Using Game Theory Strategies for Humanitarian Action and Peacebuilding

Prepared

by

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ABSTRACT

Humanitarian action and peacebuilding workers and benefit in their work by using game theory. Game theory allows the HAP player to develop strategies seeking out the best payoffs for providers, donors, recipients, and beneficiaries through the use of game trees and matrixes by showing in advance of taking specific action and spending money and resources. This works for the refugee or internally displaced person since it gives them a clearer picture as to what options are available for them, and under what conditions, as well as involving them as partners in their own decision-making process. Game theory uses many different games but while focusing on finite games and cooperative games as the best direction to work, it is important to point out the infinite and non-cooperative game as well. Using all four games help bring out a fuller picture in areas such as conflict analysis, context analysis, and transitioning to an urban context since decision making will involve all players in collaboration to reach the best outcome and the path towards that outcome.

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PREFACE

Working through the Humanitarian Action and Peacebuilding program the thought kept coming to me, wondering if game theory could be a reasonable strategy to build programming. I found that there was nothing published specifically using game theory for refugee and internally displaced people interdiction or intervention. The first step needed to be accomplished was the acquisition of appropriate literature, followed then by organizing them into a methodology.

The first set of literature I selected were books on game theory explaining the mathematical concepts and practical application of game theory in decision making. These illuminated theories and processes that helped formulate concepts on how and why decisions are made as well as who makes them. These resources set the basis for using game theory in humanitarian action and peacebuilding, most specifically in working the complex questions of conflict analysis, context analysis, and transitioning refugees and internally displaced people to an urban context.

One challenge in the selection of literature was parsing out the small documents that, even though they talked about game theory, the level of academic value they had was limited. Yes, they had a cursory value of showing matrixes and game trees, the analyses they gave to how they can be used was limited. The second challenge was deciding how much value the mathematical equations really were and should they be addressed. I moved away from those equations because explaining the actual equations themselves would be time-consuming and distracting from the purpose of the project.

The second set of literature selected came from the Humanitarian Action and Peacebuilding program readings. Using these texts, I reviewed context and conflict analyses, the transition to

an urban context, as well as post-conflict stabilization and recovery to build a groundwork for comparison and contrast of various game strategies within game theory. This literature selection asked the question if they used game theory would the results be the same, equal or worse? Programming development and implementation is the key to this project. Some literature originally selected was eliminated since they were filled with examples of doing a specific program at specific locations. Though good for illustrative material and showing worthy project completion I had to limit the illustrative material.

The third set of literature selected came from United States Army publications. Being a United States Army Chaplain, I pulled literature from the military decision planning. Intelligence Preparation of the Battlefield, the Military Decision Making Process, and Course of Action Development became the prime focus of this literature choice. Most of this literature is based on game theory. With the addition of stability and sustainment operations literature, it seems to be a good blend.

I found that organizing the literature and methodology separating into four main categories of research worked best. The first category is the what and why of game theory. There are plenty of definitions provided for game theory, so understanding the basics of what game theory is sets the tone and groundwork as to why one would use it. Understanding the definitions moves one from thinking that it manipulates decision making or causes players to make decisions based on the other player's pre-decided outcomes to an ethical review of informed consent by knowing the choices and potential results in advance. This answers the question as to why one would want to use game theory.

The second category is the strategies of game theory. Arranging the literature by topic, focused on each of the topic sections such as conflict analysis, context analysis, and payoffs.

The questions being worked through needs to be answered as to its relevance in both game theory and its particular application section. Each of these sections did not have to build off of each other and could stand alone but needed to be relevant and feasible to humanitarian action and peacebuilding, and game theory together.

The third category was the selection of games used in game theory. The literature provided more game theory games, subcategories, and processes than could be covered so the methodology was to select the four main categories of infinite, finite, cooperative, and non-cooperative games. I arranged them with a goal in mind.

Infinite games started the thought process of humanitarian action as an on-going process. There will always be humanitarian events somewhere. I then look at how to play out the infinite process. Within the infinite game, we can narrow down the focus to a finite game, seeking to achieve specific outcomes with specific players. This then moves into the cooperative game. How can the known players, with common knowledge achieve the agreed end state? Lastly, the section on noncooperative games addresses the issues of how it looks if cooperation cannot be achieved or breaks down along the way.

The last category of the research and methodology addresses the limitations and recommendations of the use of game theory. This section is intended to answer the "so what". The literature selected needed to be able to justify the use or not use of game theory in humanitarian action and peacebuilding. Between the selected literature and the methodology used, affirmative use of game theory in humanitarian action and peacebuilding should be achieved.

ACKNOWLEDGMENTS

I'd like to offer my thanks to several people who helped make this course of study and project possible: Dr. Brigitte Piquard for directing the Humanitarian Action and Peacebuilding program at Oxford Brookes University; Dr. Richard Carver my project advisor for his insight and input on my project; Francine Brady, my wife, for supporting, my academic venture and introducing me to bigger ideas and people in humanitarian work; Steve Carter, formerly of Willow Creek Community Church, for encouragement and showing theological truths in Humanitarian Action and Peacebuilding; and Dr. Robert Wilbrant for his encouragement in listening to ideas and direction in focus.

INTRODUCTION

Three events changed my life and way of thinking with an attitude of humanitarian action and peacebuilding. In 1989, I got to experience an event that changed most of my life. I served in the United States Army as a Cavalry Scout with missions to the East Germany Border. We knew something had been brewing for months with what seemed to be a daily reduction of Soviet troops in East Germany but not many would have thought the walled border between East and West Germany and Czechoslovakia would begin to be torn down.

Refugees existed long before I came around, but to me, refugees were nameless people in news footage. I'd see the old news footage and think how hard and sad that must be. Cognitively, I connected to the footage but not much more than that, since these were 20-50 years in the past until my squad ran across a present-day East Germany refugee family that just crossed the border and ran out of fuel for their Trabant car. The couple saw us and started pulling suitcases into a pile in their backseat floor. I spoke German and was able to find out what was going on but through the cracked window I was talking to I heard a voice and saw something moving in the back. I came to find out their child was under the stuff. They hide the child under the suitcases thinking we would kill them or worse the child. This scenario ends happily.

My squad member carried a teddy bear with him in his rucksack. His child gave it to him and he always brought it along with him. He decided to bring the teddy bear over to the car and try to give it to them. We were able to calm them down and gave them the teddy bear They finally came out of the car while my other squad member called in for help. This was my introduction to real-life refugees.

The second event was as I started a change in career with the military, from a combat arms soldier into the Army Chaplain Corps. Somalia was experiencing famine and political upheaval. As with refugee news footage, the famine in the Horn of Africa was just a commercial I saw on the television on occasion. In 1992 the United States became involved in operation RESTORE HOPE, bringing needed humanitarian aid to Somalia. Though not involved in the operation I knew of it and watched the briefings as well as becoming familiar to what is known today as the Battle of Mogadishu or Black Hawk Down.

United States forces became involved in combat operations against insurgents in the city of Mogadishu. I found myself asking how a country like Somalia gets to a point like this of near anarchy as well as asking how do they come out on the other side? The world community, after the withdrawal of the United Nations troops, and from my limited vantage point, seemed to have written Somalia off as a lost cause politically as well as giving the impression that the fact that famine kills Somalis was just a given. From that point on I want to learn as much as I could about Somalia. I asked questions such as, what can we do, are we prepared, what risk are we willing to accept, how can we assist to move them forward and how do we know when we have met success?

The third event of this trilogy of change in mind and attitude comes from watching a movie in 2001. The movie, A Beautiful Mind, was about John Nash, a mathematician from Princeton, New Jersey that helped develop concepts of game theory. The movie made a clear point as to why someone would want to use this theoretical concept is making decisions.

Coming out of the Methodist tradition it's important to develop strategies for spiritual success, both within the church community as well as outside of the church community. My theological tradition teaches us to love God and love humankind. Humankind has equality of

worth and free moral agency as Immanuel Kant describes so this moves me into an arena of seeing people as people. In my work in ministry, as a pastor, an army chaplain, and working with suicide intervention, I became more and more involved with individuals who needed to make decisions. At times, the decisions were of a spiritual or personal nature and time was not a critical factor in working out the questions and answers needed for such choices. When time is on one's side, they can see things relatively clearly and weigh choice deliberatively. Other times, however, time was not our friend but life choices needed to be made fairly quickly.

