

The Rapid Decision Trainer: Lessons Learned During an R & D Development and Fielding Process

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ABSTRACT

The Rapid Decision Trainer (RDT) is a virtual, interactive, game engine-based simulation developed as an applied research effort by the US Army Research, Development, and Engineering Command (RDECOM), Simulation and Training Technology Center (STTC). The trainer was developed in cooperation with the 11th Infantry Regiment and the Infantry Officer Basic Course (IOBC) at Ft. Benning, GA. The RDT simulates two live-fire training exercises conducted by infantry second lieutenants during IOBC. Unlike live training in which time and logistics constraints prevent all students from participating in key leadership positions, the RDT allows all IOBC students to assume the key roles of squad or platoon leader in the virtual training exercise. The RDT forces students to experience the same decision making process that key leaders will face during the actual live-fire exercises. The RDT has been a success with IOBC devoting three hours in the current program of instruction (POI) to using the RDT in support of platoon-level training.

Government and industry program managers as well as subject matter experts and developers will use this paper to identify and discuss a number of lessons learned from the development experience. We will describe key decisions made by the development team and will present ideas that contributed to the successful development of the RDT. The primary goal of this paper is to offer suggestions that may be useful to others planning to develop similar low-cost simulations. Many of these lessons learned are pertinent to the modeling and simulation for training community at large.

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INTRODUCTION

The Rapid Decision Trainer (RDT) is a virtual training simulation which replicates two live-fire training exercises conducted by the 11th Infantry Regiment and the Infantry Officer Basic Course (IOBC) at Ft. Benning, GA (see Figure 1). The US Army Research, Development, and Engineering Command (RDECOM) Simulation and Training Technology Center (STTC) in Orlando, FL and the 11th Infantry Regiment cooperatively developed the RDT. The primary software developer for the RDT was General Dynamics (formerly Veridian) Advanced Information Systems in Orlando, FL.



Figure 1. The Rapid Decision Trainer

Intended as an introduction to the battle drills taught in a classroom setting and reinforced by the live-fire exercises, the RDT was built upon a “first-person shooter” (FPS) game engine developed by General Dynamics. The RDT allows all IOBC students an opportunity to assume the role of squad or platoon leader and face the same decision-making process in a virtual, game-based environment as students face during actual live-fire exercises.

The RDT contains an assessment engine which provides both students and instructors an evaluation of how students perform at key decision points during the training exercise. The criteria for this assessment were provided by subject matter experts (SMEs) from the 11th Infantry Regiment at Ft. Benning. While the RDT simulation is in the FPS genre, the trainee does not fire his weapon during the virtual exercise. Instead, the focus of the RDT is in evaluating the trainee’s decisions and the orders he gives during each scenario. In that regard, the RDT could be considered a member of a growing genre of virtual training simulations – an example of a “first-person thinker” simulation.

The RDT was designed from the ground up to be low-cost and low-overhead (i.e., easy to install, run, and maintain). The primary purpose for the research effort was to answer how game engine-based simulations could go beyond the entertainment assessment of “shoot a bad guy, get a point” to provide a more appropriate assessment capability. From the viewpoint of IOBC, the RDT was intended to provide infantry second lieutenants the same decision-making exposure that is available to a limited number of students during the actual live-fire exercises.

The development team that has worked together to create the RDT over the past two years includes government and industry program managers, software and instructional designers, and SME support from the 11th Infantry Regiment. The first completed version of the RDT was delivered to the 11th Infantry Regiment at Ft. Benning in January 2005. Since that time, a number of instructors and students have used the trainer to support in-house classroom instruction and prepare for the actual squad-level and platoon-level live-fire exercises. Although no objective criteria is

used to evaluate student performance during the actual live-fire exercises, feedback provided by course instructors indicates that training with the RDT beforehand has a positive impact on student performance during the actual live-fire exercises.

The instructors and students have provided excellent feedback to the development team identifying new software modifications and enhancements that will improve functionality and effectiveness. The additional development work is underway and will be completed by the end of 2005.

The development team has identified a number of key lessons learned throughout the course of the development process. The primary goal of this paper is to share those lessons with the greater training development community with the hope that these lessons will help others who will be developing low-cost, game engine-based simulations in the future.

