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Wargame Pathologies

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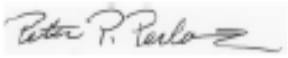

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Summary

As part of the Transforming Naval Wargaming project, CNA and the War Gaming Department (WGD) of the U.S. Naval War College (NWC) had an extended discussion regarding failure modes in professional military wargames. This paper is both a summary and an extension of those conversations regarding "wargame pathologies."

Any wargame can be broken down into a series of constituent parts, or elements. These elements are:

- Objectives
- Scenario
- Database
- Models
- Rules and Procedures
- Infrastructure
- Participants (Players, Controllers, and Observers)
- Analysis
- Culture & Environment
- Audience(s).

One way of looking at the problem of wargame pathologies is to divide a wargame into these constituent elements, and analyze each one as a potential source of pathologies. This approach, which we call Game Element Analysis (GEA), has several advantages:

- It breaks the problem into smaller parts, which is especially useful if several designers are each responsible for designing different parts of the game.
- It promotes comprehensiveness, by making sure that all parts of the game are at least considered as potential failure points.

- It can easily be included in a systematic game design approach, because it is based on the fundamental structure of a game. It requires no new game design procedures.

This paper is intended as a practical guide in implementing GEA. To that end, in the remainder of this paper we will take a detailed look at each of the wargame elements, starting with a short description of the function of the element in the game, its failure modes, and a list of key questions for the designer to ask when examining each element.

Introduction

During the course of the Transforming Naval Wargaming project for the War Gaming Department (WGD) of the U.S. Naval War College (NWC), we (CNA and the sponsor) began an extended conversation on exactly how wargames — specifically, professional military wargames — can fail. Originally focusing on the "misuse" of wargames, the conversation expanded to include all potential failure modes for professional military wargames. We called these failure modes *wargame pathologies*, and at some point we decided to add a brief paper on the subject to the list of deliverables. The goal of this paper is to discuss some of the issues involved in the diagnosis and prevention of such pathologies as part of a continuing effort to advance the state of the art of wargame design.

Organization of the Paper

This document is broken into three major sections.

The first section is an introduction to the subject, including a brief history of the discussion that led to it, some important definitions and conventions, the methodology adopted, the various caveats and assumptions associated with the analysis, and a brief history of the project to date.

The second section introduces the idea of Game Element Analysis, which is a technique designed to minimize wargame pathologies by examining "failure modes" of the individual elements common to all wargames.

The third section, which consists of the bulk of the paper, applies Game Element Analysis to the elements of a professional military wargame.

Discussion History

Our discussion of the idea of wargame pathologies started when the project sponsor, Robert "Barney" Rubel (then Director of the WGD's Research and Analysis Division) wrote a brief (unpublished) essay entitled "Wargaming Pathologies," which identified five broad types of pathologies. Prof. Rubel's goal with this essay was to examine "the various ways wargames have been and are being misused, and offer some antidotes to the pathology." As a first cut, Prof. Rubel's list is fairly comprehensive in coverage, and serves as a good basis for further efforts. Indeed, almost all of the pathologies presented in this discussion fall into one or more categories of Prof. Rubel's list. Prof. Rubel's essay is presented as Appendix 1.[1]

Prof. Rubel's essay kicked off a discussion among several people, starting with Stephen Downes-Martin of the NWC, who took Prof. Rubel's original five pathologies and expanded them fourfold. Further discussion among the authors eventually settled on a list of 21 pathologies grouped into five. A rough explanation of this framework is found in Appendix 2.[2]

While all of the participants agree that great progress had been made, we decided that the methodology we were using — essentially, remembering past failures of games we were familiar with, and extrapolating from there — had certain limitations. Most seriously, it lacked a theoretical basis.[3]

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1. Robert C. Rubel, "Wargaming Pathologies," undated (2003) and unpublished essay.
2. Modifications by Christopher Weuve, to an email by Stephen Downes-Martin, based in part on working meetings at the Naval War College during the week of UNIFIED COURSE 04, October 2003.
3. Prof. Rubel's "wargaming framework" is useful for the higher-level discussion in his essay, but was less suited for the in-the-weeds nature of the follow-on discussions.

There were three basic reasons we felt that a more theoretical approach was needed. First, the traditional advantages of such an approach — the explanative, predictive, and comprehensive nature of theory — would result in a more useful tool for preventing wargame pathologies. Second, a theoretical approach would give us a structure for organizing the work. Finally, these attributes would be useful not only in the current project, but as a basis for moving the state of the art forward. A bottom-up approach was a good place to start, but it was time to look at the problem from a top-down perspective.

Methodology

The methodology chosen for this paper consisted of:

- Initial intensive discussions, both via email and in person, on the topic of wargame pathologies, based on the personal experiences of the participants
- A literature search for game design theory appropriate to the task
- Application of theory as explanative, predictive, and structural framework.

We chose early on to focus on wargame design as a unifying theme, primarily because both the sponsor and the CNA project team consisted of game designers, so it was natural for us to think in those terms. After an extensive and somewhat futile literature search for examples of game design theory, we eventually decided that Perla's *The Art of Wargaming* best met our needs.[4] While not a theoretical book per se, the approach taken in it is methodical and systematic, and it provided us with both the theoretical tools and organizational framework needed.

While attempting to exploit the explanative, predictive, and organizational power of theory, our approach is not, strictly speaking, scientific. It is, however, a prerequisite for a more thorough

4. *The Art of Wargaming*, by Peter P. Perla. Annapolis: US Naval Institute Press, 1990.

and formal analysis of the subject. This is the beginning of the discussion, not the end.

This paper is also not a treatise on how to design a wargame. While the discussion here will be of some interest to anyone interested in professional military gaming, the assumed audience is wargame designers, or at least those familiar with the process of wargame design. As a corollary to this point, we also assume that the audience is largely in agreement regarding the definition of a wargame and exactly what wargames can and cannot do. This is not to say that there is not professional disagreement on these points, only that the disagreement is largely at the margins. The defining of terms, therefore, is merely to make sure that both the authors and the audience are on the same page, and will be presented largely on the assumption that further argument on these points is not necessary.

We assume a familiarity on the reader's part with Peter Perla's *The Art of Wargaming*, in particular Part II: Principles. We have limited our discussion of that work to points we consider especially important. This paper is a supplement to that work, not a replacement for it, and as such only quotes it for emphasis. In addition, *Rules of Play: Game Design Fundamentals*, by Katie Salen and Eric Zimmerman[5] has influenced our thinking on the subject of game design in ways that are as profound as they are difficult to specifically cite. To truly incorporate all the insights of either of these works, we would have had to sacrifice the goal of brevity.

Finally, the discussion here is presented largely in terms of professional military wargames, such as those run by the War Gaming Department of the Naval War College. In general, these games can be thought of in terms of large, multi-player events employing non-player controllers, often with computer adjudication techniques. For our purposes the marginal details are not important, as long as everyone understands that we are not discussing hobby games, schoolyard games, first-person shooters, or

5. *Rules of Play: Game Design Fundamentals*, by Katie Salen and Eric Zimmerman. Cambridge: MIT Press, 2004.

any of the other possible examples from the wide, wild world of gaming.

Conventions

We use a few conventions throughout this document. They include the following:

A *wargame* is "…a warfare model or simulation whose operation does not involve the activities of actual military forces, and whose sequence of events affects and is, in turn, affected by the decisions made by players representing the opposing sides."[6] As such, it is a subset of *game*, which Salen and Zimmerman define as "a system in which players engage in artificial conflict, defined by rules, that results in a quantifiable outcome."[7] In most cases in the context of our discussion, these terms are used interchangeably.

Magic circle is a term used by Salen and Zimmerman, borrowed from Johann Huizinga's book *Homo Ludens*.[8] It is shorthand for "the idea of a special place and time created by a game."[9] Within this magic circle, "the game's rules create a special set of meanings for the players of a game," which "guide the play of the game." The magic circle helps the players adopt the *lusory attitude* required to enter into the play of the game, in which "a group of players accepts the limitations of the rules."[10] This is essentially the same idea as the "willing suspension of disbelief."