Whether slow and deliberate or pushed for time, it's important not only to know that one needs to help, or be helped, a mechanism should be utilized to bring about relief, whether it is through justice, cultural or social structural change, economic aid, or a personal transformation such moving from refugee or internally displaced person (referred to as IDPs moving forward) to an urban context. Assisting someone to move from an "already" situation (present) to a "not yet" (future) solution will be the key to programming or receiving aid as well as understanding the choices involved in light of the possible second and third effects of those choices. This encapsulates the answer to both questions; 1) Why would someone want to use this theoretical concept is making decisions? 2) What mechanism can be utilized to bring about relief? Game theory gives us a strategy.

WHAT IS GAME THEORY

Game theory is a way to analyze decisions, see how those decisions interact with follow-on decisions, as well as, how they are affected by the decisions other people make. The various scenarios could be tailored into most decision-making thus helping understand the interconnections of courses of action.

Two definitions of game theory, help us understand what the experts define it as. "Game theory is a mathematical to real-life situations that involve two decision-makers. Each decision-maker has several different actions available, and the outcome depends not only on your action but also on what others do" (Rosenthal, 2011, p. 3). This definition brings out the idea that decisions people make will affect the decisions others make, as well as affecting the following decisions made. This seems obvious, but as we develop programming in humanitarian action and peacebuilding (referred to as HAP moving forward), we often use best practices and/or templates to work the problem to a solution, at a time missing context, actions, and reactions.

Decisions should not be made in a vacuum, which moves us to a second definition "Game theory improves strategic decision-making by providing valuable insights into the interactions of multiple self-interested agents and therefore it is increasingly being used in business and economics" (Erhun, 2003, p. 5). Insights are gained when looking at the second and third level effects of the provider and recipient, or donor and beneficiary.

A third definition says that "Game theory is a bag of analytical tools designed to help us understand the phenomena that we observe when decision-makers interact. The basic assumptions that underlie the theory are that decision-makers pursue well-defined exogenous objectives (they are rational) and take into account their knowledge or expectations of other decision-makers' behavior (they reason strategically)" (Osborne, 1994, p. 1). This definition builds on the idea that game theory builds a strategy where the best outcomes can be played out to their conclusions before making any decisions.

As we take the three definitions and highlights of those definitions, using game theory, we have a process to look for priorities, objectives, expectations, assumptions, motives, and outcomes. "We must have a preference ordering because it is only when preferences are ordered

that we will be able to begin to make judgments about how different actions satisfy our preferences in different degrees'' (Hargreaves-Heap, 2004, p. 7). Inside of game theory it's not always about winning or losing, but getting the best result for all decision-makers, again, whether those are providers, recipients, donors, beneficiaries, or even unknown players. We can see who most, if not all, of the decision-makers are, the type of influence they have as well as where they fit in the decision-making process.

Lastly, I look at game theory as a tool to ensure an ethical review. It's so easy at times to give advice and direction knowing that the reasons to justify a course of action are to meet our needs rather than the one it is intended for. A base should be set from the beginning to look at the humanity and dignity of the individuals rather than looking at the operational level to optimize performance or a strategic level, for example, keeping in good favor or donors regardless how it effects the beneficiaries (Slim, 2015, p. 112). As refugees and IDPs begin a process of transition to a stable context, we can work them through a process, though with the best intentions, into a track that will hurt or harm them. Two things show here. Game theory works with the players to find beneficial results for everyone rather than working players through a process. We don't want to get them to the next step or to get them off our list and onto someone else's list. The second thing is that we may hurt them with all our help. We do this by consciously or subconsciously by acting out a God complex, knowing what is best for everyone for forcing or coercing individuals down a path that can lead to dependency, no negative results. The key here is Do No Harm. Besides, one should guard against leaving the individual feeling as they had no real input or options by us failing to look at their priorities, objectives, expectations, assumptions, motives, and outcomes. If every person is valued, as my theological tradition believes, then the input of those receiving is equally as valid as those that are giving.

WHY GAME THEORY

Car Purchase

We may have all bought a car before and may understand the stress of making a huge financial purchase. We search for what we consider to be the best car, the best options we desire, and finally the best price. The best car is a theoretical idea based on reviews, comparison opinions, looks, and other tangible or non-tangible ideas. The best price is a fluid idea since it's the composite of what we consider to be the best car and best options with the added question of how much one is willing to pay for those items. Some do a lot of reach for this purchase. Some make these choices and final selection as a single purchaser and some do it as a group, a couple or, company, for example.

On the other hand, the salesperson is another player and weighs their presentation as various factors such as enthusiasm, aggressiveness, tone, need of the customer, how much the dealership is willing to sell for, and how much commission will be received for the sell. Checking oneself throughout the process is an on-going strategy to close the deal. This illustration has two other players involved: the sales manager and the dealership owner. These players have various inputs into the games or process with expectations and instructions for their best outcome as well. These players and outcomes may be known or unknown to one or both of the other players, (customer and salesperson).

The outcome typically, but not always, looks for the best outcome for all players where each meets their desired result in a win-win situation. Other times, the result is a lose-win situation where the customer pays more than they could have but other times, win-lose is the result as the dealer breaks even just to close the sale.

This illustration was a game theory scenario that is played out by most people without realizing they are doing game theory. There are three ideas one should keep in mind with game theory. Game theory does not predict the future but possible futures. One can see what the various possible outcomes could look like. Looking at a game theory illustration through HAP lenses, a refugee or IDP could face two scenarios: 1) What do my future and future choices look like if I seek or accept help from a humanitarian aid organization? 2) What do my future and future choices look like if I do not seek or accept help from a humanitarian aid organization and go it alone? There are nearly infinite futures based on choice and counter choice.

Game Tree

The second idea one should keep in mind is that game theory is a natural progression of choice. Each choice one makes or doesn't make results in the next series of choices. These choices can be done by players either simultaneously or in turn, but either way every play, choice, or action has additional ones to follow until the result is achieved. In natural progression of choice keep in mind that no choice is a choice not to act.

Thirdly, game theory is a guided progression of choice. This carries over us further into choice by planning out movement strategies in advance of making choices. These choices, I refer to as Couse(s) of Action (COAs). Each course of action can be diagramed using a game tree where one can visualize how COA progression can naturally result in each choice, in advance of making a choice. Once these choices are visualized the COA can be guided by looking at the various scenarios. Additionally, the adoption of a game tree or action flowchart avoids unnecessary duplication of effort when seeking ethical review or scrutiny by identifying which players are reviewing which points at which points (Iphofen, 2011, p. 146).

Figure 1 describes a brief COA game tree. As mentioned above a refugee needs to decide to engage with a non-governmental organization (NGO). If the refugee engages with the NGO the game tree continues with a cooperative COA and more choice develop in the game tree. However, if the refugee decides to engage with the NGO, the NGO can decide whether or not to engage back. If the NGO decides against engaging with the refugee, for simplicity's sake, the donor chooses not to as well. Various futures could be drawn to show differing engagement player's actions. Now, let's add another variable player "Other" (failed government or rebel forces possibly). "Other" doesn't want the UN or news negative pressure if the refugee choice to engage with the NGO but engages with or against the refugee if they go on their own.

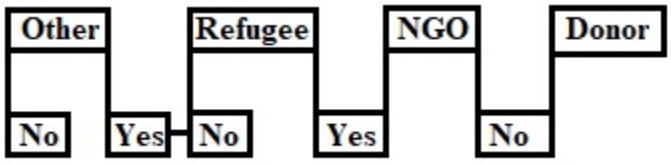

Figure 1

One last point to address on the topic of "Why Game Theory" is something called Set Theory. Set Theory helps us as we work our CAOs in various analyses such as conflict analysis and context analysis. Building sets, or in our case, players or COAs, are done in an ordered succession of steps, or decisions, and each of these steps is connected to the next set knowing the first must come before the second in succession. Furthermore, sets themselves are inter-related to each other and their actions are inter-dependent with each other.

There are two examples, revised in a HAP context, from Weiss' work. For any two sets IDP and NGO, either there is a one-to-one function from IDP into NGO or a one-to-one function from NGO into IDP. Both are in an active relationship with each other, in contrast, to actively giving and passively receiving. Additionally, if there is a one-to-one function from IDP into NGO and also a one-to-one function from NGO into IDP, then there is a one-to-one function from IDP onto NGO. This second example says that both sets effect and affect each other in purpose and action. This also tells me that even though the IDP is receiving from the NGO, they are at the same time giving purpose to the NGO (Weiss, 2008, p. 7).

As one building programing, following their game tree, one should be keeping in mind the inter-connectivity of the players, decisions, and reasons for the decisions, how each relates to each other, why they relate to each other, and lastly the ordered succession of steps. Using Gambit game theory software, I can "build, analyze, and explore game models" (Gambit, 2019).

