WP 11 Scientific Activities 2012-3

Prof. Dov Dori, Prof. Judy Dori,
Dr. Niva Wengrowicz
TECHNION
• **Description and objectives**
  - Create a virtual representation of the MCUK
  - Connect it through lucid interfaces with other media cities around the world
  - Undertaken by the THINKlab prototyping team.
  - Look into the impact of the virtual space on how people collaborate through experiencing these stories and interacting with them.
  - We have used the think-play-do zone (TPDZ) as a unique research action facility
  - modelling people’s collaboration during series of interactive sessions.
  - This project has made use of OPM (Object-Process-Methodology) developed at Technion

• **Feedback**
  - The project was very well received by the partners from Salford,
  - They indicated that the OPM modeling process has enforced an orderly way of thinking globally about the project
  - Originally, the project evolved without a real master plan
  - Initially motivated by political-economic forces of desire to enable areas out of London to enjoy the working places provided by the BBC.

http://esml.iem.technion.ac.il/?page_id=1144
Description and objectives

- Realise a conceptual model of a £1000 scanner for use in primary care.
- Support the National Health Service (NHS) in prevention of disease.
- Emphasis on Primary Care is designed to assist in keeping patients out of hospitals, thereby reducing the load on an overburdened infrastructure.
- The conceptual model encompasses the latest research at Cranfield University, providing a competitive design for a potentially viable Product Service Systems (PSS).
- The NHS will be supported in developing new systems and services around the scanner to ensure best use operationally and continued reliability.
- We developed a “As-Is” and several “To-Be” conceptual OPM models using VIVD OPM that demonstrate reduction of check time and incorporate a maintenance study to address the cost of Quality Assurance.

Feedback
- The responses to the animated models were highly positive – they instrumental in helping the team explain the various business model options.

http://esml.iem.technion.ac.il/?page_id=1427
In March 2012, following the initiative of Prof. Frédéric Noël, we have started to use OPM to model the TNA process of VISIONAIR.

People involved in discussions include from Grenoble: Cedric Masclet, Guy Prudhomme, Franck Pourroy, Samira Sadeghi, Philippe Marin, Francis Felix, and Frédéric Noël.

We are in the middle of the process to specify the entire TNA process from the publication and application through project executions and their assessment.

We expect to have a complete model by end of June 2012. This model might provide a basis for application generation, including automated creation of the database and option to track individual projects along their lifecycle.

TNA Project:
http://esml.iem.technion.ac.il/?page_id=1422


Evaluation of Pre & Post Questionnaires

Preliminary Findings
Responses to the Pre-project and post-project questionnaires

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
<th>Both</th>
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<tbody>
<tr>
<td><strong>Visionair Visitors</strong></td>
<td>19</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td><strong>Visionair Host Lab</strong></td>
<td>11</td>
<td>5</td>
<td>4</td>
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</table>

**About 50 (!!!) Accepted projects didn’t answer any of our questionnaires**
Motivation component

Includes the following reasons for participating in the VISIONAIR project:

1. Promote my professional development
2. Be part of world-wide professional collaboration
3. Learn about innovative visualization technologies
4. Learn about the technical content
5. Learn about the academic and practical research
6. Interest in sharing knowledge
7. Interest in enhancing company product portfolio

ADD: I want to learn about the host infrastructure in order to enhance ours
Motivation: pre-project questionnaire

Pre Motivation Components

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
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<tr>
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<td>2</td>
<td>3,579</td>
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<td>3</td>
<td>3,842</td>
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<td>4</td>
<td>3,316</td>
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<td>5</td>
<td>3,421</td>
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<td>3,632</td>
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Repeated Measures

<table>
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<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
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<tbody>
<tr>
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<td>15.758</td>
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<td>.467</td>
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Item 7:
Interest in enhancing company product portfolio is significantly different from all the other
Motivation: post-project questionnaire

Post Motivation Mean

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<td>3</td>
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<td>3,583</td>
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<td>7</td>
<td>1,583</td>
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Repeated Measures

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<tbody>
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<td>11.474</td>
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<td>.511</td>
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</table>

Item 7: the project enhanced my company product portfolio is significantly different from all the other
Expectations: pre-project questionnaire

• Includes the following reasons for participating in the VISIONAIR project:
  1. Study and practice the technology or the system
  2. Learn about the organization university and/or management of the laboratory
  3. Initiate professional collaboration at the academic level
  4. Initiate professional collaboration at the industrial level
  5. Initiate professional collaboration at the technological level
  6. Collaborate in writing proposals and future publications
Item 4:
Initiate professional collaboration at the industrial level is significantly different from items 1, 3, 6
Expectations Post-Expectations Mean

<table>
<thead>
<tr>
<th>Item</th>
<th>Post-Expectations Mean</th>
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Repeated Measures

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<th>Partial Eta Squared</th>
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</thead>
<tbody>
<tr>
<td>4.553</td>
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<td>.293</td>
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</table>

Item 4: Initiate professional collaboration at the industrial level is significantly different from 1,3
What can be learned?