A *player* is a human decisionmaker in a game. In most cases, each player will have a *role*, which represents the job responsibilities of the player during the game. The player will also be the

6. Perla, p. 164.
7. Perla, p. 80.
8. Johann Huizinga, *Homo Ludens: A Study of the Play Element in Culture*. Boston: Beacon Press, 1955.
9. Salen and Zimmerman, p. 95.
10. Salen and Zimmerman, p. 99.

member of a *side* of one or more players, consisting of one or more *cells*, or a grouping of players with an organizational or functional commonality. Thus, a "two-sided game" has two sides, whereas a "two-player game" has two players. This differs from, for example, the terminology used by the economic discipline of game theory, where a "two-player game" has two sides, regardless of the number of players.

We will follow the standard convention of referring to allied or friendly forces as *Blue*, opposing forces as *Red*, the Control cell as *White*, and undifferentiated neutrals as *Green*. Blue is always made up of players. Red may be made up of players, or may be controlled by the Control cell. The Control cell usually controls Green.

Thus, a given participant might be the military liaison (role) from the Blue (side) intelligence agency (cell) to the Blue military, in a large game, or the same participant might be simply the Blue side in a small game.

The final convention concerns the use of the term *wargame pathology*. The *American Heritage® Dictionary of the English Language, Fourth Edition* defines "pathology" in the following manner:

> 1. The scientific study of the nature of disease and its causes, processes, development, and consequences. Also called *pathobiology*.
>
> 2. The anatomic or functional manifestations of a disease: *the pathology of cancer*.
>
> 3. A departure or deviation from a normal condition: "Neighborhoods plagued by a self-perpetuating pathology of joblessness, welfare dependency, crime" (*Time*).[11]

In keeping with the medical character of the above definitions, we find it useful to distinguish between *healthy* games and *unhealthy* games. The difference between the two is operational, and gives us the operational definition of a wargame pathology:

Given gameable objectives,

11. http://dictionary.reference.com/search? q=pathology

1. A *healthy* game is a game that meets the objectives.
2. An *unhealthy* game is a game that does not meet the objectives.
3. A *wargame pathology* is the reason why #2 occurs instead of #1.

Note that the terms *healthy* and *unhealthy* are being used here in a very narrow sense. A game could be healthy according to this definition, yet still have noxious side effects — for instance, if it met the design purposes but contributed to an institutional gaming pattern that undermined the effort the game was trying to support. Designers and sponsors need to be vigilant for such possibilities, and take steps to deal with them.

The definition is narrowed further by the term *gameable objectives*, which are those objectives that are realistically addressable through the medium of a game. In other words, it specifically excludes unrealistic goals.[12] We will discuss this in greater detail in the section on objectives.

12. Whether a goal is realistic or not depends on a number of factors. A goal that is realistic in one context may be unrealistic in another.

Game Element Analysis

One way of looking at the problem of wargame pathologies is to divide a wargame into its constituent elements, and analyze each one as a potential source of pathologies. This approach, which we call Game Element Analysis (GEA), has several advantages:

- It breaks the problem into smaller parts, which is especially useful if several designers are each responsible for designing different parts of the game.
- It promotes comprehensiveness, by making sure that all parts of the game are at least considered as potential failure points.
- It can easily be included in a systematic game design approach such as that articulated in Perla (1990), because it is based on the fundamental structure of a game.[13] It requires no new game design procedures.

In this section we will present the elements of a wargame as originally articulated in *The Art of Wargaming*, and detail some small modifications made to that list necessary for a comprehensive treatment of wargame pathologies. We will then take a detailed look at each of these elements, starting with a short description of the function of the element in the game, its failure modes, and a list of key questions for the designer to ask when examining each element.

13. Perla, 1990. At first this point might seem tautological, i.e., it works with Perla's description of a game because it fundamentally is Perla's description of a game. However, please note that Perla's description of a game is just that — a description, based on an analysis of real-world game designs and practices.

Game elements

Perla (1990) identifies six elements as being part of any wargame:

- Objectives
- Scenario
- Database
- Models
- Rules and procedures
- Players

And, to be meaningful, a professional wargame usually must also have:

- Analysis.[14]

Each of these elements represents a potential failure point in the game design and execution process — in other words, a point where a pathology might develop.

Modified list of game elements

This initial list of game elements, however, is not entirely adequate for our purposes, because it does not address some factors that can cause a healthy game to become an unhealthy game. To remedy that situation, we have modified the list in the following ways:

- We incorporate *Players* into a category called *Participants*, which also includes *Controllers* and *Observers*. It is possible for participants to be acting in more than one capacity at a time, which can sometimes be problematic;
- We have added *Infrastructure*, because the physical implementation of a game can undermine an otherwise sound design;

14. Perla, p.165.

- We have added *Culture and Environment* as a single category, to describe the context in which games take place;
- We explicitly include the *Audience*, because concerns over the audience's reaction can affect game design and play.

The new list thus reads (additions in italics):

- Objectives
- Scenario
- Database
- Models
- Rules and Procedures
- *Infrastructure*
- *Participants*
  - — Players
  - — *Controllers*
  - — *Observers*
- Analysis
- *Culture & Environment*
- *Audience(s).*

Note that we specifically did not add the *Sponsor* as a participant, because the issues associated were better described as issues of Objectives and the Audience. Also, while A*nalysts* would seem to be a logical participant, we include them under the Analysis category.

Pathologies by the elements: Game Element Analysis applied in detail

Now that we have a list of game elements that includes, at least in theory, everything associated with the game, the next step is to examine each element in detail and look for failure points.

Objectives

Specifying objectives is fundamental to the success of a wargame, whether it is the professional military wargames we are discussing here, or a hobby game intended as entertainment. The objectives of a game determine its scope, its granularity, and even the basic purpose of the game. Without the objectives, there is literally no reason to conduct the game, hence a "wargame's objectives should be the principal drivers of its entire structure."[15]

In professional wargames, defining the objectives is a collaborative process which takes place between the sponsors and game designers, and, hopefully, the game analysts as well:

They must not only identify the game's objectives, but also define how and in what ways the game will help meet those objectives. Often, the sponsor's initial goals will be unclear, or the utility of gaming for achieving those goals uncertain. The designer must play a major role in helping to identify what gaming can and cannot contribute. Once the sponsor, designer, and analysts have agreed upon the definition of the problem, and decided how it may be usefully addressed through a wargame, the actual design work can begin.[16]

15. Perla, p. 165.

16. Perla, p. 193.

One of the key concepts in the above passage is that the objectives must be gameable, i.e., able to be accomplished through the mechanism of a wargame. Gameable objectives are the precondition for a healthy game.

Defining gameable objectives is more difficult than it might seem, because one must be very careful about what games can and cannot accomplish. In addition to the inherent limitations of wargames (detailed below, as part of the discussion of the remaining game elements), some objectives are very dependent on the specific context. For example, a game might have the goal of garnering support from a larger audience in favor of a particular doctrine. Whether this is a gameable objective depends not only on the details of the game and how it is designed to meet that objective, but whether the community in question is likely to be influenced by the game. If the community respects gaming and the doctrinal question is relatively unsettled, a wargame might be a realistic way to garner support. If the community frowns upon gaming or is already committed to a specific doctrinal option, then gaming is much less likely to be successful. In the end, whether an objective is feasible or not — and hence whether it is gameable — might be a political decision.

Wargame objectives should be explicit; part of the design process is working with the sponsor to articulate the objectives as clearly as possible. Nonetheless, most designers will find that a sponsor has implicit objectives as well. These implicit objectives can be hidden agendas that, for political reasons, cannot be stated overtly. Designers should strive to be aware of these implicit objectives, in order to understand how they affect the explicit objectives and the game as a whole.[17]

Explicit wargame objectives can generally be placed in two categories: education and research. Educational objectives can include teaching new lessons or reinforcing previously taught

17. Designers can and probably should have an implicit objective of their own: contributing to an institutional gaming pattern that reinforces intellectual habit patterns that are, as Barney Rubel puts it, "wholesome to officers who safeguard the interests of the Republic."

lessons, and evaluating assimilated learning. Research objectives may focus on developing or testing strategies or plans, identifying issues of importance for further study, or building consensus among the participants.[18]

Failure modes

There are several possible failure modes associated with objectives. They include:

A wargame cannot meet the objectives

The objective is simply inappropriate for a wargame.

The wargame does not meet the objectives

The objective is appropriate for a wargame, but the game as designed does not meet the objective. This can be for a number of reasons, including inappropriate simplifications or complexities.

