THE MAROON-WHITE GAME: A SIMULATION OF TRUST AND LONG-TERM GAINS AND LOSSES

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ABSTRACT

This paper explains how to play and facilitate the Maroon-White Game—a modified version of the Red-Black Game—which, like its predecessor, uses point maximization to motivate team performance. The Red-Black Game was designed to demonstrate to players the advantages of systems thinking, as opposed to sub-optimization, during a live playing of the game. Although effective in illustrating the greater mathematic gains incurred from systems thinking to a community-at-large, the simulation might be criticized in that obtaining a larger group gain appears to require individual diminishment—a practice that may not be as easily embraced in capitalistic societies or in societies that cherish individualism over collectivism.

The Maroon-White Game is based on rules from the Red-Black Game, and is designed to help participants recognize two main concepts relating to sub-optimization: (1) our natural tendency, generally speaking, to sub-optimize in a competitive group setting; and (2) the effects of sub-optimization on relational sustainability and long-term gains and losses. Examining results from multiple playings of the Maroon-White Game illustrates the impact of trust—both earned and broken—on total point-based gains and losses returned not only to the community-at-large, but also to individuals, over time.

KEYWORDS

Trust, collaboration, commitment, integrated form of agreement, game theory, problem-based learning, simulation.

INTRODUCTION

Trainers and educators use games and simulations in an effort to teach new concepts and encourage new ways of thinking within their respective organizations (Crookall 1995). Research has shown that this kind of "active learning" is not only generally preferred by the student, but is also more effective at promoting development of critical thinking skills (Bonwell and Eison 1991; Chickering et al. 1987; Gosen and Washbush 2004). Games and simulations introduce a problem to provide an opportunity for the student to learn based on a *need* for information, where alternatively one might be prone to ignore or dismiss the information being shared (Brown and Duguid 2002). Additionally, research suggests that gaming and simulations are particularly useful for learning regarding social interactions and

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complicated, multi-person problems with conflicting objectives (Duke and Geurts 2004). This makes games and simulations a valuable vehicle for training and teaching in the construction industry, particularly as it relates to Lean Construction.

Games and simulations fall under the umbrella of a pedagogy known as "Problem-Based Learning" (PBL). PBL focuses on "providing an experience that gives participants a sense that they are engaging in a real problem; learning then becomes a natural by-product of their engagement in and motivation to solve the problem" (Badurdeen et al. 2010, pg. 466). Badurdeen suggests that PBL is a particularly effective method for teaching and learning the concepts promoted by lean manufacturing theory "because it accords with lean's emphasis on teams and on a culture of problem solving, on learning what to pay attention to, on the value of failure, and on the importance of learning in human development" (Badurdeen et al. 2010, pg. 466). Other research has also shown that the continued propagation of lean theory, especially as it relates to the construction industry, has benefited greatly from various games and simulations (Alarcon and Ashley 1999; Nassar 2002; Rybkowski et al. 2012; Tommelein et al. 1999; van der Zee and Slomp 2005). One reason that PBL techniques have proven so effective in teaching lean principles is the set of challenges that lean construction proponents generally face in sharing their information. Someone who is attempting to teach lean construction must typically overcome scepticism and the students' experience in traditional approaches in order to effectively convey the lean message. To do this, the facilitator must be able introduce a common industry problem, and use the process of solving of that problem to create an experience and an environment where students can imagine and understand not only why lean philosophy is relevant and important, but also *how* it can be applied to their individual contexts (Dukovska-Popovska et al. 2008).

The purpose of this paper is to introduce the Maroon-White Game—a simulation designed to help students recognize how natural competitive tendencies can often result in sub-optimization and long-term losses (Smith and Rybkowski 2012). There is a similar game that has been used in lean training entitled "Win As Much as You Can" (Kirgis 2012), but we have found that the complexity of the game has prevented participants from understanding the key learning objectives. The Maroon-White Game is a simple, alternative version that seems to effectively teach the same concepts. Additionally, this paper will demonstrate how to facilitate the game along with highlighting key learning objectives necessary for successful lean implementation.

SETTING THE THEORETICAL STAGE FOR THE GAME

The Maroon-White Game emphasizes the impact of trust—both earned and broken—on total point-based gains and losses returned not only to the community-at-large, but also to individuals, over time. The game and its facilitation are supported by theory and research from three primary areas: lean construction, PBL, and game theory.

