# ELICITING AND EVALUATING TEAMWORK WITHIN A MULTI-PLAYER GAME-BASED TRAINING ENVIRONMENT

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## Abstract

Modern multi-player computer games (or multi-player games) show great potential for enabling distributed training of a variety of skills, including effective teamwork, in a variety of simulated environments. We explored the utility of a fantasy-based multi-player game for training teamwork skills. Forty members of the United States Army Infantry participated in the study. The lessons learned indicate that multi-player game-based training systems can elicit teamwork behaviors and provide a viable environment in which those behaviors may be practiced and improved. Our methodology, design, exercise, and results are discussed.

## 1. Introduction

The recent rise in the popularity and technological robustness of multi-player games has led to a variety of efforts to use such applications for training groups of people in general, and members of the military in particular. (Bonk & Dennen, 2005). These efforts seek to exploit the ability of multi-player games to engage players in an immersive, enjoyable simulated environment to elicit complex behaviors and improve performance on targeted tasks and goals. As training systems, multi-player game technologies have the potential to facilitate learning by providing opportunities that are readily available, low cost, widely distributed, and engaging. In order to explore this potential, we conducted a study, named *Gorman's Gambit*, to explore the use of multi-player game technologies to support military training of teamwork skills (Hussain & Ferguson, 2005; Weil et al., 2004; Weil et al., 2005a,b)..

Our work is based upon the thesis, put forward by General Paul Gorman (U.S. Army, Ret.), that teamwork skills can be taught effectively to military personnel using modern commercial

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off-the-shelf multi-player games, and that there is no need for the game to be realistic with regard to modern military operations to be effective (Gorman, 2003). Although the level of weaponry and the obstacles faced are very different, the elements of teamwork required for a "siege of Camelot" are similar to those for many military operations.

In an eight month effort, we developed the foundations for a training system targeted to teams of 20-40 individuals using an multi-player game based in a fantasy world, developed a framework for evaluating the training value of this system, and conducted a two-day exercise to validate our design. In the following sections, we first discuss some related research. We then describe the methodology we followed in creating our training system and the methods we developed for assessing the level and types of teamwork exhibited by players. We discuss the specific results as well as their general implications, and summarize both the lessons learned about designing and conducting empirical studies of large teams (i.e., "meta-level" lessons), as well as the lessons obtained from our study on the value of game-based training of teamwork skills for large teams.

## 2. Background

### *2.1. Game-based training for teams*

The rise of global network connectivity, together with the development of multi-player games that exploit that connectivity, has made it possible for individuals distributed around the world to interact in common virtual environments. For instance, commercially available "massive" multi-player games allow dozens to hundreds of geographically-distributed participants to work together in simulated locations, often displaying high degrees of coordination to accomplish complex goals. The potential of this type of interaction to be used for training purposes has not gone unnoticed, and a number of people have explored the use of multi-player games as training tools (Bonk & Dennen, 2005; Alexander et al., 2005).

In particular, many game-based training technologies have been fielded within the U.S. military (see http://www.dodgamecommunity.com for a complete listing). For example, the U.S. Army uses *America's Army* (registered trademark of the U.S. Army) and *Full Spectrum Warrior* (registered trademark of Pandemic Studios). Several fielded games also exist for the Air Force, Navy, Marines, and Joint Forces, such as *Quickstrike Time-Sensitive Targeting Trainer* (developed by MÄK Technologies), the *SOCOM: US Navy Seals* family of games (copyright

Sony Computer Entertainment America Inc.), *Close Combat Marines* (based on Close Combat, a trademark of Atomic Games/Destineer Publishing), and *Joint Force Employment*, respectively.

*DARWARS Ambush!* (Diller et al., 2004; Diller et al., 2005), currently used for convoy-operations training, is one example of successfully developed and deployed game-based training. Specifically, the system trains soldiers skills required to anticipate and react to ambushes and improvised explosive devices and facilitates the transfer of effective strategies during personnel rotations. The system, based on commercial gaming technology, enables the collection and dissemination of lessons in a contemporary environment, ultimately providing timely and low-cost training to improve warfighter adaptability.

*DARWARS Ambush!* has been adapted and integrated into training regimes across the U.S. military, starting with its initial Iraq deployment with the 1st Brigade, 25th Infantry Division, Stryker Brigade Combat Team. Further, the Fort Lewis Mission Support Training Facility has adapted the system to platoon-level training with upwards of 60 trainees interacting within a single training simulation, while other users have adapted it to mounted infantry tactics, dismounted operations, rules-of-engagement training, and cross-cultural communications training.

The widespread use of gaming technologies across services is testament to military demand for game-based training systems. The challenge is for research, design, and development communities to collaborate towards producing relevant and effective training technologies that are portable, engaging, extensible, and easy to use. In fact, many training technologies have been met with harsh criticism for not fulfilling one or more of these important characteristics (e.g., Brian, 2005; Erwin, 2000). Furthermore, a number of factors have been identified regarding the transfer of knowledge and skills acquired in multi-player games to the operational environment; namely, fidelity, immersion, presence, and operator buy-in (Alexander et al., 2005).

Fidelity in this context can be described as the extent to which the multi-player game emulates the real world. Fidelity can be measured on multiple continua, and a large number of subcategories (e.g., physical, functional, psychological) have been described in the literature (e.g., Andrews & Bell, 2000; Nystad & Strand, 2006).

Across the currently fielded U.S. military training systems, the focus has been placed on developing multi-player game-based systems that play particular attention to the graphic realism, or physical fidelity, of the tactical environment and equipment. An implicit premise has been that

a game-based simulator that holds to how the soldiers will experience the real world is necessary and sufficient to produce a training effect.

However, it has been shown more broadly that fantasy-based games, like simulation-based training (SBT) environments, provide training capabilities by conceptually and functionally capturing and representing the critical characteristics of military environments, known as functional fidelity, to facilitate training (Hollenbeck et al., 1998; Wickens & Hollands, 2000). Further, learning by analogy is an effective means of obtaining skills that will be applied in unrelated contexts (Gentner et al., 2001).

Immersion is another factor which has been shown as relevant to the transfer of knowledge and skills—immersion refers to the degree to which an individual feels absorbed by or engrossed in a particular experience (Witmer & Singer, 1998). The degree of immersion experienced within a multi-player game may contribute to the amount of information acquired, skills developed, and subsequent transfer of knowledge to real environments. Many activities are considered immersive (e.g., a game of chess, a book, a conversation), but the term is particularly germane to videogames, as evidenced by the rising phenomena of video game addiction (Young, 2004).

While immersion may be viewed as the objective description of an multi-player games capability to draw the user in to the act of playing the game, presence – also referred to as situated immersion – refers to the subjective experience of actually existing within the computer-mediated environment even when one is physically situated in another (Slater & Steed, 2000; Witmer & Singer, 1998). The amount of human-computer and avatar-avatar interaction required by many multi-player games, compounded by high levels of fidelity on a number of dimensions, may lead to a more vivid feeling of presence in the experience.

