UrbanSim: Training Adaptable Leaders in the Art of Battle Command

Timothy Wansbury[1], John Hart[1], Andrew S. Gordon[2], and Jeff Wilkinson[3]
[1]U.S. Army Research, Development, and Engineering Command, Orlando, FL
[2]University of Southern California, Institute for Creative Technologies, Los Angeles, CA
[3]MYMIC, LLC, Orlando, FL
tim.wansbury@us.army.mil, john.hartiii@us.army.mil,
gordon@ict.usc.edu, jeff.wilkinson@mymic.net

ABSTRACT

UrbanSim is a game-based learning solution that is designed to train leaders in the execution of the "Art of Battle Command" in complex environments where counterinsurgency (COIN) and stability operations predominate. The UrbanSim experience is divided into three components: a two-hour, self-paced, instruction module that provides students with basic knowledge on the doctrinal principles of COIN and Stability Operations, a game-based practice environment, and an instructor-led After-Action-Review. Built initially to train new battalion commanders attending the U.S. Army School for Command Preparation at Ft. Leavenworth, KS, the UrbanSim Learning Environment has been used to effectively train Soldiers in multiple institutional and operational unit settings. The trainees range in rank from Private (E-1) to Lieutenant Colonel (O-5). The success achieved with the UrbanSim project is attributable to three key factors. First, the tools were developed using proven instructional design principles. Second, the technologies were created using a spiral development process in close collaboration with trainers. Third, the components of the UrbanSim Learning Environment have been employed by trainers experienced in using game-based tools to effectively achieve specific training objectives.

This paper describes the UrbanSim Learning Environment. It describes how UrbanSim was designed and developed employing key design principles and lessons learned from previous efforts at creating effective, game-based training tools. It also describes multiple examples of how UrbanSim has been used to effectively train Lieutenant Colonels at the battalion commanders' Pre-Command Course, Majors at the Command and General Staff College, Army Captains at the Maneuver Captains' Career Course (CCC) and at the Military Police CCC, and commanders, staff, and Soldiers assigned to operational battalions in the Army. The paper concludes with a discussion of how and why UrbanSim has been so successful in training Soldiers across such a wide spectrum, and how developers of future training systems could benefit from the UrbanSim experience.

ABOUT THE AUTHORS

Timothy Wansbury is a project leader at the U.S. Army Research, Development and Engineering Command, Simulation and Training Technology Center.

John Hart is a program manager at the U.S. Army Research, Development and Engineering Command, Simulation and Training Technology Center.

Andrew S. Gordon is research scientist at the Institute for Creative Technologies at the University of Southern California.

Jeff Wilkinson is Chief Scientist and Chief Technology Officer at MYMIC LCC.

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INTRODUCTION

In the past several years there has been a dramatic increase in the use of computer game technology for military training. The reasons for this increase are numerous, and rooted in the promise that computer game technology holds for rapidly customizable, cost-effective training solutions that enable members of the armed forces to practice complex skills in realistic virtual environments. However, these game-based training environments have employed only a handful of game play styles from specific video game genres. Most prominently, the action-adventure genre has been used for practicing skills as diverse as small-unit tactics (Korris, 2004) and foreign language interaction (Johnson et al., 2004). In this genre, the player controls the real-time behavior of a single person interacting with other people in visually realistic environments, viewed from either a first-person or third-person perspective. As a predictable consequence, the breadth of training objectives that have been addressed with computer game technologies has been narrow, focusing on tactical skills, rather than operational or strategic considerations.

