Using Software as a Service (SaaS) to advance Lab. Informatics Capabilities

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Laboratory Information Management

An Information Business

Information Production Process
- Reliability
- Accessibility
- Turnaround time
- Production cost

Clinical Information Subsystem
- ASTM, HL7, IHE, ...
- Open data access with R.D.B.M.S

Interoperability

Accessibility

Lab. Revenue Cycle Management
- Connectability
- Compliance
- Collections Optimization

Knowledge Hierarchy

Wisdom

Knowledge

Information

Data

Facts

General Facts

distill
assimilate
compare
collect
observe
**Laboratory Information Management**

Front-End
Back-End

- Lab. Portal
- HIS, EMR, A/R
- Order Entry / Result Reporting / Billing

**Production**

- Lab. Production Manager (middleware)
- Automation
- Instruments
- Manual W.

**Health Informatics for the Laboratory**

- **Access to / Cost of Ownership of Lab Informatics solutions**
  - Delivery Models
  - To License, Rent or Outsource
  - Associated services

- **Access to state-of-the-art / leading edge functionality**
  - Constant evolution
  - Maintain that access
  - Benefit constantly from new technologies, new capabilities

- **Interoperability**
  - Not limited to within the Lab
  - Across the enterprise
  - W. External systems
Some Definitions

• **Fat-Client**
  – Client Software application
  – provides rich functionality independently of the central server

• **Thin-Client (remote desktop SW)**
  – Citrix, Windows TSE; SW application on the Server

• **Web Browser**
  – enables a user to display and interact with text, images, videos, music and other information typically located on a Web page

• **Rich-Client**
  – Client of Rich Internet Application (RIA)

Traditional Implementation

My Laboratory

On premise
From
• Main frame & dumb terminals
• To Client-Server
With remote locations

Ordering / Reporting / Billing

My Laboratory

My Physicians

My Patients

Orders

Results

Specimen Management
Evolution and Optimization

- Consolidation and Integration of Laboratories
- Harmonization

Share the information across organizations…

Align laboratory organizations…
- Have a centralized IT structure…
- Standardize tests, units and ranges across services…
- Transfer staff intra sites…
- Dynamically route testing…

Utilities <-> Services

And beyond the delivery aspect, ... added value services
Using Services …

Water
Electricity
Phone

SaaS, Software as a Service
What is SaaS?

• Software as a service (SaaS) is a software application delivery model where a software vendor hosts and operates (either independently or through a third-party) the application for use by its customers over a private network or the Internet.

• Customers do not pay for owning the software itself but rather for using it.

• The term SaaS has become the industry preferred term, generally replacing the earlier terms of Application Service Provider (ASP) and On-Demand:

  ASP Model: The application software resides on the vendor’s system and is accessed by users through a web browser or by special purpose client software provided by the vendor; the application is available to customers everywhere via the Internet, either in a browser or through some sort of “thin client.”

In practice

• Are hosted and managed remotely off-site:
  – Hardware: servers,
  – OS, Database, Application Software
  – Associated services

• Centralized Resources

• Remaining locally
  – Computers
  – Printers,
  – Interfaces to devices
Objectives of SaaS

- One software source code (binary) for all
- Centralized resources
- Centralized maintenance
- For immediate benefits: reducing costs and improving services
  - Reducing upfront and installation costs
  - Reducing operating costs:
    - centralized updates
    - no HW/SW upgrade burden
    - up-to-date technology
    - Usage costs
    - No or little maintenance, carried out by the Provider: backup,
  - The End-User is focusing on his core competence not his IT resources/infrastructure.
- Enhanced workflow and operations

Yes, but …

- How to deal with each specific workflow?
- How to deal with customization?
- How to address security and safety concerns?
- How to ensure a proper response time?
- How do one remain in full control?
- Do I have the same level of efficiency, interactivity, ergonomics in my User Interface?
Example of LIS Implementation

**Infrastructure**
- Primary Data Center and Secondary Data Center to support a regional LIS system
  - Secondary D.C. as DRP (Disaster Recovery Plan)
  - 26 laboratories in 6 hospitals (~3,600 beds)