GAME THEORY AS A STRATEGY

Conflict Analysis

Game theory is a strategy or technique that can be used in designing programming. When designing programming one should design the program with as thorough a conflict analysis and context analysis as time permits.

> "Conflict analysis helps you understand your context so that you can identify how your intervention may interact with it. Conflict sensitivity involves:
>
> 1. Understanding the context in which you operate
> 2. Understanding the potential interaction between your project and that context

3. Acting upon this understanding of interaction in order to avoid negative impacts and maximize positive impacts" (Core Reading, no date, p. 1).

Conflict analysis assists you in plotting the important questions involved such as Who, What, and Why. Before entering any game or COA one should have a basic understanding of the environment one involves themselves in. These answers become crucial in determining who the players are. As referenced earlier in Figure 1, we saw that refugees were debating involving themselves with an NGO. In like manner, that same figure could be seen as an NGO deciding to work with refugees. Whichever side of that figure one looks from, coming up with all possible players was the first building block in the scenario. Each player had a potential interaction point. Game theory uses many different quad charts and such showing interaction and results. But the first step is the who. Figure 2 reflects a chart with two players.

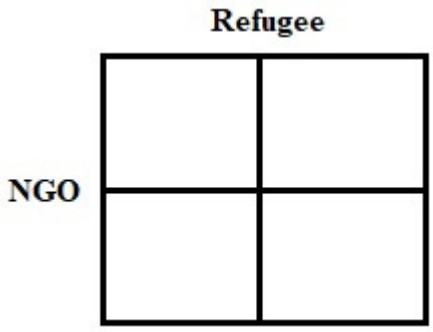

Figure 2

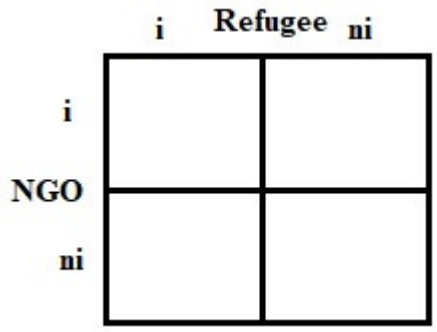

Figure 3

Two more questions conflict analysis can answer is the what and the why. Figure 3 shows that two choices give both the refugee and the NGO. As pointed out, the two choices are to interact (i) with each other or not interact (ni). This does not have to be a zero-sum game where one wins and one loses. The idea for using conflict analysis is that both will mutually benefit

from the interaction. Though not a zero-sum game, it should be assumed that there are tension points in this scenario. A good conflict analysis will help us find why each player should interact with each other as well as find the reason why they resist interaction. Do both players have complete information about each other to make reasonable choices? Complete information doesn't mean necessarily that refugees know the CEO's name or that the NGO knows what refugee's clothing sizes but it does mean that they have enough information to make an informed choice. Unfortunately, in most scenarios, one will find having complete information is a challenge.

Lastly, to do effective HAP programming and using conflict analysis we should ask ourselves: 1) Is our involvement ethical? 2) What resources are we bringing and how will they affect the overall strategy? 3) Are we bringing enough resources to the conflict? We don't have to limit ourselves to these questions only. The more questions one can ask and answer the better. One can game theory each question to find the best result. Mukesh Kapila*, in Conducting Conflict Assessments, gives us three stages in* conflict assessment where we can pose the previous questions and game through the natural or guided progressions.

The Three Key Stages of Conflict Assessment (Kapila, 2002, p.6)

Stage A **Conflict Analysis**	**Stage B** **Analysis of Responses**	**Stage C** **Strategies/Options**
Analysis of: • Structures • Actors • Dynamics	• Mapping external responses • Mapping development policies and programmes • Assessing impacts on conflict and peace	• Influencing other responses to conflict • Developing/refining DFID policy and programme approaches

Figure 4

Context Analysis

The more assumptions one can turn to facts the better. This moves us into context analysis. Both conflict analysis and context analysis are important and neither is more important than the other but works with each other to build a fuller picture of the operational environment one is working in. "Context analysis approaches aid humanitarian actors to understand the complex dynamics of a given situation by unpacking the political, economic, social, and spatial factors that could potentially enable or hinder effective crisis responses" (Meaux, 2016, p. 8). Meaux gives us an example of how we can formulate our analysis.

Comparing traditional needs assessments and context analyses for informing project design (Meaux, 2016, p. 8)

Tasks	Traditional needs assessments	Context analysis
Information gathering	Focuses on the 'what and where' types of questions to understand the current situation	Focuses on the 'why and how' to understand systemic or complex factors impacting the current situation
Project design and implementation	Project priorities and design primarily determined based on the needs of the affected population from the perspective of humanitarian actors	Project priorities and design reflect networks of actors, institutions, interests, incentives and capacities from the perspective of a variety of actors

Figure 5

In context analysis one can look at topics, in keeping with our previous illustration, such as 1) Should the NGO interact with the refugee and if so, to what extent, level or scale should that interaction look like? 2) What are the risks or constraints involved? and 3) What are the criteria

one can use in planning programming to overcome the risks and constraints. The objective is to gain as much information within the context to come to a win-win solution to the humanitarian need. We can also investigate three interrelated questions:

1. What extent can an organization enact a decision practice and make it stick?
2. What factors encourage or impede the use of what is prescribed?
3. How are pre-scribed practices and the resulting decisions linked? (Sutcliffe, 2001, p. 2)

In like manner, the refugee can look into doing their own analysis from their own perspective to term the same answers themselves. They may do this in different terms, different ways, or call it by different words but they make rational decisions for their own future. One should not suggest that a refugee or IDP does not have the skill set or education to make a complicated analysis. I live by a philosophy that a refugee or IDP can be a shepherd or a doctor but they both self-determining being with free choice and opportunity. Both become beneficiaries making choices as they interact with aid organizations and need to have tools available to play out decision-making which best suits their need as well as seeing the second and third level effects of those decisions, within their context.

A Well-Rounded Payoff

Conflict

Game theory produces a more well-rounded payoff for both providers and recipients in five areas. The first area is conflict. We covered some ideas on conflict with conflict analysis. Conflict can be as huge as two super-powers seeking dominance militarily or within global economics. Conflict can also be as small as two individual decision where to go to dinner. In our context, conflict involves giving and receiving humanitarian aid and aiding in self-

sufficiency so as not to create dependency. In a context such as war distribution of supplies can be perceived to favor one community over another, bringing tension between neighboring peoples and increased fighting may result, thus aggravating the conflict situation (Lange, 2003, p. 10). Game theory is used to analysis of how people resolve conflicts. With Nash equilibrium, for example, two players use a pair of strategies, each of which is a best response to the other, which each gives the player using it the highest possible payoff, given the other player's strategy (Game theory basic concepts, no date, p. 34).

Recovery

In looking at recovery we enact strategies to move from war-torn conflict to picking up the pieces. "The question of repatriation and reintegration of refugees and IDPs has become one of the most important items on the international humanitarian agenda" (Fischer, 2004, p. 10). As mentioned above setting strategies that don't give the impression of favoritism over another is a dilemma that HAP groups find. Working through context analysis helps drive needed resources to those in need but as we game theory that out it could look different in a matrix. Figures 6 and 7 show this dilemma.

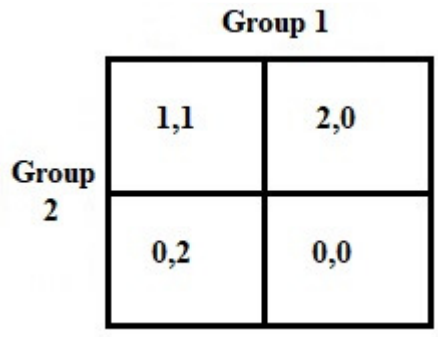

Figure 6

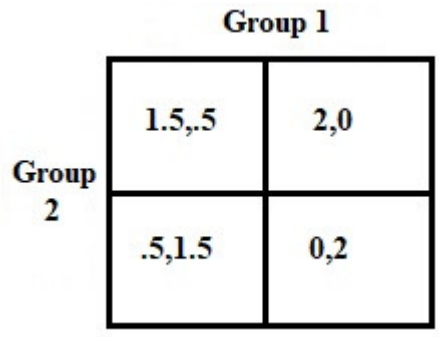

Figure 7

In figure 6 Group 1 and Group 2 are both in need of aid and our NGO has a limited number of resources that can be distributed. Our NGO games it out and has four options: 1) Both groups get an equal share of resources; 2) Group 1 gets it all and Group 2 gets none; 3) Group 2 gets all the resources and Group 1 gets none; 4) Neither group gets anything. This scenario is fairly easy. Both groups get resources split 50/50. Everyone is as happy as they can be under the circumstances.