During the past five years, the U.S. Army has engaged the research and development community to explore the applicability of game-based technologies to a wider range of training applications. Beginning in 2005, the U.S. Army began a significant research effort involving a number of research organizations in a project known as Learning with Adaptive Simulation and Training, Army Technology Objective (LAST ATO). This major research effort had three overall objectives. The first was to determine how to best design, develop, and use game-based training systems. The second goal was to develop new tools, methods, and metrics to enable training developers to rapidly create or modify scenarios in virtual simulations. The third goal was to develop tools and methods for integrating representative cultural behaviors and effects in virtual simulations. As demonstration prototypes, three game-based training systems were developed as part of the LAST ATO. First, the BILAT simulation set provided a game-based environment for practicing negotiation skills in a cultural context (Hill et al., 2006, Durlach et al, 2008). Second, the Distribution Management Cognitive Trainer (DMCT) was a game-based training environment for practicing logistical planning and understanding the Army distribution management process (Fisher, 2009). Third, UrbanSim was a game-based training solution designed for commanders to practice the "Art of Battle Command" in complex counterinsurgency and stability operations (McAlinden et al., 2008). Targeting the operational-level skills of U.S. Army battalion commanders and their staffs, UrbanSim was designed with a game play style of *construction and management simulations* and *turn-based strategy games*.

This paper reviews the development of UrbanSim, and then describes a series of pilot studies that were conducted to evaluate UrbanSim's utility as a training tool for the U.S. Army. We describe pilot experiments in institutional training environments as well as in operational units. We then discuss the factors that contributed to the success of UrbanSim as a game-based training aid.

URBANSIM

Over the last few years there has been a significant revision of U.S. Army doctrine in support of and as a reaction to the ongoing wars in Iraq and Afghanistan. An early hallmark of this change was the revised Counterinsurgency field manual (FM 3-24) in 2006, which renewed the U.S. Army's interest in studying the complexities of full-spectrum operations. Although the U.S. Army's institutional training providers did not immediately change the content of their instruction, gradual and persistent change has been seen in U.S. Army classrooms as trainers have grown to adapt to the needs of the contemporary operating environment.

Some of the changes in instruction have been relatively easy to make. For example, the skills associated with the Military Decision Making Process (MDMP) that is a focus of Captains' Career Courses throughout the U.S.

Army are equally relevant to counterinsurgency operations as they are to the high-intensity, force-on-force, kinetic wargaming, which was popular only a few years ago. Instructors needed only to change the scenarios in which these skills are exercised to ensure relevance to today's conflicts. However, the computer-based simulation environments used in the past quickly became obsolete, leaving few opportunities for students to practice the execution phase of MDMP in realistically complex, counterinsurgency and stability operations. Trainees were left with many opportunities to prepare plans, but few opportunities to see how these plans would play out. This was particularly problematic given the U.S. Army's expressed need to develop *adaptable leaders* who can adjust course in the face of changing situations. One of the key examples of where this training deficiency was particularly evident was in the Tactical Commanders' Development Program (TCDP) in the US Army School for Command Preparation (SCP), at Ft. Leavenworth, KS.

The SCP saw an opportunity to rectify this training gap through the use of game-based technologies and turned to the U.S. Army Research Development and Engineering Command, Simulation and Training Technology Center (RDECOM STTC) and the Institute for Creative Technologies (ICT) at the University of Southern California to develop a prototype training solution. The research task was to develop a prototype training application that could serve as a low-overhead simulation for practicing the art of battle command in a complex environment where counterinsurgency and stability operations predominate.

To pursue this objective, the research team adhered to a design model for training development known as Guided Experiential Learning. In this section, we motivate the use of this model and review its application to UrbanSim learning objectives, then describe an iterative development process for developing the UrbanSim software.

Learning Objectives

Considerations of effective methods for skill acquisition have a rich and contentious history within the educational research community. Debates over theoretical issues are particularly relevant to developers of game-based training applications because of the influence that they have on the early design of the user experience. One particularly contentious, but relevant, theoretical debate has been fought over the impact of instructional guidance during teaching; how much should the learner be guided toward executing skills in the correct way, and how much should these skills be discovered through trial and error (Kirschner et al., 2006). As important as the empirical evidence is in support of these approaches are the practical considerations of designing effective training materials based on each of these theoretical considerations. Clark (2008) proposed Guided Experiential Learning (GEL) as an evidence-supported theoretical framework that is paired with a practical approach to training development. The GEL model strongly favors the guided approach to instruction, and selectively picks the best aspects of previous educational design models to provide guidelines for training developers (Merrill, 2002; Clark, 2008). The GEL model is both a process for designing training to be delivered on any media platform, and a set of specific procedures for completing and testing each stage in the design and development process.