REQUIREMENTS AND RESEARCH OBJECTIVES

11th Infantry Regiment Training Requirement

The 11th Infantry Regiment, based at Ft. Benning, GA, is responsible for training newly-commissioned, infantry second lieutenants through IOBC. IOBC is an intense, 16-week, resident training program that prepares new infantry officers for their first assignment as infantry platoon leaders. Each IOBC course includes approximately 200 students divided into 40-man platoons.

To successfully complete the course, IOBC students must demonstrate a proficiency in the tactics, techniques, and procedures (TTPs) that guide the training and war-fighting of an infantry platoon. This includes an understanding of individual, squad, and platoon-level infantry operations as described in the US Army Training and Evaluation Program (ARTEP) Manual 7-8, *Infantry Rifle Platoon and Squad* (Army, 1993). Students are required to demonstrate their understanding of basic infantry principles through written examinations and practical exercises, such as participating in both squad- and platoon-level, live-fire exercises at Ft. Benning. The squad-level live-fire exercise is conducted at the Ware Live-Fire Range and the platoon exercise is conducted at the Griswold Live-Fire Range (Pike, Hart 2003).

Ideally, all IOBC students should be given the chance to assume the key leadership position and perform as the squad leader during a squad exercise and platoon

leader during the platoon live-fire exercise. Unfortunately, resource and environmental constraints make that impossible to occur, significantly limiting the number of students who can assume the key leadership positions during the actual live-fire exercises. In order to overcome these constraints, the commander of the 11th Infantry Regiment asked the STTC to create a “virtual live-fire exercise” replicating the actual live fire in a game environment. The commander’s specific guidance included:

- Scenarios must replicate IOBC squad and platoon-level live-fire exercises
- Trainer must be doctrinally accurate
- Must be low-cost and low-overhead to operate
- Must be challenging, engaging and fun to use

Since the original version of the RDT was delivered to IOBC in January 2005, the school has experimented with various techniques on how to best use the trainer to accomplish its training objectives. Those techniques range from allowing students to individually use the trainer as part of a homework assignment to using it in instructor-facilitated, platoon-sized groups in the classroom. Based on the success achieved to date, IOBC plans to devote three hours of classroom instruction time to using the platoon scenario in future IOBC student classes.

RDECOM STTC Research Objectives

The RDT was (and is) first and foremost an applied research effort. The STTC’s primary goal was to explore how a game engine-based simulation could assess student performance beyond the typical “shoot a bad guy, get a point” metric of entertainment games. The RDT’s assessment engine uses approved doctrine and TTPs. Furthermore, the STTC wanted to explore how student performance data could be presented in a useful format to both students and instructors.

The lessons learned from this approach could be used in the future by TRADOC schoolhouses and other military training organizations as they explore new techniques and practices for creating blended learning environments. These new learning environments combine distance learning and residential training. Enhanced assessment tools used in the distance learning environments will provide training managers with detailed knowledge of student strengths and weaknesses and allow greater opportunities to optimally tailor future residential training (Pike, Hosni 2004).

PROTOTYPE DESIGN

The design team completed four major steps in developing the prototype. The first requirement was to accurately define the key training objectives and develop a clear description of the two training scenarios replicated in the RDT. The second step involved the creation of the initial prototype design to include development of accurate computer terrain models (Ware and Griswold Ranges); accurate models of Soldiers, weapons, and doctrinally accurate movements and behaviors; and the Graphical User Interface (GUI). The third step included the definition and integration of the key assessment criteria used in evaluating student performance. The fourth and final step included software testing conducted by the development team, SMEs, and users at IOBC.

Defining Training Objectives and Training Scenarios

Unlike many other training simulations which use game engine technology, the RDT was created to support a specific set of IOBC training objectives and a limited set of scenarios. The overall goal was to replicate the squad- and platoon-level, live-fire exercises conducted by IOBC at Ft. Benning. The development team spent a significant amount of time working with IOBC instructors and SMEs reviewing the specific live-fire scenarios. The team observed approximately twelve iterations of the actual squad-level, live-fire exercises and in two follow-on visits to Ft. Benning, observed another five iterations of the actual platoon-level, live-fire exercises. The team used a combination of still photographs and video tape to capture a record of the two live-fire exercises.

The team then prepared a written script of both the squad and platoon exercises providing a detailed description of each training scenario. The team discussed the scripts initially with SMEs at Ft. Benning and met with the SMEs on several occasions throughout the development process. The purpose of each meeting was to review the progress being made and to ensure the virtual scenarios continued to meet the training objectives and match the scenarios used in the actual live-fire exercises.

