Web-based Radiology

By: Kevin Jett
Basic Functions of Radiologists

- Interpret scans from outside clients
  - Types of scans
    - MR
    - CT
    - Nuclear Medicine
    - Plain Film
    - Ultrasound
    - Fluoroscopy
Scan Examples

CT Scan

MR Scan

Nuclear Medicine

Ultrasound
Basic Functions of Radiologists

- Interpret scans from outside clients
  - Types of scans
    - MR
    - CT
    - Nuclear Medicine
    - Plain Film
    - Ultrasound
    - Fluoroscopy
  - Return interpretations back to clients
Primitive Solutions

- **Email**
  - Problems with Email
    - Unsecure data
    - Unreliable
    - Duplicate Data

- **Phone**
  - Problems with Phone
    - Receptionist needed
    - Work hours only
Primitive Solutions (con’t)

- Fax
  - Problems with fax
    - Use of unneeded paper
    - Extra phone line
    - Cannot make changes to data
    - Additional space needed to store archives
Needs in New Software

- Communication
  - Outside clients
  - Radiologist partners
- User friendly software
- Reliability
- Real time
- Secure Data
Responsibilities as Designer of Software

- Meet with radiologist
  - Essential components in software
    - Client order system
    - Archiving
    - Patient history
    - Administrative tools
  - Basic visual design of software
  - Rough timeline for completion
Design: Phase 1

- **Type of Language**
  - ASP.NET with VisualBasic.NET
    - Worldwide connectivity
    - Familiar user interface
    - Ease of database connectivity
    - Fast, reliable data return rate

- **Type of Database**
  - Microsoft SQL Server
    - Connection to ASP.NET
    - Great for large archiving
Design: Phase 2

- Visual design
  - Review notes from radiologist
  - Design basic layout
  - No coding in Phase 2
  - Screenshots of Phase 2 layout
- 2\textsuperscript{nd} Meeting with Radiologists
  - Review screenshots
  - Take notes of any changes
  - “If you dream it, it can be done.”
Design: Phase 3

- After approval of Phase 2
- Begin coding of homepage
  - Start small
  - Build basic functions
- Meet with Radiologists
  - Walkthrough homepage
  - Give timeline for function
  - Note any changes needed
Design: Phase 4

- After Phase 3 approval
  - Build each page step-by-step
  - Get each page approved
  - Fill database with test material

- Meet with Radiologists
  - Teach them to use software
  - User Friendly?
Design: Phase 5

- Secure data
  - Password protected
  - User roles
  - SSL certificates
  - Timeout feature
- Debug software
- Test software
  - Every possible case
  - Outside testing
Design: Finalizing

- Show radiologists
- Add one outside client
  - “Start slow!”
  - Setup users
- After users are comfortable
  - Continue adding outside clients
  - Watch very carefully
- Release as COMPLETED VERSION!
Functions of Software

- Order system
- Archiving
- Patient history
- Billing system
- Log system
- Report printing
- Order searching
- Administrative tools
Walkthrough

User Walkthrough
Walkthrough

Radiologist Walkthrough
Problems / Solutions

- Multiple report printing
  - Old way – Print as HTML
    - Browser compatibility
    - Page breaks
    - Address headers and footers
  - New way – Print as Microsoft Word Document
    - Universal format
    - Unlimited reports
    - Fast Output
```vbnet
Namespace WordApplication

Public Class WordClass
    Private oWordApplic As Word.ApplicationClass
    Private oDoc As Word.Document

Public Sub New()
    oWordApplic = New ApplicationClass
End Sub

Public Sub Open(ByVal strFileName As String)
    Dim fileName As Object = strFileName
    Dim readOnly1 As Object = False
    Dim isVisible As Object = True
    Dim missing As Object = System.Reflection.Missing.Value
    oDoc = oWordApplic.Documents.Open(fileName, missing, readOnly1, missing, missing, missing, missing, missing, oDoc.Activate()
End Sub

Public Sub Open1()
    Dim missing As Object = System.Reflection.Missing.Value
    Dim oTemplate As String = "C:\Inetpub\wwwroot\advRadiology\printpage\temp.dot"
    oDoc = oWordApplic.Documents.Add(oTemplate, missing, missing, missing, missing)
    oDoc.Activate()
End Sub

Public Sub Quit()
    Dim missing As Object = System.Reflection.Missing.Value
    oWordApplic.Application.Quit(missing, missing, missing)
End Sub
```
Problems / Solution

- Patient with multiple orders
  - Old way – One table for orders with patient info
    - Duplicate patient information
    - Hard to update patient information
  - New way – Orders table and Patient table
    - Easy to reference with patient ID field
    - Easy to update patient information
Table Example