The GEL model begins with the identification of a target skill set and a set of subject matter experts with recognized competency in those skills. For the UrbanSim project, we partnered closely with the SCP at Ft. Leavenworth, Kansas. We adopted the target skill set of the TCDP, a pre-command course for lieutenant colonels preparing for new assignments as U.S. Army battalion commanders.

While this course introduces a philosophy of the art of battle command that is unique to the School for Command Preparation, this material is strongly rooted in U.S. Army doctrine as defined in field manuals. UrbanSim was developed during a period of significant change in U.S. Army doctrine, and drew heavily from field manuals that the U.S. Army revised during the course of the project, especially Full Spectrum Operations (FM 3-0), Counterinsurgency (FM 3-24), Stability Operations (FM 3-07), Information Operations (FM 3-13), Tactics in Counterinsurgency (FM 3-24.2), Intelligence Preparation of the Battlefield (FM 34-130), and Training the Force (FM 7-0).

A key component of the GEL model is the use of a Cognitive Task Analysis (CTA) (Clark et al., 2008) as a means of identifying how expert practitioners perform the skills that are to be learned, or colloquially "*what right looks like*." A CTA involves numerous interviews with subject matter experts and iterative revisions of skill definition documents. With the assistance of the School for Command Preparation, and with additional help from instructors of the Directorate of Counterinsurgency and Cultural Influence at Ft. Riley, KS, we identified subject matter experts for UrbanSim's Cognitive Task Analysis. Seven former battalion commanders were interviewed for the initial iteration of analyses, which were subsequently reviewed by three additional former commanders recognized for their

command abilities in counterinsurgency and stability operations.

As a result of this Cognitive Task Analysis, the following five learning objectives were identified for the UrbanSim Learning Experience.

1. Demonstrate the difficulties associated with achieving and maintaining situational awareness and situational understanding in a complex counterinsurgency and stability operations environment;
2. Demonstrate the essential need for commanders to balance a wide range of direct actions (lethal and non-lethal) in this type of operating environment;
3. Show commanders the importance of being able to anticipate second- and third-order effects of decisions, and the need for commanders to consider those effects in the planning process;
4. Emphasize the key doctrinal principles of "Clear, Hold, Build;"
5. Expose commanders to many of the tools and methods used by successful commanders to assess progress in a COIN environment over time.

Additionally, this CTA identified five topics that were critical in conducting successful counterinsurgency and stability operations. These topics became the focus of the design of the simulation software.

1. Securing the population
2. Enabling the Host Nation (HN) government
3. Gathering intelligence effectively
4. Conducting information operations
5. Coordinating Lines of Effort (LOE)

The CTA was a critical step in the overall design process for the practice environment. Self described lessons learned by the battalion commanders who were interviewed combined with the many "stories" which described real life experiences contributed greatly to the design of a series of events incorporated into the UrbanSim exercises. These complex stories provide a rich realistic training experience for students at all levels.

UrbanSim Practice Environment

With these learning objectives, we began an iterative design and development process to create training materials for this skill set. These training materials were created in close collaboration with instructors and course developers at the SCP, which afforded an invaluable opportunity to get immediate feedback from instructors and students during each stage of the development process.

The main product of the UrbanSim project is a game-based environment for practicing the art of battle command in a complex urban environment. This practice environment recalls the design of turn-based strategy games, as well as the classic city-management game, *SimCity*, release by Maxis Software in 1989. In this practice environment, the trainee takes on the role of a battalion commander, directing the action of subordinate companies, civil affairs units, and quick reaction forces by managing fragmentary orders in the form of a battalion synchronization matrix.

