Linking Business and Technology (MIT Information Quality Industry Symposium)

Larry Goldberg & Barbara von Halle
Managing Partners, Knowledge Partners International, LLC
lgoldberg@kpiusa.com   BvonHalle@kpiusa.com
About KPI: Thought Leader

"...one of the classic books of a new era in computing that will have much traction in the next few years" Dr. Opher Etzion, Master Inventor, IBM

- The Decision Model
- STEP Methodology and Training for Business Decision Management
- Business Process Management
- Business Requirements
- Business Logic Testing
- Leading provider of methodology and consulting to Global 1000 companies since 1997

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Agenda

• The Problem of Logic in our Business Systems
• Introduction To The Decision Model
• The Profound Impact on Business
• The Decision Model and Information Quality
• Summary
Separation of Concerns: The One Dimension Left Behind

Traditional Application Architecture – A “Big Ball of Mud” (Foote & Yoder)

Component Based Application Architecture

Source: Ken Orr
The Impediment

• Business Problem:
  – No standard way to organize business rules/business logic into a technology-independent, universal model
  – High value but low management visibility

• Technology Problem:
  – No standard way to translate business rules/business logic into code

• Best Practice Today:
  – Express business logic as business rules, separate from process flow or as part of requirements. Organize business rules into (arbitrary) sets.

• Better Solution:
  – A universal model for business rules/business logic (like the relational model was for data)
## Why This Workshop Is Important

### The Relational Model
- Changes the way we manage, leverage, store data
- Recognizes that data has its own existence
- Elevates data as an organizational asset
- Introduces rigor through normalization principles
- Impacts the direction of technology, methodology, and best practices

### The Decision Model
- Changes the way we manage, leverage, store business logic
- Recognizes that business logic has its own existence
- Elevates business logic as an organizational asset
- Introduces rigor through normalization principles
- Impacts technology, methodology, and best practices
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A Simple Statement of Business Logic

The simplest case is the evaluation of a single fact, leading to a conclusion about one new fact:

When
The Fact in this Condition is True
Then
The Fact in this Conclusion is True

Which can also be represented as follows:

Condition Assertion → Conclusion Assertion

Or simply, a basic assertion:

Condition → Conclusion

One example of such an assertion:

A person has a poor employment history → A person is highly likely to default on a loan
What is an Atomic Piece of Business Logic?

• The concept of “atomic”
  – cannot be decomposed into smaller elements of that object without losing its meaning

• Atomic Business Logic Statement
  – A business logic statement that cannot be decomposed (into smaller business logic statements) without loss of meaning

• An atomic statement of business logic consists of zero to many conditions leading to a conclusion about a single fact type
  – Each condition is an atomic logical expression about an atomic fact type
  – Conditions are ANDed together, never ORed
What Does Atomic Mean?

- Atomic Statement of Business Logic: One conclusion, conditions connected by AND
- Atomic Fact Type: un-divisible

Below is a schematic of a Single Atomic Statement of Business Logic

<table>
<thead>
<tr>
<th>Fact Type</th>
<th>Operator</th>
<th>Operand</th>
<th>Fact Type</th>
<th>Operator</th>
<th>Operand</th>
<th>Fact Type</th>
<th>Operator</th>
<th>Operand</th>
<th>Fact Type</th>
<th>Operator</th>
<th>Operand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person Employment History</td>
<td>Is</td>
<td>Poor</td>
<td>Person Mortgage Situation</td>
<td>Is</td>
<td>Poor</td>
<td>Person Misc Loan Assessment</td>
<td>Is</td>
<td>High</td>
<td>Person Likelihood of Defaulting on a Loan</td>
<td>Is</td>
<td>High</td>
</tr>
</tbody>
</table>

Multiple Atomic Conditions Connected by “AND”

