

Medical Modeling and Simulation Based Training Return on Investment Decision Model

Joseph V. Cohn^{1,*}, David J. Combs^{2,*}, Antonio Anglero Jr.^{3,**},
Brian R. Johnson^{4,*}, David Rozovski^{5,*}, Stephen Eggan^{6,*},
Brennan Cox^{5,*}, Kirsten Carlson^{7,*}, Meredith Carroll^{8,***},
and Elizabeth O'Neill⁹

¹ Office of Naval Research, Arlington, VA

² Naval Research Laboratory, Washington, DC

³ Naval Safety Center, Norfolk, VA

⁴ United States Air Force Academy, Colorado Springs, CO

⁵ Naval Aerospace Medical Institute, Pensacola, FL

⁶ Naval Medical Research Unit–Dayton, Dayton, OH

⁷ Naval Air Warfare Center Aircraft Division, Patuxent River, MD

⁸ Design Interactive, Inc., Oviedo, FL

⁹ Strategic Analysis, Inc., Arlington, VA

oneill@sainc.com

Abstract. This effort aims to develop a software-based decision tool for determining the actual return on investment of medical modeling and simulation based training technologies to provide acquisition decision makers with critical information for system design. This will ultimately improve the effectiveness and efficiency of current health services.

Keywords: Return on Investment, Modeling and Simulation, Training, Medical, Fidelity, Cost, Visualization Tools.

1 Modeling and Simulation Technologies

The military medical community faces a wide range of challenges to improve the effectiveness and efficiency of current health services and medical procedures' training from the medical corpsmen level to the emergency and trauma room nurses' and doctors' levels [1]. One approach that is gaining increasing popularity to ensure that all military medicine providers are able to stay current on medical knowledge – in light of rapidly evolving information, and the increasing pressure to move away from animal models- is the application of modeling and simulation technologies to medical training [1]. These tools can be expensive and, if mis-applied, can lead to ineffective or negative training. Ensuring that M&S based medical training systems are effectively developed requires a delicate balance between many variables, including

* Ph.D., Medical Service Corps, United States Navy.

** Psy.D., Medical Service Corps, United States Navy.

*** Ph.D.

identifying current gaps, inefficiencies, redundancies and opportunities to improve upon training efficiency associated with training doctors, nurses, and corpsmen.

Numerous studies speak to the potential of M&S based technologies for enhancing training [2]. Nevertheless, there remains a lack of guidance on how to build systems that best support training specific skill sets, leading to an ever-increasing challenge for training designers to navigate the selection of technology components to provide the right balance between individual component fidelity, performance and cost. As might be expected, there are tradeoffs associated with finding the right balance between these three variables. As the fidelity of a system's components increases, so do the costs as well as associated maintenance and support requirements, while the added performance improvements may be less than significant [3]. For this reason, it is critical that medical M&S training system implementers integrate system components at the level of fidelity that gives them the most value for the task that they are training.

2 Return on Investment Decision Support

To accomplish this, there is a need for a tool to guide designers on the fidelity level requirements and present trade-offs based on the task that is being trained, the desired level of performance improvement and anticipated return on investment in light of identified budget constraints (see Figure 1). This effort aims to develop a software-based return on investment decision support tool that: enables users to define critical variables for calculating return on investment; develops ontology linking these variables to each other, performance outcomes and return on investment; designs novel modeling and simulation-based tools to quantify the return on investment tradespace; and, interactively displays information, complex interactions or a visualization process that encourages designers to weigh the balance of improved performance versus the long-term cost consequences.



Fig. 1. ROTI Visualization Mode. Results are provided in multiple formats to facilitate tradeoff analyses and support effective decision making.

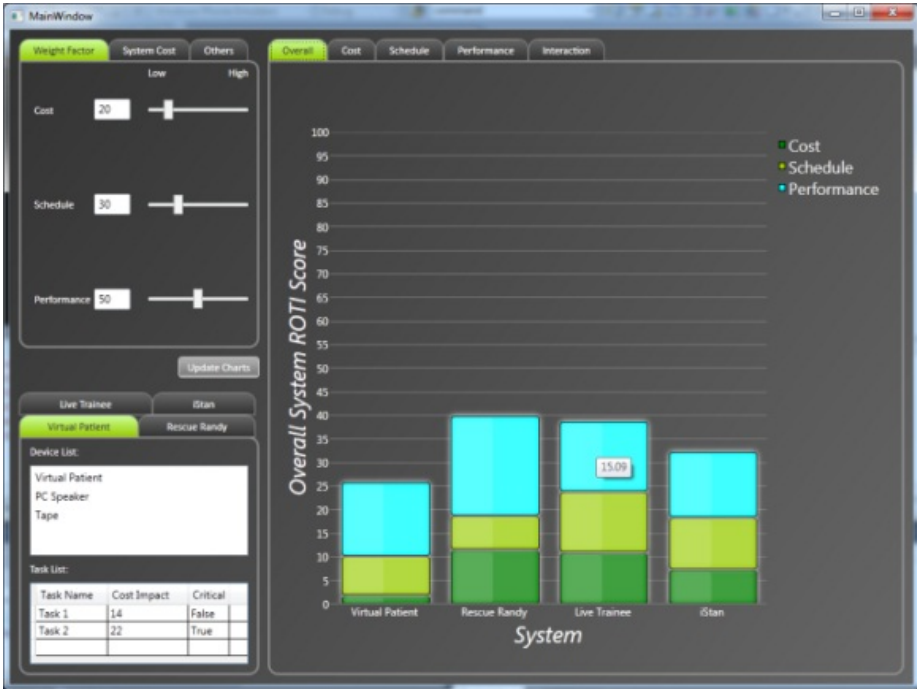


Fig. 2. ROTI Visualization Module, “Overall” display

3 Optimizing Training Cost, Time, and Performance

This technology will have broad application in commercial and military settings. Within the DoD, the ability to conduct return on investment analyses should generalize to other systems and platforms, including major acquisition programs of record. Commercially, modeling and simulation based training applications continue to form the cornerstone of a business’s continuous training programs. Providing training managers with a tool for making informed decisions as to the performance-cost tradeoffs associated with a given tool will allow them to optimize their training dollars and maximize their employees’ time and performance.

Acknowledgements. Research and development of Return on Investment Tool for Effective Medical Training (RITE-MT) by Design Interactive, Inc., has been supported by OSD through SBIR Phase I contract OSD11-H19 and funded by ONR BAA contract N00014-12-M-0105. We especially thank Dr. Meredith Carroll for her time and attention to this effort.

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