LEAN THEORY – HARD VS SOFT SKILLS

The Maroon-White Game was developed in response to a perceived need to teach soft skills to those wishing to learn about lean construction. It appears there are numerous methods available for teaching the "hard skills" involved in lean construction, but less support for the equally necessary "soft skills." This perception was confirmed in the

literature. Badurdeen et al. (2010) determined that commonly practiced games and simulations for teaching lean theory were heavily weighted towards production line principles such as cell design and layout, line balancing, pull production and one-piece flow, kanban, value stream mapping, visual control, etc. (Rybkowski et al. 2011; Rybkowski et al. 2012; Sacks et al., 2007; Verma 2003). Only a few examples of games or simulations attempting to educate the participant on the social/cultural aspects of the process were found in a literature review. Badurdeen et al. suggested that to more effectively teach lean theory, new simulations are needed to help participants develop the soft skills required to implement lean successfully.

Additional theoretical support for the importance of soft skills in lean training is confirmed by a focused review of Liker's "4 P Model of the Toyota Way" (Figure 1) (Liker 2004, pg. 6). Soft skills are clearly evident in three of the four P's shown in the model, and could arguably be included in the fourth. Of particular note is the base or foundation of the pyramid: "Philosophy—Long-Term Thinking." The Maroon-White Game aims to help participants grasp not only the value of long-term thinking, but also how easily we revert to short-term thinking especially when placed in a competitive situation.

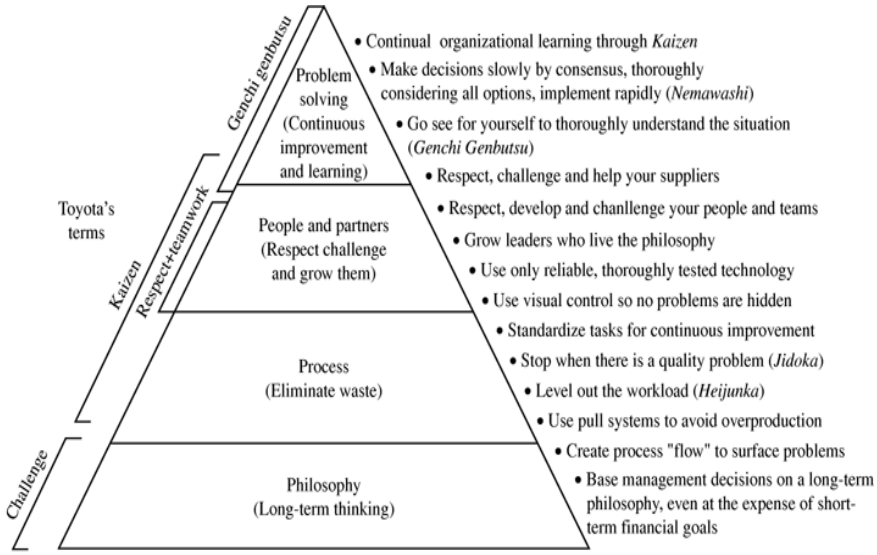

Figure 1: The 4P Model of the Toyota Way. Reprinted from Liker (2004).

It is evident in Figure 1 that in order for the hard skills and processes advocated by lean theory to be as effective as possible, they must be built on soft skills such as understanding and internalizing the philosophy and culture exemplified by Toyota. Liker suggests that leaders and teams must not only understand the work, but live the philosophy and be capable of teaching it to others. This involves other arguably soft skills and concepts that are spread throughout the text of the Toyota Way such as trust, respect, and continuous learning.

PROBLEM-BASED LEARNING THEORY

From a pedagogical perspective, the Maroon-White Game follows PBL theory. Barrows (2006) identified six characteristics of PBL:

1. Learning is Student-Centered

2. Learning Occurs in Small Student Groups
3. Teachers Are Facilitators or Guides
4. Problems Form the Organizing Focus and Stimulus for Learning
5. Problems Are a Vehicle for the Development of Clinical Problem-Solving Skills
6. New Information is Acquired Through Self-Directed Learning

Badurdeen et al. (2010) suggested that when these six characteristics are present in a learning environment the skills needed for problem solving are learned through direct experience and students are also able learn about themselves and each other. Also worth highlighting from the list of PBL characteristics is the necessary role of the facilitator in the process. In order for the learning objectives of the Maroon-White Game to be met, the facilitator must effectively enable students to come to their own conclusions and solutions. This requires a change from the traditional teacher-student educational structure and has shown to be an effective way to approach lean simulations in general (Badurdeen et al. 2010). In many lean simulations, the role of the teacher becomes focused on guiding the student through the learning process, allowing them to learn from their mistakes and successes. Students become actively engaged in the learning process because they are responsible for making decisions relating to the problem at hand. In this model, students are encouraged to go with their initial impulse to solve the problem which results in immediate feedback and self-directed changes to the approach based on the new information.

