Design and engineering of new simulations for risk-free surgery training

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Background

“What our students requests the most is to be able to train surgical procedures and methods hands on, and we can’t provide them that option.”

- Interview with professor in Oral Surgery at Karolinska Institutet
Initial research question

“What requirements should a simulator have that is to be used for training of oral surgery procedures?”
User Centered Design

1. Plan the human centered process

Meet Requirements

Specify the context of use

Evaluate designs against user requirements

Specify user and organizational requirements

Produce design solutions
In a contextual inquiry the procedure to be taught was studied by both reviewing literature as well as observations and interviews. It is worth noting that textbooks today display drilling angles, which is very hard to realize in practice. A simulated environment can help the student understand maneuver limitations and plan procedures accordingly.
First Prototype
Cooperative Evaluation
Second prototype

Course Intervention Evaluation
An independent study has been conducted by Karolinska Institutet where 60 final year dental students has undergone training in the simulator as part of a mandatory oral surgery course. Results from a questionnaire showed that 73% of the students that participated in the spring 2009 course very much agree on that training in the simulator should permanently be included in the course (Rosén et al 2009).

Validation study
Karolinska Institutet are currently validating the benefit of the simulator by a double-blinded study where 20 students will perform real surgery, of which 10 have undergone training with the simulator. As of today (May 2010) two students have practiced with the simulator pictured.

Spinn-off
A spinn-off company, Forsslund Systems AB, is in the process of introducing the simulator to the market.

Open Technologies and Open Source
The largest part of the project, development of new software, is released to the public as free and open source software, as a way to lower barriers for creation of new simulations and research.
Conclusions

By focusing on the most important aspects, reviled and iteratively developed with a User Centered Design method, a surgical simulator is possible to develop. Further validation is required to prove cost-effectiveness but the very positive student acceptance rate is encouraging.

The development project's significant size and thus high costs, is however a barrier in development of new simulations, since validation can only be done with a finalized simulator. Further investigations has to be done on how development of new simulations in a variety of surgical areas can be financed, and the cost be put in relation with the increased value of risk-free training and reduction of overall errors in surgical practices.
Questions to audience

”How can development costs of new simulations in a variety of surgical areas be motivated in relation to the increased value of risk-free training and reduction of overall errors in surgical practices?”

How can finance catch 22 be avoided?

Education providers:
We need a sufficiently good simulator to validate to justify the potential cost of purchase.

Investors:
We need positive validation results and customer commitments to buy to justify investment to build simulator.

”Who benefits most of simulation trained practitioners, and how can the value created be sourced to create new simulations?”

”Who is taking the lead to accelerate the creation and spread of use (demand) of simulators?”

Australia invests ~600 MSEK

On November 29 2008, the Council of Australian Governments (COAG) agreed to a $1.6 billion health workforce reform package. The National Health Workforce Taskforce was given carriage of, among other things, a National Plan for Simulated Learning Environments. COAG agreed to an investment of $96 million over 4 years for clinical training in Simulated Learning Environments (SLEs). A national strategy will be developed to complement and maximise existing effort and investment. http://www.siaa.asn.au/simtect/2009health/2009.htm