However, throwing in variables changes the equation. Group 1 are plains people and Group 2 are mountain people. 1) Group 1 gets 50% more than Group 2 since some supplies are perishable and hills take longer to transverse. No need to give Group 2 spoiled good; 2) Group 1 gets it all and Group 2 get none since mountains are too treacherous to travel; 3) Group 2 get half and Group 1 get more, as explained in #1; 4) Group 2 still get none and Group 1 get it all, as explained in #2. Perception could show the NGO prefers Group 1 over Group 2. Playing out this game shows us a pitfall in our plan and gives us opportunities to work out additional strategies to build peace and come up with alternate COAs.

Stabilization

Stabilization is the third area and builds capacity within the context. Stabilization takes figures 1-7 and builds unity of effort among all the players. "Unity of effort is the outcome of coordination and cooperation among all actors, even when the participants come from many different organizations with diverse operating cultures" (Guiding principles, 2009, p. 3-18). Looking at each scenario and gaming out if, and statements, one can look for the best payoff within the context. If the refugees and NGOs interact with each other, and given that the donor's financial assistance doesn't dry up, and outside forces choose not to act against the refugees, what then are possible outcomes, given that the NGOs did a proper conflict and context analysis?

Two last things to keep in mind in working in the area of stability. Planning for stability one needs to recognize complexity, balance resources, capabilities, and activities, recognize planning horizons (level of detail, and desired outcomes), and avoid planning pitfalls (ADP 3-07, 2012, p. 14). Secondly, stability "focuses on establishing the minimum-essential levels of civil security to protect both military and civilian populations and simultaneously ensure for providing water, shelter, food, and medical treatment" (ADP 3-07, 2012, p. 14).

Sustainment

The fourth area to work through is Sustainment. The key to sustainment takes all the factors that we analyzed in the stability section and worked them through to ensure logistics can be supported. In Figures 6 and 7, we found a hole in the delivery of relief supplies. Because we gamed it out in advance, we see the potential requirements to provide support for Group 2. Using our context analyses we should already know we aren't the first organization to travel this route and alternative sources for conveyance can be provided locally, for example. Again, building on the unity of effort we can nullify Figure 7 as an outcome.

Transition

Transitioning to urban context is the final area to produce a more well-rounded payoff for both providers and recipients. "Over half of all internally displaced persons (IDPs) and refugees are living in cities. This means that forced displacement is both a humanitarian and development challenge given that displacement is often long-term with more than 80 percent of refugee crises lasting ten or more years" (International Rescue Committee, 2017, p.7). The transition from refugee and IDP status to an urban context can be seen as successful within the Cedar-Riverside neighborhood, in Minneapolis, Minnesota, USA. Minnesota Department of Human Services, in

2019, reported approximately 69,000 Somalis live in Minnesota (What Is The History Behind Minnesota's Somali-American Community? 2020). A considerable portion lives in or around this neighborhood.

The figures bare out that transitions to an urban context are important for refugees and IDPs, so as strategies are programmed, a considerable amount of planning and preparation should be made to bring out this desired result. This does not mean all refugees or IDPs fly off to a foreign country but what it does show is that building capacity within their own context can have a significant result in their lives.

The Unites States Army gives us a tool that can be modified for our transition to the urban context, Intelligence Preparation of the Battlefield (ATP 2-01.3, 2019, A-1). In the IPB process, we can think, intelligence preparation for the urban context. Step 1 - Define the operational environment. This tells us where we are planning the transition to take place. Step 2 - Describe Environmental Effects. This tells us how this transition, whether in small or large numbers, will affect the community already present. Step 3 - Evaluate the Threat or Adversary. This step looks for the threat within the new community such as potential violence or resource overload. Step 4 - Determine COA. To game theory this out brings us to four types of games: Infinite, Finite, Cooperative Games, and Non-Cooperative Games.

As we move into the next four sections, we will look at four types of games. The use of the word game shouldn't minimize the project or COA. It should be thought of as a strategy, or strategies, one uses to bring out conflict resolution, problem-solving, mission completion, or transition towards a specified goal or objective.

The first game we will look at is infinite games. I placed infinite games first since it will relate to our HAP workers, organizations, or donors and how they see their purpose then act on that purpose. Finite games point to strategies that have a set end-point or result and how one plans to get to those results. Cooperative games will talk about the strategies one encounters when all players work together to meets the desired end-point or objective. Lastly, non-cooperative games address issues when one or many players in the game chose their own direction or work against the other to achieve their own specific end state.

INFINITE GAMES

Groundwork

Infinite games have infinite options and solutions, and are played with no specific ended result, but rather until one player drops out of the game. Infinite games can have known or unknown players or interchanging rules.

Purpose, Tasks, and End State

In many cases an infinite game may have started with purpose, tasks, and end state but as time progresses the original ended state is not achieved or has been reimagined thus moving the goal post. The infinite game however never ends until one player drops out of the game. One reason one player drops out could be the realization that the end state can never be achieved no matter how many different COAs one uses. Other reasons could be that it's determined that the end state is not financially feasible or funding dries up. The idea though is to stay in the game as long as possible.

An example of an infinite game that started as a finite game is the war in Afghanistan. The original idea, after 11 September 2001, was to get the Taliban, a radical Islamists who ran Afghanistan, to turn over Osama Bin Laden who was the leader of another radical Islamist group, al-Qaeda. The Taliban refused and thus the United States brought military force to achieve this goal. However, since that decision was made the goals continued to change. Mission creep sets in and the strategy became, defeat the Taliban, defeat global terrorism through the Global War on Terror, set up a successful government in Afghanistan, and the list continues. Osama Bin Laden was located and killed in Pakistan in 2011, but in 2020 the game continues.

So how does infinite game relate to HAP? I suggest that infinite games relate to HAP specifically on how humanitarians see themselves and what they want to accomplish. Winning against poverty, for example, is a worthy goal and a noble endeavor and purpose, as well as an end state, but no matter what tasks you accomplish poverty will always be there due to the fact no matter how high or low the cost of living the scale will always flux since there will always be people in the bottom 10%, for example. Defining payoffs in games that last an infinite number of periods presents the problem that the total payoff is infinite (Rasmusen, 2005, p. 130). With the infinite amount of moves or turns in winning over poverty, since we are not automatically assured of an optimum strategy, the payoff is never fully realized, though, in short term, the individual's poverty situation can be addressed. Figure 8 shows an example of a game tree in an infinite game until play 1 and player 2 drops out of the game.

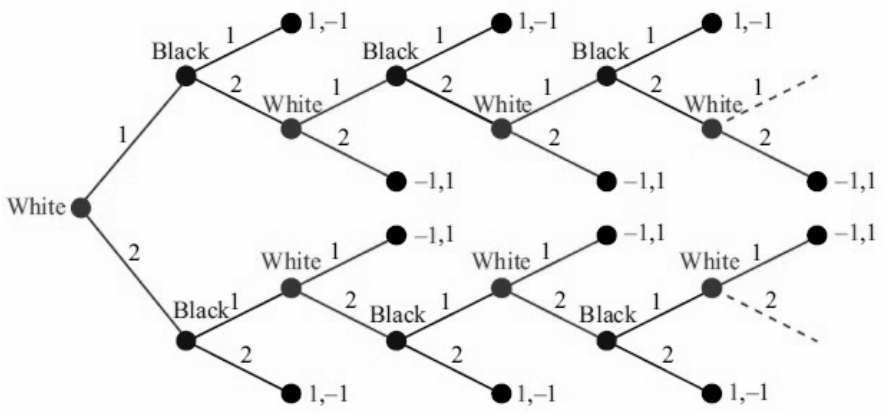

Figure 8 (Prisner, 2014, p. 56)

Defining who we are and why we play the game is the key to staying in the infinite game as long as possible. Simon Sinek points out some answers to the question; if winning is not an option why play the game? He points out that we should have a just cause. Just cause explains why an organization exists, how we understand it, and the vision of the future that doesn't exist but we expend all energies to get there (Sinek, 2020). This is what keeps one in the game.

As an example of what keeps one in the game comes out of the Bible, Matthew 25:35-36, "For I was hungry, and you gave me something to eat; I was thirsty, and you gave me something to drink; I was a stranger, and you invited me in; naked, and you clothed me; I was sick, and you visited me; I was in prison, and you came to me" (Bible Gateway, 2020). This could be thought of as a finite game. Person "A" was hungry, thirsty, stranger, naked, sick, and in prison. Person "B" brought a remedy to all six negative situations. But what about the next one that comes along, or the next? This COA repeats over and over and becomes an infinite

game. What keeps one in the game is the vision of a future for meeting each of the individual needs each time.

