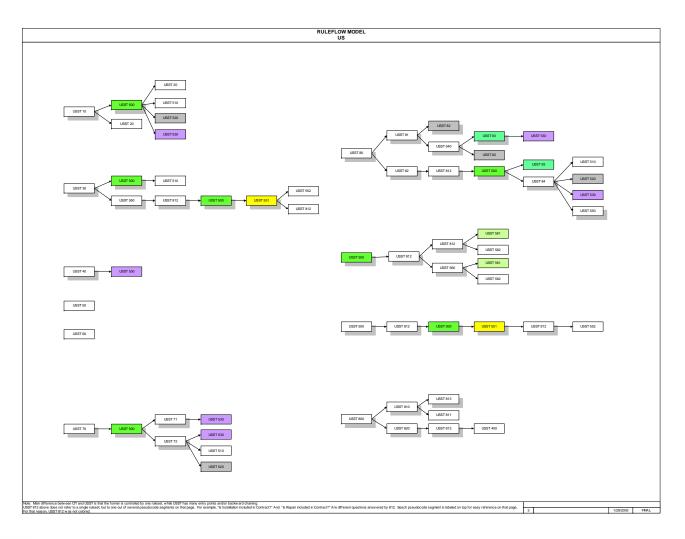# Some tools have Tree Induction algorithms that can derive decision trees from data…

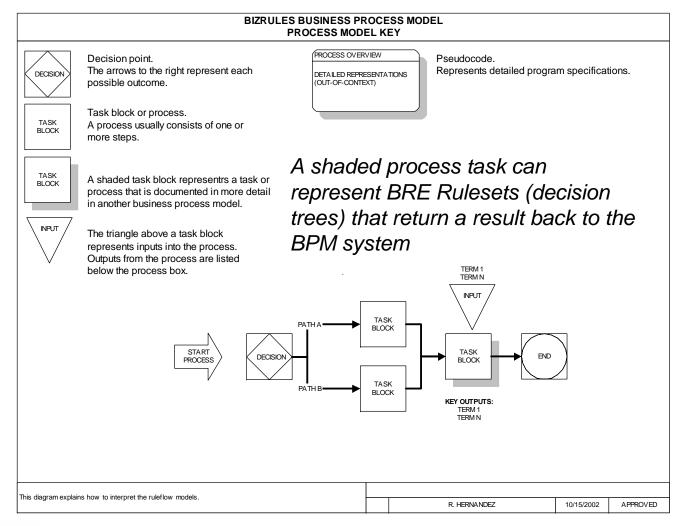# Rule Flow Model is a blueprint of all the rulesets (decision trees), and the links between (chains).

RULEFLOW MODEL
US

Note: Main difference between CIT and USST is that the former is controlled by one ruleset, while USST has many entry points and/or backward chaining.
USST 812 above does not refer to a single ruleset, but to one out of several pseudocode segments on that page. For example, "Is Installation included in Contract?" And "Is Repair included in Contract?" Are different questions answered by 812. Each pseudocode segment is labeled on top for easy reference on that page.
For that reason, USST 812 was not colored.

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We Write the Rules of eBusiness℠

Business Process Model depicts procedural steps. Any time data is needed, the BPA tool can evaluate (fire) the rules in the BRE automatically
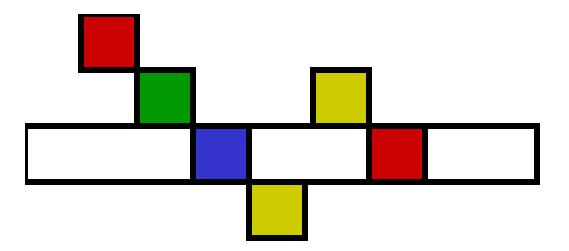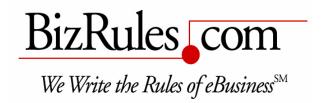
BIZRULES BUSINESS PROCESS MODEL
PROCESS MODEL KEY

DECISION

Decision point.
The arrows to the right represent each possible outcome.

PROCESS OVERVIEW

DETAILED REPRESENTATIONS
(OUT-OF-CONTEXT)

Pseudocode.
Represents detailed program specifications.

TASK BLOCK

Task block or process.
A process usually consists of one or more steps.

TASK BLOCK

A shaded task block representrs a task or process that is documented in more detail in another business process model.

A shaded process task can represent BRE Rulesets (decision trees) that return a result back to the BPM system

INPUT

The triangle above a task block represents inputs into the process. Outputs from the process are listed below the process box.

TERM 1
TERM N

INPUT

START PROCESS

DECISION

PATH A → TASK BLOCK

PATH B → TASK BLOCK

TASK BLOCK

END

KEY OUTPUTS:
TERM 1
TERM N

This diagram explains how to interpret the ruleflow models.

	R. HERNANDEZ	10/15/2002	APPROVED

Customer needs & wish list for rules

Primary needs

- **You need a framework to work in or else you get lost**
  - Zachman Framework is as good as any
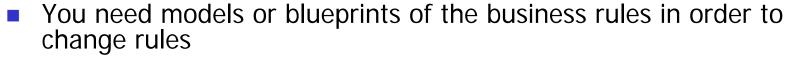
- **You need a business rules methodology that fits in to your enterprise architecture framework**
  - To know how to elicit rules from SMEs, and how to harvest and mine for rules
  - To know how to represent/engineer those rules for rule engines
  - To know what rules you have to program

- **You need models or blueprints of the business rules in order to change rules**
  - You can't change or modify a complex system unless you know what it is like today
  - If you have the plans, you need to verify they are up-to-date and accurate; if they are not you need to redraw them
  - If you don't have the plans, you need to create them

Tools for harvesting

- You need to decide what tools (upstream/downstream) and techniques you want to use to document your rules

- You can either tailor your methodology for rules, or select a specialized business rules methodology designed specially for declarative, rules-based application development

- You need to evaluate whether to use and link rule reverse-engineering tools into your new rules repository

Business rules vs. systems requirements

- Functional/technical specs are for systems people
  - Use cases are tools for modeling a computer system, not a business operating rule

- Business rules specs are for business people
  - Business rules govern internal business operations
  - Rules enforce external compliance requirements
  - Rules should be auditable and reportable

Business rules management & change control process
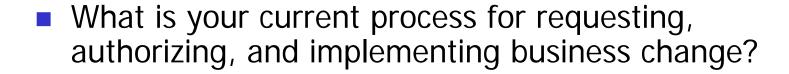
- Who owns the rules?