• VISIONAIR’s visitors have proper motivation and expectations with no commercial facet and is in line with VISIONAIR’s principles.
Pre-Post means Comparison

<table>
<thead>
<tr>
<th></th>
<th>motivation</th>
<th>expectation</th>
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</thead>
<tbody>
<tr>
<td>pre</td>
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<td>3.09</td>
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<td>post</td>
<td>3.42</td>
<td>2.93</td>
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</table>

* N=only 9 pairs!

No significant difference
## Pre-Post Paired t-test

<table>
<thead>
<tr>
<th></th>
<th>Total Pre</th>
<th>Total Post</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
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<tbody>
<tr>
<td><strong>Motivation</strong></td>
<td>total_pre_motivation - total_post_motivation</td>
<td></td>
<td>0.55</td>
<td>8</td>
<td>0.59</td>
</tr>
<tr>
<td><strong>Expectation</strong></td>
<td>total_pre_expected - total_post_expected</td>
<td></td>
<td>-0.80</td>
<td>8</td>
<td>0.45</td>
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</table>

*N=only 9 pairs!

It seems that Host labs meet the motivation and expectations of the visitors but we can’t conclude based on 9 pairs only.
Preliminary Qualitative Comparison

It seems that Host labs meet the motivation and expectations of the visitors from the preliminary quantitative analyzing too:
• **Pre:** Why did you choose to apply?
  
  (5) Because I'm interested in *improving* my international research background

• **Post:** Did the training met your requirements and needs? *Strongly agree*

• Explain:

  (5) We have *advanced in the knowledge* of the different graphics engines used in CAVE facilities. We have *found limits* both in UNITY-middleVR and XVR (graphic engines). We have *learn also* different cluster organizations for CAVE rendering. We have *increase our knowledge about* eye-tracking devices.
Preliminary Qualitative Comparison (2)

• **Pre:** Why did you choose to apply?

  (18) I found it a great opportunity to do interdisciplinary and international research

• **Post:** Did the training meet your requirements and needs? **Strongly agree**

  Explain:

  (18) Good field for interdisciplinary approach.
Preliminary Qualitative Comparison (3)

• **Pre:** Why did you choose to apply?
  
  (15) My research work on visualization expressions which students use in virtual science fair projects just started and I am very thankful for any kind of help and support of colleagues in that field.

• **Post:** Did the training met your requirements and needs? **Strongly agree**
  Explain:
  
  (15) I was trained to use the OPM methodology. We had great and deep project discussions, I got very useful informations and critical suggestions - very helpful.
JRA 11: Servitization of GE Vscan pocket ultrasound for primary healthcare

Cranfield University
Dr. John Ahmet Erkoyuncu
Prof. Daniel Steenstra
Prof. Rajkumar Roy

Technion Institute of Technology
Prof. Dov Dori
Sergey Bolshchikov
Visionair- Deliverables

Conceptual model (Month 12) .1
- The conceptual modelling of a £1000 scanner for use in primary care
- Development of associated services to support the end user

Demonstrator (Month 32) .2
- Realisation of a demonstrator for virtual and physical assessment
- Realisation of a maintenance program

User evaluation (Month 42) .3
- Research visualisation-related ergonomics and usage in the context of the £1000 scanner
- Assess the social impact of the scanner in the appropriate domains
Disruptive Innovation required to bridge the gap

Costs of needs for healthcare

Fundings from the government
Context of the project

GE Healthcare Vscan pocket ultrasound scan
Aim & Objectives

**Aim**
Designing affordable Business Models for ultrasound procedures for use in primary health care.

**Objectives**
- Reviewing current process
- Developing a series of visualized models
- Developing Cost/Benefit analysis
- Validating these models with end-users
Agenda