Limitations, Obstacles, and Vulnerabilities

As the infinite game continues, we have to face our limitations, obstacles, and vulnerabilities (LOV) to define how or if we stay in the game. Common knowledge helps us to play the infinite game, however common knowledge is not limited to infinite games alone and will be of benefit to the other three games I'll address. "Information is common knowledge if it is known to all the player's if each player knows that all the players know it if each player knows that all the players know that all the players know it, and so forth ad infinitum" (Rasmusen, 2005, p. 47). Common knowledge gives us insight into building a strategy and helps point out LOV to our strategy. If both players have common knowledge over theirs and the others LOV this continues to define how long one is willing to play the game, knowing how their resources match up to the others. How many plays can a donor afford to give resources and an NGO give personnel to relieve poverty in Somalia, most specifically when known or unknown players are playing against that goal though cooperate over-fishing on the Somali coast?

Achieving Objectives as a Provider or Donor

This moves us into achieving the objectives in an infinite game as a provider or donor. Why play with game if you're a HAP worker especially if what Prisner suggests is true, that "Nobody will lose since losing can easily be avoided. So, if nobody loses, nobody wins" (Prisner, 2014, p. 56)? I would suggest that his statement may be true in a theoretical sense but in a practical sense, within our context of HAP, there is a winner; a continual winner. Just the fact that a HAP organization has stepped into the game and works to bring change constitutes winning. Though

the game continues indefinitely good can result in it as it continues. As mentioned earlier it is possible to reduce certain infinite games to finite games. (Karlin, 1959, p. 28). The finite game within the infinite game can bring help, assurance, and encouragement to the people experience a situation that continues.

Keeping a flexible playbook, remembering that there are known & unknown players as well as the possibility of rule changes, keeps one's best responses fluid and flexible and allows one to adapt and adjust to those changes. One should build their programming using SMART goals: Specific, Measurable, Achievable, Realistic, Timely. Even in the infinite games, this "helps to give these humanitarian projects continuity" (Davies, 2012, p. 15). If an infinite amount of time always remains in the game, a way can always be found to build capacity, accountability, and respect with all players even if a perfect equilibrium can't be achieved.

There are two cautions one needs to take, in all games. The first is informed consent. As the infinite game plays out, the HAP player must make sure that common knowledge stays common, meaning, the refugee or IDPs needs to understand that when plays are made upon them, that they understand and agree to the next play and how it affects them. Loss of trust and respect will cause the player to drop out. The second caution is paternalism. Paternalism is doing for the other person what they can do for themselves (Corbett, 2012, p. 109). We can generate a pattern of behavior by deciding to make the game-play or choice for the other person because we think they aren't educated enough to make the choice themselves or that we envision or favor a future potential outcome and we ignore the objectives of the recipient or beneficiary.

Achieving Objectives of the Recipient or Beneficiary

Achieving the objectives of the recipient or beneficiary is goal number one. The Folk Theorem tells us that equilibrium of an infinite game can generate any pattern of behavior observed over a finite number of periods that generate particular patterns of behavior that may seem unreasonable (Rasmusen, 2005, p. 119). Why is this important? The importance of this comes through by understanding that how we envision their decision-making comes from a differing cultural context thus what we think we think is reasonable or obvious may not be how they see it. Our goal is to assist them in improving their condition but if our brilliant solution doesn't meet with their real or implied need, we may think we did good but left the recipient or beneficiary feeling used or powerless. The humanitarian aid we provide and the strategies in which we provide it must be both relevant and essential.

An illustration of this is a religious organization that I have personal knowledge of provided food to a community in Africa. This was a worthy goal, and the donors were feeling good about doing good. Sometime later, the church leaders went to the community to see how they were doing, since famine and poverty were an on-going crisis (infinite game). The church leaders found out that the community's situation hadn't changed much, even with the aid given. Meeting with leaders in the community is was discovered that the food only lasted so long and when it was gone, the community reverted to the pre-aid condition. The solution to this was that the church would send seeds, teach planting skills whereas the community would still receive aid but would become self-sustaining through locally grown produce and the skill sets that come along with that. The church became flexible and adaptable by listening to the community and its needs. This illustration shows the connection of achieving the objectives as a provider or donor

with achieving the objectives of the recipient or beneficiary. This also moves us from an infinite game scenario to put a fine point onto the finite game scenario.

FINITE GAMES

Groundwork

For starters, let's define what a finite game is. In contrast to infinite games, finite games have known players, fixed rules, and agreed objectives. In a finite game of perfect information, the number of stages and the number of actions at any stage are finite "and the players know the complete history of the game (previous actions of other players) at every stage of the game" (Erhun, 2003, p. 17). It is reasonable to assume all games are finite unless otherwise stated or as the facts within the game bare out a different result than assumed at the beginning. Finite games guarantee that a game eventually ends.

In contrast to the previous illustration of the Afghanistan war, I would suggest that the war in Iraq was a finite game. Because of a sufficient context and conflict analysis, Coalition forces knew who the players were, how they were going to fight, and what they wanted to accomplish. I should point out that this finite game was not a cooperative game but rather a noncooperative game.

- Known Players: Coalition troops led by the United States, opposing the Iraqi military.
- Fixed Rules: Eliminate as much of the Iraqi military until resistance stops.
- Agreed Objectives: Remove Saddam Hussein from power and establish a new Iraqi government.

As you should see from the illustration, this is fairly more specific than infinite games. Likewise, for HAP programming most everything is known in advance by both players; provider or donor, and the recipient or beneficiary. The only thing that is unknown in advance is the actual decision to be made at each decision point. In addition, the choices, when made will be known to both players in advance.

One more item of groundwork needs to be laid in advance. There are two types of decision-making; backward induction and forward induction. With backward induction, the opponent's rational behavior in the future should be looked at. What are they most likely to do? Forward Induction looks at the opponents' rational behavior in the past. Based on what they have done previously what is the possible choice they will make (Ichiishi, 1990, p. 8).

With that information at hand, I find that when entering into a game, especially one that is defined such as finite games our actions should be based on philosophies of purpose, tasks, and end state. Let's look at one way to define those points.

Purpose, Tasks, and End State

One can't build a game tree or any type of matrix to get to one's end game. Proudlock, Ramalingam, and Sandison lay out a clear humanitarian impact assessment that can help a HAP origination build its program through defining its purpose, tasks, and end state.

> First, an impact assessment must balance the priorities and interests of a range of different stakeholders. Is the assessment for learning or accountability? Is it for donors, the agency, wider academic research, or the affected people? Second, how should humanitarian impact be defined – impact on what, and over what timescale? Third, how can impact be measured? What indicators are appropriate, and against what baselines or

> comparison groups? How can it be proved that any observed or reported effects are caused by a particular intervention? What methods are appropriate to the given context, and how will issues of data, baselines, and timing be addressed? Fourth, how should data on impact be analyzed and interpreted, and what role should the affected people play in this? Fifth, how can incentives and capacities be developed to enable and improve humanitarian impact assessment? (Proudlock, 2014, pp. 4-5).

One thing I want to emphasize is the finite game from the recipient's point of view. I can't suppose into the mind of a refugee of an IDP but I can say with certainty that they have an end state in mind as well. Though not an exhaustive list refugees and IDPs want stability, to take care of themselves, a sustainable livelihood, inclusion within and outside of their community, and protection. With these end states in mind, they also can play out the game theory methodology. Not every refugee and IDP is a goat herder. Not that goat herders can't process complicated decision-making but they could also be doctors, lawyers, or teachers, to name a few higher education professionals.

Limitations, Obstacles, and Vulnerabilities

The first LOVs I need to point out has to do with the Harsanyi–Aumann doctrine. The Harsanyi–Aumann doctrine states that "when two rational individuals have the same information, they must draw the same inferences and come, independently, to the same conclusion" (Hargreaves-Heap, 2004, p. 28). Moreover, "rational players with common knowledge of rationality will not be able to agree to disagree on the likelihood of any action in the game" (Hargreaves-Heap, 2004, p. 60). On the surface, this sounds reasonable but when adding culture and context to the equation there remains a possibility that's given the exact same information, individuals can come up with a different conclusion. I do not believe that

Harsanyi–Aumann takes into account the interpretation of information. X+Y=C may very well look like the best response and very well may mathematically work itself out as the best response but cultural and contextual difference may suggest otherwise.