- Who has authority to approve the rules?

- Who has authority to change the rules?

- What is your current process for requesting, authorizing, and implementing business change?

- What is your ideal (TOBE) process?

- Will change control be a feature of your BRE or your application development environment?

A model process for managing business rules / rule governance

- Propose rules
  - Business units, HQ/field staff, call center can propose rules & scenarios
    - A scenario is a package of rulesets (i.e. promotions) that can be activated as necessary
  - Propose adds, changes, deletes

- Authorize rules
  - Authorize adds, changes, deletes
  - Scope and schedule the rule scenario

- Implement rules
  - Design & model rule adds, changes, deletes
  - Simulate entire rulebase
  - Beta test (internal/offline)
  - Parallel test (external/online)
    - Selection rules (to select % of transactions)
    - *SELECT [1%] OF TRANSACTIONS FOR [SCENARIO x] PARALLEL TEST*
  - Launch into production
  - Report rule metrics, results, volumes, etc.

Design a fast-track process for emergency rule changes

- Sometimes rules must be changed immediately. Two ways to do this in the model process:
    - Parallel test, selecting 100% of the transactions, or
    - Skip simulation, beta/parallel tests and launch right into production

- Examples
    - United Airlines
        - *"On Jan. 31, United Airlines posted on its website a surprisingly reasonable fare for a round-trip flight to Paris: $25. The airline pulled the offer -- the result of a programming glitch -- after 55 minutes, but not before 143 keen-eyed Web surfers saw fit to take United up on it."*

            Time, March 5, 2001, p. 82

        - *NO INTL FLIGHTS LESS THAN [$200] WITHOUT MKTG APPROVAL.*

    - 9/11 – Can rental agencies added $1 per mile charge for all one-way rentals

        - *ADD-ON $1 PER MILE FOR ALL ONE WAY CAR RENTALS, EFFECTIVE IMMEDIATELY, UNTIL FURTHER NOTICE.*
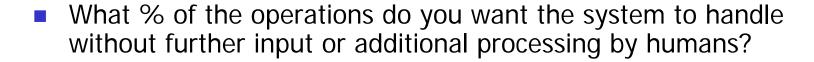
Selecting your first Rules project for PROOF OF CONCEPT

- What the highest-value project you should do first?

- What is it's function?
    - Process a data file...   Make an expert decision...
    - Recommend a product...   Approve a product....
    - Solve a problem
    - Provide expert guidance or advice

- What % of the operations do you want the system to handle without further input or additional processing by humans?

- Do you want to allow users to override expert decisions?

- Do you just want a list of recommendations but let the human make the final decision, or do you truly want the system to operate "hands-off"?
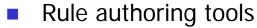
Large companies are looking for upstream tools and downstream tools

- Rule management/documentation tools
  - Repositories for documenting, managing, and reporting on business rules
  - No standards exist today for documenting business rules
    - IT bodies are working on standards from a technology standpoint
    - Seem to be working on systems-oriented tools, not business-oriented
  - Companies usually start with Visio because SMEs know how to use it
    - As a project grows over time and it slowly outgrows Visio, companies start looking for other solutions
    - Rapidly changing market, no clear solutions at this time

- Rule authoring tools
  - IDEs/editors for rule programming
  - Most BREs have their own proprietary authoring front-end
  - Some clients wish they could mix and match authoring/execution tools

- Rule execution tools
  - BREs for executing rules
  - Today the leading vendors are the standard-bearers

The ultimate solution
The Holy Grail

- Writing or drawing a specification, pushing a button, and automatically generating a completed, working application
  - Rule management tools that export rules into Rule authoring tools
  - Rule authoring tools that export code into Rule execution tools
  - Rule execution tools that fire the rules

- This is a great goal to work towards
  - Companies can't wait for the perfect ideal solution
  - They need to get started and keep an eye on those emerging tools/solutions

- Some tools already come close

Emerging Trends

- Visual rule modeling will become more common, in addition to the textual modeling approaches
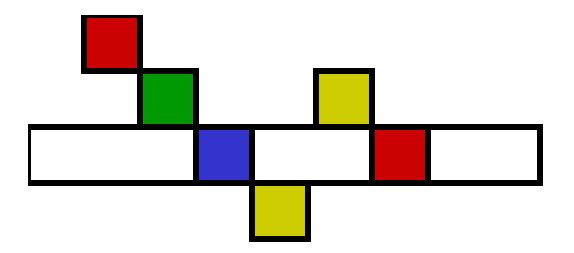 - Most Experts I know "see" rules as either decision trees or decision tables, not textually
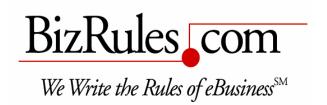
- Rule simulation will become more important
  - To speed up the rules validation/approval process

- The "perfect" BRE/ES tools will handle:
  - Visual rule modeling, such as decision tree/decision tables
  - Rule documentation/repository
  - Rule simulation
  - Rule execution
  - Business processes **and** business rules

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Thanks

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