Development of Initial Prototype Design

The primary contractor responsible for developing the RDT was General Dynamics Advanced Information Systems. I.D.E.A.L. Technology Corporation of Orlando, FL, was brought on as a sub-contractor who assisted in developing the initial assessment process.

A number of major actions were required to develop the prototype design. Those steps included:

- Develop Ware and Griswold Range terrain databases
- Develop models of Soldiers and weapons
- Develop the 3-D simulation engine
- Develop Graphical User Interface (GUI)
- Define doctrinally accurate algorithms for movements and behaviors
- Develop assessment capability
- Incorporate elements into two virtual exercises

One of the first steps accomplished was the creation of a virtual replica of the Ware and Griswold Live-Fire Ranges at Ft. Benning. Both terrain databases were developed during the first year of the effort in an Open Flight terrain database format. Grid post elevation was provided at 30-meter resolution by PM OneSAF for the entire region of Ft. Benning with higher resolution data existing for specific areas such as the McKenna MOUT site. The grid post data allowed a rough version of the terrain to be laid out, but the terrain modeler had to account for several hills and valleys that existed between the grid posts. Photographs and videos taken during the data collection trips played an important role in providing realistic detail to the terrain databases. The pictures also provided some of the textures that were used in developing the trees, bushes, soil, grass, and foliage. A representative tree distribution of southern pines provided the necessary cover within the database. Bushes were also placed in representative locations. Actual locations of roads, paths, and streams were carved into the database to add the final details.

The graphical representation of the Soldiers used in the simulations included weapons, equipment, camouflage uniforms, and movement animations. Since there were only nine members of the friendly squad and fewer than five enemy combatants, the avatars in the squad-level exercises could be made up of several polygons and have hand-edited, frame-by-frame movement sequences. The sheer number of Soldiers involved in the platoon-level exercise was an issue that needed to be addressed. As a test, 50 of the squad-level avatars were placed on the Griswold Range database and tested for frame-rates. It quickly became apparent that the number of polygons in the avatars needed to be reduced in order for the frame rate to remain at a real-time level. The developer was able to reduce polygons while retaining the fidelity of the characters through better texturing. Also, the hand-

animated movements were replaced by motion-capture movement data. The end result was characters that looked better, that moved much more realistically, and that were implemented with much fewer polygons than in early versions of the characters.

The IOBC simulation application was developed using *Alloy*, a platform-independent, three-dimensional game engine developed by General Dynamics. The game engine is built upon a foundation of several freely-available, freely-distributable, open-source software components. The game engine includes an open-source audio library and an open-source graphics project called *OpenSceneGraph*, a mature, robust, 3D graphics library.

The RDT GUI was implemented using a game-like menu system which allows commands to be easily and intuitively issued during the heat of gameplay. *Alloy* supports a XML-based GUI layout format, which makes it easy to reconfigure the placement of the menu items. *Alloy* also supports loading the Open Flight terrain databases and supports keyboard- and mouse-based navigation controls.

The movement of the computer-generated forces (CGF) is self-contained within the RDT application. The behaviors of the CGF within RDT are very important because they need to follow the general directions of the squad leader yet autonomously react in the field to obstacles and enemy contact. The requirement to develop a CD-deliverable training application changed the focus from integrating with OneSAF to implementing CGF behaviors within the game itself. The CGF movement within RDT is fairly sophisticated in that the avatars are programmed to perform a number of maneuvers such as conducting 3-second rushes, maintaining doctrinal spacing and behaviors within the wedge, traveling, and bounding formations and avoiding obstacles. The CGF avatars automatically adjust their speed in order to maintain formations and reach their objectives in a timely manner. Enemy CGF, which on the live fire ranges at Ft. Benning are limited to pop-up targets, actually have movement within RDT.

The assessment portion of the initial phase of the RDT was primarily developed by I.D.E.A.L. Technology Corporation. Working with subject matter experts (SME's) at STTC and the 11th Infantry Regiment, numerous in-game assessment criteria were defined. Events triggered in the simulation were written to a game log, were analyzed by a parser, and generated an XML assessment file. The XML assessment file was

converted to HTML in order to display the results of the exercise.