The second LOV is that "when making decisions we are essentially looking at risky alternatives and therefore are dealing with lotteries" (Rosenthal, 2011, p. 255). All payoffs are assumed and best responses are based on those assumptions, even with common knowledge. The promise of a future becomes a risk, even after playing it through one's game tree, showing all possible choices, in reality, it may play out differently and alternative COAs may not be planned for.

The third LOV is concerning agreed objectives. This vulnerability is more precautionary since the key term is "agreed" objectives. Three questions come to mind: 1) Was the objective stated clearly, meaning did one say or write what one intended to say or write. 2) Was what the other person heard or read understood? 3) Was what the other person heard or read the intention of the first person? Only then can there be an agreed objective and considering that in HAP one can begin dealing with different cultures and languages, the transmission of the objectives may be as difficult as the agreement to them.

Achieving Objectives as a Provider or Donor

Looking more deeply into shared objectives we explore how we can use infinite games to achieve objectives as a provider or donor. The finite game shows most clearly in the rule of law. "Law is particularly well suited to analysis by game theory because the legal process is so concerned with conflict and the provision of definite rules to regulate that conflict" (Rasmusen,

2005, p, 135). Three examples show laws, guidelines, or principles that need to be followed within the HAP field:

1. Customary International Humanitarian Law
2. Convention and Protocol Relating to the Status of Refugees
3. Guiding Principles on Internal Displacement

Each of these shows what needs to be followed to achieve the player's objectives. Just as with the game Monopoly, the instruction manual tells the player what they can and can't do. In the finite game of Monopoly, the known players, follow the rules of the game to achieve their objectives. Failing to follow the rules game one can't move forward. In like manner, the provider or donor follows these laws, guidelines, or principles to stay in the game and not be removed by the international community. Within these rules, providers and donors can meet their desired objectives. Nash equilibrium is achieved as both players work with each other to get the highest possible payoff. Neither out-does the other, but work together reaching a clear tailored objective. Each understands and balances each other's interests.

The finite game is the culmination of the mission statement whereas the players stay within their lane of expertise avoiding getting distracted by other ventures outside their purpose. Building on set theory, where each point of the game builds on the last move, no move is independent, and with "perfect information, every node in the game tree starts a subgame" (Erhun, 2003, p. 19).

Achieving Objectives as a Recipient or Beneficiary

The finite game is a little trickier when achieving the objectives as a recipient or beneficiary. This section will move naturally into the next section on cooperative games as you'll see. The

finite game for recipients or beneficiaries vaguely agreed to objectives. Somali refugees having been displaced by the terrorist group Al-Shabaab flee to neighboring Ethiopia and Kenya. These refugees are seeking safety, security, and protection. In themselves, these words sound like agreed objectives, and in ways they are, but a deeper look into the words themselves bring out a myriad of visuals of what that looks like. One could say it means safe from harm, food security, and gender protection. One could also suggest safety from the elements with housing and economic security since there housing and livelihood were destroyed by Al-Shabaab and protection against terrorist attacks.

One thing that can be agreed upon. An outline of an end state reason acts like a pair of scales to weigh the pros and cons of their actions to enable the selection of the individual's or group's desires or passions (Hargreaves-Heap, 2004, p. 30). Whatever they define safety, security, and protection as, for example, can become the agreed objective.

One other issue that develops in achieving objectives for recipients or beneficiaries is that refugees and IDPs may have experienced or are experiencing trauma. Trauma survivors can develop persistent and negative beliefs and expectations about themselves, and the surrounding world, as well as fear, anger, guilt, and shame (Bauman, 2016, pp 137-138). All these negative feelings and experiences can cause the player in the finite game to withdraw internally, due to lack of trust, turning what could be perfect information to imperfect information., thus turning the finite game to an infinite game. Finite games can be played independently but overall, the best pay-off arrives as they are played, at least in the HAP realm, as a cooperative game.

COOPERATIVE GAMES

Groundwork

While working in HAP, the best results are gained through cooperation, teamwork, and building partnerships. This is true for NGOs getting donors to participate in their mission, HAP organizations working with countries for access, NGOs working with other NGOs, HAP workers assisting refugees or IDPs to achieve mutually agreed goals, and refugees or IDPs communication with HAP organizations with fear but with trust. "A cooperative game is a game in which the players have complete freedom of pre-play communication to make joint binding agreements. These agreements may be of two kinds: to coordinate strategies or to share payoffs" (Jones, 2002, p. 161). Coordinated strategies work as both players develop programming or COAs together before setting their plans in motion. The idea is not just to know where one is going but how one is going to get there in advance of setting a plan in motion. The shared payoffs are achieved as both party's needs, desires, goals, or objectives are met in tandem with each other. The keyword is cooperation. "Many of the hallmarks of good relationships – trust, mutual respect, understanding – are intangibles that develop and evolve, based on individual collective experiences and interactions" (Communication, no date, p. 3). This sets the tone and conditions for the cooperative game.

Cooperative Games by Examples

Shapley Value

As we begin to look at two examples of cooperative game theory, we should look at the Shapley value. Based on what each individual contributes, players cooperate, to ensure each gain from that cooperation. Some players may contribute more to the game than others due to

different bargaining power such as a refugee coming to an NGO for assistance. Indeed, there could possibly be a power imbalance between players but the ultimate goal is to ensure a successful outcome from the players without winning over the other.

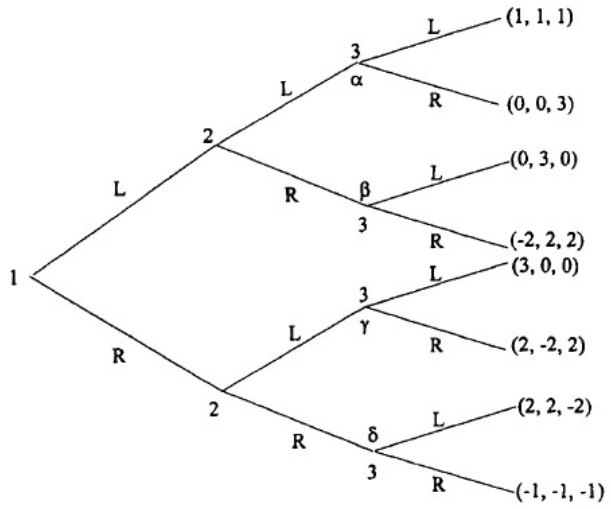

Figure 9 (Jones, 2002, p. 167)

Figure 9 shows 3 players with perfect information, that is to say, each knows all information involved and that each player knows that each player knows that. For this example, each player decides to go left or right. Working this game tree in advance of making the actual decision it seems obvious that the best choice is keeping players 1, 2, and 3 together whichever direction. 1,1,1/-1,-1,-1 denotes the best choice of keeping the players together. Keeping this simple and leaving out the mathematical calculations for the end values, we see that power of the group diminishes as each player moves away from coordination with the other.

To move this into our HAP environment player 1 looks at a decision of L as a transition to an urban context with shelter, security, and economic opportunity or R as a transition back to a rural context with societal and locality familiarity, and economic aid. Player 2 and player 3 has those same options. When presented the choices independently, it could be assumed that each player made the best choice for themselves but by coordinating the decisions before making them, a coalition can be made, weighing the risks and impacts of each choice together. The Shapley value satisfies the properties in the variables that make a sharing agreement (Rasmusen, 2005, p. 318).

There is a risk when dealing with interpersonal relationships that one person's comparison of choice will differ from the others. Cooperative game theory does not analyze the strategic bargaining that occurs within the coalition that affects the distribution of the collective payoff between the members. HAP is no longer the expert, to lecture to the participants and impart certain content, but rather to be a facilitator, in dialogue with the participants, who together are engaged in a process-oriented activity (Webel, 2007, p. 124).

Prisoner's Dilemma

Figure 10 shows the prisoner's dilemma game as another example of a cooperative game. The synopsis for the game is that two criminals are arrested. Both are given an opportunity to confess in various ways: 1) Neither confess and face three years in prison, 2) Only one confesses and gets 1 year in prison but the other one who doesn't confess faces four years, 3) Both confess and face two years each.

