

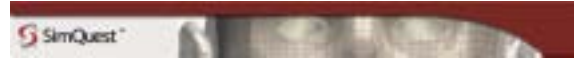


Simulator Construction Without the Agonizing Pain

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

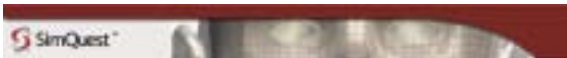
Review real world project cases

Low tech 'simulator'

Part task simulator

Serious game

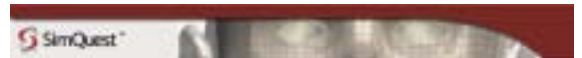
High fidelity simulator



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



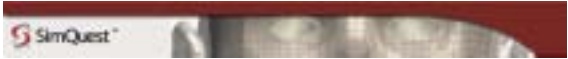
Open Surgery Simulator



Program Conception

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

How did these projects turn out the way they did?



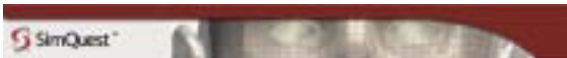
Program Conception

Depends

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

Ultimately

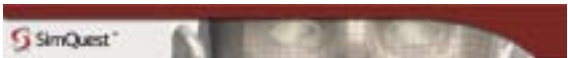
Educational Requirements



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

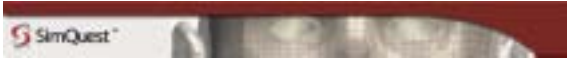
Metrics

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

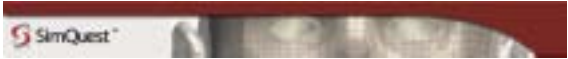
Why do one?

How else will you know what to build?

What is the end game?

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

All parts of an overall needs assessment

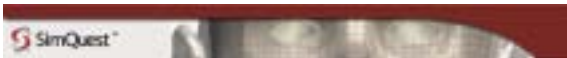


Needs Assessment

What is?

What should be?

How do we fill the gap?



Who are the stake holders?

Government

HHS, NIH DOD

Education

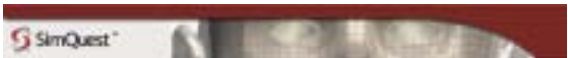
Medical & Nursing Schools

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

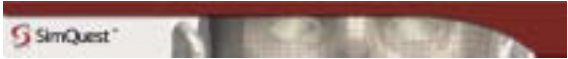
- What is the current method of training?
- What is working?
- What is missing?

Technological Requirement

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

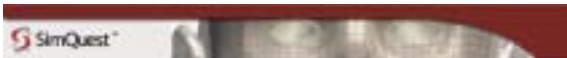
Functional Requirement

- What does system need to do / provide / record?



Process

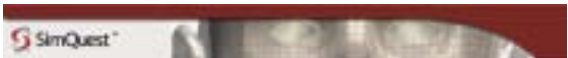
Key Components



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



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

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.

Limb Hemorrhage



Realistic pressure measurement for teaching proper tourniquet placement.

Limb Hemorrhage



Realistic pressure measurement for teaching proper tourniquet placement.

Limb Hemorrhage



7 Modules | Case Scenarios | 3-D Anatomy Viewer

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

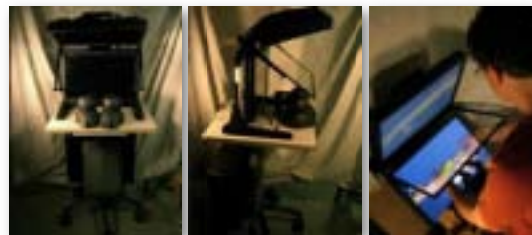




Pandemic Flu Game

- 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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