Single Atomic Conclusion
### Grouping Multiple Statements

Multiple Atomic Logic Statements may be made about a Single Conclusion Fact Type

<table>
<thead>
<tr>
<th>Person Employment History</th>
<th>Is</th>
<th>Poor</th>
<th>AND</th>
<th>Person Mortgage Situation</th>
<th>Is</th>
<th>Poor</th>
<th>AND</th>
<th>Person Misc Loan Assessment</th>
<th>Is</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person Likelihood of Defaulting on a Loan</td>
<td>Is</td>
<td>High</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Person Employment History</th>
<th>Is</th>
<th>Good</th>
<th>AND</th>
<th>Person Mortgage Situation</th>
<th>Is</th>
<th>Good</th>
<th>AND</th>
<th>Person Misc Loan Assessment</th>
<th>Is</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person Likelihood of Defaulting on a Loan</td>
<td>Is</td>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Person Employment History</th>
<th>Is</th>
<th>Poor</th>
<th>AND</th>
<th>Person Mortgage Situation</th>
<th>Is</th>
<th>Good</th>
<th>AND</th>
<th>Person Misc Loan Assessment</th>
<th>Is</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person Likelihood of Defaulting on a Loan</td>
<td>Is</td>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Here are Three Examples of all the Possible Logic Statements that have a Conclusion about the Fact Type “Person Likelihood of Defaulting on a Loan”. Can you suggest a few more? Could the first statement be broken into smaller statements without losing meaning?
The Rule Family – A Way to Represent Multiple Logic Statements
Instead of Multiple Logic Statements that Look Like This:

They May be Represented in Two Dimensional Tables:

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person Employment History</td>
<td>Person Likelihood of Defaulting on a Loan</td>
</tr>
<tr>
<td>Person Mortgage Situation</td>
<td></td>
</tr>
<tr>
<td>Person Miscellaneous Loans Assessment</td>
<td></td>
</tr>
<tr>
<td>Is Poor</td>
<td>Is High</td>
</tr>
<tr>
<td>Is Good</td>
<td>Is Low</td>
</tr>
<tr>
<td>Is Poor</td>
<td>Is Medium</td>
</tr>
</tbody>
</table>

Rule Families are Tables that Conform to Rigorous Principles

What is the organizing principal behind the Rule Family?
Building Further: Where Do We Get Our Input?

<table>
<thead>
<tr>
<th>Rule Pattern</th>
<th>Person Employment History</th>
<th>Person Mortgage Situation</th>
<th>Person Miscellaneous Loans Assessment</th>
<th>Person Outside Credit Score</th>
<th>Conclusion: Person Likelihood of Defaulting on a Loan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>is Poor</td>
<td>Is Poor</td>
<td>Is High</td>
<td>&lt; 650</td>
<td>is High</td>
</tr>
</tbody>
</table>

- Starting with the first condition, we ask where this fact value comes from. Input from a web page or a file? Is it persistent data? Is it the result of execution logic?
- In this case we discover that it comes from executing logic that evaluates other business criteria: the business experts want to judge a Person’s Employment History based on criteria such as Person’s Years at Current Employer and Person’s Number of Jobs in the Past Five Years.
- We have to build an additional Rule Family where the conclusion will be “Person Employment History”, a different conclusion to that of our current Rule Family (Rule Family: Business logic grouped by Conclusion Fact Type.)
Building Up to Two Rule Families

- Note the Interim Conclusion “Person Employment History”
- We discover the need for yet another Rule Family. This one comes to a conclusion about a Person’s Employment History which is based on two conditions: Person Years at Current Employer and Person Number of Jobs in Past Five Years.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person Years at Current Employer</td>
<td>Person Employment History</td>
</tr>
<tr>
<td>Person Number of Jobs in Past Five Years</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person Employment History</td>
<td>Person Likelihood of Defaulting on a Loan</td>
</tr>
<tr>
<td>Person Mortgage Situation</td>
<td>Person Miscellaneous Loans Assessment</td>
</tr>
<tr>
<td>Poor</td>
<td>Poor</td>
</tr>
</tbody>
</table>

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Three Rule Families (How do we connect them?)

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule Pattern</td>
<td>Person Student Loans</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule Pattern</td>
<td>Person Years at Current Employer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule Pattern</td>
<td>Person Employment History</td>
</tr>
<tr>
<td>1</td>
<td>is</td>
</tr>
</tbody>
</table>

We can see how they can be connected, but a large set of dependencies would soon become unwieldy.
Organizing Logic

• Logic statements group and relate themselves naturally:
  – By their Conclusion Fact Types into Rule Families
  – Rule Families relate themselves naturally by their dependencies (Supporting Rule Families for Condition Fact Types)
  – We determine scope by the group of Rule Families that relate themselves to a natural business anchor point, the *Business Decision*

• The Decision Model begins with the Business Decision and ends naturally when there are no further dependent Rule Families
Defining a Business Decision

"Business decision: a conclusion that a business arrives at through business logic and which the business is interested in managing."

