

## 5.11 Analog Design for Digital Deployment of a Serious Leadership Game

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**Abstract** This paper presents the design, development, and user testing of a leadership development simulation. The authors share lessons learned from using a design process for a board game to allow for quick and inexpensive revision cycles during the development of a serious leadership development game. The goal of this leadership simulation is to accelerate the development of leadership capacity in high-potential mid-level managers (GS-15 level) in a federal government agency. Simulation design included a mixed-method needs analysis, using both quantitative and qualitative approaches to determine organizational leadership needs. Eight design iterations were conducted, including three user testing phases. Three re-design iterations followed initial development, enabling game testing as part of comprehensive instructional events. Subsequent design, development and testing processes targeted digital application to a computer- and tablet-based environment. Recommendations include pros and cons of development and learner testing of an initial analog simulation prior to full digital simulation development.

#### 1.0 INTRODUCTION

This paper describes development of a serious leadership game – first as a board game, then as a digital game – and presents lessons learned as to how the “analog first” approach can be an efficient and effective game design methodology.

The Leadership Challenge Simulation (LCS) is a game-based learning experience that helps players to develop their leadership capacity. In the game, players compete within and between teams to acquire effective leadership capabilities and to perform in a series of leadership challenges. Game facilitators guide players through the experience, leading discussions and debriefs focused on understanding the nature of leadership, the difficulty of developing leadership, and the application of lessons learned in the game to real-world situations.

The LCS was first developed as a facilitated board game, which was used as a test environment for later development of a digital game. The board game was piloted and delivered in the initial organization and was then adapted for delivery in different organizations. Evaluation of the analog game experiences informed game revision, which had the benefits of being relatively inexpensive and requiring no hardware, software, or network access. Once game mechanics and facilitation protocol were established, game designers, software developers, and instructional designers worked together to understand the steps to translate the game experience to a digital format, retain the most valuable elements of the board game, and make changes to adapt to a digital game experience.

This paper is presented in three parts. First, we describe the design and development of the initial board game, including how organizational data were analyzed to create a game experience that met precise learning objectives. Second, we describe

how the board game was evaluated and the lessons learned that are relevant to analog as well as digital environments. Third, we describe the process for turning the board game into a digital game, primarily by presenting and explaining the steps taken that can be replicated by others.

The intended benefit of this paper is to provide lessons learned regarding the use of an “analog first” method to designing digital games. These lessons include how to design an analog leadership development game, how to evaluate its design and effectiveness, and how to use an analog design and its evaluation in preparation to create an effective digital game for leadership development.

## **2.0 CLIENT NEEDS AND OBJECTIVES: OVERALL PURPOSE**

### **2.1 Organizational needs analysis**

The LCS was first conceived as a proactive way to address identified future challenges in organizational leadership in one specific organization. The organization, referred to in this paper as “FerroTech,” faced age-related demographic risks. Specifically, about two-thirds of their workforce was eligible for retirement within the coming five years. Many of these retirements would come from the leadership ranks of the organization. The organization had identified thousands of high-potential future leaders to fill their ranks, through performance appraisal data and manager ratings on readiness for promotion. However, many of these candidates with high potential were rated as lacking the leadership skills that were essential at higher levels of leadership, suggesting a future cadre of leaders with potential, but not enough leadership skill to perform as the organization would need.



**Figure 2.1. Analog Game Testing**

## **3.0 GAME**

### **3.1 The Case for a Game for Leadership Development**

We incorporated the application of a “serious game” to the problem of rapidly training candidates with high potential in the various aspects of leadership that they will be expected to display. By engaging candidates in interesting and active media, FerroTech has its best opportunity to increase the awareness, understanding, and retention of these various leadership qualities.

Games used to simulate real-world dilemmas fall into a class of gaming known as “Serious Games.” These dilemmas may range from governance and stability issues to terrorism to developing leadership capabilities. Serious games are an interactive, highly customized, and attractive means of transmitting content to a broad audience. In particular, they are a powerful medium for simulating situations and posing questions that a person would not normally encounter. They can also foster competition, which can also act as a spark for social interaction. In this manner students become fully immersed in the experience and engage as co-creators of the learning experience, in contrast to

traditional, presentation-heavy learning techniques that lose the attention of students and fail to deliver lasting impact [1].

Many of the reasons to use an experiential-based game as the primary training medium lie in adult learning theory. The research into adult learning is quite clear that adults learn differently than what is supported by a presentation/lecture-only university model [2]. Adults need to understand why they should learn. They are motivated to learn as they experience needs and interests that learning will satisfy. Adults need to be able to understand the value in doing what they are being asked to do. They also have a strong need to be self-directed. They know what they want to learn and want to do with newfound knowledge.

The orientation of adult learning is life-centered, such that they learn best when they understand how the content of the learning event will fit with their life experiences. Immersive experiences are thus the richest resource for adult learning; they provide experiences in which adults create their own interpretations and attach their own meaning to events tied directly to the learning objectives.