Varying the levels of fidelity or increasing the feelings of presence and immersion are thought to impact the degree of transfer from the multi-player game to the operational setting. However, there is another construct that may influence transfer: user acceptance or “buy-in.” In the present context, buy-in refers to the degree to which a person recognizes that an experience or event is useful for training. The conjecture is that higher levels of buy-in imply that the user will invest more effort to extract generalizable lessons from training, and more effort to transfer those lessons to the real world. Transfer is consequently more frequent and successful as a result.

### *2.2. Teamwork*

Psychological, sociological, and anthropological research has clearly distinguished between "teamwork" and "taskwork" (Salas & Cannon-Bowers, 2001). According to this literature, taskwork involves an individual using a particular set of skills to perform a job; for instance, knowing the sequence of button-presses to successfully draw, aim, and fire a weapon within a combat-oriented multi-player game. In contrast, teamwork skills are not only a compilation of several individuals' skills, but the ability to use these interactively to support team functioning. Orasanu and Salas (1993) note several fundamental characteristics that facilitate team functioning, including multiple members, multiple information sources, interdependence among members, clearly defined roles, and common goals. Team functioning is clearly critical for most military operations, and teamwork behaviors are the observable processes that support effective team functioning, and ultimately increase mission effectiveness.

Table 1.

Teamwork Skills Supporting Team Effectiveness

| |
|---|
| **Leadership:** The ability to direct and coordinate the activities of other team members, assess team performance, assign tasks, motivate team members, plan and organize and establish a positive atmosphere. |
| **Monitoring:** The ability to develop common understandings of the team environment and apply appropriate task strategies and processes in order to accurately monitor teammate performance. |
| **Back-Up Behavior**: The ability to anticipate other team member's needs through accurate knowledge about their responsibilities. Includes the ability to shift workload among members to achieve balance during high periods of workload pressure. |
| **Adaptability:** The ability to adjust strategies based on information gathered from the environment through the use of compensatory behavior and reallocation of intra-team resources; altering a course of action or team repertoire in response to changing conditions (internal or external). |
| **Team Orientation:** Propensity to take other's behavior into account during group interaction and the belief in the importance of team goal's over individual member's goals. |
| **Closed Loop Communication:** The practice of confirming receipt and understanding of others' communications. This practice builds trust in the communication skills, knowledge, and intent of others and ensures that information is accurately conveyed. |
| **Team Mental Models:** The ability to accurately represent the capabilities of others, their responsibilities, and their perception of the state of the world. |
| **Coordination**: The practice of planning, preparing, organizing people and/or tasking to accomplish a goal. |
| **Communication Push**: The practice of sharing or sending information with/to others. |
| **Communication Pull**: The practice of seeking information from others or other data sources; asking questions; attempts to gather intelligence. |

There is a large body of work demonstrating that these teamwork skills exist, and that they can be defined, trained, and assessed (e.g., Salas & Cannon-Bowers, 2001). Among others, these skills include Adaptability, Monitoring and Back-up, Communication, and Leadership, as detailed in Table 1 (e.g., Cannon-Bowers et al., 1995; Freeman et al., 2003; Serfaty et al., 1998; Sims et al., 2004; Smith-Jentsch et al., 1998; Smith-Jentsch et al., 1998).

These teamwork skills form the basis of our training development; we ask whether they can be observed in multi-player game environments, and how these environments can be used in the future for training.

## 3. Methodology

*Gorman's Gambit* not only represents an attempt to examine the utility of multi-player games for training, but also an opportunity to assess the process of multi-player game-based training system development (Hussain & Ferguson, 2005). In order to achieve the desired learning in training system users, both technical and pedagogical assumptions need to be periodically examined. We adopted an iterative development methodology based on best practices from both software development and the psychological sciences.

The *Gorman's Gambit* project had a four month high-level planning phase (April – August, 2004) in which we explored different commercial game solutions and identified the general form of our study (including design approach and basic system design). The development of the training system and assessment tools took place in three main developmental phases over a period of four months (September to December, 2004), culminating in a final exercise held at Fort Benning, GA (December 15 and 16, 2004).

## 4. Goals and Development

In the *Gorman's Gambit* project, we had multiple high-level goals that influenced our design. We sought to elicit a variety of observable teamwork behaviors from a large team using a multi-player game-based training system and gather information on the utility of such systems for training teamwork. However, we also sought to identify processes for rapid development of multi-player game-based training, gather information on the utility of such systems for training in general, and investigate the importance of issues such as the fidelity of the simulation and immersion produced by the game for multi-player game-based training.

Given these high-level goals, we did not have highly specific "training objectives" as such. However, we did focus on developing conditions and measures intended to capture data on a variety of different issues pertaining to multi-player game-based training. Rather than simply list our goals out of context, we introduce them below as the supporting reasons behind a variety of design and development decisions.

### *4.1. Basic Technical Design*

During our planning phase, we made several basic design decisions in order to achieve our high-level goals of eliciting observable teamwork behaviors from a large team while minimizing development effort.

To avoid the potential of restricting teamwork behaviors, we adopted a weakly-scripted approach in which the terrain and non-player characters were made relatively simple, but the gameplay options open to the human players were plentiful (i.e., rather than heavily-scripted approach that carefully guides players using in-game cues, events and non-player character actions). In particular, we chose to create a scenario in which two large teams (or "platoons") of players would play against each other in a "capture-the-flag" mission, described in the next section.

To encourage a variety of interactions among teammates, we chose to divide each platoon into of multiple squads, give different players game characters (or *avatars*) with different strengths and weaknesses, and to limit communication channels among squads.

To facilitate development and minimize risks, we chose *Neverwinter Nights* (Trademark of Wizards of the Coast, Inc.) to be the basis for our training environment. *Neverwinter Nights* supports up to 64 distributed players; provides extremely stable operation, with straightforward and robust setup and execution of multi-player sessions; allows for the customization of avatar skills and inventory; includes a powerful scenario development environment, the *Aurora Toolset* (Trademark of Bioware Corp, copyright 1997-2005); allows for non-intrusive observation and control via a "Dungeon Master" avatar; and includes pre-scripted game and interface tutorials.

### *4.2. Iterative Development*

Throughout our development process, our goals guided our decisions. We present here a brief summary of this process to illustrate factors to consider when developing fielded training

systems. We describe three development phases, each culminating in a pilot study that was used to validate whether we were achieving certain goals.

