

## **DRAFT**

### **Data Collection for Analysis**

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#### Introduction

Perla defines the seven elements of a wargame as “Objectives, Scenario, Data, Models, Rules, Players, and, for professional games, Analysis.” What Perla calls a ‘hobby game’ typically does not have any analysis element connected with the finished product. That said, we argue that a professional game is not simply a hobby game with ‘Analysis’ added in as an afterthought, but rather that a professional game must be designed around the means to collect the data required for the analysis.

For a professional game, the sponsor’s objectives and issues drive the game design. The analysis requirements are simply a translation of the sponsor’s objectives and issues into the information that must be collected to answer those objectives and issues. Thus the design of the other six elements needed for the game are driven by the analysis requirements. In short, for a professional game, the analysis requirements dictate the game’s design and conduct.

#### Study Team

One of the keys to a successful professional game is consider it to be a component of a larger study framework, which is intended to address the sponsor’s objectives, be they related to problem solving or decision making. This permits the analysts to pursue avenues to address the sponsor’s objective, even when they are not associated with any game. However, once the study is oriented to conduct gaming, the inclusion of analysts is critical to every phase, from the planning through the design, development, and conduct of the game. Too often, games are designed by non-analysts, and the analysts are “invited” to analyze a game that has been already designed and developed. Not building your analysis into the game design is a recipe for disaster, but is one that continues to be replicated throughout DoD. One recommendation is that the study team consist of a (game) design sub-team and an analysis sub-team, but both must be included in all game activities. Clearly, the game must be designed around the analysis requirements, so these two sub-teams must coordinate closely.

#### Types of Games

Games may be classified in several respects. In granularity they may range from strategic to tactical. They may address only decisions made by players within the game. Or they may address many aspects where the game is a driver for related activities, e.g., the human interactions of a command team or a command team’s use of new technology in their command and control support systems. The structure of a game may be intended to foster seminar interactions between participants (a seminar game). Or games may be to examine how some activity is or should be done or done better, e.g., logistics, information operations, or targeting. They may examine a particular activity from different points of view or identify issues that can be included in subsequent analysis or in future exercises.

Games may be supported with computer-based models or simulations. Or they may be austere and rely on little more than maps and movable unit counters. The chosen forms of support should accommodate the chosen form of analysis, and, when applicable, extract related data, e.g., casualty counts from combat simulations.

With such variety, there is no one analysis approach that will be universally applicable. This section provides a “catalogue” of methods and tools from which analysts can choose those that may apply in a specific circumstance.

The recommended procedure is to focus first on the sponsor’s objectives and the issues that surround them. War gaming may be chosen at this point as an analytical tool, or not. If it is chosen, then the analysis components should be addressed from the beginning of the study.

### Planning for Analysis

Professional games require analysis, and an analysis plan defines the requirements for analysis. There is no one-size-fits-all prescriptive analysis plan, but an analysis plan should, include as a minimum, what the sponsor’s objectives and issues are that need to be addressed, what data needs to be collected in order to adequately address them, and when that data is expected to be generated in the game.

“When” may sound unusual, but a game’s design is focused on collection of the necessary data, so it is reasonable to expect that a certain item of data will be generated when players are forced to make specific decisions.

A specified data collection methodology includes the various tools and means that will be used to collect the required data. This methodology has as its focus the Data Collection and Management Plan. This is the roadmap that the analysis team lays out that specifies the data that must be collected in order to produce the required analysis.

Most analysis of games depends on solid planning so appropriate diagnostics can be applied after the conclusion of the games: “Something interesting happened back at that point... but why?” The better organized in advance the analysis sub-team is for applying subsequent diagnostics the better. Hence it is recommended that considerable effort be devoted to planning data collection and the follow-on analysis, so such diagnostics are relatively easy to implement. Progression through a game however can be very dynamic: after all, the idea is to have decisions of the player-participants influence the outcomes. Thus the analysis plan should not be (and cannot be) applied rigidly, but must be highly adaptable as events unfold.

From initiation of the study, the analysis team should document the constraints, limitations, and assumptions that apply, see [TRAC CLA COBP]. These will affect the outcomes almost as much as player decisions, so a complete record should be maintained.

The analysts must anticipate the support they will need as the game is designed. Some of the obvious points are adjustments to the scenario and ensuring the schedule allows time for analysis tasks and the game design provides the opportunity for data to be collected. But there are many other aspects of support. For a larger game the analyst team may need a separate network for real-time collaborations, e.g., emailing, messaging, blogging, tele-conferencing. If on-line surveys are part of the data collection, then all concerned need to have access to the larger network, and appropriate software may be needed to distribute, collect, and analyze appropriate forms.

The actual data may be a combination of qualitative and quantitative components. The qualitative components may come from interviews, questionnaires, structured brainstorming, opinion surveys, or the ranking of options according to participant judgement. Quantitative components may include some form of scoring game results (e.g., in war games the casualty counts may be an important factor), and may be provided by the use of computer-based M&S.

### Preparing for Data Collection

The analysis sub-team will consist of, as a minimum a Study director, a Facilitator, and a Scribe. Larger games will include a larger cast: adjudicators and assessors, subject matter experts and specialist panels, observers and data collectors, computer support, others. In the smallest professional games, there may be only two individuals: during game play, there should be a facilitator and a scribe at the least. (The study director may take on one of these two roles during gaming.)

The facilitator interacts with the player-participants and the scribe records activity. Trying to combine both functions may mean that neither is done well. Also the facilitator should not be the study director, unless the game is of very limited scope. In a game of any size, the study director is generally in demand for other tasks once the game is under way; whereas a full-time facilitator should not be distracted from the main task of guiding the player-participants through the scenario.

For games that are larger in scope, the analysis sub-team may be considerably enlarged.

### Producing a Data Collection and Management Plan

The Data Collection and Management Plan (DCMP) is the lynchpin of the professional game. Details on developing a DCMP can be found in [ABCA 2004]. The DCMP provides the means to translate the sponsor's objectives and issues into the data that the game is designed to produce. A common convention that is used by analysts begins by taking the objectives and issues and decomposing them into "Essential Elements of Analysis" or EEAs. Again, there is no strict method for doing so. Each issue may produce an EEA, or an issue may be broken apart into several sub-issues before cogent EEAs can be identified. EEAs are typically stated as a question, such as "What were the key pieces of information that led player X to decide to employ nuclear weapons?" or "How lethal are the three blue tank alternatives?"

### Collecting Data

We talk about data collection here in terms of how it provides the information required for the analysis to be completed, however this should not be confused with the element "Data" from Perla's seven elements. Perla's "Data," or more accurately "Data Base" refers to the information players may use to help them make a decision. In some instances, data needed for analysis may also be used to update or add to the Data Base by providing the players feedback, but it is important to realize the distinction.

In most cases, analysis data must be collected as the game unfolds. However there is also a component of data that may be required within the game to determine certain outcomes. If computer-based M&S are used to support the game, analysts have traditionally been responsible for the preparation and running of the M&S as well as analysis and/or interpretation of the M&S output.

It may also be necessary to collect data during the course of a professional game partly to be used for analysis, but also to provide feedback to players during the course of a game. Some gaming facilities may provide this in the form of video replay of player interactions, or where computer simulations are used in support, the computer may provide a replay with a moving map and symbols. Since gaming often focuses on human decisions, it seems only natural to provide the players with feedback that gives them a better understanding of their impact on game results.