The outcome is pre-ordained, intentionally or unintentionally

In this failure mode, "playing to win" breaks the game. This is usually because the game is designed to support a pre-ordained outcome.

Key Questions

What are the objectives?

Does the sponsor understand what can and cannot be learned from a wargame?

Are the sponsor's objectives gameable?

What does the sponsor want to learn from the wargame?

18. Perla, p. 194. One should always keep in mind the limitations of wargaming, especially when using wargaming to test strategies or plans.

What does the sponsor want to convey to the players?

How and in what way will the game fulfill those objectives?

— By providing information?

— By sharpening skills?

— By providing experience?

— By building consensus?

How can the game best ensure that the goals of the sponsor and the goals of the players will reinforce each other?

Scenarios

A wargame's scenario sets the context for player decisionmaking. It should include a beginning state (geopolitical situation, political limitations, and intentions) and a desired end state (goals or, as hobby gamers put it, "victory conditions"). It should also include how the players are expected to effect that end state (i.e., the players' mission) and the resources available to the players. Additionally, it should include the command relationships among the players and cells, and between the players and the control cell.[19]

By victory conditions, we mean a set of goals defined by the designer that the players are striving to achieve. These goals may involve hypothetical combat operations, but often do not. Victory conditions may be relative or absolute — indeed, many historical hobby games define victory in terms of how the players do in relation to the historical outcome.[20] In professional military games, victory conditions have an explicit element ("defeat country Orange"), but often have an implicit element ("and trigger a war with Red in the process") that often is ignored.

19. Perla, p. 208.

20. Meaning, for example, that the German cities may be ruins, but if Berlin does not fall until October 1945, then the Germans have "won."

This is especially true when dealing with players who have more junior real-world roles, and hence have a tendency to focus on the more tactical elements of the game, regardless of the strategic ramifications.

Scenarios in a wargame can be likened to stage plays, from which the term was originally borrowed. Stage play scenarios have authors (who have a purpose in presenting the play) and scripts; a stage to focus the attention of the audience; actors; and both portray chains of events, both acts of player volition and acts of nature.[21]

> The actor who points a gun on the stage is portraying an act of volition. When he pulls the trigger, he also portrays an act of volition. But when the gun fails to fire, that portrays (or is) an act of nature. …In scenarios for military planning, the decision for one nation to attack another is an act of volition, but the expected failure of some fraction of the missiles, due to unreliability, is an act of nature.[22]

The above distinction is from the point of view of the actors — or in our case, the players. From a game controllers standpoint, acts of nature may be a "natural event" — say, generated by a table of random events — or it may be a volitional act on the part of the control staff. For the sake of consistency and clear communication, we recommend always speaking from the player's point of view.

Failure modes

There are several different ways in which scenarios can negatively affect the health of a wargame. They include:

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21. *Toward a Calculus of Scenarios*, by Carl H. Builder. Rand Note N-1855-DNA. Santa Monica: The Rand Corporation, 1983, p. 17. In the theatrical world, the term usually refers to an outline or synopsis of a work. (Perla,, p. 203) Note that Builder uses the terms somewhat more broadly.

22. Builder, p. 17.

Information is missing or incorrect

The players are unable to make real-world-type decisions, because the information they have is incomplete.

Information is overly complete or specific

The players are unable to make real-world-type decisions, because the information they have is unrepresentative of what a real-world actor would have. Overly specific information may focus their attention on specific action that may or may not be appropriate in the real world.[23]

Implicit or unstated victory conditions

Players do not understand the implicit victory conditions for a scenario. This can be a failure to understand the beginning-state political limitations, or through end state problems such as ignoring the political consequences of their actions. An example of the former is assuming that the National Command Authorities will okay a politically unlikely pre-emption policy; and example of the latter is winning the game by starting a global war.) These implicit victory conditions may seem to the designers to be "common sense," but involve concerns at a higher level or of a different nature than the players' real world experience.

Scenario is too large to be adequately gamed in the time available

The scenario gives the players too little time to evaluate courses of action and make meaningful decisions.[24]

Scenario is too short

The scenario does not extend far enough forward in game time to explore the results of player action.

23. Perla, p. 256.

24. Perla, p. 256.

Scenario is artificially constrained

The options presented in the scenario are a subset of the full list of realistic options, in a way not required by the objectives of the game.[25]

Key questions

Does the scenario give the players the context and information they need to make decisions?

Are the player goals (victory conditions) explicit?

What are the implicit player goals? Why are they implicit and not explicit? Is the implicit nature of these goals appropriate for both the role of the players, and for the players' real-world experience level?

Do the players *understand* the goals, both explicit and implicit? How can you tell?

Does the scenario adequately reflect the game objectives?

Are the constraints placed upon the player actions by the scenario necessary either to meet the objectives, or to be consistent with implicit objectives?

Is the scenario long enough to sufficiently explore the implications of player decisions?

Database

A wargames database is the (largely quantitative) information associated with the game. These include such important pieces of information as the forces and capabilities of the different sides

25. This is not to say that every game should have every option. Sometimes the purpose of a military scenario, for instance, is to test military options, even though the primary response would normally be diplomatic. This is another reason why game analysis is important.

in a game, and the physical and environmental conditions of the geographical area under consideration. The line between what is part of the scenario and what is part of the database can be arbitrary; a useful delineator, should one be needed, is to consider quantitative information as being part of the database, and the qualitative information as being part of the scenario.[26]

The information in the database is used by the players to help them make decisions, and by the control staff to help them evaluate those decisions.

Note that this information is not simply raw, unprocessed inputs. Rather, it should be tailored to the player's game role, and should be preprocessed accordingly. This not only allows the players to better play their roles, but it also can greatly help in the in the suspension of disbelief. "If players are aware of the range of possible outcomes of their decisions and have some idea of the relative likelihoods, they will be more willing to accept an unlikely result as the 'fortunes of war' rather than a dastardly plot of the control team."[27]

Failure modes

The information in the database is incorrect or incomplete

The information in the database does not support good decision making by the players and the controllers, either because it is incomplete, or because it is wrong.

The information in the database is hard to use

The information is there for the players and controllers to use, but it is not in a format that is easy to use, or is otherwise difficult to get at.

26. Perla, p. 212.

27. Perla, p. 212.

The information in the database is not believed or trusted

The players are skeptical of the information that is presented.

Key questions

What sources of information are used?

How was the information compiled?

How is the information accessed?

Does the database adequately reflect the game objectives?

Do the players trust the information provided? If not, then why not? Assuming the problem is not with the information per se, what can be done to earn their trust?

Do the players and controllers have adequate access to the information?

Models

"Wargames use models as representations of all aspects of reality the game may be required to simulate." These models usually are lookup tables or mathematical expressions, either manual or computer.[28]

Good models need to be flexible enough to support player decisionmaking, and accurate enough to reflect important processes. They should also be adaptable to changes in the game's database, and documented so the controllers and the analysts can understand their assumptions and algorithms. Most importantly, they "need to reflect accurately the influence of those factors most prominent in the decision process of the game's player roles."[29]

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28. Perla, p. 215.

29. Perla, p. 215.

Models can either preprocess data before the game, or can process data during the game. The former process is usually quicker, whereas the latter is more specific to the exact situation that has developed in the game.[30]

Models shape the way the players and controllers play the game, and will naturally channel the play towards aspects the models handle well, and away from those handled less well. The models can alter the players' "evaluations of capabilities and methods of operation in ways not entirely consistent with their experience or with objective reality."[31] This applies not only for players, but for controllers as well.

> What is crucial for wargaming, with its focus on creating as accurate a decisionmaking environment as possible, is that the models reflect our best-available understanding of the factors and conditions that affect the player's decisionmaking process and his ability to gather and interpret information. Fabricating such an accurate environment is easier for some levels and types of warfare than for others.[32]

In short, the models are at best an approximation of reality, and "are best considered as inputs to the game, devices to move play along rather than measures to evaluate player success or failure."[33]

Failure modes

The models are difficult, inflexible, or overly complex

The models are hard to use during the game.

30. Perla, p. 216.
31. Perla, p. 256.
32. Perla, p. 242.
33. Perla, p. 215.

The models are too simple

The models do not allow an adequate exploration of the subject in question, because the fidelity of the simulation is too low.