In the first development phase, each platoon had a separate "camp" in the simulated world (largely the same as shown in Figure 1), and avatars were distinguished primarily by the items carried by those avatars (e.g., weapons, healing items, magic items) and their intrinsic skills (sword-fighting, trap detection, spell casting). To limit communications, we augmented *Neverwinter Nights* with a hierarchical chat-based communication capability based on the third-party Talus Speech System software (Developed by Josh Dalton (Lanthar D'Alton); Includes code copyright 2003 by Ingmar Stieger and Jeroen Broekhuizen; This product includes software developed by the Politecnico di Torino, and its contributors; Available at http://nwvault.ign.com/) so that each platoon had distinct communication channels, members of one squad could only talk to their leader and squad leaders could talk to each other and to the platoon leader. The communication hierarchy restricted unrealistic chat channels in order to increase functional overlap between the voice-over IP system and true military communications. To ensure that players could actually use the game and to minimize the amount of time spent designing and developing interface training, we chose to use the in-game tutorial to train players. We conducted a pilot run on October 29, 2004 with 12 game-novice personnel from the author-affiliated institutions comprising two "platoons" of six players each, organized in two "squads" of three players each. Following this, the scenario was tested with the mission objective of occupying the enemy camp, operationalized as having two of a team's players alive in the enemy camp for any 2-minute period. The pilot showed that the text-based chat interfered significantly with gameplay, that the in-game tutorial was lengthy and ineffective, and that our mission goal resulted in a very fast-paced game that did not encourage players to exploit their various capabilities. The pilot also provided an opportunity to test our assessment techniques, and revealed that several improvements in our data collection tools were required.

In the second development phase, we made large modifications to individual avatar characteristics, such as endurance and strength, in an effort to promote teamwork through necessitating dependence on teammates' skills sets. We incorporated the BBNTalk Voice-over-IP system (copyright BBN Technologies) that was developed as part of and used successfully in the *DARWARS Ambush!* system, and which is capable of readily handling 20 to 40 players with hierarchical communication channels. The voice-over-IP software was set up external to the

game and players wore a headset and microphone. To improve the tutorial process, we developed a guide for participants to follow in order to minimize non-essential aspects of the tutorial (e.g., aspects of an entertainment based storyline, teaching skills that were not to be used by that avatar in the *Gorman's Gambit* scenario). We also developed two additional semi-scripted tutorials, the Tutorial Arena and the Tutorial Mission (described later) that emphasized experiential learning. We conducted a second smaller pilot with 7 personnel from the author-affiliated institutions which validated our changes.

In the final development phase, we added a third hidden camp and adapted the mission objectives in order to encourage differentiated strategies and avoid simple race conditions. We also incorporated a several capabilities to enable an in-game observer (via a "Dungeon Master" class) to keep better track of game activities. We conducted a final pilot using 32 personnel from the author-affiliated institutions as participants, and using a reasonably fast game server machine (Pentium M 1.7 GHz) and a variety of client machines (Pentium III to Pentium M 2.0 GHz). The pilot showed that our system scaled well; only low-end client machines (i.e., Pentium III) exhibited significant slow-downs under heavy load. It also validated our measurement tools and showed that the new conditions elicited a variety of teamwork behaviors, such as resource management, communications, strategizing, and working towards common goals.

## 5. Conditions

### *5.1. Final Training System Design*

The world used in the *Gorman's Gambit* training system is illustrated in Figure 1. A new mission would begin with each platoon stationed within its own home camp (i.e., Platoon A in Camp A, Platoon B in Camp B). Travel between the two camps was constrained. There were two routes that the players would be informed about in advance, a "long-but-safe" route, and a "short-but-dangerous" route. The long-but-safe route traversed the Southern Hills, a safe area with no traps, while the short but dangerous route traversed the Central Cavern, an area filled with hidden traps of varying severity. There was also a third route that was both safe and of medium length, but which players would not be informed about and would therefore need to discover. Upon death, avatars would respawn (after a 1-minute period) to the Healer's Hut, at a significant distance from both home camps.

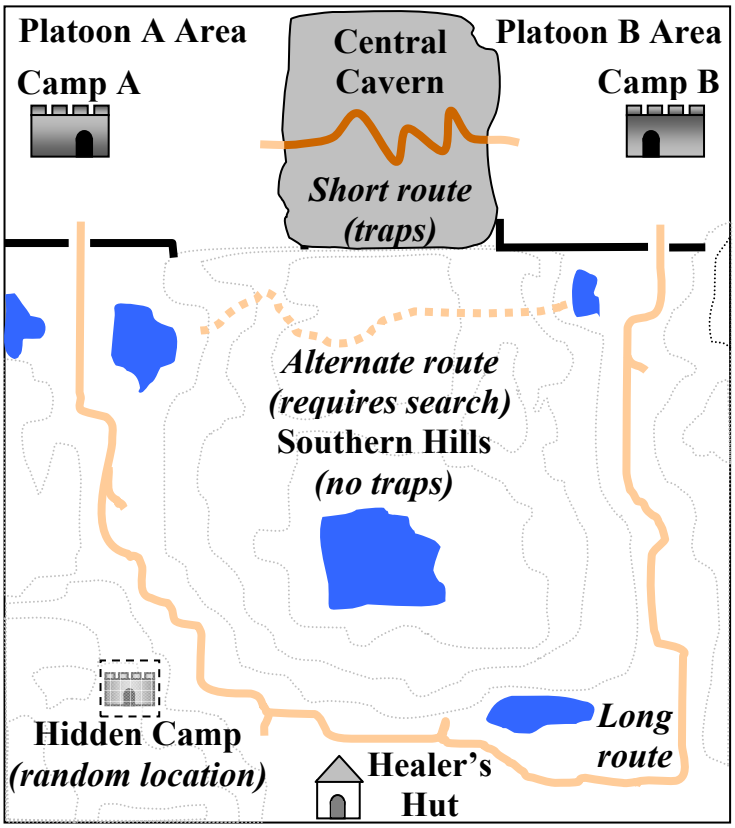


Figure 1: Simulated World for Teamwork Training Scenario

To encourage teamwork, mission-essential skills were distributed among five primary avatar types (archer, artillery, medic, scout and tank), as detailed in Table 2. For example, disabling a trap in the Central Cavern would require the assistance of a Scout, while healing a serious wound quickly would require a Medic. The platoon and squad leader were given avatar types with general skill sets.

A third camp ("Hidden Camp") also existed which was heavily protected by non-player characters. At the beginning of each mission, the location of this camp was randomly determined (within the Southern Hills or Central Cavern areas), and the players would not be informed of that location. The third camp was considered neutral territory until captured and defended by a team.

Within all three camps was a pillar of colored light (i.e., the "flag") that indicated the current "possessor" of the camp. To obtain possession of a camp for his team, a player's avatar would have to pull a lever placed adjacent to the flag; the territory would then remained in that team's possession until an avatar from the opposing team pulled the lever.

Table 2.

Exercise characters and their respective roles and resources.

| Character Class | Role in Scenario | Resources |
|---|---|---|
| **PLATOON LEADER** Platoon Leadership | Coordinates activities directly with the Squad Leaders. | Small dagger |
| **SQUAD LEADER** Squad Leadership | Communicates with the Squad, other Squad Leaders, and the Platoon Leader. Moderate combat ability, moderate speed, vulnerable to injury. | Long sword |
| **ARCHER** Long-Range Weapons | Provides long-range weapons support with low-moderate close-range combat abilities. | Long bow, crossbow, and several arrow types. |
| **ARTILLERY** Long-Range Magic | Capable of short and long-range attacks. Low physical combat ability, high resistance to spells. | Scrolls, Potions, Wands, Staves and Rods. No armor. |
| **MEDIC** Health Support | Provides health support via resurrection and healing. Very low combat ability, but high speed. | Healing magic, small weapon. |
| **SCOUT** Primary Reconnaissance | Provides fast reconnaissance, stealthy maneuvering, trap setting, detection and disarming, and mild offensive fighting capabilities. | Short sword and Claw blade. Able to set traps (i.e., mines). |
| **TANK** Primary Close-Combat | Provides powerful fighting capabilities, but cannot travel quickly. | Long sword, Short sword, and Great sword |

The general goals of a mission were for each platoon to defend their own flag, capture the enemy's flag and find and capture the hidden flag. We defined two distinct winning conditions. The first was to hold the most flags at the end of a given period of time. The second was to hold as many flags as possible for the longest total amount of time by the end of a given period of time.

