

APPLICATION OF GAME THEORY IN ORGANISATIONAL CONFLICT RESOLUTION: THE CASE OF NEGOTIATION

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Abstract

This study aimed at investigating game theory with a view to determine the extent to which it influences the effectiveness of negotiation method of conflict resolution in Nigerian organizations. To achieve this purpose, a review of extant literature was made and it was hypothesized that game theory does not significantly enhance the effectiveness of negotiation method of conflict resolution in Nigerian organizations. In order to generate the necessary data for this study, seventy (70) copies of questionnaire were administered on the general managers and union chairmen of the selected companies in Port Harcourt. The data generated were statistically tested with t-test which revealed a value of 3.37. At 0.05 level of significance and 68 degree of freedom, t-critical indicated a value of 1.95 for a two-tailed test. The result therefore suggested that game theory significantly enhance the effectiveness of negotiation method of conflict resolution in Nigerian organizations. Based on the above, it was recommended that Nigerian organizations should apply the use of game theory for conflict resolution and training programmes, seminars and workshop should be organized for decision makers to adequately equip them with the application of game theory.

Keywords: Game theory, negotiation, conflict resolution, nash equilibria, zero sum game

Introduction

The organization is made up of different interest groups such as board of directors, management, employees and unions. In their attempt to achieve their goals, differences of interest may occur among the various groups. This clash of interest is commonly described as conflict. However, Robbins (1999) defined conflict as a process that begins when one party perceives that another party has negatively affected or is about to negatively affect something that the first party cares about. In other words, conflict is a struggle or contest between people with opposing needs, ideas, beliefs, values or goals. Algert and Watson (2002), claim that conflict might escalate and lead to non-productive results, or it can be beneficially resolved and lead to improved performance.

According to Johnnie and Nwasike (2002), the sources of conflict are the aggressive nature of man, competition for limited resources, differences in values and interest, inherently antagonistic roles, drives for power acquisition, poorly defined responsibilities, initiation of change, poor organizational climate, denial of identity, denial of basic human needs, poorly designed social class, task interdependence, and competitive reward system. Irrespective of the source of conflict, what is important is that the organization must devise a means to handle the conflict so that it does not degenerate to violence and wars but

an improvement to productivity. One of the things that can make conflicts hard to resolve is the way that the parties behave towards each other which could be assertive or co-operative. However, DuBrin (1974) in Johnnie and Nwasike (2002), affirm that conflict in organization can be resolved through compromise, third-party judgment, procrastination, perfect coexistence, and reorganization. Morris (2010) posit that methods of resolving conflicts based on game theory, are quite effective, because game theory attempts to formulate rules of behaviour that optimize outcomes by considering the utilities and probabilities of the various outcomes to each party. Ekanem and Iyoha (2002) state that game theory is applicable in competitive situations involving two or more persons with conflicting objectives. Each player is assumed to know the objectives of his opponent. The action of each player has significant repercussions on the outcome of the game. Boskey (1999) states that the effectiveness of negotiation, mediation, and arbitration methods of conflict resolution depend on a basic understanding of the mathematical theory of games.

Despite the publicity that game theory has received in recent times as a veritable tool for conflict resolution, to the best of my knowledge there is still lack of adequate literature and empirical studies on the application of game theory in conflict resolution in Nigerian organizations. It is upon this premise that this study is being conducted to investigate the extent to which game theory enhances the effectiveness of negotiation method of conflict resolution in Nigerian organizations.

Research Hypothesis

To achieve the above objective, the following hypothesis was raised

H₀: Game theory does not significantly enhance the effectiveness of negotiation method of conflict resolution in Nigerian organizations.

Literature Review

In any setting which human beings have to interact, one form of conflict or the other is inevitable. According to Rollinson, Broadfield, and Edwards (1998), conflict is the behaviour of an individual or group which purposely sets out to block or inhibit another group (or individual) from achieving its goals. Organizational conflict in particular is said to exist when two or more individuals or work groups in the organization disagree on significant issue and clash over the issue. Organizational conflict can occur between individuals, individual and group, group and group, individual and organization, or group and organization (Thom Otuya, 2005). There are number of issues over which organizational members in conflict can have incompatible goals. These include gaining a sense of achievement, obtaining financial rewards, making profit for the firm, getting the job done as quickly as possible, having a feeling of self-esteem, and recognition for one's efforts over the opponent), games (attempts to outwit the opponent), and fights (attempts to harm or destroy the opponent).