The models are wrong or incomplete

The models give wrong results.

The models are opaque, leading to player disbelief

Even if the models are accurate representations for what the purposes of the game, the players do not understand the models sufficiently enough to trust in them, especially when they see what they believe are incorrect results.[34]

The models are opaque, leading to controller credulity

If the controllers do not have an understanding of the limitations and failures modes of a model, they may be lulled into a false sense of security regarding the models outputs.

The models are being used in a context that invalidates their design assumptions

The models were originally designed for use under a specific set of assumptions, but those assumptions do not hold for their current use. This often occurs when models that dealt with peripheral issues in one game are used to evaluate that specific issue in another game. For example, a simple model of air combat designed to provide inputs for a detailed model of logitistic movements may not be sufficiently rigorous to function as a model of air combat in a game focusing on air combat.

34. This is very similar to the idea expressed in the database section above: when the players understand how the process works, they are less likely to interpret unlikely results as being due to bad fortune than to bad models.

Key questions

How are the models compiled?

How are the models used?

How are the models documented?

Are the models at an appropriate level of complexity for the role they are performing?

How are the models selected? How are they evaluated?

Do the controllers understand the models? Do they understand what the limitations of the models are?

What level of training is required to use the models?

Do the models have any failure modes? Are the failure modes easy to spot? Have the controllers been trained in how to spot them?

How long does it take for the model to process a "typical" interaction? How many typical interactions can be processed simultaneously? How many typical interactions are expected?

Do the models adequately reflect the game objectives?

Rules and Procedures

Rules are the specified procedures for the "orchestrated use" of scenarios, databases and models. In professional wargames, they are usually monitored and controlled by one or more *controllers*, who function as umpires or referees. These controllers can also function as facilitators, allowing the players to have only minimal knowledge of the intricate details of the rules. Rules, along with controllers, serve to "translate player decisions into terms that can be understood by the game's models.[35]

35. Perla, p. 217.

As a practical matter, most rules contain a sequence of play, which governs the order in which processes take place, and a method for adjudication of player decisions.

Salen and Zimmerman point out that all game rules share the following general characteristics:

- Rules limit player action
- Rules are explicit and unambiguous
- Rules are shared by all players
- Rules are fixed
- Rules are binding
- Rules are repeatable[36]

Rules are, in short, the "logical underbelly beneath the experiential surface of any game."[37]

Rules can be thought of as occurring on three levels.[38] Most of the time, discussion of "game rules" refers to what Salen and Zimmerman term the *operational rules* of a game, which are the "guidelines the players require in order to play." These are the "rules as written."

In addition, one can speak of the *constituative rules*, which are the "underlying formal structures that exist 'below the surface' of the rules presented to the players."

Finally, there are *implicit rules* to a game concerning etiquette, good sportsmanship, and other implied rules of behavior. Many players, and even some designers, confuse the operational rules and the constituative rules.

36. Salen and Zimmerman, p. 122-23.

37. Salen and Zimmerman, p. 120.

38. Salen and Zimmerman, p. 126.

An example of the differences between these three levels of rules can be found in the game Tic-Tac-Toe. The operational rules of Tic-Tac-Toe are pretty simple:

- Players are assigned to use either an X or an O
- Players alternate placing an X or O in a space of a 3x3 grid
- The first player to place three of his symbols in a row (vertically, horizontally, or diagonally) wins.

This is not the only operational way to express these rules, of course. Indeed, Tic-Tac-Toe is so simple that you could probably teach the rules using a half dozen examples, with no words at all. All of these different expressions would share the same constitutative rules.

Indeed, it is possible for two games to have quite different operational rules yet share a "formal underlying logic," as Salen and Zimmerman put it. Tic-Tac-Toe shares its underlying mathematical logic with the game "3-to-15", which is a game about arranging the numbers one through nine in a 3-by-3 grid so that the total of any row, column or diagonal equals 15.

And in all versions of Tic-Tac-Toe/3-to-15, there are implicit rules about the etiquette of playing, which include ideas such as "the player must take his turn in a reasonable amount of time," "the losing player cannot prevent the other playing from winning by refusing to take his turn," etc..

Every game has a *core mechanic*, which is the "essential play activity players perform again and again in a game. …Very often, when a game simply isn't fun to play, it is the core mechanic that is to blame."[39] Salen and Zimmerman are speaking in the context of games produced for a mass audience, but the warning is just as strong for professional military games, and applies to the controllers as well as the players. Players who are enjoying the play of the game, or at least aren't annoyed by it, are less likely to become bored or hostile.

39. Salen and Zimmerman, p. 316-17.

Failure modes

The rules are wrong or incomplete.

The rules do not adequately reflect reality, or there are situations that arise in a game that are not covered by the rules.

The rules are too complicated or too weird to use

The rules are therefore difficult to use or to understand, by the players or the controllers.

The rules do not match the game's objectives

The rules do not adequately represent the situation necessary to support the objectives.

The core mechanic of the game is not enjoyable

Players get bored or hostile by the nature of the game.

Key questions

Do the controllers understand the rules, and how they will be applied?

Do the players understand the rules, and how they will be applied?

Do the rules adequately reflect the game objectives?

Do the rules cover all necessary aspects of the situation?

Do the rules represent reality to the level required?

What are the players doing from moment to moment while playing the game? Are the fundamental actions they are undertaking sufficient to engage them intellectually?

Infrastructure

Infrastructure in this context refers to all of the "physical plant" aspects of the game not directly tied to the game design and analysis itself, but which can affect the design and play of a game. In short, it is all of the hardware, software (non-game-specific), facilities, and supplies.

Most potential infrastructure problems fall under what the NWC refers to as the "wedding planning" aspects of running a game. This includes conti9ngency planning (e.g., in the event of a power failure). We will not consider these "wedding planning" issues here. The remaining infrastructure issues are generally in the realm of surrogate systems infrastructure, such as a LAN at Newport serving as a surrogate for a global WAN.

Failure modes

Inadequate/inaccurate surrogate representation of real-world characteristics

Surrogate infrastructure does not adequately represent the real-world infrastructure, thus invalidating game conclusions depending on the fidelity of the surrogate.

Key questions

How does the surrogate infrastructure represent its real world counterparts? Is it as capable? More capable? Less capable? As reliable? More reliable? Less reliable?

Does the infrastructure adequately support the game objectives?

Participants: Overview

There can be several different types of participants in a game. These include: players, controllers, observers, and designers. Even the games ultimate audience may in some ways be considered a participant.

In this section, we will look at all of these different types of participants, except designers and the audience. The audience is discussed in a separate section because, unlike the other participants, they may not be known in advance.

Designers also are not addressed, for two reasons. First, it would be difficult to address the subject without turning this into a "how to design a game" essay. Second, to the degree there are pathologies associated with designers, it is the pathology of designing games with pathologies. In that light, this entire essay can be seen as addressing the issue.

In a similar vein, the pathologies associated with analysts are essentially that of performing poor analysis. Analysis is covered later in this essay.

Wargame participants may wear many "hats." It's not unusual, for instance, for the designers of the game to also function as controllers. It is possible, therefore, for one participant to fit into more than one of the categories listed.

Players

"Wargaming is an experiment in human interaction. Without human players there may be a model, but there is no game."[40] In popular usage, *player* can refer to an individual decisionmaker, the *side* a decisionmaker is on, or the *role* the decisionmaker has undertaken. In our usage, we will refer to these as players, sides, and roles, respectively.

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40. Perla, p. 274.

One of the tasks of the designer is to identify the player roles most important for achieving the game's objectives. These roles should be consistent with the geographic and operational scope of the game.[41]

Playing Red requires special consideration, to avoid issues of "mirror imaging' on the one hand, and rigidly following "accepted" Red doctrine on the other hand. Therefore, special preparation for Red players is useful.[42]

On a more general level, Salen and Zimmerman have identified five types of players:

- A *standard* player generally obeys restrictions and has the lusory attitude, but has no particular stake in the game.
- *Dedicated* players are similar to standard players, but with an extra zealousness which sometimes puts off less-dedicated players. The difference between a standard player and a dedicated player is one of degree, not kind; players are willing to tolerate games of a far more complex nature than standard players, and they tend to invest the magic circle with more authority, because of their investment in the game.
- *Unsportsmanlike* players will violate implicit rules without breaking the operational rules, due to their strong interest in winning. Unsportsmanlike players are surprisingly similar to dedicated players, but have not subscribed to the lusory attitude to the same degree.
- *Cheaters*, on the other hand, will break operational rules in order to win, but they do so secretly, because they acknowledge the authority of the rules.
- *Spoil-sport* players are farthest away from the standard player, in that they refuse to acknowledge the game in any way. More

41. Perla, p. 196.

42. Perla, p. 257-58.

problematic, spoil-sports tend to be nihilistic players who do not hesitate to destroy the magic circle.[43]

These five player types are not always distinct, in that the same behavior may fall into different contexts, depending on the specific context of the game. Moreover, players can move from one player type to another in the context of a single game, or can be a different type of player when playing different iterations of the same game or when playing altogether different games.