Feedback is a second critical element of adult learning that is central to serious games. Immersion in an experience alone does not guarantee learning. Adults learn by sharing their experiences and engaging with various perspectives to produce richer interpretations of experience. By understanding the experience of fellow students on a particular issue, adults can place themselves into situations they have not yet experienced. Effective serious games drive precisely this combination of new first-hand experiences with rich feedback to draw out valuable lessons and connect them to their own life experience.

### **3.2 How to Design a Board Game for Leadership Development**

At the base level, the design of a board game is arguably the most critical aspect in the development of a program to cultivate leadership qualities. A properly designed game will identify proper issues, analyze the best way to present them to the user, and provide quantifiable results so that the objectives of the program may be met.

The first step in quality game design identifies the objective. In the case of FerroTech, we understand that the purpose of this game must be to rapidly bring high-potential candidates to a level where they can acquire leadership skills necessary to succeed at the next level within their organization. The second step is to identify the issues that need to be addressed. This includes understanding the competencies and qualities that successful leaders have at FerroTech, as well as how they developed them. Based on a solid understanding of these leadership qualities, game designers can then work to postulate the desired output, which is the specific way to demonstrate successful results to the client.

Once a good foundation has been established in understanding the purpose of the game and the issues to be addressed, game designers can focus more on the game itself. This will include developing the game scenario and the game environment. Next, developing the game structure will allow designers to identify the equities to be addressed, while also incorporating creative tension in the game. This is essentially the quality of game design that keeps participants interested in the game. After this has been developed, the designer may identify the timing of the game and the moves to best address the objectives, after which he may actually prepare game materials and models.

The entire game design process comes down to developing something that correctly addresses the topic of interest, while also

**Table 3.2. “Analog First” Process Phases**

|    | Phase   | Lessons Learned  |
|----|---|--|
| 1. | Identify the Objective                        | It is important that the analog game being developed will fulfill the needs of the client. The objective of the LCS was to rapidly bring high-potential candidates to a level where they can acquire leadership skills necessary to succeed at the next level within their organization. |
| 2. | Identify Issues to Address                    | With the objective in mind, this phase requires analog game designers to figure out the key elements involved in accomplishing the client's mission. The LCS sought to understand the competencies and qualities that successful leaders at FerroTech have and how these were developed. |
| 3. | Develop Analog Game Scenario and Environment  | Once key elements and the objective are known, it is the job of the analog game designers to come up with interesting and enjoyable ways for these elements to interact in an analog game.   |
| 4. | Develop Analog Game Structure                 | Deciding what and where to place elements on the analog game board as well as creating intuitive interactions with game pieces will require careful thought during this phase.   |
| 5. | Design Iterations with “After-Action Reports” | This phase involves working with the client to make sure that the analog game is on par with the client's expectations. Collecting valuable feedback will allow game designers to return to the phases above to revise design decisions.   |

keeping players interested. In order to make players aware of the leadership qualities that they should be developing, it is essential for game designers to prepare an “after-action report” to identify the results of the game and next steps for game facilitators and FerroTech training administrators.

### **3.3 Facilitation Design to Maximize Learning**

Just as the research shows that sharing experiences is not enough, the research points to the role of the “faculty” in an adult learning environment. The evolving roles are modeling (in which the master demonstrates behavior), coaching (in which the learner does the complex task with the master observing), and fading (where the master only gives help when needed) [3].

The LCS makes use of a facilitator in each of these three capacities to maximize the benefit to the game participants.

Design and facilitation of the LCS includes an additional focus on experiential variety as well as feedforward (not only feedback) in order to develop adaptive leadership capacity. Facilitators guide learners in adaptive leadership behaviors, specifically metacognition and self-regulation, to help learners practice and refine skills necessary to overcome the variety of challenges in the game. This approach is grounded in recent research in leader adaptability and responds to a call for greater attention to adaptive versus routine expertise in training and development [4].

## 4.0 GAME EVALUATION

Before moving the LCS into the digital space, a few design concerns were raised involving the abilities and disabilities that digital games have compared to analog games. This section describes these concerns.

### 4.1 What a Digital Game Can Do

Bringing an analog board game to the digital stage opens up design opportunities and game enhancements that are not easily feasible for analog games. Consider the fact that analog board game designers are limited by the amount of physical board space that is available to them. For example, an analog designer may be restricted to keeping a board to the size of a standard dinner table. This is not the case for a digital version of the same game. With a well-planned graphical user interface (GUI), digital designers are able to present much more information on a single computer screen than a dinner table-sized physical board [5]. On the LCS board, a chart that describes pre-defined development behaviors for a number of required tasks takes up much of the physical board space. During the analog design of the game, the placement of this chart was under scrutiny and the number of possible development behaviors was limited. For a digital design of the LCS, there is no longer a board space dilemma. With the ability to page and scroll data on a computer screen, the digital re-design of the LCS for organizations other than FerroTech that may identify many more development behaviors, would not run into a game-changing decision when it comes to physical board space.