### *5.2. Tutorial Process*

Three structured tutorial steps were used to ensure that all players would be proficient with the *Neverwinter Nights* game mechanics prior to using the training system. The tutorials progressed

in their levels of complexity and interactivity, and are described below. In particular, though, there was no explicit tutorial on teamwork skills.

The first tutorial step used the existing tutorial exercise contained within *Neverwinter Nights* to train novice players on game and interface basics. The in-game tutorial would place the player's avatar into a virtual environment containing virtual instructors that would engage in simple training dialogs. Under the auspices of these virtual instructors, the player could practice the essential gameplay fundamentals, such as using their avatar's inventory, weapons, and basic functions. The players were given specific written materials to help them focus on learning the gaming and character skills that were of particular use for the *Gorman's Gambit* training system.

The second tutorial step provided each team with a relatively free-form "tutorial arena" within which the players could gain detailed specifics about their avatars' individual skills and abilities (provided by several avatar-specific non-player characters with which players could hold brief dialogs) and engage other teammates to practice those skills (e.g. combat, casting spells, healing others, etc).

The third tutorial step provided a squad with a "tutorial mission" that required all squad members to work together towards locating and capturing a hostage princess, located somewhere within a "tutorial village." In order to reach the princess' location, the squad needed to perform a variety of tasks. These tasks included finding hidden keys to unlock doors along their path, detecting hidden doors, obtaining information from villagers, engaging enemies, and ultimately defeating a dragon. The tutorial mission was designed to emphasize the importance of each individual avatar's unique skills, attributes, and abilities (e.g., certain tasks could only be accomplished by certain avatars; for example, a hidden door or key could only be detected by a scout; while others could only be accomplished together; for example, the dragon could only be killed through a collaborative effort of several different avatar types).

### *5.3. Gorman's Gambit Exercise Structure*

The *Gorman's Gambit* exercise was structured to involve three successive sessions. In order to facilitate effective teamwork, we adopted a session design that enabled each team to privately coordinate together in person prior to playing a mission (planning period) and then to privately discuss the events occurs immediately after conducting a mission (debriefing). We determined that both of these sessions would be more effective if done in person, occur more quickly than if

performed online (using, say, the in-game text chat), and have the benefit of being easily observable. At the end of the third and final session, all participants would complete a post-experiment questionnaire and then participate together in a final AAR. While debriefings were intended to be used to reflect on specific instances in specific sessions, the AAR was intended to be used as an opportunity for the participants to reflect on the larger questions pertaining to the potential of using multi-player games to train teamwork.

## 6. Measures

The primary dependent measures for the *Gorman's Gambit* effort were observations of teamwork skills. Accordingly, the first step was to ensure that our exercise was designed to elicit teamwork (as described in the previous sections). The second step was to develop a technique to capture the behaviors that are indicative of teamwork within the context of a multi-player game. It is important to note that our aim was not to capture every instance of teamwork, but rather to obtain a sample of representative behaviors to support the notion that multi-player games can be used for training. Given the broad nature of our goals, we chose to capture data through both observer-based and self-report techniques. We chose not to capture data via systems-based techniques. On the one hand, the level of data we could capture easily within the training system (e.g., number of casualties, traps disarmed, buttons pressed, or menus accessed) would not have provided direct support for our goals. On the other hand, significant software development would have been required to capture data that would have supported our goals (e.g., instances of decision making, communication of situation reports, issuing of commands).

As such, we developed a suite of measurement techniques and tools that would enable us to capture a broad array of data.

- Observer in-game evaluation forms
- Post-session team debriefings
- Post-exercise questionnaires
- Final AAR participant feedback

Each of these measurement techniques is described in turn, below.

### *6.1. Observation Tool*

Our primary tool to capture data on the teamwork elicited during game-play was the *Observer In-Game Evaluation Form*, which was filled-in by experimenter/observers using one of three techniques. Our primary technique was over-the-shoulder observation of player activities; a second technique was the use of the in-game observation capability (provided by a "Dungeon Master") which enabled viewing of other players' activities without them being aware (the "Dungeon Master" avatar was invisible to other avatars); a final technique was the use of a video camera to capture game-play ("over-the-shoulder") as well as more general player activities. These observation techniques were adopted in order to allow us to monitor participants' behavior (e.g., see actions, hear communications) without disrupting game-play.

The observation form allowed for the recording of event details (i.e., event #, time, players involved), a detailed description of the event, the presence or absence and quality rating of several key teamwork skills, and comments. An example of an event recorded onto the Observer In-Game Evaluation Form can be seen in Figure 2.

| # | Time | Participants Involved | Description of Event | Teamwork Skills Exhibited | | | Comment |
|---|---|---|---|---|---|---|---|
| 1 | 08:00 | Platoon A Archer and Platoon B Tank | Tank and Archer engage in battle. Archer calls up squad members for back up. Squad confirms message receipt, arrives and destroys Tank. | **Skill Shown** | **Y/N** | **Quality (1-5)** | |
| | | | | Monitoring | Y | 3 | |
| | | | | Back-up | Y | 4 | |
| | | | | Coordination | Y | 3 | |
| | | | | Comm – Push | N | n/a | |
| | | | | Comm – Pull | Y | 5 | |
| | | | | Other… (Closed Loop Comms, Leadership, Orientation, Backing Up, Adaptability | Y | 5 | |

Figure 2. An event captured on the Observer In-Game Evaluation Form. Quality scale ranged from 1 to 5; 1 indicates a poor example of the behavior; 5 indicates an exemplary example.

A critical component of the observer form was the ability to record instances and quality of observed teamwork skills. Towards this end, the form included a subset of skills identified by contemporary teamwork psychology literature (monitoring, back-up, team orientation,

communication push and pull, coordination; see Sims et al., 2004). A content dictionary (Table 1) provided operational definitions for each teamwork skill.