Some of these player types are more represented in the gaming world at large than they are in professional military games. It's rare, for example, to see an example of out-and-out cheating in one of these games.[44] Note though, that dedicated players and unsportsmanlike players may both use degenerative strategies, defined by Salen and Zimmerman as "a way of playing a game that ensures victory every time." Degenerative strategies are usually due to exploiting a flaw in the game design.[45] Such a flaw may have even been justified as a necessary simplification.

43. Salen and Zimmerman, p. 268-69.

44. But while outright cheating may not be likely, it is possible for players who bored or otherwise unengaged to leave the magic circle. Players who do not have the lusory attitude tend to create problems, for other players and for controllers.

45. Salen and Zimmerman, p. 241. One example of such a strategy, used by a naval officer playing NAVTAG (a computerized naval warfare game formerly used as a training aid) was to wait with his radars off until he saw the computer switch from two minute turns to 30 second turns. At that point he knew there were missiles inbound, and he would switch on his radars and fire SAMs at the incoming strike. Perhaps fittingly, his final assignment before retiring was to the War Gaming Department of the U.S. Naval War College.

Failure Modes

Wrong Player roles

The appropriate player roles must be defined in light of the "game's objectives, scope, and level of player activity."[46] If the wrong roles are defined, or if critical roles are not defined, then the objectives of the game will not be met.

Players not understanding their game roles

Players need to have a clear understanding of the role they are to play in the game.

Player unfamiliarity with gamed concept or equipment

Players need to be familiar with the concepts and equipment of the game, especially if the game is to explore the utility of new concepts or equipment. Otherwise, the player's play at best will not be able to take full advantage of all of the available resources, and at worst the game will become focused on the players' reaction to new concepts and equipment.

Unqualified players

Players must be minimally qualified for the role they are to play. This does not mean that the player must play that role in real life, only that the stretch must not be too great, with the acceptable difference between real-life and game roles highly dependent upon the type of game and its objectives. For example, a former ambassador playing the President of the US in a large political-military game designed to explore NATO reorganization is probably acceptable, because the ambassador has experience with "big picture" policy decisionmaking. A LTJG has

46. Perla, p. 252.

much less experience in this arena, and would probably be a bad choice for the President in such a game.[47]

Not only do players playing roles above their experience level risk missing some of the wider implications of their decisions, but they also tend to focus on a level closer to their own personal experience. This tendency to "lose the forest for the trees" is natural; the players are gravitating to the level of their experience, to a place where they feel comfortable. One way of dealing with this situation, therefore, is to provide "synthetic experience," by designing the game "in a way that helps the player carry out his role competently." This can be done through the information or options presented to the player, and through the structure of the game itself.[48]

Bored players

Players who are bored have a tendency to get into mischief. That mischief can manifest itself in several ways, from a desire to "stir things up," to simply stepping out of their roles — and maybe outside of the magic circle altogether — and refusing to engage in game play.[49] This is bad enough in and of itself, but these players tend to drag others with them.

Players who feel they are not in control

Players who feel they are not in control get frustrated, and generally act the same as players who are bored. Games are about human decisionmaking — in other words, about humans making choices. If the players do not feel that their choices are meaningful — for example, if the decisions appear to be arbitrary, if they lose the game without knowing why, or if they do not know if an action had an outcome — player enjoyment will

47. Of course, some players handle this better than others. Basically, the higher in the chain of command a player is in his real life, the more experience he has with issues at the top of the chain.

48. Perla, p. 199.

49. Perla, p. 199.

decrease markedly.[50] Contrast this with the importance of uncertainty of outcome, for "it is the uncertain outcome of a game that allows players to feel like their decisions have an impact on the game."[51] Salen and Zimmerman describe boredom and anxiety as the "Scylla and Charybdis" of player experience.[52]

Player pushback because game does not fit pre-conceived notions

Oftentimes, this is a symptom that there might be a communication problem between the staff and the players.

Key questions

What roles are needed to meet the game's objectives?

How are the players selected for these roles?

Are the players who actually show up appropriate for their roles?

Do the players have any familiarity with the topics to be covered by the game?

Do the players understand their game roles?

How are the players prepared for their role? Will the players prepare for their role? Does the game depend on an unrealistic level of preparation?

How does the game incorporate synthetic experience to aid the players?

50. Salen and Zimmerman, p. 66.

51. Salen and Zimmerman, p. 174.

52. Salen and Zimmerman, p. 353.

Controllers

Controllers are participants who actually run the game. Controllers have several important functions:

- They monitor player actions, translate player actions into game terms, enforce the rules of the game, and prevent physically unrealistic actions or sequences of events.
- They assess interactions using models, data, and rules — and judgment as required.
- They inform players about action outcomes, employing realistic limitations to do so, as appropriate.[53]

Controllers make up the White cell, which represents the forces above and below the player cell(s).

Failure modes

Not enough controllers

Controllers are unable to adequate attend to all of the tasks before them.

No clear lines of responsibility among controllers

The controllers do not understand to whom they should pass problems to, or from whom they should take direction. In other words, the controllers do not have a clear chain of command.

Wrong people functioning as controllers

People who are not suited to be controllers are acting as controllers, or the controllers would be more useful in other roles.

53. Perla, p.217.

Controllers distracted by other issues

The controllers have other roles, and cannot do both jobs at the same time.

Controllers not understanding their jobs as controllers

The controllers do not understand the nature or the specifics of their job, due to a lack of training in their exact function, or in the overall objectives of the game.

Controllers not understanding their jobs as players (roles)

Controllers embedded within player cells, or functioning as the Red cell lose sight of the fact that they are working for the Control cell. This can lead to these players either "going native" or "playing to win" in inappropriate ways.

Key questions

How are the controllers selected? How are the controllers trained?

What are the controllers' duties? What other tasks might get in their way?

How many controllers are needed? How many controllers are available?

Do the controllers understand the game objectives?

Observers

Observers refer to any non-player, non-controller people who may be watching the game as it is conducted, and who may therefore interact with the game participants. These observers may be from the command that have sent players, from the sponsor, or from the commands whose projects are featured in the game. In short, there are a multitude of reasons why an observer may be present.

Failure modes

Observers distract players or controllers

While it would be going too far to say that observers should be seen and not heard, they should not interfere with the running of the wargame.

Observer inhibition of play, as a result of who the observer is or whom the observer represents

Players will often modify their behavior if they perceive officials representing their community, command, service, or agency are watching them.[54]

Observer competition with players or controllers for scare resources

Observers will often desire access to the same resources — e.g., phones or computers — as players or controllers.

Key questions

Why is a particular observer there? Should the observer be there?

How has the observer been briefed?

Will the status or personality of the observer be a distraction?

How can we minimize observer distraction?

How many observers are too many? Have we reached that threshold?

Do the observers understand the game objectives?

54. This is also part of the reason why many high level games are NOFORN.

Analysis

Wargame analysis that tries to treat wargames as sources of scientific evidence experiments is not generally useful, because of the nature of wargaming itself. Wargame analysis is most likely to be useful when it

> focuses on why players made certain decisions and why, in turn, those decisions led to particular sequences of game events. Such an investigation should examine the important driving characteristics of the scenario, the rationales for each side's actions, and how alternative course may have changed the course of events.