As another consideration, the ability to have a board and pieces on a board appear differently to each player is a considerable challenge for a physical, analog board game. This effect can be achieved in a variety of manners on a physical board although the methods seem a bit haphazard

when compared to the style in which it would be implemented in a digital version of the same game. In a digital version, each player can be given an individual device in which a centralized server would manage the visualizations that each player is able to see on their device's screen. This implementation allows digital game designers to easily comply with fog of war rules, such as allowing players to see only up to three spaces beyond their current position on the board, or not allowing players to see opposing player's pawns or resources. During the analog design of the LCS, there was a question of how many tasks would be visible to users on the development behaviors to tasks chart mentioned above. Analog designers considered covering up the tasks that were not available to users in the current stage of the game as a fog of war technique. This feature would have been easily implementable in the analog version by covering up columns on the development behavior to tasks chart, although this would have led to further intervention by game mediators, and another dynamic component to an analog game that many users had already perceived as "complicated." In a digital version of the game, this feature can be implemented in a similar manner, by covering up columns on the development behaviors to task chart, although this would be mediated automatically by a central server. A digital design also offers distinct opportunities to reward players for good performance. For instance, players that are first to circle the board can be given the ability to view additional columns on the development behaviors to task chart, or the ability to see further than the fog of war limit.

Further enhancements that a digital game allows that are not easily implemented in analog games include the ability to display real-time probabilities and statistics as well as post-game analysis results of a game. In a digital version of the LCS, before players roll dice, they may be presented with the probabilities of landing on a tasking board space as well as the probabilities that they

will land on a tasking space if they choose to trade in for more dice as a decision aid. Furthermore, a digital version of the game can easily allow the events of a game to be tracked and stored as a linear series. This allows the ability to display real-time and post-game statistics and also allows game moves to be undone easily during a game or replayed during a post-game analysis.

## 4.2 What a Digital Game Cannot Do

Although a digital version of a game may provide various enhancements to an analog game, there are a number of characteristics that a digital game cannot simulate as well as an analog version of a game such as the LCS. For one, players may wish to communicate and interact with one another to discuss game strategy or to ask for advice, and doing so in a digital environment may not seem as natural to them. Much study has gone into assessing the manners and abilities in which individuals communicate in virtual environments as opposed to physical environments [6]. These studies have shown that certain virtual environments are able to reproduce many communication aspects that are present in physical environments although there are characteristics of physical environments that are difficult to reproduce in a digital environment. For example, individuals rely heavily on body language and gestures in physical communication. Digital environments that attempt to display or recreate these gestures often require plenty of costly network bandwidth in order to display a live video feed or a physically mapped avatar.

Another advantage that an analog version of a game such as the LCS has over a digital version of the game is the fact that these analog games are often times designed to be facilitated by mediators. These mediators are typically experts in the simulation field and are trained to mentor and coach players throughout the course of a game. A digital version of the LCS would

likely mitigate much of the interaction that players would have with mediators, which may reduce the ability for players to absorb many of the messages that the game is designed to engrain in its players.

The vigorous involvement that players experience as part of an analog board game plays a key role in a player's understanding of a game, its rules, and any learning points that a game is designed to teach players. For instance, in the LCS, if a player wishes to develop a leadership behavior, they must pay one resource into a resource well. The act of physically taking a resource chip and placing it in the resource well better reinforces the concept that it costs to develop a leadership behavior, as opposed to a computer application taking care of this step automatically.

## 5.0 DIGITIZATION PROCESS AND NEXT STEPS

After assessing the possible enhancements as well as the limitations of a digital version of the LCS described above, we started developing a digitization process. To start the process, we needed to describe the game as a state machine in which players can perform actions to modify the state of a game. To do this, we divided the LCS into its basic components and described each in a generic sense. We were able to describe the analog board as a set of nodes and edges in a directed graph. The characteristics of game pieces were then described, including all pawns, chips, and dice. Finally, we decided on the set of actions that players make during the course of a game. Describing the game, in detail, in this generic way allows a software development team to begin implementing the game logic.

The next step to full digitization would be to take these components and create a digital model of the initial state of components that can be stored and read from a data store. After accomplishing this step, a digital

development team could work in parallel to describe the rules as results of the identified actions that players may take, as well as take the digital information and graphically present this to a user.

## 6.0 CONCLUSION

After the digitization process, we came to realize that the “analog first” methodology was a very effective way of developing a well-planned leadership development game that players will eventually be able to play in a digital environment. Table 6.1 below describes the “analog first” process phases and the key lessons learned for each phase.

After a playable analog game has been developed and incrementally tested for consistency with the client’s objectives, addresses key issues important to the client, and is enjoyable to play, the game is ready for the digitization process. The digitization process includes describing the analog game in its most basic components, followed by identifying the set of actions that players make during the course of the game. After an analog game has been fully digitized, further enhancements to the game may be incrementally built in to a digital version.

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