<table>
<thead>
<tr>
<th>Fact Type</th>
<th>Business Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claim Payment Amount</td>
<td>Estimate the claim payment amount</td>
</tr>
<tr>
<td>Claim Payment Eligibility</td>
<td>Determine Claim Payment Eligibility</td>
</tr>
<tr>
<td>Customer Likelihood of Loan Default</td>
<td>Determine Customer Likelihood of Loan Default</td>
</tr>
<tr>
<td>Insurance Policy Renewal Method</td>
<td>Determine insurance policy renewal method</td>
</tr>
<tr>
<td>Inventory Item Minimum Stock Level</td>
<td>Assess the Inventory Item minimum stock level</td>
</tr>
<tr>
<td>Loan Prequalification Requirements</td>
<td>Determine loan prequalification requirements for a customer</td>
</tr>
<tr>
<td>Person BMI (Body Mass Index)</td>
<td>Calculate Person BMI</td>
</tr>
<tr>
<td>Vendor Performance Index</td>
<td>Calculate the Vendor Performance Index</td>
</tr>
</tbody>
</table>

The underlined words (Calculate, Estimate, Determine, Assess, Validate) are “Decision Words”

A Business Decision is built from Fact Types (Terms)
The Decision Shape denotes the Decision and is named with a Decision word: e.g. Determine, Calculate.
The Rule Family directly connected to the business decision shape is called the “Decision Rule Family.”

Determine Policy Renewal Method

Policy Renewal Method
Policy Tier Within Bounds
Policy Renewal Override

All labels below the Rule Family name denote condition column headings.

The (Pnumber) denotes Rule Pattern numbers within the Rule Family. Where the (Px) appears with no header but a symbol [...] that indicates a pattern with no conditions.

The Name of a Rule Family is the conclusion column heading.

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The solid line terminated by the dot connects Rule Families that have an inferential relationship. In this case the condition column “Policy Renewal Override” in the Decision Rule Family has an inferential relationship with the conclusion column of the “Manual Renewal Override” Rule Family.

The labels below the dotted line denote condition columns that do not serve as conclusion columns in another Rule Family. These condition columns will be populated by known fact values (e.g. persistent data).

The labels below the solid line but above the dotted line denote condition column headings that serve as a conclusion column heading in another Rule Family.
Decision Model Notation

This diagram shows graphically how the Rule Family shapes depicts the Rule Families themselves and...
The Decision Model is seen to be complete when there are no further dependent fact types for which supporting Rule Families have not been drawn.

Decision Model Notation

Policy Tier Within Bounds
- Policy Discount
- Policy Tier

Policy Renewal Method
- Policy Tier Within Bounds
- Policy Renewal Override

Policy Renewal Override
- Insured Major Ownership Change
- Insured Major Location Change
- Policy Annual Premium
- Policy Discontinued Agent
- Policy Manual Flag

Insured Major Ownership Change
- Insured Minority Stockholder
- Insured Majority Stockholder
- Insured Board Change
- Insured CEO Change

Insured Major Location Change
- Insured Location Zip-5
- Insured Location Occupied Square Footage
- Insured Location Construction

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The Common State of Decisions*

• In recent years decision makers in both the public and private sectors have made an astounding number of poor calls
  – Teneco
  – General Motors
  – Time Warner
  – Yahoo...

• Decisions have been viewed as the prerogative of ... senior executives.

• The decision process, information, and logic are like a black box

* based on Thomas Davenport, HBR, Nov 2009
The Evolving State of Decisions

• Decision-making is becoming the focus of systematic analysis

• Sample Successes
  – Chevron*
  – Educational Testing Service*
  – The Stanley Works*
  – Healthcare Insurance companies **
  – Personal Lines Insurance Companies **
  – Mortgage Companies **
* Thomas Davenport, HBR, Nov 200
** KPI clients
Two Ways of Assessing Decisions

Value/Volume

- e.g. Merger and Acquisitions
- e.g. Product Design and Launch
- e.g. Pricing; Underwriting

Decision Value

High Value, Low Volume ← Decision Volume

Low Value, High Volume

Decision Volume

Complexity

- Unknown Knowables
- Unknown Unknowns
- Known Unknowns
- Known Knowns

Complexity Domain

Unordered ← Complexity Domain

Ordered

(Source for Volume and Value: derived from Smart (Enough) Systems, Taylor & Raden, Addison Wesley 2007)
Putting it Together

Pattern Based Decisions

Operational
- Unexpected Customer Problems
- Complex Events

Mid-level
- Project Failures
- Product Development
- Pricing
- Customer Segmentation

Strategic
- Crisis Management
- M&A Platform
- Strategic Planning
- M&A (add-on)

Fact Based Decisions

Operational Transactions

Chaotic Complex Complicated Simple
Unordered Ordered

Complexity Domain
(Source for Volume and Value: derived from Smart {Enough} Systems, Taylor & Raden, Addison Wesley 2007)
## The Business Decision Maturity Model (BDMM)