The final step in making the simulation application come to life was the construction of the actual training scenario. In order to provide flexibility in modifying and adding scenarios in the future, RDT supports XML-based scenarios. The XML structure lays out the components and decisions in the scenario, and outlines the actions that are taken based on certain time-based, proximity-based, or GUI, keyboard, or mouse events.

Development of Assessment Criteria

The RDT uses two separate methods for assessing a player's performance. The first uses a form of an embedded assessment technique where the game tracks and validates performance against a number of key decision points monitored by the software. The squad version of the RDT includes 18 embedded assessment criteria and the platoon version includes 37 assessment criteria.

The second method of assessing performance uses a form of self-assessment whereby a student is asked to respond to a variety of open-ended questions or is asked to create reports using an open text format. The student must type his answers in text boxes. His responses are saved to a data file for later use. The student or instructor can compare the student's answers against the "schoolhouse answers" provided by SMEs during the AAR .

Once the student completes a scenario, a report is provided showing how well he scored against each of the embedded assessment criteria. The student can review his answers for the self-assessment questions, can save his game log to a file, and forward a copy of that file as an attachment to an electronic message to his instructor for additional evaluation. The RDT includes a "Group Assessment" module which allows an instructor to quickly consolidate and evaluate the results of all students.

The assessment criteria used in the RDT was developed through coordination between the STTC program management office and the SMEs from Ft. Benning. An initial outline was developed based on doctrinal references, specifically ARTEP 7-8, *Drill, Rifle Platoon and Squad*, (Army, 1993), ARTEP 7-8-MTP, *Mission Training Plan for the Infantry Rifle Platoon and Squad* (Army, 1988), and the IOBC TACSOP (IOBC, 2003).

The development team worked with key IOBC instructors to validate the assessment criteria by conducting detailed reviews during live walk-throughs of each scenario on the Ware and Griswold Ranges. The team also sought out assistance from the US Army Research Institute (ARI) Infantry Forces Research Unit at Ft. Benning in evaluating both our evaluation methods and the actual assessment criteria. The comments and recommendations provided by ARI were incorporated in the design of the assessment process.

Development Team and User Testing

Placing the RDT into the hands of SMEs and actual users took on a spiral development process. As in any software development project, on-going testing was a vital component of the RDT development process. The testing process began with the General Dynamics' software engineers testing each incremental code modification. STTC researchers would test the RDT for both stability and doctrinal correctness. Copies of the software were delivered periodically by the development team to the SMEs at Ft. Benning. Comments and recommendations provided by the SMEs were incorporated in subsequent test versions of the software.

The development team conducted two important experiments to test the instructional design and effectiveness of each training scenarios. The first experiment designed to test the squad scenario was conducted in May 04. The experiment involved nine IOBC students assigned to Alpha Company, 2-11th Infantry. The experiment required each student to complete the planning, mission, and assessment phases of the squad exercise. The students were asked to complete pre- and post-exercise questionnaires designed to capture their overall impressions of the trainer. Following completion of the virtual training experience, the students were allowed to complete the actual squad-level live-fire the following week on Ware Range. Feedback provided by the IOBC platoon trainer indicated the virtual training event produced a significant improvement in student performance during the actual live-fire exercise. Feedback from both students and cadre alike was included in future enhancements.

The second experiment conducted in October 2004 focused on the platoon scenario. Lessons learned from the squad experiment regarding the power and capabilities of the end-user PC hardware led to the STTC enlisting the assistance of ARI Infantry Forces

Research Unit to line up more powerful computers for the platoon-level pilot study.

The platoon-level experiment involved two groups of twenty IOBC students. The first group of twenty students was divided into two-man teams – one working as a player and the second as a coach/evaluator. Each student played the scenario, then reversed roles and became a coach for his partner. The IOBC instructor conducted an AAR in a group setting at the end of the experiment.

The second phase of the experiment was conducted in a different manner. In this case, students were selected at random and were asked to play a portion of the game in front of their peers while the game was projected on a large screen. The platoon trainer facilitated discussion throughout the exercise and led an AAR at the end of the experiment. Following the experiment, the students participated in an actual, platoon-level, live-fire exercise the following week. Again, feedback from the IOBC cadre indicated the virtual training had a positive impact on student performance. Additional user feedback went into further enhancements.