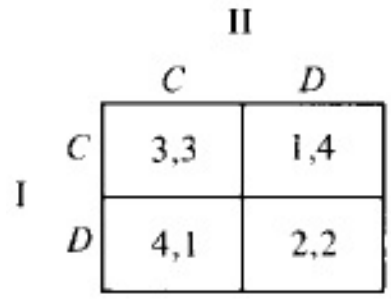

Figure 10 (Coleman, 1982, p. 146)

There are two strategies equilibrium; both say nothing and confess. However, when looking for a dominant strategy, the players form a coalition with each other and both confess. They have a greater payoff together rather than deciding to go it alone or if they decide both not to say anything. It is often a more attractive idea for players to work as a coalition especially because they can build off of the knowledge and experience of the other players within their coalition. In the prisoner's dilemma game both players benefit by establishing a two-person cooperative coalition (Coleman, 1982, p. 145). In this scenario, there may be a high level of trust as the agreement is made but on the other hand, the fear of retribution for not agreeing could also be the reason for the agreement. The third reason for this agreement could be is that the players know how the other players acted in a previous game, such as an earlier arrest. The knowledge of how one player acted previously gives each other a broader scope of information for decision-making. Lastly, it's not necessarily important that the players make the agreement for the same reason. Their definition of what's important to them and their preference may differ and well as how they weigh the importance. The key to this game is that they agree on a COA.

Achieving Objectives Together

Achieving objectives together is the primary goal of a cooperative game. In like manner, HAP is not a game of dominating the other but rather a game of cooperation with coalitions. But just like in contract law there is a set of rules that are agreed to, mutually benefitting all the players. Some players may be able to provide near the same contribution, such as NGOs working with other NGOs. There are other times where the players are on a different power balance and can only contribute marginally. "Each piece has a contribution to make, primary for a time, yet yielding appropriately to the other, equally integral, components within the continuum of effort" (Seiple, 1996, p. 5). There are probably fewer power imbalances than a refugee or IDP seeking help. What they bring to the decision-making table though is understanding the fuller contextual picture of what has happened to them and their own skill sets.

In a cooperative game, all players have the same information so if that's the case then the refugee or IDP can not only be the receiving of aid or action but in like manner assist fellow dispersed individuals with the skill sets they bring. Schrodinger Equation in quantum mechanics suggests that a wave can be in a number of different states simultaneously. This can be extrapolated into HAP by asking, can one be a provider and recipient simultaneously, and at what point could can one be identified as either if measured randomly? Quantum mechanical HAP suggests that they are no less a refugee than the rest of the group but could be labeled a provider and recipient depending on the point identified and who is doing the identifying. An example would be a refugee doctor, teacher, or tradesperson assisting the group until outside humanitarian aid arrives or while aid is being rendered. Without a game-tree finding the mutually agreed decision points, this group could get lost in the flood people.

The role of HAP is to work within this structure to assist the refugee or IDP regain their sense of power and stability throughout this continuum of effort, looking together to a mutually agreed outcome. A significant way to bring about the power and stability, achieving mutually agreed goals to ensure using various viewpoints from various perspectives to get a clearer understanding of what the end state should look like. Seeing endpoints from an ethnocentric point of view missed the cultural context.

Working as a team to provide or receive humanitarian aid looks for common interests and common grievances which gives a fuller picture as a COAs is developed and worked through. This "underlines the necessity of developing the capacities to identify and articulate key dilemmas facing people in the setting, to design strategic initiatives that integrate vertical and horizontal potentials in the society, and to respond to immediate emerging issues in a manner that lays the groundwork for transforming the subsystem and achieving structural change in the broader society" (Lederach, 2002, p. 148). This says that a cooperative game concept is the best approach for the process to be accepted or understood by all the stakeholders instead of an approach of telling one what one might perceive the need be, then giving them aid based on what could be a faulty perception. "It is possible, for example, that more serious crises are usually associated with more defective decision-making and with less favorable outcomes" (Herek, 1987, p. 217).

It seems reasonable to believe that using the coordinated method of game theory structures knowledge about a context. This shapes the shared information or perfect information by asking ourselves, before enacting our COA, what information gaps are missing, and what assumptions can we turn into facts before proceeding? In addition, we find out early what coordination gaps are missing as well as additional partners we can bring in to fill a need. If we need non-

humanitarian actors to assist in meeting the shared objective, those can be identified early, such as construction teams or military protection (Archer, 2017, p. 8). All these points give us a better situational awareness of the problem, the players, and the end state. These examples reflect a non-zero-sum game where one does not have to lose for another to win.

NON-COOPERATIVE GAMES

Groundwork

The last game I will cover is non-cooperative games. Most are familiar with the Soviet-American arms race. This was an example of two countries involved in a non-cooperative game of war and politics with each other. The distinction between cooperative and non-cooperative game theory relates to whether agreements made between players are binding. Cooperative game theory assumes that such agreements are binding, whereas non-cooperative game theory does not (Hargreaves-Heap, 2004, p. 39). A non-cooperative game can assume all players are in the game for themselves and that each player has an outcome in mind, or develops a payoff strategy as the game is played, seeking the best payoff for themselves. The term "noncooperative" means this branch of game theory explicitly models the process of players making choices out of their own interest (Turocy, 2001, p. 6).

When involved in non-cooperative game theory one key phrase to keep in mind is imperfect information. Imperfect information, or the lack of common knowledge, is when is missing vital information to make an informed decision. Imperfect information can be not knowing whom all the players involved are, not knowing what the rules of games are, not know what the end state or pay is supposed to be, and not knowing what plays the others have made. One additional part of imperfect information is the possibility of not knowing the strategy the other players are using.

What seemed to be a rational strategy, consistent with previous moves, suddenly turns to an irrational strategy, outside the normal strategy thought to be consistent with other players.

In a HAP context, it is no surprise that humanitarians arrive on the scene during or after a conflict or disaster with little information answering the 5Ws. The fluid situations between the impact phase throughout the recovery phase can bring the change of players and situations that can change the expected or assumed outcomes. These do not undo the often antagonistic relationships between local governments and the urban poor and their informal communities and livelihoods (McClean, 2010, p. 26). At times the humanitarians are welcomed whereas other times they are not. Each variation of events can cause friction between the host nations, effected parties, communities, NGOs, and beneficiaries. One added dimension is transitioning refugees or IDPs to a new urban context, where their welcome may be hostile, cold, or fraught with suspicion or fear.

Non-Cooperative Games by Examples

The State vs the NGO

An example of this non-cooperative game is the tension between a host nation and a humanitarian organization coming into the country to give aid. It could be assumed the country believes the NGO thinks the country is a failed state and needs to be rescued by the NGO. This is based on an assumption but with imperfect information. It could also be assumed that the country is a failed state and needs assistance. Lastly, it could be a failed state, it probably should be assisted, but partially rejects or half-heartedly accepts assistance. As an aside, if they need assistance, wanted assistance, and receive assistance, that would be a cooperative game.

Though choices between the host nation and NGO could be sequential, more than likely both players are making decisions simultaneously from what seems to be in the best interest of the individual player based on previous moves or perceived upcoming moves of the other player. "the ordering and timing of player's choices are crucial to determining the outcome of a game" (Turocy, 2001, p. 6). In this situation, the players are either responding to what the others have done or could do. Control of the game is a prime motivation.

There are fewer better examples than when dealing with who is funding what. The state needs to stay in control of the country and realize they need to fund portions of recovery and stability actions. However, in our example of a failing state, finances and support are short. However, the NGO wants to provide relief but they too have limited funds, neither can proceed without the other. "Non-cooperative game theory is economic in flavor, with solution concepts based on players maximizing their own utility functions subject to stated constraints" (Rasmusen, 2005, p. 22). The question is asked, what is the utility function or perceived end state the other is looking for? If there have been communication amounts the players there may have been agreements but no real way to enforce those agreements. The competition then arises between the two. The state's viewpoint contemplates what barest amount of funding and resources it can provide to meet the obligation of the state but at the same time stay in control of the game whereas the NGO contemplates how much funding and resources can they invest without being perceived as to dominate the game.

As one deduces from this example, neither player has completely conflicting interests. Both players compete for a share of humanitarian involvement. Whether out of benevolent or malevolent motivation neither do 100% of the action and for each percentage of credit one receives is one less percentage of credit the other receives. Yes, on a human level the state wants

the world to see them in control whereas the NGO needs their donors to see they achieving their setup mission objectives.

Refugee vs the Urban Context

In 2018, the United States experienced a surge of refugees on its southern border. This is just one example worldwide of refugees transitioning to an urban context or a new urban context. The numbers and political motivations are not especially important to this example other than it reinforced the idea of their arrival was met with hostility, suspicion, and fear. A mythical mathematical equation touted at the time was that one refugee equaled the loss of one citizen's job. Additionally, change of the community was inevitable because of "those people". It was most definitely a non-supportive environment. This is not just an issue within the United States. This issue is felt as urban areas filled with change for outside. To complicate it a bit more the non-cooperation can lead to injustice, inequality, and exploitation of the newcomers within the urban setting.

Building coalitions within these contexts allows the players to work within a community of activity and thought rather than venturing into transition independently. With this in mind, the payoff goes from an individual strategy to a group strategy. From here, we can move toward cooperation.