The practice environment is supported by a printed Background Reader ("Road to War"), which provides intelligence details about each scenario. This reader includes the general history of the area, a timeline of recent key events, an overview of forces and key leaders in the area, a discussion of the terrain, the brigade commander's Operation Order, the brigade commander's Statement of Commander's Intent, Lines of Effort, and Commander's Critical Information Requirements. This background reader provides sufficient information to support an abbreviated mission analysis.

The normal sequence of actions in an UrbanSim exercise is for trainees to first review the background reader followed by the development of four key planning products –a Statement of Commander's Intent, a prioritization of Lines of Effort with defined milestones and end-states, a list of Commander's Critical Information Requirements (CCIRs), and a list of Measures of Effectiveness (MOEs). Each of these products are entered into the practice environment by the trainee at the beginning of each practice session, and are used by the software to develop an initial course of action as well as customize the presentation of information to the trainee based on their mission plan.

The first scenario developed for the practice environment is set in the fictional Iraqi city of Al-Hamra', based very loosely on the conditions seen in 2006 and 2007 in the northern Iraqi city of Tal Afar. This scenario includes ethnic and religious rivalries among the population, several active insurgent groups, a difficult political environment, and a devastated civil infrastructure. This scenario and its variants were used in each of the pilot experiments described in this paper.

The practice environment includes a number of key research technologies that make it unique. First, the underlying simulation engine for the behavior of non-player individuals and groups is computed using a decision-theoretic process, where these computer driven individuals and groups identify actions during each turn that maximizes their expected utility given the current

state of the simulation. This behavior engine, called *PsychSim*, has been used in other applications that employ alternative methods of calculating the utility function (Pynadath & Marsella, 2005). The use of PsychSim in UrbanSim was motivated in part by the availability of PsychSim authoring tools for defining complex socio-cultural models.

Second, UrbanSim includes a mechanism for injecting realistic story content directly into the underlying simulation using a dedicated story engine. To create a story engine, we began by conducting a series of story-collection interviews with several former U.S. Army battalion commanders, using a set of interview techniques developed to support the authoring of story-based learning environments (Gordon, 2009). Dozens of these real world stories, largely based on experiences in Iraq and Afghanistan, were then encoded as chains of stimulus-response rules and integrated into the simulation engine. During each turn in the simulation, these rules check the state of the simulation to determine if the conditions are right for the interjection of specific story content. If the conditions are right, the story engine modifies the state of the simulation accordingly. For example, a real world story about a friendly-fire killing of an Iraqi police officer is used to author an analogous event in the Al-Hamra' scenario, which fires when the conditions of the simulation are analogous to those observed in the real world case.

Third, the practice environment includes a set of research technologies that guide trainees toward the proper execution of the skills they are practicing, in accordance with the GEL model. Many of these technologies are realized as interactions between the user and two "virtual staff members," namely virtual intelligence (S2) and operations (S3) officers. These virtual staff members will proactively offer advice to students according to a programmed intelligent tutoring strategy. Additionally, they provide feedback through deep causal explanations of changes in Lines of Effort, explaining how the actions of the player and of the non-player characters contributed to an increase or decrease in the mission metrics of success.

UrbanSim Primer

The second component of the UrbanSim project is a multimedia primer on the core concepts and principles of counterinsurgency and stability operations. The primer consists of a series of video-based lessons and is embedded in a software-based media player that enables trainees to view lessons and navigate through concept definitions and other supplementary information. The primer consists of eight video-based lessons providing students with the minimum exposure to the key principles of COIN and stability operations required in order to effectively participate in the UrbanSim practice environment exercise.