GAME THEORY – A PRISONER'S DILEMMA

The Maroon-White Game is a three-group non-zero sum game. A non-zero sum game describes a situation where one team scoring points does not *necessarily* mean that fewer points are available for the other teams (Von Neumann and Morgenstern 2007). This type of game is commonly used in situations where cooperation between teams is a possibility. Within the context of game theory, The Maroon-White Game falls under the broad characterization of a *prisoner's dilemma*. A prisoner's dilemma explores the conflict between social incentives to compete versus those encouraging cooperation (Holt and Capra 2000). Many researchers have tested and built upon the initial work of the RAND Corporation and John von Neumann in relation to game theory (Von Neumann and Morgenstern 2007). Most of these experiments have shown that generally speaking, when given the option to cooperate with another party or look out for their own best interests, barring additional incentives, the selection of a cooperative move is unlikely (Axelrod 1981; James Jr 2002; Smale 1980). This tendency was confirmed during our various playings of the Maroon-White Game.

PLAYING THE MAROON-WHITE GAME

GAME DESCRIPTION

The Maroon-White Game is derived from the Red-Black Game found on the College of St. Benedict website (CSB-SJU 2012). The objective of the game is to help participants develop an intuitive understanding of fundamental lean principles and soft skills such as trust, respect, and optimization of project over individual parts.

Common takeaways include a better understanding of: (1) our natural tendency, generally speaking, to sub-optimize in a competitive group setting; and (2) the effects of sub-optimization on trust, relational sustainability, and long-term gains and losses.

The game is played as follows:

1. *Write the following score chart (Table 1) on a chalkboard, flip chart, or dry-erase board for everyone to see (M = Maroon, W = White):*

Table 1: Maroon-White Game Scoring Chart

Team Choice	Point Distribution		
M – M – M	50	50	50
W – M – M	100	0	0
W – W – W	0	0	0
(all other combinations)			

2. *Divide the group into three teams*:
   Each team should consist of a similar number of players. There is no maximum number of players but we have found that 3-5 per team provides for ideal participant involvement and overall better results. Each team should be allocated its own space to allow for private deliberations. This can be accomplished by having different rooms for each team, or by simply dividing the room so that each can have a discussion separate from the other teams.
3. *Explain the following guidelines for the game:*
   a. Clearly and aloud, state the following: "The goal of the game is to score as many points as possible" (this direction to participants should be stated frequently throughout the game).
   b. For each round, each team picks a color, either maroon or white, and then reports to the facilitator their selection when asked.
   c. Scores are then distributed to each team based on the point distribution included above.
4. *The facilitator can manipulate the game if desired by adjusting or introducing any of the following aspects of the game:*
   a. Order of decision reporting by the teams.
   b. Whether a team can change its choice during reporting.
   c. Number of rounds, although 4-7 is recommended (the facilitator can also decide whether or not to let participants know from the start of the game how many rounds they will be playing).
   d. Level of interaction between the teams (i.e., pick a representative from each team to negotiate with the other team representatives). Allowing the teams to try to come up with ways to structure the reporting or the negotiating can also provide valuable insight.
5. *Reflections between rounds:*
   a. Literature suggests that students may learn better when they are given the chance to choose improvement methods for the next round as opposed to being told what to do (Dukovska-Popovska et al. 2008). The list of adjustments included in step 4 are potential options.

6. *Keep score following each round on the white board/flip chart as shown in Table 2, basing tabulations on the score chart shown in Table 1.*

Table 2: Sample Scoring Table

	Team 1 Color Choice	Points	Team 2 Color Choice	Points	Team 3 Color Choice	Points
Round 1						
Round 2						
Round 3						
Round n						
TOTAL						

7. *Reflections, discussion and analysis of results:*
   Following the game, time should be taken by the facilitator to allow students to reflect on and process their experience. The following guiding questions and potential responses can be used to engage participants in discussion:
   a. The goal of the game was to score as many points as possible. How would we have scored as many points as possible?
      - Everyone pick Maroon every time (150 points a round)
   b. What can we learn from this game?
      - Optimal solutions often require long-term perspectives and rely on consistent, sustainable choices.
   c. What could we have done to reach the optimal solution [earlier]?
      - Early negotiation
      - Change of mind-set
   d. Once one team chooses white, how is the game affected?
      - Distrust and betrayal is introduced
      - Other teams seek opportunities to return the negative treatment
   e. How can this be applied to the construction industry?
      - We need to step out of the silos our industry has built in order to optimize projects and sustain long-term relationships

TYPICAL RESULTS

The Maroon-White Game has been conducted in a variety of settings with only minor variations in the outcomes. As the game has not been documented sufficient times to merit statistical significance, this paper includes results from a few actual playings that are representative of generally observed results to date. These results are included to show how the game is capable of teaching some of the soft skills critical to lean implementation. It is interesting to note that the game has been conducted with a wide range of participants including students from various different

departments, professionals from different fields with varying degrees of experience and groups with varying levels of previous interactions. Results have been surprisingly consistent regardless of the makeup of the groups. However, to date, the game has *not* been played in countries other than the United States, or exclusively with other cultures that we are aware of. It is possible that a different culture's orientation towards cooperation and competition would alter the results significantly. Figures 2 and 3 show examples of actual results:

Figure 2: Typical Results: Consequence of Choosing White

Typical results like those shown in Figure 2 include the following notable characteristics:

1. When placed in teams, participants naturally seem to be driven by competition.
2. When given the opportunity, teams will often choose to sub-optimize at the expense of the other teams and the explicitly expressed goal of the game to "score as many points as possible." In other words, teams will choose white when given the opportunity to maximize their own points for a given round, without regard for the potential impact on future rounds.
3. Consequently, the other two teams will refuse to place themselves in a situation where they might be taken advantage of again (see Bohnet and Zeckhauser 2004 for relevant additional analysis of betrayal), ultimately reaching the point where all three teams select white every time and will even state their intentions of doing so indefinitely. In game theory, this is known as the Nash Equilibrium (Nash 1951).
4. Unwillingness to cooperate from the other two teams ultimately prevents the team that chose white from scoring *any* additional points long-term. So while they may have scored 100 points once or twice, their total possible earnings over the long-term would have been substantially higher had each team been willing to cooperate.
5. While it may seem that on the surface Team 1 was the "winner" of the game, Team 1 could have actually scored twice as many points as they did had each team cooperated. This analysis helps participants move beyond the fear of the seemingly socialistic approach to choosing maroon every time. What we see is that due to the seemingly inevitable reactions of the other teams to one team choosing white, the *only* sustainable choice that will produce long-term gains for the *individual* team is maroon.

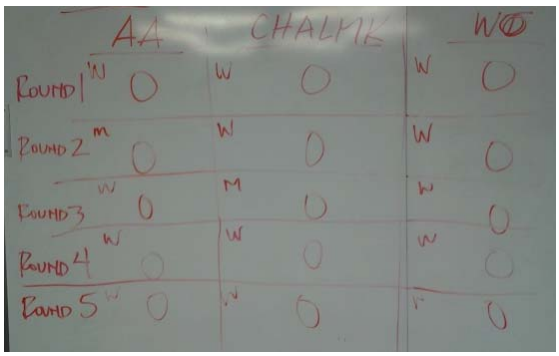

Figure 3: Typical Results: Inability to Cooperate

Typical results like those shown in Figure 3 have included the following additional notable characteristics:

1. When given the opportunity to reflect and discuss between rounds, teams will often suggest alternative ways to play the game in order to score additional points. This often includes ideas such as having team representatives write down their color choices and submitting them to the facilitator, or having representatives from each team negotiate with one another and make commitments prior to reporting. Interestingly, despite these efforts, long-term results do not generally improve.
2. Inability to trust other teams prevents potential gains.

REAL-WORLD APPLICATION

While this game is admittedly not designed to be an exact simulation of construction project delivery or any of its specific processes, it *does* showcase actions and decision types that industry participants have likely either suffered from or been party to. Being betrayed by other teams in the game conjures familiar emotions to those many practitioners have experienced in the field. How that experience impacts future decisions and effectively limits our potential gains is also clear. Students and practitioners alike have been able to make the conceptual jump from the game to industry application without the need for coaching.

What the game does very effectively is help participants recognize how natural the tendency to sub-optimize is when placed in a competitive situation. It provides an opportunity for participants to analyze their decisions based on the simple concept of whether they are figuratively choosing maroon or white. Decisions that fall into this category are made most every day by those in the industry. For example, the decision of when to pay subcontractors, how to charge for a change order, or how to interact with an architect over design discrepancies can readily be viewed through the lens of this game.

Perhaps the most important lesson for industry from this game involves the recognition of how the sustainability of our business relationships depends on our ability to make decisions based on a broader perspective than one individual job. This in turn impacts our ability to continue to benefit from the relationships that we have built, whether with owners, architects, engineers, subcontractors, suppliers, or any other industry players. It would seem that our natural tendency, and in some cases even our accounting policies encourage us to approach projects and interactions

as "one-offs." However, this game reminds us that sub-optimizing, especially as it relates to relationships, is ultimately unsustainable.

CONCLUSION

This paper supports the principle that successful lean implementation requires both hard and soft skills. We have discussed how games and simulations are an effective way to teach lean concepts but how our current body of knowledge is lacking in ways to teach the soft skills. The Maroon-White Game can be used to teach participants about their natural tendency to sub-optimize in competitive situations, and how that tendency can impact trust and long-term gains. Participants can see how in many situations, optimization of the whole can ultimately result in higher overall individual gains.

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