### Order Table

<table>
<thead>
<tr>
<th>id</th>
<th>examDate</th>
<th>status</th>
<th>patientNo</th>
<th>sendClient</th>
<th>tech</th>
<th>Radiologist</th>
</tr>
</thead>
<tbody>
<tr>
<td>15862</td>
<td>4/20/2006 5:25:00</td>
<td>5</td>
<td>3005615</td>
<td>Mar1</td>
<td>rcoley</td>
<td>bmccrudden</td>
</tr>
<tr>
<td>15861</td>
<td>4/20/2006 7:12:00</td>
<td>5</td>
<td>31048495</td>
<td>mhf</td>
<td>DVINCENT</td>
<td>bmccrudden</td>
</tr>
<tr>
<td>15859</td>
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<td>64098</td>
<td>Herm1</td>
<td>wwilliams</td>
<td>bmccrudden</td>
</tr>
<tr>
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<td>60115</td>
<td>Herm1</td>
<td>wwilliams</td>
<td>bmccrudden</td>
</tr>
<tr>
<td>15857</td>
<td>4/20/2006 4:31:00</td>
<td>2</td>
<td>151948</td>
<td>drmg</td>
<td>jturner</td>
<td>cmccall</td>
</tr>
<tr>
<td>15856</td>
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<td>5</td>
<td>31578</td>
<td>Herm1</td>
<td>wwilliams</td>
<td>bdecosta</td>
</tr>
<tr>
<td>15855</td>
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<td>5</td>
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<td>wwilliams</td>
<td>bdecosta</td>
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<tr>
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<td>MSHC</td>
<td>rhall</td>
<td>bmccrudden</td>
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<tr>
<td>15853</td>
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<td>30029898</td>
<td>rhj</td>
<td>THORNER</td>
<td></td>
</tr>
<tr>
<td>15852</td>
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<td>12266</td>
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<td>rhall</td>
<td>bmccrudden</td>
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<tr>
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<td>bmccrudden</td>
</tr>
<tr>
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<td>11191923</td>
<td>drmg</td>
<td>jturner</td>
<td>cmccall</td>
</tr>
<tr>
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<tr>
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<td>12231931</td>
<td>drma</td>
<td>iturner</td>
<td>cmccall</td>
</tr>
</tbody>
</table>
### Patient Table

<table>
<thead>
<tr>
<th>ID</th>
<th>firstName</th>
<th>lastName</th>
<th>IDnumber</th>
<th>DOB</th>
<th>address</th>
</tr>
</thead>
<tbody>
<tr>
<td>3005615</td>
<td>Emma</td>
<td>Bright</td>
<td></td>
<td>7/23/1936</td>
<td></td>
</tr>
<tr>
<td>10799</td>
<td>JOE</td>
<td>HEARN</td>
<td></td>
<td>10/2/1935</td>
<td></td>
</tr>
<tr>
<td>10791</td>
<td>BILL</td>
<td>CUMMINGS</td>
<td></td>
<td>10/19/1952</td>
<td></td>
</tr>
<tr>
<td>10788</td>
<td>HILDA</td>
<td>SPIRES</td>
<td></td>
<td>2/9/1919</td>
<td></td>
</tr>
<tr>
<td>10768</td>
<td>MATTIE</td>
<td>SNYDER</td>
<td></td>
<td>1/31/1926</td>
<td></td>
</tr>
<tr>
<td>10767</td>
<td>KAREN</td>
<td>SNYDER</td>
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</tr>
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<td>10763</td>
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<td>Florence</td>
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<td>3/14/1933</td>
<td></td>
</tr>
<tr>
<td>10762</td>
<td>jane</td>
<td>cooper</td>
<td></td>
<td>5/30/1971</td>
<td></td>
</tr>
<tr>
<td>10746</td>
<td>LEE</td>
<td>SMITH</td>
<td></td>
<td>8/27/1931</td>
<td></td>
</tr>
<tr>
<td>10737</td>
<td>JENNIFER</td>
<td>COOK</td>
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<td>2/3/1967</td>
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<td>7/23/1923</td>
<td></td>
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<td>ALBERT</td>
<td>NOE</td>
<td></td>
<td>6/8/1942</td>
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<tr>
<td>10711</td>
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<td>BENNETT</td>
<td></td>
<td>11/23/1975</td>
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<tr>
<td>10706</td>
<td>LEAMON</td>
<td>FERGUSON</td>
<td></td>
<td>10/12/1954</td>
<td></td>
</tr>
</tbody>
</table>
Real Time View

Real Time Software Walkthrough