Instructor-Facilitated Discussion

The third component of the UrbanSim Learning Experience is the emphasis placed on instructor-facilitated discussions at multiple stages of the overall exercise. An instructor is responsible for setting up the framework for the overall exercise recognizing the strengths and weaknesses of students who will participate in the training. Instructors typically require students to brief the status of their operation at three times during game play – upon completion of the mission analysis phase of the exercise; during a "Battle Update Briefing" (BUB) which is conducted halfway through the game exercise; and during the After-Action-Review. In all three cases, a well facilitated discussion highlights success and challenges during game play and allows the instructors to link game activities to key instructional goals and objectives.

PILOT STUDIES AT TRADOC INSTITUTIONS

Our collaborators at the School for Command Preparation provided a unique opportunity for us to receive feedback on the utility of UrbanSim throughout the development process. Instructors were willing to test early versions with students in their classrooms and develop teaching methods that capitalized on the software's strengths, thus providing us with extensive comments and recommendations which helped to guide the software engineering process. This iterative design-and-test cycle continued over the course of one year. By the end of that year these instructors had greatly shaped the end-product ensuring that UrbanSim specifically met their training needs. The system was subsequently incorporated into the formal program of instruction at the SCP.

Following our successes with employing UrbanSim at SCP, we began to investigate the use of the toolset across a wide range of institutional settings throughout the U.S. Army Training and Doctrine Command (TRADOC). To investigate this broader utility, we sought out instructors and course developers who would be willing to conduct pilot exercises with their students.

The Command and General Staff College (CGSC) was an obvious candidate. Co-located with the School for Command Preparation at Ft. Leavenworth, CGSC had close access to technical and instructional expertise on

the use of UrbanSim software. The training audience, U.S. Army majors in the Intermediate-Level Education program, was close in rank and experience to the Lieutenant Colonels who had been using UrbanSim. As well, CGSC had an ideal course for this content: the XO/S3 Elective Course for future battalion and brigade staff officers.

Based on the successful methods used by the School for Command Preparation, we designed a course of instruction for the XO/S3 Elective Course at CGSC consisting of roughly 16 hours of classroom time. This design, which became the model for UrbanSim use in all of our subsequent pilot exercises, was divided into four, four-hour blocks that could be executed over two to four days. This design is as follows:

1. Primer & background reader: Students use the UrbanSim primer to familiarize themselves with key doctrinal concepts of counterinsurgency and stability operations. They are divided into two-person teams to study the UrbanSim background reader for the chosen scenario. These teams each develop a set of battalion-level products, including a Statement of Commander's Intent, CCIRs, Lines of Effort, and Measures of Effectiveness.

2. Briefing the products & knobology demo: The two-person teams brief their battalion-level products to the course instructor, who leads a whole-class discussion of the pros and cons of each approach. Students are then introduced to the UrbanSim practice environment using methods developed from many lessons learned in prior experiences using other game-based tools to train Soldiers. User interface functionality of the system is demonstrated, and then the two-person teams each execute two or three turns of a practice scenario to familiarize themselves with the software.

3. First simulation exercise: The two-person teams enter their battalion-level products into the UrbanSim practice environment, and play through all 15 turns of the first scenario. At the halfway mark, the instructor calls an administrative halt and leads a "Battle Update Briefing," where each team briefs the instructor on their operational strategy, the adjustments that they have made, and the additional battalion resources that they could use. An After-Action Review (AAR) is conducted at the end of the exercise supported by a variety of performance data and graphs generated by the UrbanSim practice environment.

4. Second simulation exercise: An additional 15-turn exercise is run with a variation of the scenario. Terrain and other starting conditions remained the same, allowing for the reuse of the battalion-level products, but the significant activities and situation reports generated by the simulation are all different. The final after-action review topics are broadened to enable discussion and assessment of the whole UrbanSim course experience.