LESSONS LEARNED

Expectation Management

A constant challenge in developing the RDT was the need for weighing STTC research goals and IOBC training requirements against the amount of resources that were available to develop the trainer. Early on it became apparent that both the development team and user community wanted to create a training tool that exceeded the resources we had available. Expectation management became critical to user acceptance and the successful transition of the RDT into the hands of the Warfighter. For example, an original STTC goal was to incorporate training content into the RDT and to interface the trainer with a learning management system (LMS). A second goal was to develop a multi-player version of the RDT in which several students could assume the role of different key leaders in a single exercise. Both of these goals were suspended in order to focus our research efforts on those aspects of the trainer that were of most importance to the users. Establishment of clear and frequent lines of communication between the development team and the ultimate user community was the key to the successful management of expectations and ultimately to the successful development of the trainer.

Importance of SME Contribution

The first two measures of success established by the Commander, 11th Infantry Regiment were (1) the game must replicate the squad-and platoon-level, live fire exercises, and (2) the game must be doctrinally accurate. The importance of SME contribution became clear early in the development process when two IOBC instructors pointed out serious shortfalls with the CGF behaviors in an early version of the RDT. As a result, the team had to regroup and redesign certain aspects of the CGF behaviors. Failure to do so would have doomed the RDT and made it irrelevant as a useful training tool for IOBC.

One of the factors that the development team had to contend with was turnover of key SMEs due to rotations, reassignments, and deployments. Since the project began in 2003, all of the key leaders within the 11th Infantry Regiments and SMEs at Ft. Benning have been replaced. Despite that fact, the team was able to quickly assimilate new team members into the team and most importantly, continued to receive outstanding leadership support from the 11th Infantry Regiment.

One of the techniques the design team found most effective was to break up the development process into small incremental steps and to meet with SMEs more frequently to review progress. The development team's approach was to strive for the 90% solution. As a result of this approach, the team was able to maximize the accuracy of the training experience while minimizing the amount of required rework.

Fidelity of Game – How Good is Good Enough?

One of the key questions that developers of a game engine-based training application will face concerns the level of graphics fidelity that must be included in the simulation. Today, there are a lot of game engines available offering a wide range of graphics capabilities. Generally speaking, the higher fidelity of graphics included in the simulation, the higher the cost. Oftentimes, developers place too much emphasis on providing high quality graphics fidelity before studying the needs of the customer.

The third measure of success established by the Commander, 11th Infantry Regiment was the RDT should be “low-cost to develop, low-overhead to operate.” With few resources available to utilize on high-end graphics programs, the RDT was developed using a graphics library based on open source technology. The question facing the development

team was, “Are the open source graphics in the RDT good enough?”

Feedback received from the 11th Infantry Regiment leadership and cadre indicated that the graphics in the RDT were sufficient to meet the training requirements for IOBC. Cost-savings realized by adapting open source graphics were invested in developing more doctrinally accurate CGF behaviors. Thus, the team was successful in meeting the commander's objectives for this requirement.

Using Open Source Technology

In order to promote reuse and keep costs reasonable, open source technology was explored wherever possible in developing the RDT. Open source technology allows programs to piggyback on the efforts of others and contribute findings back to the community in order to grow additional capabilities. This philosophy can certainly have its drawbacks including reliance on delivery schedules that are not under the implementer's control, lack of technical support, and licensing issues. However, when properly applied, open source technology can serve as the foundation of military training applications, as shown in RDT.

While the development team initially wanted to rely entirely on open source technology, limitations in existing open source libraries made this unfeasible, at least at the time development started. Instead, a General Dynamics game engine, called *Alloy*, which integrates several high quality open source graphics, audio, input, and physics libraries with a proprietary kernel, was used for development. This allowed the development of the RDT to be performed under mostly open source technology and recognized that the limitations present during the early stages of the project constrained the full potential benefit to portability provided by open source code.

The development team initially explored using an open source java-based LMS for capturing student assessment data, but the development of the LMS within the open source community didn't mirror the ambitious schedule for the first phase of RDT.

Importance of a Simplified GUI

Experience has shown that students will not be given a lot of classroom time to use the RDT. Therefore, the game must be easy to learn and simple to use in order to make it beneficial as a training tool at IOBC. Hence, a significant amount of effort was spent to develop a

simple, straightforward interface for the RDT. The initial attempt was to simply put all possible commands on one screen (see Figure 2). However, a project team made up of graduate students at the University of Central Florida (UCF) reviewed the initial GUI design and concluded that the RDT menu system was too unwieldy. The majority of the UCF project team was human factors students.



