Towards a Healthcare Business-Process Reference Model

Paul C. Brown, TIBCO Software
John Kelly, NaviNet
David Querusio, Harvard Pilgrim Health Care
Overview

• Need for Action

• Reference Models and Reference Architectures

• Concept: Exploit the Natural Order of the Business Processes

• Example: Claim Processing

• What Needs to be Done?

• Summary
Need for Action

• Industry in flux

• Enterprises experimenting with different business models
  – Trying various combinations of roles: risk holder, plan manager, plan administrator, care provider

• Health plans are often aggregates
  – Different business models, administration approaches, companies

• Monolithic COTS applications span multiple roles
  – Difficult to use for individual roles

• Business experiments are expensive:
  – Custom contracts, interface specifications, development work
Reference Models and Reference Architectures
Essential Architecture Views

- Process Model – The Process
  - *The business view*

- Architecture Pattern – The Structure
  - Also called architectural style
  - *The IT view*

- Process-Pattern Mapping – How the Solution Works
  - *The business/IT alignment view*

Process Model

- Activities and data flow
- Business information models
  - What does Order Status Result include?

```
select "check order status"

Initiate Order Status

enter order identification information

Order Identification Information

submit order status request

Order Status Request

look up order status

Order Status Result

display status result
```
Architecture Pattern

- **All major participants**
  - Systems
  - People

- **Communications channels**

- **Restrictions on components and channels**

  - Application servers will remain stateless
  - All back-end system access will be mediated via services
  - All application data persistence will be managed by the back-end system

- **Order Management System**
  - Internet Explorer or Firefox
  - Apache Tomcat
  - TIBCO Business Works
  - Customer

- **Communication channels**:
  - HTTP.WAN
  - SOAP/HTTP
  - proprietary API
  - keyboard/display
Process model mapped onto architecture pattern

- Some activities split across participants

<table>
<thead>
<tr>
<th>Customer</th>
<th>Internet Explorer or Firefox</th>
<th>Apache Tomcat</th>
<th>TIBCO Business Works</th>
<th>Order Management System</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>display options</td>
<td>call query service</td>
<td>&quot;lookup order status&quot; activities</td>
<td>get order status</td>
</tr>
<tr>
<td>select &quot;check order status&quot;</td>
<td>prompt for order ID</td>
<td>format result for display</td>
<td>interrogate back-end system</td>
<td></td>
</tr>
<tr>
<td>enter orderID</td>
<td>submit query request</td>
<td>display result for display</td>
<td>return query result</td>
<td></td>
</tr>
<tr>
<td>read result</td>
<td>display result</td>
<td>&quot;display status results&quot; activities</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Reference Architecture: Definition

- Standardized structure for solving a class of problems
  - Reference Model – The Abstracted Work Process
  - Architecture Pattern – The Abstracted Structure
  - Process-Pattern Mapping – How the Abstracted Solution Works
Concept: Exploit the Natural Order of the Business Processes
The overall structure of health care business processes is consistent and stable
  – Little variation in activity structure

Logical roles in the process remain relatively stable
  – Changes usually sub-divide existing roles

What varies is who plays which role
Leveraging The Natural Order

- Standardize business process reference models
  - Focus: Logical roles and their interfaces

- Standardize the process status reporting

- Leave architecture pattern and activity implementation unspecified

- Goal: flexible business models with transaction tracking
  - Improve response times
  - Improve quality of care
  - Reduce cost
Example: Claim Processing
## Claim Processing

<table>
<thead>
<tr>
<th>Provider</th>
<th>Payer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Provider</td>
<td></td>
</tr>
<tr>
<td>Claim Preparer</td>
<td></td>
</tr>
<tr>
<td>Claim Submitter</td>
<td></td>
</tr>
<tr>
<td>Claim Router</td>
<td></td>
</tr>
<tr>
<td>Claim Acceptor</td>
<td></td>
</tr>
<tr>
<td>Claim Adjudicator</td>
<td></td>
</tr>
<tr>
<td>Claim Payer</td>
<td></td>
</tr>
<tr>
<td>Funds Provider</td>
<td></td>
</tr>
</tbody>
</table>

1. **Provider**
   - **Service Provider**: `provide service`
   - **Claim Preparer**: `prepare claim`
   - **Claim Submitter**: `submit claim`
   - **Claim Router**: `route claim`