In this way, good wargame analysis is closer to analytical history than to scientific analysis.[55] Therefore, "[j]ust as good historical analysis treats events as indicators of deeper underlying realities, good wargame analysis and documentation treats game events only as indicators of the decision processes of the players."[56] Phrased another way, wargame analysis is about issues raised, not lessons learned.[57]

One key area that wargame analysis should look at is the validity of the wargame, defined as "the extent to which its process and results represent real problems as opposed to artificial ones generated only by the gaming environment."[58]

Analysts are special participants who are part of the reconstruction and analysis effort. Oftentimes, an analyst also has duties as a controller or sometimes even a player, although the latter case is rare.

55. Perla, p. 261.

56. Perla, p. 267.

57. Perla, p. 179.

58. Perla, p. 266-67.

Failure Modes

Undocumented controller hand waving during game

Controller actions that are not documented may distort understanding of what happened during the game, especially if it affected player decisionmaking to a significant degree. In addition, it may have been an incorrect handwave, e.g., the controller allowed unrealistic play, or prevented realistic play.

"Declaring victory" as analysis ("game validated the concept")

Declaring that the game validated the concept is a conclusion, not analysis. It's also likely to be a BAD conclusion, because by their nature games do not provide lessons learned, but issues raised.

Rejection of inconvenient analytical conclusions

To be useful, the analysis must be independent enough of the political process to give an accurate assessment of the situation.[59]

Sponsor impatience ("quick look" becomes only look)

Sponsor expectations about how long it takes to analyze a game often need adjusting.

BOGSATT ("Bunch of Guys Sitting Around a Table Talking") as analysis

This methodology will produce lots of opinion, but makes no rigorous effort to get at the data underneath the opinion.

59. Note that some might comment that sometimes the purpose of the game is to bring people together and demonstrate a concept, or provide a teambuilding experience, or some other goal where the simple act of running the game meets the goal. If that is the case, it should be included as an objective, and the analysis should reflect that reality.

Analysis without player data (no meaningful hot-wash)

The players have the best understanding of their collective decisionmaking process; as Prof. Downes-Martin has observed 90% of the game data is in the players' heads, and if you don't capture it immediately, it is gone. Simply having a "hot wash" is insufficient, because not all hot washes are created equal. To be useful, the process must be rigorous, not simply a collection of opinions and feelings.[60]

Undocumented design process

The game design itself is opaque, which may obscure how the workings of the rules, database, models, etc., affected the players' decisionmaking process.

The analyst is untrained

The analyst doesn't know how to conduct the analysis.

The analyst is inappropriate

The analyst is unsuited to the task for some reason.

Key questions

What is the analysis plan?

How are data for analysis being captured?

How are the data being stored? Accessed?

What constraints are attached to the release of the data?

60. The Center for Quality of Management has developed a methodology known as the Language Processing Method. When used by skilled practitioners, LPM is an extremely useful alternative for a traditional hot wash. Information on LPM can be found at http://www.cqm.org.

How was the game design documented?

How does the *act* of analysis support the game objectives?

How did the game support the game objectives?

How are analysts selected?

How are analysts trained?

Do the analysts understand the game objectives?

Did the analysts have first hand knowledge of the game?

How are the analysts getting their data?

Culture and Environment

As Salen and Zimmerman succinctly put it, "games are culture." As representations games *reflect* culture, and, under some circumstances they can *transform* culture.[61] Most professional military wargames do not aim so high; nonetheless, all games "involve a series of cultural structures against and within which play occurs."[62]

In other words, all games, even professional military wargames, take place within a cultural and environmental context. These cultural frameworks are not abstract anthropological dissertation topics, but real-world considerations that can limit game design and play. As such, they are largely impossible to eliminate; you can only compensate for them. They range from the mundane, like restrictions on when games can be conducted (just try to schedule a hot-washup session for a Friday afternoon — an impossible task in the commercial world, let alone in the military) to the profound (such as the intense institutional self-worth associated in the military with certain services and mission

61. Salen and Zimmerman, p. 507.

62. Salen and Zimmerman, p. 509.

areas — for example, the air superiority mission in the USAF). Culture and environment are the quicksand of game design.[63]

Failure modes

Cultural and political risk aversion

The players are unwilling to go against cultural norms. These norms may be those of their warfare community, their service, their command, their agency, or their country.

Player bias leading to distorted play

The individuals cultural biases lead the player to behave in particular ways that may not be appropriate to the role they are playing.

The game design ignores cultural norms

Game designs that violate cultural norms will encounter more player resistance than those that do not.[64]

Key questions

How does the culture and environment affect the design of the game?

How does the culture and environment affect the play of the players?

Are these effects distortions of the game? How do these effects affect the ability of the game to meet the game objectives?

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63. This might be used to the designer's advantage, of course, as lure to the recalcitrant. Knowing that a rival service will get to "call the shots" in their absence may be one of the definitions of "enlightened self-interest" in the sphere of military gaming.

64. The point here is not that cultural norms should not be violated, but that if you are going to violate them, you should do it knowingly.

Audience

In many ways, the audience is an element of wargames similar to culture and environment, in that it represents factors not fully related to the actual game itself. Audience in this case refers to non-participants who will be interested in the game or game analysis. These can include:

- the sponsor
- service or Department of Defense entities in the sponsor's chain of command
- other agencies of DOD outside the sponsor's chain of command
- other branches of government, such as Congress or the General Accounting Office
- the public at large.

Failure modes

Knowledge of larger audience inhibits game play

Similar to the issue with players modifying their behavior when certain observers are present, players may modify their behavior if they know that the game report will be released to certain audiences.[65]

Larger audience prevents examination of "real" issue(s)

Knowledge of the larger audience will sometimes not only affect play, but also prevent issues from being discussed in the first place. As a practical matter, this is not something with an easy solution.

65. This is the reason, for instance, why most professional military games have a non-attribution policy.

Key questions

Who is the larger audience for the game?

What are the implications of the game objectives to the larger audience?

What elements of the game were not discussed because of the larger audience?

Appendix 1: "Wargaming Pathologies" by Professor Robert C. Rubel, NWC

Introduction

Wargames are powerful tools that the American armed forces have been using since the late 19th Century to support operational decision making, develop strategic plans, evaluate potential procurement programs and to educate and train officers. They are also increasingly popular if one is to judge by the ever-increasing numbers of service and joint concept development games. However, despite their power, it is easy to misuse wargames, and perhaps precisely because of their power and popularity, they are indeed subject to routine misuse within the Department of Defense. This article will examine the various ways wargames have been and are being misused, and offer some antidotes to the pathology.

A Wargaming Framework

In order understand wargame misuse, it is first necessary to establish a framework for talking about them. The first convention we will adopt is that anytime we speak of U.S., allied or other friendly forces, we will call them BLUE. Any opposing force will be RED. This is common wargamer procedure. There is any number of ways to categorize and describe wargames, but for the purpose of this article, we will construct a hierarchical framework oriented on the number of methodological dimensions incorporated into them:

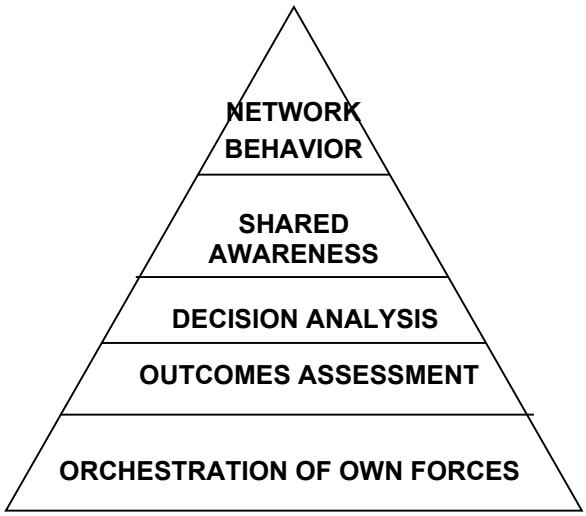

Figure 1. Gaming Methodology Hierarchy

At the bottom of the pyramid we have the most fundamental dimension of gaming. When some shaped blocks representing ships are laid out on a table, we can move them around and see their relationship to one another at various points during a maneuver. Similarly, the Army routinely practices "rock drills" in which markers as elemental as rocks can represent platoons or tanks and be used to pre-orchestrate maneuvers. It follows that even complex operations, including logistics, can be simulated using either physical markers or computer symbols. This is an extremely important aspect of gaming, because the outcomes of the higher dimensions of the game are dependent on a realistic orchestration of own forces. Using tactics that are impossible to execute in the real world will cause assessments of interactions with the enemy to be invalid. In fact, many games go no farther than this first dimension, because that is all that is necessary for the purposes of the game. At this level, the power of the game comes from combining a map, an order of battle, a directive and a scenario. If knowledgeable operational planners engage in such an exercise (authors such as Peter Perla would argue that at this level of methodological simplicity, we do not have a true wargame), they are likely to discover certain connections between geography, concepts of operation mission requirements, time and logistics that would not otherwise be visible.

