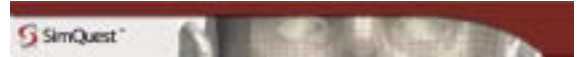


Simulator Construction Without the Agonizing Pain

## Educational Requirements Analysis

19 January 2009  
MMVR

Bob Waddington  
SimQuest, LLC



## Agenda

Review significance of requirements gathering

Why do a requirements analysis?

Understand the problem domain

Who are the stakeholders?

Design pitfalls and common mistakes

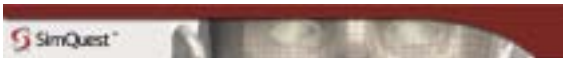
Review real world project cases

Low tech 'simulator'

Part task simulator

Serious game

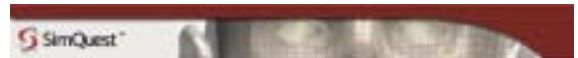
High fidelity simulator



## Low Tech Simulator/Trainer

Smallpox  
Inoculation  
Training  
Unit

From  
SimGroup  
@ CIMIT



## Part Task Trainer/Simulator



Limb Hemorrhage Simulator



## Simulation Tools/Serious Game

Pandemic Flu Game



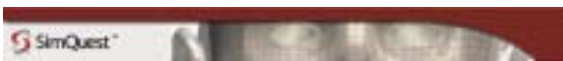
Tool to develop strategic plans and practice response tactics.



## High Fidelity Simulator



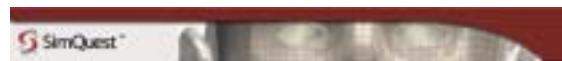
Open Surgery Simulator



## Program Conception

How does a simulator/training program evolve from concept to product?

How did these projects turn out the way they did?



## Program Conception

### Depends

Internal business opportunity identified  
Solicitation for SBIR  
Other request for development  
(commercial or government)

### Ultimately

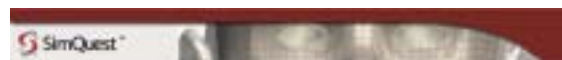
Educational Requirements



## Understanding the Problem Domain

What is the problem you are trying to solve?

What *specifically* are you trying to teach?



## Understanding the Problem Domain

What *specifically* are you trying to teach?

### Domains

Psychomotor  
Cognitive  
Affective  
Conative

### Applications

Knowledge  
Skills  
Awareness  
Critical decisions  
Allowing practice



## Educational Requirements Considerations

### Educational Requirements

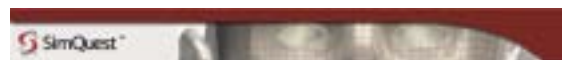
What needs to be taught?  
skills; decision making; initial training  
remedial or sustainment?  
Where does it fit in the overall curriculum?  
Independent study?  
Voluntary or mandatory study?

### User Requirements

Who's the end-user?

### Evaluation Criteria

How do you know if the system is successful?



## Educational Requirements Considerations

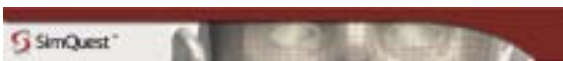
### Metrics

What do I track? How? Why?  
Who will have access to data?  
How will data be used / accessed?

### Functional / Technical Requirements

System used in lab / in field / battery operated?  
Wired / wireless / mobile  
LMS / SCORM compliant (why?)  
Haptics

Can't be all things to all people



## Educational Requirements Analysis

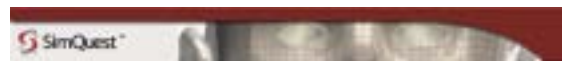
Why do one?

How else will you know what to build?

What is the end game?

What do you want the user to do, feel, or know?

All parts of an overall needs assessment



## Needs Assessment

What is?

What should be?

How do we fill the gap?



## Who are the stake holders?

Government

HHS, NIH DOD

Education

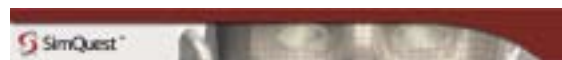
Medical & Nursing Schools

Commercial/Industry

Development & Distribution

Professional/Trade Societies & Associations

ACS, ABS, DCMT, National Registry



## Who are the stake holders?

People/Organizations responsible for

Training/Certification

(ACS, ABS, DCMT, National Registry, etc)

Providing Quality Care / Services

Quality of Product/Service (reduce errors)

Investors – Funding

End-users

Students, instructors, training directors (ROI)



## Design Pitfalls and Common Mistakes

Problem not clearly defined

Forget for whom we are working

It's not about us

Opinion over data

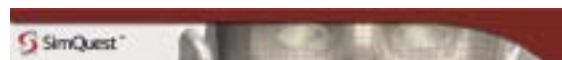
It's the educational goals stupid

Technology is the hammer to every educational nail

Not involving the end-user in solution development

Not listening to the end-users!

A solution in search of a problem

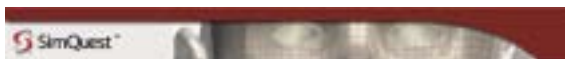


## Design Pitfalls and Common Mistakes

Too narrow a focus in solution development

Too broad a focus on solution development

Too much emphasis on absolute perfection



## Process

### Educational Requirement

What is the current method of training?  
What is working?  
What is missing?