<table>
<thead>
<tr>
<th>Level 0</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unmanaged</td>
<td>Visible</td>
<td>Agile</td>
<td>Aligned</td>
<td>Predictive</td>
<td>Autonomic</td>
</tr>
</tbody>
</table>

### Minimum

<table>
<thead>
<tr>
<th>MINIMUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of loss of business control is high. Risk of business change is high. Ability to predict business impact of change is low. Cost of change is high.</td>
</tr>
</tbody>
</table>

### Immature

<table>
<thead>
<tr>
<th>IMMATURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>No business architecture; no business architecture to speak of.</td>
</tr>
</tbody>
</table>

### Not Present

<table>
<thead>
<tr>
<th>NOT PRESENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>No stewardship.</td>
</tr>
</tbody>
</table>

### Business Value

<table>
<thead>
<tr>
<th>BUSINESS VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of loss of business control greatly reduced at the project level; business change becomes possible through automated analysis. Ability to predict business impact of change is still low.</td>
</tr>
</tbody>
</table>

### Business Architecture

<table>
<thead>
<tr>
<th>BUSINESS ARCHITECTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project level process and business decision standards established within broader architectural standards.</td>
</tr>
</tbody>
</table>

### Business Stewardship

<table>
<thead>
<tr>
<th>BUSINESS STEWARDSHIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration of Business Decisions with use cases and process flows with business metrics.</td>
</tr>
</tbody>
</table>

### Enterprise

<table>
<thead>
<tr>
<th>ENTERPRISE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full integration of process and Business Decision Management into business planning.</td>
</tr>
</tbody>
</table>

### Decisions Shared Across

<table>
<thead>
<tr>
<th>DECISIONS SHARED ACROSS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROJECT LEVEL ONLY</td>
</tr>
</tbody>
</table>
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## Decision Model Information Quality Framework

<table>
<thead>
<tr>
<th>Information Quality Dimension</th>
<th>Definition</th>
<th>Repository of Information Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completeness</td>
<td>All required fact types are provided</td>
<td>The Glossary indicates whether a fact type is always required for the general context of a business process. Decision Model Views indicate the logic by which a fact type is sometimes required or irrelevant for specific context of a business process.</td>
</tr>
<tr>
<td>Data Type and Domain Values</td>
<td>A fact value conforms to the predefined data type and within valid range of values for its fact type.</td>
<td>The Glossary indicates data type, valid values. Decision Model Views indicate the logic by which a fact type domain is further restricted for a specific context of a business process.</td>
</tr>
<tr>
<td>Consistency and Reasonableness</td>
<td>A fact value makes business sense in the context of related fact type/s fact values and/or conform/s to predefined reasonability limits.</td>
<td>Decision Model Views provide the logic to determine consistency of values for related fact types, or to determine whether a fact value is within sensible limits fact type.</td>
</tr>
</tbody>
</table>
Determine Policy Renewal Method


What if we don’t have all industry standard data available for a geographical area?

Policy Renewal Method
- Policy Tier Within Bounds
- Policy Renewal Override

Policy Tier within Bounds
- Policy Discount
- Policy Tier

Policy Discount
- Policy Grade
- Package Grade
- Package Discount
- Location State Category

Policy Renewal Override
- Insured Major Ownership Change
- Insured Major Location Change
- Policy Annual Premium
- Policy Discontinued Agent
- Policy Manual Renewal Flag

Insured Major Ownership Change
- Insured Minority Stockholder
- Insured Majority Stockholder
- Insured Board Change
- Insured CEO Change

Insured Major Location Change
- Insured Location ZI RP-5
- Insured Location Occupied Square Footage
- Insured Location Construction
Decision Model for Determine Policy Renewal Method referencing a reduced glossary (View:RG).

The Asterisk (*) Is a Rule Family Changed from Base View: One RF is changed in content only. The other RF is changed in structure. Such changes are visual.
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The Decision Model has produced requirements faster, incrementally, and with unprecedented agility.

Vocabulary Models:
- Glossary/Semantic Model
- Logical Data Model
- Object Model

Decision Model:
- business rules and business logic

Process Model

Use Cases

SOA Components

Business Requirements & Test Cases

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Conclusion

• The Decision Model takes the mystery (and risk) out of the decision-making black box described by Davenport in Harvard Business Review Nov 2009.

• Based on our experience with the Decision Model, we predict that it will have the same (or greater impact) on business and technology as the Relational Model did.
How to Learn More

• Log in to the KPI Website to:
  – Review The Decision Model Primer, a free download on the web site
  – Buy the book
  – Find other Decision Model information as it becomes available
  – Conduct a 2-3 week pilot (KPI STEP)

www.TheDecisionModel.com