The course director and instructors of CGSC's XO/S3 Elective Course has conducted two successful UrbanSim exercises and has integrated UrbanSim into the course for future classes. This success at CGSC encouraged us to explore the utility of UrbanSim to the training of officers at even lower echelons of command. We sought out instructors and course developers at Captains' Career Courses at different TRADOC institutions to conduct a series of pilot exercises with U.S. Army captains. Beginning in 2010, we conducted three pilot exercises at the Maneuver Captains' Career Courses (MCCC) at Ft. Benning and Ft. Knox, and the Military Police Captains' Career Course (MPCCC) at Ft. Leonard Wood.

One concern during these three pilot exercises was that the content of instruction may not be at an appropriate level for the training audience. Critical to addressing these concerns was a discussion with instructors at each school focused on validating the underlying learning objectives for UrbanSim. Although the students are not training to be battalion commanders, the question was whether there was value in having the students "*walk a mile in the commander's shoes*" by assuming the role of a battalion commander for the purpose of this exercise. In each case, the instructors agreed that the learning objectives were appropriate for the students in their classrooms.

In order to obtain feedback from the students who participated in the training, we administered an attitudinal survey to each of the students who participated in these pilot exercises, and received back 35 completed surveys. Questions on this attitudinal survey were selected based on UrbanSim's original learning objectives. Table 1 presents the survey results, combining all of the completed surveys from each of the three Captains' Career Courses. In total, 88% of these captains agreed or strongly agreed with positive statements regarding UrbanSim's use as a training tool for counterinsurgency operations.

Anecdotally, we found that captains were generally more comfortable with game-based technologies than higher-ranking officers who have used UrbanSim, but somewhat less successful in advancing their specific mission objectives in each of the UrbanSim scenarios. A full evaluation of training effectiveness and a comparative analysis of content appropriateness is the subject of a follow-on research effort which will be

conducted by the RDECOM STTC and the Army Research Institute.

PILOT STUDIES WITH OPERATIONAL UNITS

Our experiences in TRADOC classrooms encouraged us to consider the applicability of UrbanSim to operational units. After seeing the applicability of the content to both junior and senior officers, we began to look for opportunities to use UrbanSim as a training tool for battalion staffs. In particular, we sought out commanders of battalions with newly constituted staff elements in need of pre-deployment training in counterinsurgency and stability operations. We conducted a series of pilot studies in 2010 with two operational battalions preparing for deployment, a battalion at Ft. Hood and a National Guard battalion.

In addition to the five original training objectives, these two commanders believed that UrbanSim would be helpful as well in improving staff coordination and familiarizing their newly constituted staffs with the styles and approaches of each other. These staff-development training objectives led us to modify the course of instruction that we had used in TRADOC classrooms to better suit the needs of these battalions. Primarily, these modifications concerned the composition of the teams who developed the battalion level products and collaboratively executed these plans in the scenarios. Three variants used in these pilot exercises are as follows:

1. Staff Element Exercise: Two and three-person teams were created by dividing the battalion staff without regard for their formal staff element roles (e.g., personnel (S1) intelligence (S2), operational (S3), etc.) Instead, the battalion commanders selected teams based on the desire to have teams that matched more experienced personnel with less experienced and members of one staff element working with members from a different element. This approach enabled the commanders to also use this opportunity as a team building exercise across the entire staff. Each team developed battalion-level products individually, and then briefed them to the battalion commander. The commander also developed his own version of the battalion-level mission analysis products. During the mission analysis "hot wash" with the staff teams the commander selected aspects of different plans to produce a final set of products to be followed during the execution of the scenario. These products were used by all teams to set the same initial conditions then each team conducted the operation independently. The battalion commander reviewed the approach and progress of each team and conducted a mid-exercise BUB and an after-action review at the end of the exercise.

2. Single Staff Exercise: The entire battalion staff collectively developed battalion-level products and executed the scenario as a single group. In this variation, multiple computer workstations running the UrbanSim practice environment were kept in sync with each other by committing the exact same fragmentary orders during each turn. This allowed members of each staff element to review scenario information independently, and perform their staff responsibilities in parallel with other elements.