Move Towards Cooperation

The examples above are just a few or probably scenarios that can be played out in a non-cooperative game. The challenge in non-cooperation games is the addition of unknown players, unknown to either player or both players. The unknown players can represent stakeholders privately attempting to influence the decision-making process, either positively or negatively.

There are so many directions a non-cooperative game can go that a game-tree could barely scratch the surface. One objective within a non-cooperative game is to turn it into a game of cooperation through information collecting and negotiation. In like manner, a non-cooperative game has the possibility of becoming an infinite game. I find that J.P. Lederach addresses this when he talks about demystifying theory.

> A theory is an assumption about how something works, or a prediction of what will happen as a result of an action. Social change theories usually refer to one of two things:
>
> • How are things connected and related?
>
> • What is the peacebuilder's best guess about how such things "work" in the real world?
>
> In the peacebuilding context, demystifying theory means making explicit the underlying assumptions about how things work, about how particular actions or processes create consequences, in environments of conflict and change (Lederach, 2007, p.4).

This demystifying theory brings the humanitarian back to a cooperative, finite game where the strategies discussed earlier can be enacted and tracked. Informed predictions of the opposing player's moves become easier as one knows who the players are, what the rules are, and what the defined end state looks like. When all the indicators provide meaningful information to implement of the COA relevant steps can proceed in gameplay (Shotton, 2019, p. 108).

Due to the fact that as humanitarian involve themselves with assistance in areas that have long-term conflict, either ethically, politically, or economically, the NGO should work for collaboration with internal partners, who live and understand the cultural context, who can help

build agreements for share payoffs and beginning moving the non-cooperative game to a cooperative conclusion.

LIMITATIONS OF GAME THEORY

Unknown vs Known Variables

One of the challenges and limitations is concerning unknown and known variables. One of the keys to using game theory is to understand that as you enter a HAP environment it can be assumed that you are entering an infinite, non-cooperative game. This assumption can be based on that there will be many details to the HAP project that are unknown and though an invitation may have been offered and accepted there can be ulterior motives within the host country, community, or organization that are initially outside of one's knowledge.

Moving the game towards a finite, cooperative game may present a challenge and limit one in developing an appropriate game tree based on common knowledge versus assumptions. This is not an easy task, with or without game theory. People are free will beings with motivations that we may or may not be understood. In addition to this variable, there are a host of others that need consideration.

- PMESII-PT: political, military, economic, social, information, infrastructure, physical environment, and time (ATP 2-01.3, 2019, p. 1-2).
- ASCOPE: areas, structures, capabilities, organizations, people, and events (ATP 2-01.3, 2019, p. 3-6).
- Conflict Transformation: personal, relational, structural and cultural (Lederach, 2007, p. 29).

Game theory cannot account for every variable, but through additional planning toolkits, one should be able to develop appropriate programming seeking out the best responses to each nod or decision point in the game with an expectation of transforming the HAP program from infinite, non-cooperative toward a finite, cooperative game.

Communicating Outcomes Outside of One's Culture

Explaining game theory can be challenging between the game trees, graphs, and the mathematical computations showing what a projects best response should be, as well as the decision-making process to get there, but the added limitation of explaining it outside of one's culture can be limiting. There lays a challenge in communicating the intended road map, path, decision points, end state outside of one's one language, cultural dimensions, behaviors, and decision-making process.

Communicating outcomes outside of one's culture is a challenge throughout HAP and is not limited to game theory, but adding this seemingly complicated process may get lost in translation. One needs to be culturally sensitive based on mutual understanding, respect, and empathy (Piquard, n.d., p. 2). Game theory can come across as the smart one knows best thus the outcomes may not be fully understood or miss the cultural decision-making norms within a different culture.

Achieving Shared Objectives

Achieving shared objectives is the third limitation. Disasters and crises bring about different values as to what's important, opportunity possibilities, and resource availability. A refugee or IDP presenting themselves to a humanitarian aid agency, they may have a shorter objective than the aid worker objective. The refugee or IDP objective may simply be making the bad stuff stop

and return to their normal as soon as possible whereas the aid worker may be looking at the long-term solutions and opportunities.

This situation puts us into a finite, non-cooperative game. Non-cooperative doesn't imply a combative relationship but it means that the goals and objectives seem to be a win-lose game between the provider / donor and recipient / beneficiary relationship. Game theory, taking a managed, long-term approach, may be limited to providing short-term, crisis-driven, decision-making.

Time and Capacity Constraints

Disasters and crises may not be the only time-related limitation game theory has. In the area of transitioning from and refugee or IDP context to an urban context takes time, staffing, and resources to accomplish the task effectively. Assuming a finite game with known players, fixed rules, and agreed objectives, and assuming the language and culture difference are overcome, there still lays the time constraint question of how much time can or should be spent per beneficiary to achieve the shared objective. Again, this question is not limited to game theory alone but walking each beneficiary through the game tree process does take time. The capacity of staffing numbers in contrast to beneficiary numbers may put strain and delay on the process.

Additionally, there may be an intellectual capacity limiting factor of explaining it, then working the process adequately as well as understanding it fully to make an informed decision. This can produce an attitude of the simplest way is the best way without thinking through actions and reactions or causes and effects.

Deep-Rooted Conflicts Within Certain Contexts

The last limitation I want to address is that there are deep-rooted conflicts within certain contexts that game theory can't overcome. Resolution to conflict depends on the decisions made by all the players involved. Though game theory can attempt to transform conflict by working out the best responses, it is dependent on the player's will to bring about change in conflict. An infinite non-cooperative game may just be a battle of wills with neither aside coming to an agreement and the results of negotiations not being able to be enforced.

Though game theory can work through specific issues showing up within the conflict, it does present opportunities through the game trees to see better ways and approaches to handle presenting issues, but overall, it will not through some mathematical concept remove hundreds or thousands of years of mistrust or hostility. This limitation does not imply that one should not attempt to use game theory to work through the deep-rooted conflicts. This limitation implies that game theory alone will not work and that other conflict transformation strategies should be applied.

CONCLUSION

The topic of using game theory in humanitarian action and peacebuilding is an original topic with little to no literature on the subject. The idea behind it seems complicated at first look since it's steeped in mathematical computations that chase most individuals away from its usage. Taking the basic framework of game theory, it can be used as an excellent tool for working out problems, solutions, and the path between both. Incorporating game theory doesn't discount the pre-existing humanitarian action and peacebuilding toolbox solutions but tries to use them within

a tailor-made outcome predictive style for each challenge humanitarian action and peacebuilding workers encounter.

Game theory is a reasonable and practical way to look for the best outcomes when designing programming. Each of the four game styles, infinite, finite, cooperative, and non-cooperative game styles discussed can be visually seen and used so they can make the best decisions possible for their own outcomes, understanding the possibilities of choices and ramifications of those choices in a more informed context. Knowing what kind of game you're playing allows one to seek out more information creating the mutually beneficial finite cooperative game rather than finding oneself in an infinite came or worse yet an infinite noncooperative game.

The visual pictures of possible choices through game trees and matrixes shows building blocks in the decision-making process and how each interrelates with the other. Using the pre-play decision-making process helps find the variables within the game tree that could create conflict as well as showing in advance of making the decisions the ramifications of choices with additional secondary or tertiary orders of effect of those plays and decisions. It is reasonable and practical to have all of this situational awareness to understand the objectives, payoffs, and specific route choices to arrive at both mutually agreed understandings and beneficial payoffs, including how and why each relates to each other.

When looking at context and conflict analyses, the transition to an urban context, post-conflict stabilization, and recovery, game theory can help define and explain processes that refugees and IDPs can use when they make choices for their own future rather than making the decisions for them. Working within a HAP environment is important to know what kind of game one is in.

Bringing refugees and IDPs to a mutually agreed payoff brings better success to the mission and keeps the programming ethical, reflecting common knowledge in both progress and end state.

Humanitarian organizations can benefit by using game theory models to present their cause to projected donors in a clear and concise way. It shows that the project coordinators have looked at all the possible directions that programming could go based on the choices made by all players. It points out possible dead-end directions in advance of spending money before finding out that their selected strategy was a failing strategy in those selected directions. Game theory also assists donors to understand how their donations can be best used by showing a benefit to contribution comparison for each game tree or matrix, and what strategy they can play out to do the most good for the most people or projects.

It is recommended that HAP players focus their directions on finite, cooperative games. As players find that they may be in an infinite game or a non-cooperative, they should refocus on the shorter finite options to help bring resolution in the short term while continuing to gather more information and negotiations for the longer term.

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