Observers sampled across multiple participants and throughout the entire exercise duration. Sampling rates varied across observers given differences in teamwork frequencies and durations, and participants' locations; average sampling rates were one observation per minute, per observer. Observers were instructed to actively gather information from multiple participants regarding a variety of teamwork behaviors; it is possible, of course, that certain teamwork behaviors were unobserved, or that particular behaviors were more salient than others. Following the exercise, the video was analyzed to capture additional instances of teamwork that had not been noted previously. All observations made during the exercise, including planning periods, missions, debriefings and the AAR, and from the video were collected into a single multi-data source (see Figure 3).

| | | Teamwork Behaviors | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Teamwork Observed** | **Specific Teamwork Skill/s** | **Monitoring** | **Coordination** | **Comms. Push** | **Comms. Pull** | **Leadership** | **Orientation** | **Data Source** | **Team and/or Mission Details** |
| At start up of Mission. PL assessed map, coordinated group, pushed commands and instructions, discussed setting up booby traps. PL also described environ-ment and instructed platoon to move slow. | Monitoring, Coordination, Comms-Pushed and Pulled, Leadership, Team Orientation | 1 | 1 | 1 | 1 | 1 | 1 | LS Observa-tion Sheet | Mission #1, Platoon B, 8:40 AM, Observing Archer S1 and PL |

Figure 3. An example of teamwork captured and archived in the multi-data source

## *6.2. Team Debriefings*

The team debriefings were intended to be used for actively capturing measures, with the teams explicitly being instructed to discuss such topics as goals, strategies, performance, and lessons learned; this debriefing format is quite similar to that used in actual military operations. Observers used this opportunity to ask specific questions related to ambiguous or incomplete

teamwork recordings from the mission, elaborating on observations, and filling in any gaps in knowledge.

### *6.3. Post-Experiment Questionnaire*

We designed a *Post-Exercise Questionnaire* to be presented to and completed by the participants before the final AAR (see Appendix A). The *Post-Exercise Questionnaire* was two pages and was comprised of 21 questions addressing several areas, such as: game experience (e.g., pleasurable, stressful), knowledge about their avatar, team interactions, self and team assessment, situational awareness of self and team, and practical applications of the game as a learning tool. Nineteen of the 21 questions asked participants to give their answers on a 7-point Likert scale relevantly anchored at low, midpoint, and high. Five of the 21 questions also included comments fields where participants could further detail their experiences and opinions.

### *6.4. Final AAR*

The final after action review was a critical part of our measures since it was a communal activity in which all participants could offer their views. In particular, the AAR was intended to address experiences and elicit opinions on the following six topics:

1. Positive and negative feedback regarding gameplay
2. Challenges faced by the team
3. Examples of teamwork used to overcome challenges
4. Generally-adopted strategies and adaptations
5. Suitability for Army training needs
6. Comparison to other multi-player games

Appendix B lists the prepared AAR questions.

## 7. Exercise

The entire exercise was conducted over the course of two days, the first of which was dedicated to the tutorial process, and the second to the main *Gorman's Gambit* exercise.

### *7.1. Participants*

Forty members of a U.S. Army Infantry Platoon, between the ages of 19 and 33 years (M = 23.6), participated in the exercise. Military rank and experience varied from E-2 (Private) to O-1

(Second Lieutenant), and from 1.5 to 174 months, respectively. Overall, the participants reported both computer game (M = 3.7 hours/week) and console game (M = 4.0 hours/week) experience within the preceding year (see Appendix C for demographic form).

Participants were randomly divided into two groups of twenty, each roughly representing a platoon. Each group contained one Platoon Leader and three similarly-composed squads, with 6 or 7 players each, as defined in Table 2. Critically, roles, resources, and responsibilities varied widely within squads as a function of avatar type. Figure 4 illustrates the composition and communication hierarchy of each platoon. All participants used a personal computer (PC) with a 15" CRT monitor, keyboard, optical mouse, and voice-over-IP headset.

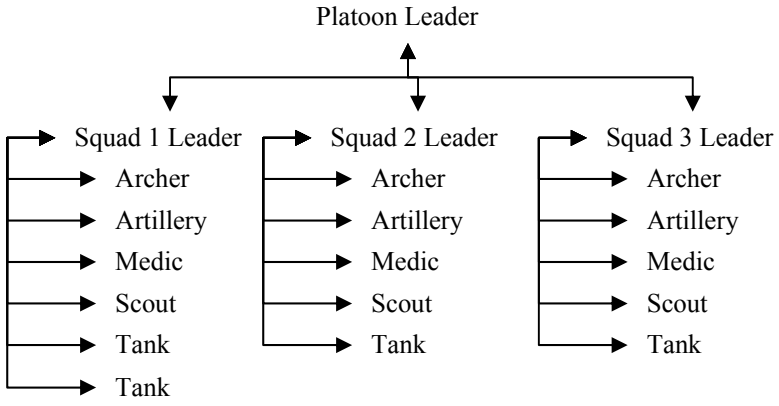


Figure 4. Platoon Composition and Communication Hierarchy

### *7.2. Tutorial Day*

On the first day, the participants were presented with the tutorial materials relevant to their avatar, and then all participants executed all three steps of the tutorial process. We ended each step of the process only once everyone had completed it. The first step (in-game tutorial) lasted approximately 45-50 minutes, and staff were available to field questions as necessary. The second step (tutorial arena) lasted approximately 30 minutes. The third step (tutorial village/mission) lasted approximately 40 minutes. During the tutorial mission, it was clear that teamwork suffered, and many avatars were injured and killed, until the participants became aware of, and leveraged, each avatar's unique characteristics. This mission also provided a last opportunity for participants to practice using their complex array of skills and resources (e.g., voice-over-IP) before the main *Gorman's Gambit* exercise took place.

### *7.3. Main Exercise Day*

The same participants returned on the second day for the main *Gorman's Gambit* exercise. The exercise involved three successive sessions, each with a 15-minute planning period, 30 minute mission, and 15 minute debriefing. Different winning conditions and communication mediums were used in different sessions:

- Possession of at least 2 levers at the end of 30 minutes of play using voice-over IP
- Possession of at least 2 levers for the longest duration in 30 minutes of play using text chat
- Possession of at least 2 levers at the end of 30 minutes of play using voice-over IP

The use of alternating conditions was intended to encourage different strategies across missions. For gameplay, all participants were instructed to behave as they would in a true military mission; for example, they were to maintain contact with their leaders, assist their teammates, and engage the opposing team as necessary.

The planning periods were used effectively by the platoon leaders to devise a strategy for that session and to convey it to the team. It was interesting to note that the two platoon leaders followed very different styles (one discussing a plan with the entire team on a white board and the other collaboratively discussing the plan with his squad leaders, who then relayed the decisions to their squads). During mission execution, the two platoons were physically separated; one (Platoon A) was seated in cubicles within a single large room, while the other (Platoon B) occupied four separate rooms due to facility restrictions. During the debriefing, the platoon members discussed their execution of the mission, focusing positive and negative aspects of the platoon's performance, as well as potential strategy improvements. At the end of the third and final session, all participants completed the post-experiment questionnaire and participated together in the final AAR. The questionnaire enhanced the quality of the data received through the AAR and enabled those who are less vocal an anonymous medium for sharing their experiences and opinions. During the semi-structured AAR, the staff facilitators presented several core questions probing for global information regarding overall game experiences and the potential utility of multi-player games for use in military training. Some of the questions had been determined in advanced of the exercise (Appendix B), but others had been identified during the exercise itself. The AAR produced a rich discussion and many valuable insights into the utility of multi-player game-based training systems for military training, as perceived by the participants.