**Front-End / Back-End**
- Browser (Web based) Application for Ordering/Reporting
  - ~1,700 users
  - Includes specimen management / collection

**Production**
- Fat-Client intra-lab
  - 130+ Instruments interfaces
  - ~830 users
  - 8,000 Requisitions/day

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Model => toward Rich Internet Application

**Infrastructure**
- Primary Data Center & Secondary Data Center (DRP)
  - Own, rent, outsource?

**Front-End / Back-End**
- “Rich(ier)” Client

**Production**
- Rich Client
Why RIA for managing Lab Production?

Characteristics
- Expressiveness,
- Rich Media Integration,
- Performance/Responsiveness,
- Real-Time,
- Off-Line,
- Deep back-end integration,
- Web Deployment model

The face of the SOA

RIA, a SaaS enabler

Wrapping-up

- SaaS is available today
  - Not only another delivery model
  - But also…
  - New technology coming to create a RIA (Rich Internet Application) for the Lab.

- Not one model fits all … at least for the time being
  - What is the strategic fit for your particular organization?
    - Cost of Ownership
    - Outsourcing
    - IT policies
    - Infrastructure
    - IT resources
    - Economic (invest or rent)
Lâle White - XIFIN

What’s been missing

Flexible
Reliable
Low Cost
Bi-Directional
Real-time
Universal
...Communications
Web 2.0 “A Conversation”

- Internet – Facilitates real time, 2-way communications between and among various resources and services
- A higher degree of connectivity than simple integration
- The Web and Web Services optimized
- Technology standards facilitate the process

Tail Wagging The Dog

- Legacy Systems – little consideration for
  - Ease of integration and interoperability
  - Availability of needed data elements

- Enterprise System

- Needs of other business processes
  - Avoid duplication of efforts
  - Provide information needed by other processes
- The “Railway” gives way to more complex information highway
The Information Highway

Rethinking Information Management

• Enabling the workflow through:
  – Timely and reliable access to best and most up-to-date capabilities and resources throughout every step in a process
  – Intelligent and comprehensive automation
  – Design and plan for change and flexibility
  – “Mine” the data stream
Service Oriented Architecture

- System Designed to
  - Optimize business processes
  - Operate as a continuous service
- IT infrastructure enables different applications and resources to exchange data and interact in business processes
- Separates functions into distinct units (services)
  - distributed over a network
  - combined and reused to create business applications
- Services “Collaborate”:
  - Communicate with each other
  - Coordinate activities
- Evolved from older concepts of distributed computing and modular programming

Web Services

- Software system designed to support interoperable Machine to Machine interaction over a network
- Web Services usually communicate over HTTP using XML standards including SOAP and WSDL.
"The Web gets better when developers can spend less time working through interoperability issues and more time developing…"  

Dean Hachamovitch  
Internet Explorer general manager

Software as a Service (SaaS)

- Application continuously tailored to the needs of diverse customers  
  - Customization replaced by Configurable logic  
  - Customer & vendor insights improve product
- Collaboration benefits all parties
- Facilitates “Best of Breed”
Revenue Cycle Management = \textit{COMPLEXITY}

- \textbf{Healthcare AR requires the most complex integration, connectivity and functionality}
  - Interactive from point of order to payment
- \textbf{Optimized connectivity enhances functionality}
  - Speeds up processing
  - Removes manual steps
  - Mitigates clerical errors resulting in compliance issues and waste
- \textbf{Utilization of internal and external information}
  - Data mining
- \textbf{Maintenance of changing standards (HIPAA, ICD,CPT,LOINC)}
  - Speed of changing rules outpace capability of legacy systems
Revenue Cycle Management

Bringing it all together...