Overview

Functional design of Business Models

Visualization tools

Validation

Conclusions & Current and future interests
Research Methodology

- **Understanding the context**
  - Literature review
  - Define approach

- **Interaction with stakeholders**
  - Development of questionnaires
  - Interview of stakeholders

- **Development**
  - Business Models
  - Cost/Benefit tool
  - Visualization

- **Verification and Validation**
  - Semi-structured interview
  - Internal assessment
Business Models

- Profit Formula (Assets and cost structure)
- Value Proposition (Products or Services)
- Processes (Ways of working)
- Resources (People, Technology)

Functional Design
Observations

For a Procedure Lasting 20 minutes:

- Patient travels 24 Miles (typical)
- 18 Service Point Contacts
- 17 Days to Complete from Initial to Final Consultation (non emergency)

Source: Data supplied by sample of Bedfordshire GPs
Insights

Hospital

Patient

Reduce Patient Journey Time

↑ Cost  Complexity  Portability

↓ Cost  Complexity  Portability

Cranfield University  Technion Israel Institute of Technology
Model 1 of 4

GP Uses Vscan to Complete Scan at Surgery

- Minimum process contacts
- No use of external resource
Model 2 of 4
Radiographer Visits Surgery Every Week

Maximise GP Availability
Model 3 of 4: Radiologist Visits Surgery Every Week

Further minimise use of external resources
Minimise patient travelling
Model 4 of 4
Mobile Radiographer Visits Patient at Home

Maximise patient convenience
election criteria of conceptual modelling languages

Ability to show interactions •
Ease of understanding •
Ease of learning and implementing •
Capability to generate dynamic visualization •
Conceptual modelling languages

- UML (Unified Modelling Language)
- IDEF (Integration Definition)
- BPMN (Business Process Modelling Notation)
- EPC (Event-driven Process Chain)
Description of Object-Process Methodology (OPM)

Hierarchy of in-zoomed layers

Object-Process Diagram (OPD)

Object-Process Language (OPL)
Example of OPM

SD 1.3: Follow up Consulting in zoomed

- Surgery Receptionist
- Report
- Patient Record
- Patient Medical Status: scanned, diagnosed
- Consulting Executing
- Final Diagnosis
- GP

Example of process in-zoomed
OPCAT Player Demonstration
Vivid OPM

Vivid OPM animation snapshot
Validation of the Business Models

Validation with GPs at three surgeries in the UK

<table>
<thead>
<tr>
<th>Business Models</th>
<th>GP completes the Scan</th>
<th>Radiographer visits the surgery each week</th>
<th>Radiologist visits the surgery each week</th>
<th>Mobile Radiographer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td>• Lowest cost</td>
<td>• Outsource to two resources</td>
<td>• Outsource to one resource only</td>
<td>• Maximum patient convenience (adapted for patient with limited mobility)</td>
</tr>
<tr>
<td></td>
<td>• Lowest patient journey</td>
<td></td>
<td>• Quick process</td>
<td></td>
</tr>
<tr>
<td>Operational Issues</td>
<td>• GPs’ training</td>
<td>• Radiologist required to complete analysis</td>
<td>• High cost of resource</td>
<td>• Higher cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Lower utilization of radiographer time</td>
</tr>
</tbody>
</table>
**Validation of the visualization tools**

<table>
<thead>
<tr>
<th>OPM Model</th>
<th>Strengths</th>
<th>Areas for improvement</th>
</tr>
</thead>
</table>
|           | • Easily upgradable  
• Intuitive | • No quantitative data |

<table>
<thead>
<tr>
<th>Vivid OPM</th>
<th>Strengths</th>
<th>Areas for improvement</th>
</tr>
</thead>
</table>
|           | • High level of explanation for non experts  
• Interactions between objects and processes | • Appearance is not user friendly  
• Configuration of Vivid |
Application OPM: Multi-touch table

Facilitating implementation of OPM business models (e.g. radiologist and radiographer communicate)

Linking the iPads with the surface table, where the surface table and the projector could be the central assessment station.

Application of Mind-Meister facilitating dynamic communication

- Ability to share ultrasound images
- Ability to share OPM images
- Ability to also connect to iPad's to enhance mobility
Conclusions

Visualisation has a key role in improving the design and delivery of healthcare

OPM helped to conceptualise the detailed level drivers for business models

Vivid OPM offers further opportunities to visualise conceptual models

Validation results show that the findings are suitable and visualisation helps in many ways
Thank you!

QUESTIONS

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