Figure 2. Early RDT Command Menu Screen

The students developed and recommended some alternative approaches which the RDT development team was able to use. (Pike, Bradley, et. al., 2004) The current version of the RDT uses only the arrow keys and the “WASD” keys (typical of FPS games) to navigate. All other commands are issued via a menu system (see Figure 3).



Figure 3. Sample RDT Command Menu Screen

“Learning the Game” versus “Playing the Game”

While simplicity was a key design consideration in the RDT, there is a training “ramp-up” time required for a student to understand how the game works before the student can actually use and benefit from the training experience. Having ARI’s Infantry Forces Research Unit come on-board as a research partner was important to resolve this issue. ARI helped by setting up experiments designed both to gauge student perception of the RDT and its ability to prepare students for the live-fire exercises. In so doing, the STTC was able to gather a wealth of data on how the RDT and similar applications can be used for training.

One of the more interesting points identified by ARI during the October 2004 experiment dealt with how much experience each of the students had with using video games before participating in the experiment. Although there is a common perception that all young Soldiers today are “gamers” and that most of the young Soldiers play video games regularly, either on computers or commercial game platforms, that was not the case for most of the 40 second lieutenants who participated in the October 2004 experiment.

Prior to conducting the experiment, ARI completed a biographical sketch of the test group which included a description of the game-playing skill level of each student. Based on the data collected by ARI, 79% of the students admitted to having some experience with video games, however, only 19% of the students considered themselves as avid gamers. Additionally, only two of the 40 students admitted to playing video games over five hours per week. Conversely, over 50% of the students considered themselves “beginners.”

As a result of this assessment, the team decided to match students with various video game experiences in the first experiment and used the group teaching approach in the second experiment. Both approaches appeared to be more effective than by simply allowing the students to play the game individually. Assuming that this test group is representative of future IOBC classes, instructors should be careful to evaluate the experience level of their students before using a game engine-based trainer and allow for the fact they are likely to have students with divergent backgrounds while conducting their planning process.

A second important lesson learned in this regard was that the comfort level of the instructor directly influenced the student perception and the overall effectiveness of the training experience. Instructors

must know how to play the game and just as importantly, must know how to plan for using this technology in their training programs. For this reason, the STTC decided that in the future, an STTC researcher would attend at least the initial run of the RDT at each new site. Heeding this lesson paid off when the STTC partnered with the US Military Academy at West Point and used the RDT in the summer of 2005 to prepare cadets for a situational training exercise (STX) similar to IOBC exercises. Furthermore, the STTC decided to develop a pseudo-“course of instruction” on how to use the RDT and a handful of similar products (Beal, Christ 2005).

Testing

By the time the RDT was considered ready for release to IOBC, the design and development team had tested the scenarios in excess of 50 times, from testing the application to demonstrating it to potential users. While this comfort level made for effective demonstrations, it also limited the team’s effectiveness in uncovering all glitches in the software. Not until we ran the first, full-fledged experiments at IOBC and subsequent fielding of the initial version of the RDT in January were all software shortfalls uncovered.

CONCLUSIONS

The spiral design and development process undertaken by the STTC and General Dynamics led to several lessons learned that can aid future developers of game engine-based training simulations in specific and training simulations in general. These include:

- Start with a realistic set of expectations, especially if there are potentially conflicting goals and/or audiences (e.g., research and production) to be satisfied;
- Establish a good working relationship early with subject matter experts; however, do not wait on SME input before moving forward with a best-guess, 90% solution;
- When SMEs rotate out of their positions, keep the momentum by meeting with their replacements as early as possible. If possible, conduct a transition meeting with both the new and old SME together;
- Game-based trainers typically do not assess student performance the same way small-group instructors do, nor do they provide feedback to instructors. From an instructional design perspective, developers used a combination of embedded and self-assessment

techniques to create an effective assessment capability for both students and instructors.

- Understand the target audience, their technology maturity and the capabilities of their hardware. Keep in mind that not every game engine-based simulation has to be “X-Box” quality. The RDT is an example of how lower-fidelity graphics and open-source technologies can be applied to create an effective training application;
- Contrary to popular opinion, not every 22-year-old is game-savvy. Consider how much time a student will spend in the simulation when designing the user interface;
- After developers and knowledgeable users have tested the simulation, line up testers who are not familiar with it to test it.

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