The next dimension is outcomes assessment, the determination of what might happen when own forces confront those of the enemy. Whether based upon a roll of the dice, the crunching of complex algorithms by a computer or through the judgment call of human umpires, the outcomes form the basis for judging the suitability of orchestration in the previous dimension or as an input for subsequent player decisions. Many games stop at this dimension. Termed "campaign analysis," this type of game is analytical and meant to provide insights into the suitability of tactics or the efficacy of new equipment. Frequently, such games are wholly contained within a computer program and are run over and over to produce patterns of results. Simulations such as the Integrated Theater Evaluation Model (ITEM), Extended Air Defense Simulation (EADSim) and a host of others are routinely used by the military services to evaluate or justify procurement programs. There is also a manual version of this activity, frequently referred to as "red teaming." Teams playing either an abstract enemy or simulating a specific projected opponent examine BLUE plans/equipment and determine what RED could do to counter them. This is sometimes an added feature of the "rock drills" mentioned previously.

At the third level is the analysis of player decisions. A number of wargame experts consider this to be the minimum methodological level to be considered a wargame. Frequently the focus of educational gaming, the purpose of this level is to develop insights into player reactions to warfare situations. Often, players will be allowed only partial information on outcome assessments in order to create for them the "fog of war." Because of the indeterminate and unpredictable nature of player decision making in the stress of a game, research games often do not deal with this dimension, although a notable exception was the Navy's Global series of games. It is frequently the case that organizations conducting campaign analyses will use a traditional wargame with human players to get a "sanity check" on the outputs of their computer simulations.

The fourth methodological level incorporates various types of "collaborative information environments," CIEs in habitual military acronymology, to support more extensive and intricate player command and control schemes. Players use e-mail, teleconferencing, chat, web pages and a host of other connectivity and knowledge management technology to try and achieve that elusive condition in

which physically separated commanders and staffs get inside each other's heads.

The top dimension involves the simulation of wide area networks in the game. This has not yet been achieved within the context of a true disciplined wargame. However, it has been at least an informal and partial element of large field exercises such as Joint Forces Command's Millennium Challenge 02, that incorporated some elements of wargaming, including the use of synthetic forces within the electronically-generated "common operational picture," a RED team and a control cell.

Wargaming Pathologies

The first, most fundamental pathology associated with wargaming is the propensity for organizations to use the word wargame to describe activities that are no such thing. This is extremely common, even within professional wargaming centers. Commonly termed BOGSATs or Bunch of Guys Sitting Around a Table, these "games" involve nothing more than directed discussion. A key litmus test of such events is whether the analysis and report deals with what happened (plans made, battle outcomes, decisions, etc) or simply reports what was said by the participants. A true wargame, even at the lowest dimension, will produce some kind of military event. A BOGSAT will not. However, given the presumed power of wargaming (in part based on the reputation of the Naval War College's wargaming efforts between the world wars), organizations that hold BOGSATs will frequently, in their reports use language such as "The game demonstrated…" Since there were no events occurring in the event, it could not demonstrate anything.

BOGSATs tend to materialize despite the best intentions of professional gamers when one of two conditions holds: a) the game's objectives are not defined with the required degree of rigor or specificity or b) the event's sponsor wishes to keep control over the output. Frequently, perhaps most of the time even, sponsors and gamers (educational games excluded) do not apply a rigorous and disciplined process of game development, especially in the area of objective definition. Without clear objectives, game methodology cannot be adequately developed. As a default position, seminar dis-

cussions are substituted for any of the methodology dimensions on the hierarchy. Frequently, wargames are used to demonstrate or socialize concepts – a legitimate use of wargaming if conducted fairly. However, the game's sponsor may wish to exert detailed control over the game's events, to the point that any planning and evaluation are done prior to the game, in controlled circumstances. The actual "game" becomes a discussion of the very orchestrated results of the pre-game "development" efforts. This allows the sponsor to seed the discussion with hand-selected participants, including discussion moderators.

The net effect of BOGSATs is simply records of discussion, much like a workshop or any other kind of academic seminar. The BOGSAT does not contain the power of even the most elementary game, and therefore cannot produce the same kinds of intellectually valid results a game can. If organizations did not call these events wargames, there would be no pathology, but they do, and there is. The first cause of BOGSATs can be cured by the application of disciplined wargame design and development procedures. Game designers must have a firm grasp of game methodology and a commitment to apply it rigorously. Frequently, objective definition requires both extensive dialogue with sponsors, and the application of various analytic procedures such as root cause analysis. The second cause is probably not curable so long as large dollar procurement programs, organizational power and careers are at stake. The only thing that can be done is for either DoD if it can, or Congress, if it must, to establish a sort of "wargaming inspector general" to observe, critique and report on major service and joint wargames (or at least what are called wargames).

The second type of pathology that afflicts games is the application of invalid tactics, equipment or assessments. This pathology manifests itself at the bottom two layers of the hierarchy, and it is all too easy to do for any number of reasons. The first reason is the "hand wave." The hand wave consists of allowing game events to occur that either violate the laws of physics or in some other way break the rules because the umpires are assessing the game at too high a level of abstraction, in which case they assume things can be done (such as, say combining a Marine Expeditionary Brigade with its prepositioned equipment at sea) for which nobody has demonstrated the capability, they don't bother to make detailed calculations of

the logistics involved, or make unwarranted estimates concerning various unit or platform capabilities or effectiveness. Sometimes hand waves are justified, if, for instance, a game is examining future capabilities that don't yet exist, and close track is kept of the assumptions being made. However, if such assumptions are not tracked, and game analysis is not rigorously and honestly conducted, then game reports can be populated with garbage (as in the old computer adage "garbage in, garbage out"). This is dangerous because executive-level consumers of game reports most likely will not be sophisticated enough to discern whether or not the touted game results are based to any extent on illegal hand waves. The cure is simple, if not easy: the game director must insist that umpires keep track of major assumptions used in move assessments. That way, analysts back-tracking game events will know what was involved in determining move outcomes and can either draw or refuse to draw conclusions accordingly.

Speaking of analysis, the third type of gaming pathology is sloppy, or non-objective analysis. Wargames are synthetic military history, and analysis of what happened in them must be subject to the same rules of critique Carl von Clausewitz articulated for the study of real military history. Theoretically the wargame analyst has the massive advantage of witnessing the real event, but this presumed advantage could be frittered away easily. First, if the game has any degree of complexity, whether in numbers of players, a free-play RED or extensive BLUE command and control arrangements, it will be very difficult to properly observe. Analysts must devise sophisticated data collection plans that snare all relevant information related to game objectives, and do not distort the game by their intrusiveness. This is especially dicey if it is necessary to get information on why players did what they did or why umpires made the assessments they made (and it almost always is). Analysts trying to develop "insights" from a game without such information inevitably end up either in the untenable situation of having nothing (or very little) to report, or (more likely) settle for broad, generic statements. In the worst case, they infer more than the available data supports, and on that basis claim insights from the game that are not justified. Again, the danger is that such a game report will appear rigorous, and executive consumers of the report may base important decisions on a flawed analysis.

On the other hand, many senior military officers have participated in wargames over the years, and some of them have developed a decided skepticism, if not cynicism about the large service and joint wargames and their attendant reports. While this attitude is understandable, it tends to stereotype wargaming in general as a waste of time, and wastes the legitimate value good games can have.

Another pathology of wargames, related to assessment, is the obscurity of the algorithms and assumptions built into computer simulations. Even simple simulations have complex programming, the basis of which frequently not known, even to the "puck pushers", the analysts that build and run the various scenarios for sponsors. As an example, years ago, using the Rand Strategic Assessment System or RSAS, to assess moves in a large inter-war college student game, we continually got complaints from BLUE air commanders concerning the outcomes. Some extensive digging revealed that the program assigned BLUE tactical aircraft only a twenty-five percent effectiveness at night. Apparently, the algorithm had been incorporated some years before the advent of imaging infrared equipment and night vision goggles. While RSAS in general had been continually updated in various ways, that particular algorithm stowed away until we caught it. I hate to think about what decisions might have been made on the basis of RSAS runs in those years. When you use computer simulations to assess moves, that gremlin lurks, because programmers seldom start from scratch – they reuse code.