3. COIST Team Exercise: The battalion staff collectively developed battalion products and executed the scenario, but did not use the UrbanSim practice environment directly. Instead, they communicated their orders to remote company intelligence support teams (COIST). These teams, consisting of enlisted soldiers (E1 and higher), who assumed the roles and responsibilities of individual company units in the UrbanSim scenario. During each turn, each COIST team would use the UrbanSim practice environment to review significant activities and situational reports that were relevant to their company's area of operation, and communicate the results of the actions back up to the battalion staff. The staff would then maintain their own operational picture based solely on this information, and then develop actions for the next turn.

None of these variants were envisioned during the time that UrbanSim was developed. However, these battalion commanders successfully and creatively used UrbanSim to satisfy specific training needs. In addition to the comments provided to us by these commanders, we administered the attitudinal survey to each of the staff members who participated in these exercises, receiving 23 completed surveys. The combined results of these attitudinal surveys are presented in Table 2. In total, 96% of these staff members agreed or strongly agreed with positive statements regarding UrbanSim's use as a training tool for counterinsurgency operations.

Table 1: Captains' Career Course, results of attitudinal surveys (N=35)

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
UrbanSim is an effective training tool.				22	13
UrbanSim furthered my knowledge and understanding of counter insurgency (COIN) operations.		1	6	17	11
UrbanSim is relevant to contemporary operating environment (COE) COIN operations			1	17	17
UrbanSim is consistent with current Army COIN doctrine			4	17	14
UrbanSim will benefit deploying units in improving understanding of COIN operations.				18	17
UrbanSim will benefit deploying units in developing staff team building functions for future COIN operations.		1	8	12	14
Playing the game helped me understand that reaching a desired end state can be accomplished through direct and indirect paths.			3	20	12
Playing the game helped me understand that LOEs are interrelated and every action can have 2nd and 3rd order effects.			1	17	17
Playing the game provided an opportunity to practice basic strategies of COIN OPS such as clear-hold-build.		1	4	18	12
Playing the game required me to engage in the same thought processes that are required for preparing, executing, and assessing COIN operations in theatre.	1		5	15	14
As a result of playing the game, I have a better understanding of the tasks a commander must perform during COIN operations.			9	15	11
Total	1	3	41	188	152
Total percent	0	1	11	49	39

DISCUSSION

The UrbanSim project was a research success, particularly with respect to the first goal of the Army Training Objective on Learning with Adaptive Simulation and Training: to determine how to best design, develop, and use game-based training systems. For each of these three activities (design, develop, and use), there were specific lessons learned throughout the course of this project.

First, the *design* of UrbanSim was the result of a principled design model, Guided Experiential Learning. The GEL model pairs two critical components of a successful design approach: an evidence-supported theory of skill acquisition and a practical design methodology. Although we believe that other design models with these components may also yield successful designs, our use of the GEL model in this project and others has been extremely helpful. By the nature of all research projects of this sort, the systems that we build are first-of-a-kind. Consequently, it is challenging to directly apply the experimental results of previous research efforts to the design of new research prototypes. Instead, we are required to look at analogous research results, identify commonalities to the current training objectives, and adapt previous approaches. Following the GEL model gives us some confidence at the beginning of each project that the end-result will be an effective training solution. Given the significant costs associated with research in this area, this assurance is extremely important.

Furthermore, the specific design of UrbanSim has demonstrated that a broader range of video game genres can be successfully used in military training applications. First-person shooters and other action-adventure genres will continue to have their role in game-based training, but the military training community should not hesitate to capitalize on other innovative game play styles emerging from the computer game industry.