## 8. Results

The results of our study are highly varied in form. We present some of the objective measures here, and introduce more subjective results primarily in the context of our discussions in the next section.

### *8.1. Scenario Outcomes*

The overall results for each of the three scenarios were as follows:

- At the end of mission one, Platoon B possessed the majority of levers.
- At the end of mission two, Platoon A had the longest total lever control time.
- At the end of mission three, Platoon B possessed the majority of levers.

### *8.2. Teamwork Observations*

550 instances of specific teamwork skills were extracted from over 115 recorded observations, the post-session team debriefings, and final AAR. The teamwork behaviors seen in these instances are enumerated in Table 3. Critically, the number of teamwork skills observed *during* each mission (mission 1 = 114; mission 2 = 136; mission 3 = 158) increased substantially over the course of the exercise [$\chi^2(2) = 7.12$, $p < .05$]. Most events involved multiple teamwork skills (5-6 skills), as teamwork skills often work in conjunction with each other, such as leadership and monitoring. Leadership involves directing and coordinating the activities of others, assessing performance and/or assigning tasks (Sims et al, 2004). Monitoring involves understanding the team environment and applying appropriate strategies (Sims et al., 2004). The two skills have overlapping definitions that would make it probable, although not without exception, that where you have leadership you also have monitoring and visa-versa.

The events that were observed varied highly, even when considering a single type of teamwork skill. For instance, the 43 occurrences of adaptability included:

- Revising strategies in between missions based on lessons learned from previous missions;
- Adjusting to a breakdown in communication medium (e.g., by setting up a message relay protocol between the avatars in the game);
- Adopting new roles (e.g., by recognizing that an avatar with a typical non-combat role was best suited for a particular offensive attack since it was faster than the enemy);

- Changing the team organization to improve offensive capability (e.g., by splitting up into pairs of avatars with complementary skills);
- Modifying the mission plan dynamically upon discovering that an avatar had a useful capability they had not been notified of (e.g., discovering that they could summon a flying goblin led to its use for remote surveillance, much in the manner of a modern unmanned aerial vehicle).

Table 3.

Instances of teamwork observed in the current exercise.

| Behavior | Number of Observations |
|---|---|
| Monitoring | 75 |
| Coordination | 88 |
| Pushing Information | 57 |
| Pulling Information | 35 |
| Leadership | 69 |
| Orientation | 66 |
| Backing-Up | 53 |
| Adaptability | 43 |
| Closed Loop | 6 |
| Mental Models | 58 |
| **Total** | **550** |
| Total Mission 1 | 165 |
| Total Mission 2 | 176 |
| Total Mission 3 | 209 |

Although we could present detailed examples of each of the behaviors observed, space precludes this. Rather, we will introduce some illustrative behaviors in the context of our discussion of the lessons learned. Further, note that it would be possible to extract several hundred more examples of teamwork from the data sources. However, our intent is not to document all of the instances of teamwork, but rather, to demonstrate that teamwork is readily elicited (and therefore, that multi-player game environments may provide at least some of the conditions necessary for teamwork skills training).

### *8.3. Questionnaire Responses*

Table 4 summarizes the responses of the 40 participants, giving the mean and standard deviation for all questions. Some of the original questions had multiple parts, and these are separated out here. For improved readability, Table 4 uses highly shortened versions of the questions. We discuss most of these responses in our discussions.

Table 4:

Summary of questionnaire results (N=40)

| Short wording | Mean | StdDev | Short wording | Mean | StdDev |
|---|---|---|---|---|---|
| Understand avatar? | 6.2 | 1.2 | Monitor teammates? | 4.7 | 2.0 |
| Game exciting? | 4.1 | 1.6 | Anticipate teammate needs? | 4.9 | 1.5 |
| Game interesting? | 4.2 | 1.6 | Your situational awareness? | 5.2 | 1.4 |
| Game stressful? | 1.7 | 1.8 | Workload level? | 3.6 | 1.7 |
| You help teammates? | 5.1 | 1.9 | Good teamwork tool? | 3.9 | 1.8 |
| Teammates help you? | 4.5 | 2.2 | Learn to strategize? | 3.9 | 1.8 |
| Push info? | 5.6 | 1.8 | Enough tutorial training? | 4.9 | 1.6 |
| Receive info? | 5.4 | 1.8 | Aware of need to manage | 0.9 | 0.2 |
| Provide non-combat help? | 2.8 | 2.5 | Aware of lack of resources? | 0.8 | 0.4 |
| Receive non-combat help? | 4.1 | 2.2 | Aware of real-world parallels? | 0.8 | 0.4 |
| Overall teamwork of team? | 5.4 | 1.5 | | | |
| Overall performance of team? | 5.7 | 1.2 | Playing leads to better teamwork? | 3.5 | 2.0 |
| Coordinate with teammates? | 5.3 | 1.5 | | | |

## 9. Discussion

Based on our experiences in developing the training system, the results obtained from observing the participants during the tutorial and exercise sessions, and the comments and suggestions experienced during the AAR, we are able to identify a number of lessons that validate the goals of the *Gorman's Gambit* project. In this section, we discuss the training utility and fidelity of multi-player games and convey lessons learned for efficiently developing and studying game-based training.

### *9.1. Training Utility*

The results of the exercise show, in several ways, that multi-player games may be useful for supporting team training. First, it is clear that a variety of teamwork skills (550 instances) were demonstrated, which is highly suggestive that multi-player games can support large-scale

exercises in which many individuals with differing but complementary skills work together towards a single effort.

Second, when asked, soldiers were able to see several positive aspects to the game they participated in. From the questionnaire, we see that soldiers rated playing games like the *Gorman's Gambit* scenario as having a moderate (M = 3.4) ability to help them become a better team member. Moreover, the most frequent positive verbal comments provided by soldiers were related to teamwork. Soldiers viewed the game and scenarios as a reasonable tool to train teamwork (M=3.9) and for promoting development and adaptation of strategies (M=3.9).

Interestingly, from the observer's standpoint, the soldiers appeared to demonstrate better and better team coordination as time passed and over successive missions. In fact, the number of teamwork instances increased substantially over the course of the three missions, with the fewest and most occurring during the first and third missions, respectively. In other words, it appears the participants were learning better ways of working together within the context of the game. However, during the AAR, the soldiers did not acknowledge that they had learned any teamwork – rather that they were already experts in teamwork and that the game would have training utility primarily for novices. Thus, the results argue that properly developed games can have favorable training outcomes, but that participants may learn while using a game-based trainer without consciously realizing its training value.

### *9.2. Fidelity*

In terms of seeing functional similarities between a game environment and a military environment, a large majority of the sample (80% of the soldiers) reported verbally in the AAR that they saw such similarities. This sub-sample of soldiers went on to enumerate several examples where the game environment provided a functional relationship to a military environment, the examples were: teamwork, specializations, communications, hierarchy, fighting in squads, coordination, setting defensive positions, short/long range weapons, healing times, traveling in formations, strategizing, and conserving resources.