Our examination of game pathology now takes us into the dimension of player decision making. One of the fundamental embedded assumptions of game design is that players will make the best decisions they can. The decisions may be wrong, but they won't be capricious or self-destructive. However, as any experienced gamer can tell you, keeping players' heads and hearts in the game is always a challenge because of the inevitable artificialities that attend any game. Players can become either bored due to an unchallenging scenario or alienated because of adverse move assessments. However, player disaffection to the point of deliberate game sabotage is rare to non-existent in the military community (I hope), but there is a more subtle distortion that keeps players from making the best decisions they can. That is an artificial lack of information. Acknowledging that there will always be some degree of "fog of war"

present in the real world, we must still understand the connection between player access to information and game design.

Let's first think about a board game of the type Avalon Hill used to make, or even chess. The game design automatically delivers to the player all of the information he or she is entitled to for the purpose of making game decisions. What the player cannot know, the opponent's strategy, is legitimately unknown. Similarly, in computer games, the player must know the required decision making information in order to input valid moves. Now let's consider the kind of free-assessed game so often found in the military. In this kind of game, the umpires feed information to the players. Players make move inputs to the umpires, who then use "professional judgment" to assess move outcomes, aided sometimes by either holistic or specialized computer simulations. There is no *a priori* reason an umpire must furnish the player with the full range of relevant information for producing a move decision. For instance, the umpire may depict move results in terms of percent attrition to the BLUE player's force as well as the latest unit positioning. BLUE, playing a joint task force commander, will presumably use that information, along with anything the umpires elect to tell him about RED's condition, to craft the next move. Yet there is plenty of critical detail missing. Due to lack of time (a frequent condition) the umpires do not inform BLUE exactly why they assessed the move as they did, and given the problems discussed in previous paragraphs, they may not themselves know exactly why – "professional judgment." So BLUE is left to guess at why his forces did not perform the way he had expected. Player demands for information are met with injunctions not to get "into the tactical weeds." What we are left with is player decisions based on a dearth of information that is an artifact of the game. That is, the lack of player information is not connected in any robust way to game objectives or design; it's just an unhappy artificiality that results from not enough time, umpire knowledge, game preparation, etc. Moreover, it is most definitely not a valid simulation of the fog of war. If, subsequently, an analyst attempted to derive insights based on such player decision making, even though there might be plenty of data on move generation and assessment, he may very well produce garbage because the players, through no fault of their own, did not make the best decisions they could. Clearly, the antidote to this pathology is to closely link re-

quired umpire outputs to player information requirements in the context of game objectives and methodology.

Another pathology involves the practicalities of running a game. This afflicts mostly decision-level games, but could also infect shared awareness and network games. Wargames are not open-ended events. Player time is expensive, and so gamers are challenged to execute games in the shortest practicable time (at least a fixed time), and keep all players challenged throughout. Again, let's go back and consider a chess game. Timed or not, the exact length of the game is not knowable in advance; it takes as long as necessary to produce a checkmate. Thus chess can be considered an "open-ended" game – it takes as long as it takes. DoD games are invariably "closed" games; they are executed in a set amount of time, say three days or maybe two or three weeks for the larger games. Because of this, the games cannot be allowed to take their natural course – the flow of events in time and character rigorously linked to the interwoven web of player decisions and umpire assessments. At some point, the game director or "council of elders" makes a decision to either skip a chunk of time in order to get at some subsequent phase or to terminate the game prior to all objectives being met. As you might expect, the former is the almost universal response. The difficulty in skipping chunks of time is that many player decisions are assumed in the time jump assessment. This results in a distorted situation for the next round of player decision making. At the very least, the game now becomes a sort of story told by the umpires rather than a game that has a rigorous cause and effect linkage between player decision and game events. Rare, if non-existent is the game report that acknowledges such distortions and limits its analysis on that basis. A common prescription for this malady is to segment the game into "vignettes," each of which is semi-autonomous and can be specified in advance. This has the advantage of getting the game predictably to the desired end phases, but most often results in some form of BOGSAT, because no real game events occurred.

This particular kind of pathology is very difficult to treat because of the very real pressure of practicality. However, game designers should exercise discipline and commitment in ensuring that game events are related to each other in some intellectually rigorous way so that the analysis and game report can honestly link insights to

game events. Part of the solution transcends individual game design and moves into the realm of institutional gaming policy. If an institution such as a concept development center demands honest games, then it should be willing and able to lay out a gaming campaign plan that provides for certain games terminating before all objectives are met, and scheduling follow-on games that take up where their predecessors left off. Alternatively, institutions could adopt a more cumulative approach to gaming in which individual games are not burdened with having to produce a rigid set of objectives, but in total, the year's worth of games gets at the most important ones on the list. What is lost in total number of objectives achieved would be more than compensated for by the confidence one could put in the game analyses and reports. After all, garbage on schedule is still garbage.

We now ascend into the esoteric world of shared awareness wargaming, the penultimate dimension on our hierarchy. First, it is necessary to point out that there is a real intellectual divide between the layers of gaming heretofore discussed and the command and control layer. Most importantly, the first three layers of gaming involve simulation – the partial representation of reality. However, at the command and control layer necessarily embedded in shared awareness gaming, we are dealing with reality itself – players actually command and control each other. This means there is a potential firebreak of sorts that might insulate these games from certain distortions at the lower levels, particularly invalid assessments and unrealistic tactics. However, this level is highly sensitive to game artifacts, defects in the simulation, related to information generation and flow. For instance, in a large game a few years back, a web of computer simulations was used to help populate the "common operational picture" or COP. However, due to the tempo of the game and the limitations of the models, representation of red forces was in certain cases aggregated, that is, one symbol represented a number of similar units arrayed in a designated geographic area. Players did not know this. Moreover, the pace of the game overwhelmed the umpiring crew, and when BLUE destroyed certain of these units, the results were not depicted on the COP, although they were related via text chat. BLUE commanders, looking at the COP, saw the disconnect, and decided the COP was not trustworthy – at all. Now, it's one thing for commanders to distrust their COP

based on real world technology limitations, but in this case, the COP defect was an artifact of the game. Therefore, any analysis of player shared awareness via the COP would have had to be limited by this fact. However, such artifacts are subtle and require either luck in detecting or highly experienced observers and analysts who are empowered to call 'em like they see 'em. The only prescription is to recognize and acknowledge the inimical effects of game artifacts. To some extent they may be avoided through rigorous gaming system design, but shared situational awareness gaming is so new and so complicated, that more of this is bound to occur. Honest analysis and reporting is the only defense.

Network gaming has not really gotten off the ground except in the most tangential manner associated with large field experiments

Appendix 2: Stephen Downes-Martin's list of pathologies

Explanation

Prof. Rubel's essay kicked off a discussion among several people, starting with Stephen Downes-Martin of the NWC, who took Prof. Rubel's original five pathologies and expanded them four-fold. These were discussed further during working meetings for the UNIFIED COURSE 04 wargame at the Naval War College, where Mike Martin was added to the discussions. From those conversations, the following list was developed from Prof. Downes-Martin's original.

Pathologies

Pathologies of Purpose

Not a game
No clear objectives
Wargame/objectives mismatch: clearly stated objectives with no connection to game
Impossible or inappropriate objectives

Pathologies of Politics

Pre-ordained outcome
Cultural and political risk aversion
Player attitude problems
Not fit pre-conceived notions
Unqualified players

Pathologies of Design

Distraction/mismatch between objectives and mechanics
Players not familiar with gamed concept/equipment
Ignoring political consequences (end state)
Ignoring political limitations (beginning state)

Pathologies of Assessment

Inappropriate simplifications
Undocumented controller hand-waving

Pathologies of Analysis

"Declaring victory" as analysis ("game validated the concept")
Rejection of inconvenient analytical conclusions
Sponsor impatience ("quick look" becomes only look)
BOGSAT as analysis
Analysis without player data (no meaningful hot-wash)


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