Table 2: Operational units, results of attitudinal surveys (N=23)

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
UrbanSim is an effective training tool.				11	12
UrbanSim furthered my knowledge and understanding of counter insurgency (COIN) operations.				16	7
UrbanSim is relevant to contemporary operating environment (COE) COIN operations			2	10	11
UrbanSim is consistent with current Army COIN doctrine			2	13	8
UrbanSim will benefit deploying units in improving understanding of COIN operations.				9	14
UrbanSim will benefit deploying units in developing staff team building functions for future COIN operations.				9	13
Playing the game helped me understand that reaching a desired end state can be accomplished through direct and indirect paths.				14	8
Playing the game helped me understand that LOEs are interrelated and every action can have 2nd and 3rd order effects.			1	5	17
Playing the game provided an opportunity to practice basic strategies of COIN OPS such as clear-hold-build.			2	17	4
Playing the game required me to engage in the same thought processes that are required for preparing, executing, and assessing COIN operations in theatre.			2	11	10
As a result of playing the game, I have a better understanding of the tasks a commander must perform during COIN operations.				12	9
Total	0	0	9	127	113
Total percent	0	0	4	51	45

Second, the *development* of UrbanSim was successful primarily because of the close collaboration between the research team and the School for Command Preparation. The lesson here is that it is imperative to partner early with the intended users of the training materials. UrbanSim followed an iterative development process, where instructors used each new revision of the UrbanSim software in the classroom. This allowed for immediate feedback on content and functionality, and moved the development team to work on issues that were actually relevant to the intended audience.

The most surprising aspect of this development approach was the willingness of these instructors to tolerate half-baked systems full of software bugs, which crashed students' computers on numerous occasions throughout the iterative development cycle. This required a long-term view on the part of these instructors, and some faith that all of these software development issues would eventually be ironed out.

Third, UrbanSim was used successfully in our pilot exercises in classrooms and in operational units primarily due to the talents of the instructors and commanders who led this training. These exercises convinced us that the UrbanSim primer and practice environment are not themselves the source of learning in these courses, but instead are tools to be used by effective instructors. Critical to this success is the approach the team used to train the trainers in both the methods and processes for effectively employing the game-based training environment. The requirement for instructors to be deeply involved in this sort of training came as a surprise to some of the instructors who had an initial expectation that any "simulation exercise" would produce desired results just simply by having students “play the game.” Instead, instructors found themselves responsible for leading instructor-facilitated discussions during the UrbanSim experience focusing on key doctrinal principles of counterinsurgency and stability operations. They monitored the progress of the teams as over-the-shoulder mentors and innovated

where necessary to accomplish their own learning objectives.

We believe the demonstrated success of using a well designed, well built, game based tool, which is placed in the hands of well trained instructors, will accelerate the use of similar *low-overhead* training solutions in the future. Game-based training, in particular, brings with it a number of new instructional challenges and opportunities for classroom instructors and unit commanders. Best practices for game-based training should be widely collected and disseminated, and effective communities of practice should be established in the future.

CONCLUSIONS

This paper describes UrbanSim, a research effort to develop a game-based training tool which is used for practicing the art of battle command in complex counterinsurgency and stability operations. We described the methods used to develop the system and provided multiple examples of how it has been used successfully to train Soldiers in a variety of institutional and operational unit settings. We provided the results of several attitudinal surveys which showed that 88% of students in Captains' Career Courses and 95% of the Soldiers from operational units who participated in an UrbanSim exercise agreed that it was a useful training tool. We stressed the importance of placing this well designed, well built tool into the hands of well trained instructors in order to produce the successes we've seen in the UrbanSim exercises. Finally, we discussed how and why UrbanSim has been used across a wide spectrum of training contexts, and how developers of future training tools could benefit from the UrbanSim experience.

ACKNOWLEDGEMENTS

The project or effort described here has been sponsored by the U.S. Army Research, Development, and Engineering Command (RDECOM). Statements and opinions expressed do not necessarily reflect the position or the policy of the United States Government, and no official endorsement should be inferred.

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