The *Neverwinter Nights* software is largely limited to ground-based interaction, congruent with the operational requirements of the infantry. There were several powerful (unexpected) analogies that occurred during the exercise. For instance, *Neverwinter Nights* allows the artillery avatar to summon a small flying goblin. The soldier's point of view could be changed to take on

the goblin's perspective and fly quickly through dangerous areas, avoiding traps and enemy engagement, and allowing for reconnaissance. This was quickly recognized as being analogous to the real-world function of a UAV and exploited accordingly.

Game-based simulators operating on a laptop or desktop do not have the same physical or visual fidelity as large simulators, but they can still, if designed appropriately, reflect real-world characteristics to a high degree. For instance, an important component of teamwork skills is communication and coordination. We explicitly attempted to provide an adequate and realistic communication capability by augmenting the game with hierarchical text and voice-over-IP communications. Our efforts were rewarded, for the soldiers commented that the communication system was a good analogue to their typical hierarchical system. The questionnaire results show that soldiers thought they were able to push information at a high level to others (M=5.6), receive a high level of communications (M=5.4), and coordinate at a high level (M=5.3).

It is clear that, as predicted by General Gorman, the use of a fantasy setting afforded the exhibition of the teamwork behaviors. However, the departure from their usual operational environment also makes it more difficult for buy-in from military participants. Some soldiers reported having difficulty taking on a military mind set while playing the game, and the most frequent negative comment voiced during the AAR by soldiers was poor realism (43%). This indicates that a sizable minority of soldiers is conflicted by the game environment and believes that more operational realism is required for adequate transfer of training to occur. However, the non-operational setting could easily be used to train critical thinking skills and challenge participants to engage appropriately in unfamiliar environments.

### *9.3. Developing Games for Training*

Several lessons were learned regarding the development of games for training and the development of effective empirical studies of such games. Developing our training system so that it would elicit the desired teamwork behaviors was not always straightforward. As shown in the pilot studies, subtle imbalances in game play led to a complete breakdown in the effect we were targeting. The iterative development strategy we adopted and the authoring capability provided by *Neverwinter Nights* turned out to be crucial for rapid development and for achieving the effects we wished in the game.

When conducting a study of games for training, time for an exercise is a limiting factor – both in terms of availability of participants (i.e., it is hard to get soldiers to participate for extended periods of time) and cost (i.e., if paying the participants, costs will increase with time required). One area to which it is critical to devote sufficient time, but in which it is also important to minimize that time, is the tutorial process for playing the game itself. As revealed in the pilot studies, this was a key factor. With too little tutorial time, many players were ineffective during the actual scenario and therefore less immersed and poor at teamwork. With the wrong type of tutorial activities, the players spent much of the time during the actual scenario playing independently or trying to learn capabilities, which in turn resulted in poor teamwork. The three step tutorial process we developed was validated since, mostly, the soldiers "hit the ground running" on the first scenario played. In the questionnaire, soldiers clearly understood what their avatars were capable of (M=6.2) and rated the tutorial process as moderately to highly effective (M=4.9).

The ease of conducting and maintaining a training session are critical for successful participation within a game-based training system. When managing the interaction of 40+ players, simple connectivity that is mostly transparent to the user is a necessity. Within *Neverwinter Nights*, setting up the client and getting started playing the game took a matter of seconds. Further, if a restart of the server (e.g., to start a new mission) or of a client (e.g., machine crashed) was needed, the users could easily join or re-join the game (within seconds). Without this capability, the exercise would have been constantly delayed and participant buy-in would have been negatively impacted.

Likewise, the ease with which changes to the system may be made can impact buy-in. For instance, platoon leaders reported increased levels of satisfaction and effectiveness as a result of the following rapid manipulations.

- At the end of the first day, the platoon leaders indicated that they felt that the written map materials were insufficient for them to maintain situational awareness. After an hour's effort, we introduced an in-game item that performed localization analogous to a compass.
- After the first session of the second day, both platoon leaders expressed dissatisfaction with their avatar's slow speed and low combat abilities, and believed these deficiencies detracted from their ability to lead their platoons effectively and gain their soldiers' respect. In only a few minutes, we improved the speed and effectiveness of their avatars.

Despite all design efforts and interventions, it is of course possible for software vulnerabilities to be exposed, especially by inventive game-players. For example, during the second mission several soldiers found a way to bypass an intentional game manipulation; by exiting and restarting the *Neverwinter Nights* application upon death, players were able to immediately respawn, fully healed, at the location where they had died (i.e., thereby circumventing the mandatory visit to the Healer's Hut). Even though both platoon leaders subsequently ordered their teams not to do that, it continued to happen increasingly towards the end of the final mission. (We note, though, that several simple technical solutions would have been available if we had realized the extent of the abuse earlier; one such solution being as simple as changing a password.) In addition, by inviting opponent team members into chat groups, several players were able to view enemy communications during the text chat gaming session. These examples of soldier resourcefulness led to frustration and reduced effectiveness of the opposing team (until they figured out how to do it too…), and undermined the facilitator-imposed scenario structure. For these reasons, while the training product must be robust enough to allow for flexibility, it must also guard against user or environmental factors that could mitigate training value.

## 10. Conclusions

The military is interested in supporting effective large-scale distributed simulation-based training that will enhance and expedite soldier instruction. In the *Gorman's Gambit* effort, we focused upon clearly demonstrating the potential of multi-player games for training of teamwork skills. The training system we developed was shown, in an exercise, to elicit a variety of teamwork behaviors, and was perceived by both the participants and the observers to have some potential value for training. Collectively, the lessons learned from this exercise demonstrate that multi-player games may be good models to emulate for military training. However, there are inherent challenges with using commercial, off-the-shelf gaming systems in assessment-intensive applications such as military teamwork training that were not directly addressed in *Gorman's Gambit* which must be considered in future efforts.

For instance, the observer-based sampling methodology used in this study was effective in capturing instances of teamwork and sufficient for our needs. However, if we had desired to achieve a truly representative sample of teamwork behaviors under the dynamic conditions of

our multi-person environment, it is unclear how many observers would have been required, whether the fields of our Observer In-Game Evaluation Form are the ideal fields, and whether the scales used were sufficient to capture the complexity of interaction. Furthermore, as the number of simultaneous users increase, the sustainability of using human observers diminishes.

Effective, large-scale multi-player game-based training systems clearly will require mechanisms to capture participant performance directly within the training system. However, existing commercial multi-player games, being originally designed for entertainment purposes, do not generally have the components critical for enabling monitoring of training progress and objectives fulfillment. This includes, for example, the ability to readily specify in-game performance measures as well as the ability to automatically capture low-level and high-level data that may be used to identify complex, interactive teamwork behaviors, support after action reviews and aid trainers in making performance assessments.