Game theory is a branch of mathematical analysis developed to study decision making in conflict situations. Such a situation exists when two or more decision makers who have different objectives act on the same system or share the same resources. Aumann (2008) states that game theory provides a mathematical process for selecting an optimum strategy (that is an optimum decision or a sequence of decisions) in the face of an opponent who has a strategy of his own. It studies the strategic interaction between individuals in social situations. Games can have several features, a few of the most common as indicated by Aumann (2008) and Shapiro (1989) are:

- (i) **Number of players** Each person who makes a choice in a game or who receives a payoff from the outcome of those choices is a player.
- (ii) **Strategies per player** in a game each player chooses from a set of possible actions, known as strategies, if the number is the same for all players.

- (iii) **Nash equilibria** A set of strategies, which represents mutual bests responses to the other strategies. In other words, if every player is playing their part of a pure strategy, no player has an incentive to unilaterally change his strategy.
- (iv) **Sequential game** - A game is sequential if one player performs his actions after another, otherwise the game is a simultaneous move game.
- (v) **Perfect information** A game has perfect information if it is a sequential game and every player knows the strategies chosen by the players who preceded them.
- (vi) **Constant sum** If the sum of the payoffs to every player is the same for every set of strategies, the game is a constant sum. In these games, one player gains if and only if another player loses. A constant sum game can be converted into a zero sum game by subtracting a fixed value from all payoffs, leaving their relative order unchanged.

The adoption of game theory for conflict resolution is only made possible based on certain assumptions as stated by Camerer (2003). These assumptions are:

- (i) Each decision maker (player) has available to him two or more well-specified choices or sequences of choices (called plays).
- (ii) Every possible combination of plays available to the players leads to a well-defined end-state (win, loose, or draw) that terminates the game.
- (iii) A specified payoff for each player is associated with each end state. A zero sum game means that the sum of payoffs to all players is zero in each end-state.
- (iv) Each decision maker has perfect knowledge of the game and of his opposition. That is the decision maker knows in full details the rules of the game as well as the payoffs of all other players.
- (v) All decision makers are rational. Given two alternatives, each player will select the one that yields him the greater payoff.

Stef (2003) posit that game theory is a general theory of rational behaviour for situations in which two or more parties have available to them a finite number of courses of action each leading to a well defined outcome or end with gains and losses expressed in terms of numerical payoffs associated with each combination of courses of action and for each party. The parties have perfect knowledge of the rules of the game but no knowledge about the opponents' moves and are rational in the sense of making decisions that optimize their individual gains. The matrix of payoffs can represent various conflicts. In a zero sum game one person wins what the other loses. In other situations gains and losses may be unequally distributed which allows the representation of numerous competitive and conflict situations. The theory proposes several solutions, eg in a minimax strategy each participants minimizes the maximum loss the other can impose on him, a mixed strategy involves probabilistic choices. Experiments with such games revealed conditions for co-operation, defection and the persistence of conflict.

Game theory has found applications in management science bargaining and conflict resolution (Krippendorff 2010). Krippendorff further reiterated that game theory can only be successful for negotiation if the following questions are adequately answered:

- (i) What do the parties want? This must be clearly spelt out;
- (ii) What do the parties want to get and what are they willing to give away?
- (iii) What are the parties anticipations for the negotiation?
- (iv) What alternatives are available to the parties if the negotiation fails?
- (v) What are the perceived risks of the negotiation?

Case Study:

The workers' union of a firm demanded a minimum wage of ₦45,000 and management offers the sum of ₦15,000. As a result, disagreement ensues between the union and management, which manifested in strike action. In resolving the differences, there was need for negotiation between the parties. The payoff table below shows the strategies and various outcome by both parties in determining the optimum minimum wage.

Management Strategies				
	A	B	C	
	1	35,000	30,000	25,000
Workers' union strategies	2	45,000	40,000	15,000
The determination of the optimum wage requires determining the value of the game as shown below.				
Management Strategies				
	A	B	C	Row min
Workers' 1	35,000	30,000	25,000	25,000
Union strategies 2	45,000	40,000	15,000	15,000
Col Max.	45,000	40,000	25,000	
From the table above, $R_1 \text{ Min.}$ is 25,000 and $R_2 \text{ Min.}$ is 15,000. Similarly $C_A \text{ Max.}$ is 45,000, $C_B \text{ Max.}$ is 40,000 and $C_C \text{ Max.}$ is 25,000. At the location $R_1 C_C$, row minimum (25,000) is equals to column maximum (25,000). Therefore the optimum minimum wage is ₦25,000 which is acceptable to both parties because it is the maximum for the union and the minimum for management.				

Methods And Results

In order to generate the necessary data for this study, a pilot survey of thirty five (35) private sector organizations was carried-out in Port Harcourt, the Rivers State capital. The questionnaire, which was administered on 35 general managers and 35 union chairmen of the selected companies, was the instrument for data collection used in this study. The questionnaire was designed in five response option of Likert scale very high extent, high extent, low extent, very low extent, and

indifferent. The responses were assigned weights of 4,3,2,1 and 0 respectively. The seventy (70) copies of questionnaire administered were all retrieved and found usable thereby representing hundred percent response rate.