2. **Payer**
   - **Claim Acceptor**: `accept claim`
   - **Claim Adjudicator**: `adjudicate claim`
   - **Claim Payer**: `pay claim`
   - **Funds Provider**: `provide claim payment funds`

- **Interfaces**:
  - Claim Submission Interface
  - HIPAA 837 Claim Interface
  - Claim Acceptance Interface
  - Claim Adjudication Interface
  - Claim Payment Interface
  - Funds Provisioning Interface

- **Protocols**:
  - `HIPAA 837`
Few Standard Interfaces Exist

- HIPAA Provider-Payer Interface
- Incomplete - does not represent business sub-roles
- Custom extensions required for real business use
  - Typically 100 pages per interface
Information Required for Eligibility Checks

- **Benefit Policy Administration**: the processor of claims.
- **Authorization Limitation**: count limit on service provided.
- **Benefit Category**: dollar value limit on paid services.
- **Benefit Plan**
- **Benefit Administrator**
- **Benefit**:
  - service count limit
  - serviceDollarLimit
- **Limitations**:
  - -requiredProcedures
  - -requiredDiagnosis
- **Conditional**: Entirely based on what is on claim.
- **Type of Service**
  - -authorizationFor
  - -paidServiceHistory
- **Service Instance**
  - -startDate
  - -endDate
  - -claimAmount
  - -paidAmount
- **Member**
- **Provider**
  - -taxID
  - -NPI
  - -payerSpecificID
  - -UPIN
- **Explicit Authorization**
  - -authorizationPeriod
- **Provider Type**
- **Policy**
- **Non-processing support**: deals with member issues, may redirect benefit administrator.
Claim-Related Concepts in HIPAA 837

- **Subscriber**
- **Member**
- **Claim**
  - 1..* adjusted Service lines
  - coverage Through
  - 1..* initiallySubmitted ServiceLines
- **Service Instance**
  - startDate
  - endDate
  - claimAmount
  - paidAmount
  - group 0..1
- **Submitter**
  - 1..* grouped Services
- **Provider**
  - -taxID
  - -NPI
  - -payerSpecificID
  - -UPIN
- **Payer**
- **837 Claim**

Submitter may be a provider or an intermediary.
Traditional Payer Activities

- handle HIPAA claim status query
- claim settlement process monitoring service

Traditional Provider Activities

- provide service
- prepare claim
- submit claim

- route claim
- accept claim
- adjudicate claim
- pay claim
- provide claim payment funds

HIPAA 276-277 Claim Status Interface
HIPAA 837 Claim Interface
Claim Status Reporting Interface
Claim Acceptance Interface
Claim Adjudication Interface
Claim Payment Interface
Funds Provisioning Interface
Example: Two Cooperating Parties

Health Care Nameplate Company

- HIPAA 837 Claim Interface
- Accept Claim
- Pay Claim
- Provide Claim Payment Funds
- Route Claim
- Adjudicate Claim
- Claim Status Reporting Interface

Vision Care Company

- Claim Acceptance Interface
- Accept Claim
- Pay Claim
- Claim Adjudication Interface
- Claim Payment Interface
- Adjudicate Claim
What Needs to be Done?

• **Standardize High-level Process Models**
  – Standardize major roles, major activities, interactions
  – Standardize major interfaces and coordination patterns
  – Develop milestone-level tracking states
  – Identify and accommodate:
    – Variations in process structure
    – Variations in individual activities (black box perspective)

• **Abstract Shared Functionality as Business Services**
  – e.g. Eligibility, Procedure pricing

• **Use models to validate data structures and interfaces**
  – Ability to handle common variations
Why this Approach Works

• Activities, activity relationships, and roles remain relatively constant within a process
  – Empirical observation of business process evolution over four decades
  – What commonly changes:
    – Who plays each role
    – Sequencing of activities without dependencies
    – Occasional introduction of a new activity
    – Formatting of information and interfaces

• Process structure provides framework for validating:
  – Interfaces
  – Data structure information content
Next Steps

• Track ongoing progress at Harvard Pilgrim Health Care

• Identify appropriate industry working group(s)
  – HL7
  – Joint Initiative Council (JIC)
  – … Open for suggestions!

• Merge work

• Give us your feedback at healthcarereferencearchitecture.com
Summary

• Business model evolution can be facilitated by standardizing business processes and role-based interfaces

• The approach is being put into practice at Harvard Pilgrim Health Care

• More process focus is needed in health care
  – Interfaces are process artifacts, not information artifacts
  – Information is only valuable when used in a process