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# Appendix A – Post-Exercise Questionnaire

**Gorman's Gambit Exercise – Post-Exercise Questionnaire**
**Ft. Benning, December 2004**

---

Participant Number: _____
Character Name/Type:_____
Team: **A** or **B** (Circle One)

*Please answer the following questions by circling the point on the line that corresponds*

| | | |
|---|---|---|
| *to your answer and/or writing short answers in the space provided.* | | |
| 1. | How well did you understand what your character was supposed to do? | ●--------●--------●--------●--------●--------●--------●--------●<br>Not Understood Midpoint Well Understood |
| 2. | Regarding the game, how… | |
| | …exciting was it? | ●--------●--------●--------●--------●--------●--------●--------●<br>Not Very Midpoint Very |
| | …interesting was it? | ●--------●--------●--------●--------●--------●--------●--------●<br>Not Very Midpoint Very |
| | …stressful was it? | ●--------●--------●--------●--------●--------●--------●--------●<br>Not Very Midpoint Very |
| 3. | How often did you help another teammate with a combat task? | ●--------●--------●--------●--------●--------●--------●--------●<br>Very infrequently Midpoint Very often |
| 4. | How often were you helped by a teammate with a combat task? | ●--------●--------●--------●--------●--------●--------●--------●<br>Very infrequently Midpoint Very often |
| 5. | How often did you pass information to another teammate during the game? | ●--------●--------●--------●--------●--------●--------●--------●<br>Very infrequently Midpoint Very often |
| 6. | How often did a teammate pass information to you during the game? | ●--------●--------●--------●--------●--------●--------●--------●<br>Very infrequently Midpoint Very often |
| 7. | How often did you provide non-combat resource/service to another teammate (e.g., healing spell, trap detection)? | ●--------●--------●--------●--------●--------●--------●--------●<br>Very infrequently Midpoint Very often |
| 8. | How often did another teammate provide you with non-combat resource/service (e.g., healing spell, trap detection)? | ●--------●--------●--------●--------●--------●--------●--------●<br>Very infrequently Midpoint Very often |
| 9. | How would you characterize the overall teamwork exhibited by your team? | ●--------●--------●--------●--------●--------●--------●--------●<br>Very Poor Midpoint Very good |
| 10. | How would you rate the overall performance exhibited by your team? | ●--------●--------●--------●--------●--------●--------●--------●<br>Very Poor Midpoint Very good |
| 11. | How well did you coordinate with your teammates? If midpoint or lower, why? (For example, Distractions, Difficult to do in Game, Hardware wasn't working, etc…). Use the space below for your answer. | ●--------●--------●--------●--------●--------●--------●--------●<br>Not Very Midpoint Very |
| | | |
| 12. | How well did you monitor (pay attention to) the behavior of your teammates? | ●--------●--------●--------●--------●--------●--------●--------●<br>Not Very Midpoint Very |
| 13. | How well did you anticipate the needs of your teammates? | ●--------●--------●--------●--------●--------●--------●--------●<br>Not Very Midpoint Very |
| 14. | Overall, how good was your situational awareness | ●--------●--------●--------●--------●--------●--------●--------● |

| | | |
|---|---|---|
| | during the missions? | Very Bad Midpoint Very Good |
| 15. | Overall, how would you describe your workload? | ●--------●--------●--------●--------●--------●--------●--------● Very Low Midpoint Very High |
| 16. | Overall, how would you characterize the game as a tool to learn teamwork? | ●--------●--------●--------●--------●--------●--------●--------● Very Poor Midpoint Very good |
| 17. | To what extent did playing the game help you learn how to develop and adapt strategies to accomplish your mission? | ●--------●--------●--------●--------●--------●--------●--------● Not Helpful Midpoint Very Helpful |
| 18. | Did you receive enough training to play the game well? How would you change training to make it more effective? (Use the space below to answer) | ●--------●--------●--------●--------●--------●--------●--------● Not Adequate Midpoint More than Adequate |
| | | |
| 19. | This game was designed to force team members to manage limited resources (i.e., the skills of the archer or medic, limited ammunition). Were you aware of this? Yes or No (Circle One). Did you notice the lack of resources? Yes or No (Circle One). If yes, how did you overcome these limitations? (Use the space below to answer) | |
| | | |
| 20. | Although the fantasy setting of this game was not realistic, many aspects of the game were designed to have parallels to the military. Were you aware of any similarities between the team structure or the scenario and the characteristics of the Army? Yes or No (Circle One). If yes, which aspects of the game? If no, how do you think we could strengthen this relationship? (Use the space below to answer) | |
| | | |
| 21. | Overall, to what extent do you believe playing a game like this for some period of time can help you to become a better team member of a fire team, squad or platoon? Why or why not? (Use the space below to answer) | ●--------●--------●--------●--------●--------●--------●--------● Not Much Midpoint Very Much |
| | | |

| | |
|---|---|
| | *Do you have any additional comments about the exercise? Please use the back of this page. We appreciate any thoughts you might have.* |

Thank You

# Appendix B – AAR Questions

**Gorman's Gambit Exercise – AAR Questions**

**Ft. Benning, December 2004**

1. What aspects of the game did you like the most and why? Which would you change? How & why?
2. Can you think of any specific instances of good teamwork? What were they? What made it a good example? (use observer forms as a guide). Can you think of instances which you could have done better? What would you have done differently?
3. What difficulties did your team encounter in completing the mission? Were any of these difficulties teamwork related?
4. What were successful and unsuccessful strategies? Why do you think they were successful or unsuccessful? Did these strategies require teamwork to be successful?
5. What adjustments or changes did your team make during the scenario? Which appeared to be most effective? Why?
6. How would you improve the game?
7. What did you learn from the game?
8. Do you think what you learned in this game would help in other Army tactical games? What would and what wouldn't?
9. Do you think what you learned in this game would help in actual Army tactical operations (e.g., Baghdad)? What would and what wouldn't?

# Appendix C – Demographic Form

**Gorman's Gambit Exercise – Demographic Survey**
**Ft. Benning, December 2004**

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***Please fill in the following information to the best of your ability.***

Participant Number: _____ Rank: _____ Age: _____

**Assignment for the Demonstration**:

1. Team A or B (Circle One)

**Education and Military Experience**

2. Formal Education (in years): _____
   (high school diploma/GED = 12, 2 years college = 14, etc.)

3. Current MOS: _____

4. **Months** of experience in Infantry-related MOS: _____

5. **Months** of military service: _____

6. If you have been an infantry fire team leader, squad leader, platoon leader, platoon sergeant, etc., list the number of **months** you served in these leadership positions:

   a. Position: _____ Months: _____
   b. Position: _____ Months: _____
   c. Position: _____ Months: _____

7. Number of **months** of military deployment for peacekeeping, peace enforcement, stability operations or combat: _____
   If so, where? _____

**Computer and Gaming Experience**

8. In the past year, on average, how many **hours** per week have you used a computer for any activity (e.g., internet, school, work, etc.)?

0 1-5 6-10 11-15 16-20 21-25 26-30 31-35 36-40 More than 40

9. In the past year, on average, how many **hours** per week have you spent playing any type of video game (e.g., PC-based, Nintendo, Playstation, arcade, etc.)?

0 1-5 6-10 11-15 16-20 21-25 26-30 31-35 36-40 More than 40

10. Have you played the PC-based game *Neverwinter Nights*™? **YES** **NO** (Circle One)

    If yes, approximate number of hours played: _____

Thank You

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