DMN
Decision Model & Notation

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CONTENTS OF FINAL SUBMISSION

- Overall modeling paradigms
- Comprehensive notation and vocabularies
- Decision tables
- Expression language
  - S-FEEL, FEEL
- Metamodel
  - Definitions, Expression
- Interchange formats
  - XMI, XSD
- Conformance levels
ASPECTS OF MODELING

Decision Model (DMN)

Routing

Routing table

Application risk

Eligibility

Eligibility rules

Application

Decision Requirements Level

Decision Logic Level

Eligibility rules

<table>
<thead>
<tr>
<th>P</th>
<th>Employment status</th>
<th>Country</th>
<th>Age</th>
<th>Eligibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>UNEMPLOYED</td>
<td>-</td>
<td>-</td>
<td>INELIGIBLE</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>not(uk)</td>
<td>-</td>
<td>INELIGIBLE</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>-</td>
<td>&lt; 18</td>
<td>INELIGIBLE</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>ELIGIBLE</td>
</tr>
</tbody>
</table>

Business Process Model (BPMN)

Collect application data

Decide routing

Routing = ACCEPT

Routing = DECLINE

Offer product

Decline customer
PRIMARY USE CASES

• Modeling human decision-making
  • Descriptively model the decisions within an organization
  • Natural language used rather than formal expressions

• Modeling requirements for automated decision-making
  • Descriptively model the decisions within an organization
  • Formal expressions used but may be incompletely specified
  • Some decisions may be delegated to humans

• Implementing automated decision-making
  • Decision logic must be completely specified
DMN - THIRD IN A BMI TRILOGY

- Three standards designed to be complementary
- BPMN 2.0 (2010)
  - **Prescriptive** (business) process
  - Included a forward looking “business rules task”
  - Expression language was “nice to have” so deferred
- CMMN 1.0 (2012, currently in FTF)
  - **Descriptive** (case management) process
  - Expression language was judged “should have”
  - But to manage v1 scope submission team deferred to DMN
- DMN (2013)
  - “Decision Tables” are a core DMN feature
  - Expression language was “must have” so team stepped up
DECISION REQUIREMENTS DIAGRAM

Decision 1

Input data 1

Decision 2

Input data 2

Business knowledge 1

Business knowledge 2
KNOWLEDGE SOURCES

Knowledge source 1

Decision

Business knowledge

Knowledge source 2

Input data
DECISION LOGIC

Decision 1

<table>
<thead>
<tr>
<th>Business Knowledge 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>parameter 1</td>
</tr>
<tr>
<td>Binding expression 1</td>
</tr>
<tr>
<td>...</td>
</tr>
<tr>
<td>parameter 2</td>
</tr>
<tr>
<td>Binding expression 2</td>
</tr>
<tr>
<td>parameter $n$</td>
</tr>
<tr>
<td>Binding expression $n$</td>
</tr>
</tbody>
</table>

Business knowledge 1

Parametrized value expression

Decision 1

Input data 1

Decision 2

Input data 2

Decision 2

Value expression
**DECISION TABLES**

Hit policy:
- If one rule is required:
  - **Unique** (if there is only one for every set of inputs) [default]
  - or select the desired one: **Any**, **First**, **Priority**
- If all applicable rules are required:
  - results in an output list (operations may be applied, e.g. sum(partialscores))
  - List order is **No order (arbitrary)**, **Rule order**, **Output order**

<table>
<thead>
<tr>
<th>U</th>
<th>Applicant Age</th>
<th>Medical History</th>
<th>Applicant Risk Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&gt; 60</td>
<td>good</td>
<td>Medium</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>bad</td>
<td>High</td>
</tr>
<tr>
<td>3</td>
<td>[25..60]</td>
<td>-</td>
<td>Medium</td>
</tr>
<tr>
<td>4</td>
<td>&lt; 25</td>
<td>good</td>
<td>Low</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>bad</td>
<td>Medium</td>
</tr>
</tbody>
</table>
EXAMPLE DECISION LOGIC

Bureau Call Type

<table>
<thead>
<tr>
<th>Pre-bureau risk category</th>
<th>Bureau Call Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 HIGH, MEDIUM</td>
<td>FULL</td>
</tr>
<tr>
<td>2 LOW</td>
<td>MINI</td>
</tr>
<tr>
<td>3 DECLINE</td>
<td>NONE</td>
</tr>
</tbody>
</table>

table with unique columns - complete

Pre-Bureau Eligibility

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Bureau Call Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>INELIGIBLE</td>
<td>-</td>
</tr>
<tr>
<td>ELIGIBLE</td>
<td>FULL, MINI</td>
</tr>
<tr>
<td>CONTINUE</td>
<td>NONE</td>
</tr>
</tbody>
</table>

table with unique columns - complete

Pre-Bureau Risk Category

<table>
<thead>
<tr>
<th>Application Risk Score</th>
<th>Pre-Bureau Risk Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>False</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Existing Customer</th>
<th>Application Risk Score</th>
<th>Pre-Bureau Risk Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>True</td>
<td>&lt;100</td>
<td>HIGH</td>
</tr>
<tr>
<td></td>
<td>[100..120]</td>
<td>MEDIUM</td>
</tr>
<tr>
<td></td>
<td>&gt; 120</td>
<td>LOW</td>
</tr>
<tr>
<td>False</td>
<td>&lt; 80</td>
<td>DECLINE</td>
</tr>
<tr>
<td></td>
<td>[80..90]</td>
<td>HIGH</td>
</tr>
<tr>
<td></td>
<td>(90..110]</td>
<td>MEDIUM</td>
</tr>
<tr>
<td></td>
<td>&gt; 110</td>
<td>LOW</td>
</tr>
</tbody>
</table>

single hit - consistent - complete - non redundant
EXPRESSING THE DECISION LOGIC

• FEEL (“Friendly Enough Expression Language) implements the required mechanisms
  • Built-in types, functions and operators
  • Every decision in a DRD can be defined using a formal expression that specifies how the decision’s output is determined from its inputs
  • Complete decision models can be defined
  • Formal expressions may also be encapsulated as functions
  • Supports abstraction, composition, and scalability

• S-FEEL (“Simple FEEL”) is a basic subset of FEEL designed to cover the essential requirements of Decision Table-based DMN models

• DMN can be extended to use other expression and type definition languages
Conformance

- level 1
  Notation, Interchange

- level 2
  Notation, Interchange
  + S-FEEL

- level 3
  Notation, Interchange
  + FEEL
IMPLEMENTATION WORK

- Market has indicated (strong) demand and vendors are moving to answer that demand and require a standard to evolve the market.
- Available decision modeling tools by FICO, DMS, KUL, IBM are complete or partial implementations of DMN.
- Available decision modeling tools with existing client base by KPI/Sapiens and KPI/BIZZdesign will continue to support TDM but will also be DMN compliant shortly.
- Other commercial and open-source implementations of DMN are under development.
  - E.g. RuleManagement Group
DISCUSSION QUESTIONS

• Which problems does DMN solve?
• Is it a good solution?
• Will there be tools?
• What is the relationship with BPMN?
• Is it a methodology?
• Who are possible users?
• When is a tool compliant?
• When is a methodology compliant?
• Your questions?