### Technological Requirement

What options available to provide training?  
Which of those options support training

### Functional Requirement

What does system need to do / provide / record?



## Process

### Key Components



## Low Tech Simulator/Trainer SITU



Developed by SimGroup at CIMIT/MGH



## SITU – Smallpox Inoculation Training Unit

Offers full dress-rehearsal training  
Kit supplies all materials necessary to practice three inoculations.



SITU undergoing evaluation at Camp Casey

Developed by SimGroup at CIMIT/MGH

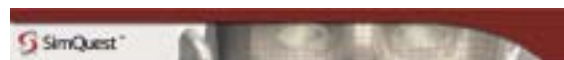


## SITU – Smallpox Inoculation Training Unit

2002 President Bush calls for Smallpox inoculation  
Problem – lack of experienced inoculators  
US Army Surgeon General seeks info on existing inoculation training/simulators

Need training for inoculators

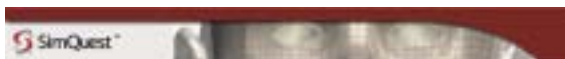
Solution options ranged from  
1 year - 1 million dollars  
10 weeks - 145k



## SITU – Smallpox Inoculation Training Unit

Educational requirements did not dictate a high tech solution

Problem was fear, misinformation, lack of practice and a need for rapid response to support a presidential order.



## SITU – Smallpox Inoculation Training Unit



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## SITU – Smallpox Inoculation Training Unit

- Researched the problem
- Spoke with instructors National Vaccine Healthcare Center; Ray Anspach, et.al
- Stake Holders: US Army Surgeon General; Walter Reed Chief of Allergy/Immunology; LTC Mary Parker 2ID / TATRC
- Field tested with 2ID Camp Casey Korea
- Educational requirements quite different than originally anticipated – resulted in low tech solution
- 2003 US Army's Greatest Invention

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## Part Task Simulator/Trainer Limb Hemorrhage

Develop a prototype simulator for teaching and practicing the successful control of acute exsanguinating hemorrhage by both medical and non-medical personnel at the point of wounding.

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## Limb Hemorrhage



Realistic pressure measurement for teaching proper tourniquet placement.

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## Limb Hemorrhage



Realistic pressure measurement for teaching proper tourniquet placement.

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## Limb Hemorrhage



7 Modules | Case Scenarios | 3-D Anatomy Viewer

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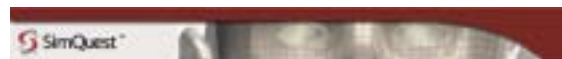
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## Limb Hemorrhage

- Audited existing training; modified design
- Adhered to project goals (low cost solution supports educational budget)
- End user feed-back included students, medics, instructors, and leadership – all stakeholders in educational outcomes
- Limited feature creep – kept focus on tourniquet training
- Recently purchased by Madigan Sim Center for evaluation under the AAMTI program



## Simulation Tools / Serious Game



## Problem

Medical Treatment Facilities (MTF) or hospitals need to increase capacity to handle surge from Pandemic Flu infected.

MTFs must also maintain normal functions of the hospital; trauma victims; heart attacks, surgery, etc., during the surge.

How do we prepare people to respond to an event that hasn't occurred in over 40 Years?



## Need

Local mitigation strategies expected to help stem disease spread - falls on the local MTF.

Allow MTF administrators a chance to practice response plans prior to an event.



## Pandemic Flu Game

Tool to develop strategic plans and practice response tactics  
Targeted toward medical treatment facility administrators  
Practice local mitigation strategies  
Manage surge without sacrificing normal level of care



Dashboard Master

Media Monitor

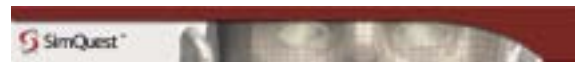
Resources





## Pandemic Flu Game

- Established where and how the game will be used in existing curricula
- Audited existing training
- Significant internal debate over game features GUI
- Needed realistic responses (scientific models)
- Researched available technology (game engines)
- Mapped GUI and technology to educational goals and target demographic
- Interest from HHS, CDC, DoD, Civilian Centers

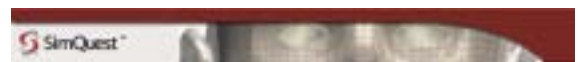


## High Fidelity Simulator – OpenSurgSim™



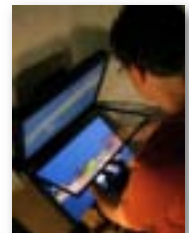
## High Fidelity Simulator – OpenSurgSim™

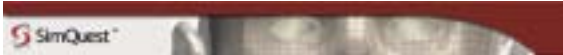
- Simulation-based standalone experiential training system providing a hierarchy of basic surgical skills instruction



## High Fidelity Simulator – OpenSurgSim™

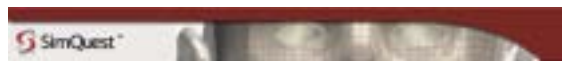
- High Fidelity Physics
- Modified Haptics
- High Fidelity Metrics
- High Fidelity Graphics





## High Fidelity Simulator – OpenSurgSim™

- Supports Basic Surgical Skills
- Original funding TATRC (HOSTS)
- Support from NIST, NIH, NSF
- Working with leadership of ACS, ABS, RCS



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