Components

• **Application**
  – Rules-driven workflow automation, closed-loop, flexible/adaptable, precise & reliable

• **IT Infrastructure**
  – Comprehensive, managed and maintained as SaaS vendor

• **Managed Services**
  – Ongoing billing, compliance and process monitoring and management services
Application

- Comprehensive Automation
  - Embedded business/compliance logic throughout process
- User-Configurable Business Rules
  - Lab specific process flow, parameters policies
- Integrated Resources
  - Critical resources accessible throughout workflow
- Closed-loop Processes
  - Continuous self-monitor, track and direct claims’ progress
- Accurate Financials
  - GAAP compliant accounting & reporting
- Analytic Report Writer
  - Unprecedented monitoring and analysis operational performance

IT Infrastructure

- Technology Management
  - High-end Hardware, Applications and Data Center
  - Data Driven Architecture – Highly Configurable
  - High Availability, Security and Scalability
- Connectivity Management
  - Interfaces
  - Transaction Services
  - Data Resources
  - Ancillary Services
  - Browser Based User Access
Managed Services

- **Reference Resources**
  - CPT, ICD-9, Physician license numbers, NPI, Address & Zip Codes+4
- **System Logic Updates**
  - LCD/NCD edits, ABN formats, CCI & OCE edits, CPT Cross-walks, Expect fee schedules, Payer IDs and edits, Eligibility files
- **Transaction Services Providers**
  - Contract, Integrate and Manage
- **Compliance Management**
  - Standing order guidelines, State level "no-mark-up" and disclosure rules, NPI exclusions, HIPAA
- **Account Management**
  - AR reconciliation & closing package, Continuous monitoring of all aspects of process performance

Benefits of SaaS

- **Scalability**
- **Versatility**
- **Web Services Real Time Integration**
- **IT Services & Infrastructure provided by SaaS Vendor**
- **Timely, Evolving Functionality**
- **Efficiency Through Maximized Communications**
Business Processes Have Evolved

From sequential and siloed …

… to parallel and collaborative

Requires technology that is smart, agile, low cost and secure
Making it work for a laboratory

CLIENT INTERACTION

LABORATORY INFORMATION SYSTEM

ORDER ENTRY AND CHECK IN 
SPECIMEN RECEIVING
TEST ORDER TO ANALYZER
RESULTS ENTRY
LAB REPORTING

SPECIMEN TRACK & TRACE

Test Ordering Process
Transformations that lead to SaaS

From point to point …

Application 1

Application 2

To hub-n-spoke …

Application 1

Application 2

Application 3

Service Oriented Architecture (SOA)

A Paradigm Shift

<table>
<thead>
<tr>
<th>Traditional Architecture</th>
<th>Service Oriented Architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functionality Driven</td>
<td>Process Oriented</td>
</tr>
<tr>
<td>Designed to last</td>
<td>Designed for change</td>
</tr>
<tr>
<td>Long development cycles</td>
<td>Iterative development</td>
</tr>
<tr>
<td>Tightly Coupled</td>
<td>Loosely Coupled</td>
</tr>
<tr>
<td>Application Specific</td>
<td>Heterogeneous</td>
</tr>
<tr>
<td>Batch Process/Point-to-point integration</td>
<td>Message Based/Using Standards</td>
</tr>
</tbody>
</table>
SOA: Improves Business & IT Alignment
Business Process Focused Development

Business Processes
Sample Process
- Update Address
- Reserve Inventory
- Create Customer Order
- Schedule Shipment
- Create Supplier Order

Business Services
Sample Services
- Update Address
- Reserve Inventory
- Schedule Shipment
- Create Purchase Order
- Schedule Production
- Check Inventory

Services Correlate to Process Steps

SOA: Extends & Evolves IT Investments
High Re-Use Through Interoperability

Business Services
- Update Address
- Reserve Inventory
- Schedule Shipment
- Create Purchase Order
- Schedule Production
- Check Inventory

ERP
SCM
CRM
Legacy

Update Inventory
Composite Service
Create Order
Composite Service
SOA: Cuts Development Time & Effort
Rapid Application Composition via Re-Use of Services

How does SOA work?

- Monitoring & Optimization
  - BAM
  - JMX

- Interact/Access
  - Portal JSR-168
  - Struts/JSF

- Orchestrate
  - BPEL
  - XSLT/XQuery

- Gateway
  - WS-Security
  - WS-Policy, SAML
  - Web Services Mgmt

- Business Services
  - XML/XML Schema
  - WSDL/WSIF
  - SOAP, JCA, JMS
Putting technology into perspective

... using a loan processing example