In testing the stated hypothesis in this study, the t-test statistical technique was used as computed in the table below which shows the responses on the extent to which game theory enhances the effectiveness of negotiation strategy of conflict resolutions.

Table 1: t-test computation for the test of hypothesis

Responses	General Managers (x1)						Union Chairmen (x2)					
	Scores (x)	Frequencies (f)	Fx	$(x - \bar{x})$	$(x - \bar{x})^2$	$f(x - \bar{x})^2$	Scores (x)	Frequencies (f)	Fx	$(x - \bar{x})$	$(x - \bar{x})^2$	$f(x - \bar{x})^2$
Very high extent	4	11	44	8.87	8.72	7.94	4	6	24	1.74	3.03	18.17
High extent	3	18	54	-0.17	0.03	0.52	3	11	33	0.74	0.55	6.03
Low extent	2	6	12	-1.17	1.37	8.21	2	8	16	-0.26	0.07	0.54
Very low extent	1	1	1	-2.17	4.71	4.71	1	6	6	-1.26	1.79	9.53
Indifferent	0	1	0	-3.17	10.05	10.05	0	4	0	-2.26	5.11	20.43
Total	-	35	111	-	-	31.43	-	35	79	-	-	54.69

Source: Fieldwork, 2011

$$\bar{x}_1 = 3.17 \quad \bar{x}_2 = 2.26$$

$$s_1^2 = 0.90 \quad s_2^2 = 0.90$$

$$n_1 = 35 \quad n_2 = 35$$

$$t = \frac{3.17 - 2.26}{\sqrt{\frac{(35-1)(0.90) + (35-1)(0.90)}{35+35-2} \left[\frac{1}{35} + \frac{1}{35} \right]}}$$

$$t = 3.37$$

Decision:

Reject H_0 since t computed (3.37) is greater than t -critical (1.95). The result implies that game theory significantly enhance the effectiveness of negotiation method of conflict resolution. This seems to be correct because game theory attempts to formulate rules of behavior that optimize outcomes by considering the utilities and probabilities of the various outcomes to each party. Therefore, in competitive situations involving two or more persons with conflicting objectives, game theory serves as an effective instrument for resolving the conflict.

Conclusion

In game theory, the basic framework of optimization is changed to that of finding either the maximum among a set of minimum (maximin) or a minimum among a set of maximum (minimax). Game theory provides solutions to a game of strategy based on the assumption that each player behaves conservatively and as such would always wish to maximize his minimum expected gains and minimize his maximum expected loss. In the theory of game some must win and receive positive payoff and some other must lose and receive negative payoff. Games are characterized by a number of players or decision makers who interact, possibly threaten each other and form coalitions, take actions under uncertain conditions, and finally receive some benefit or reward or possibly some punishment or monetary loss. In this study, the result of our analysis shows that game theory significantly enhances the effectiveness of negotiation method of conflict resolution. It helps in creating structures that take away all incentives or rewards for irrational or non self interested

behaviour, yielding a predictable set of interactions.

Recommendations

Based on our findings, it is recommended that Nigerian organizations should imbibe the culture of using game theory for negotiation method of conflict resolution as such helps to promote justice and fairness in negotiation. More so, training programmes, seminars and workshops should be organized for decision makers to adequately equip them with the application of game theory.

References

- Algert, N.E and Watson, K. (2002) *Conflict management introductions for individuals and organizations*; Bryan; New York
- Aumann, A.J (2008) Game theory; the new palgrave dictionary of economics; <http://www.palgrave.com/ed/archives>; Retrieved on 30th September.
- Boskey, J.B (1999) Negotiation applying game theory; *Journal of Economic Literature*; 11; pp285-299
- Camerer, C.F (2003) Behavioural game theory experiments in strategic interaction; *International Journal of Industrial Economics*; 26(2); pp 147-162
- DuBrin, A.J (1974) *Fundamentals of organizational behavior*; New York; Pergamon Press
- Ekanem, O.T and Iyoha, M.A. (2002) *Managerial economics*, Benin City; March Publishers
- Heinz-Jurgen, A; Antonio, M. and Schwarz, O. (2006) *Conflict a literature review*; Essen; University of Duisburg Press
- Johnnie, P.B. and Nwasike, J.N (2002) *Organizational behaviour and advanced management thought An Epistemological Analysis*; Lagos; University of Lagos Press
- Krippendorff, V. (2010) Application of game theory in management sciences; In S. Herman, (Ed) *Management in the 21st Century*; London; Heidelberg Inc.
- Morris, C. (2010) "Conflict Transformation and Peace Building"; <http://www.resolution.tau.ac.il/coruse> retrieved on 30th September,