

## A GAME THEORY FOR CONTROLLING STUDENTS' UNREST ON NIGERIAN TERTIARY INSTITUTIONS

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### Abstract

*Many Nigerian Tertiary Institutions have experienced students' crises which have had different consequences on different campuses including damage on Institutions' facilities, unwanted change in academic calendar, loss of lives of either staff or students, and most times, incurring additional cost for the students by way of paying for damages. This research examined four popular strategies to manage students' crisis when it erupts in a particular higher institution in Nigeria with the aim to determine the optimum strategy to be employed. This has provided scientific information to the authorities of Nigerian Higher Institutions in curtailing students' riots on campuses.*

**Keyword:** Game Theory, Students' Unrest, Zero Sum Game, Pay off Matrix, Optimum Strategy, Saddle Point, Prisoner's Dilemma

### Introduction

Game Theory is the study of mathematical models of conflict and cooperation between intelligent rational decision-makers. It is a tool that can model any situation in which there are people that interact by taking decisions, making moves, etc., in order to attain a certain goal. This mathematical description of conflicts began in the twentieth century. Thanks to the work of John Von Neumann, Oskar Morgenstern and John Nash. One of its first motivations was to help military officers design optimal war strategies. Nowadays, Game Theory is applied to a wide range of disciplines, like Biology, Political Science and most of all, to Economy. It is also used in the study of behavioral relations (Myerson, 1991). Game theory was derived from James Waldegrave's idea in 1713 regarding a belief that one person's behavior results from others' behaviors. Game theory was first used in zero sum games. It was then developed into other games, for example Battle of the sexes, Blotto games, cake cutting, chicken. Game theory is also used to describe social behavior and political interest groups. Nowadays, game theory has extensively been used by many scholars. More than eight scientists who employed game theory in their works received Nobel Memorial Prize in Economic Sciences. The key concept of game theory is equilibrium concepts. In social sciences, it is believed that if equilibrium occurs, it will reflect human behaviors and reactions to the event which is a crucial factor of game theory. However, game theory has been widely criticized as the theory was created based on a radical rational decision and may be opposed to the morality of the society. For example, the assumption that the game players will do everything to win the game or gain the most profits or Homo economics model seems to be an extreme capitalist idea and it may not be rational from a psychological point of view. Nonetheless, game theory may be used to examine human nature. Human beings are selfish and will make a decision primarily based on their own benefits. Therefore, it can be said that game theory is actually based on a practical assumption of human behaviors (Aumann, 1994).

In recent times, it has been observed that students' unrest in higher institutions of learning in Nigeria is mostly precipitated by factors such as: increase in tuition fees, cultism, failure of institution's authorities to listen to students' complaints, poor campus transportation system, poor infrastructural facilities. Others include non-participation of students in decision making, academic stress, changing value systems of students, contemporary national issues and welfare problems (Falua, 2004; Adeyemi, 2009, in Okeyo, 2017). All these have led to the breakdown of law and

order, loss of lives and properties. It is on this note that this work sought to examine the strategies by which student's unrest can be optimally managed and if possible, avoided in Nigerian higher institutions of learning.

#### Literature Review

Kelly, (2003) assert that game theory was conceived in the seventeenth century by mathematicians attempting to solve gambling problems of idle French nobility by the correspondence of Blaise Pascal and Pierre de Fermat (1654).

Kelly, (2003) admits that game theory in modern era was ushered in with the publication in 1913, by German mathematician Ernst Zermelo in which he proved that every competitive two-person game possesses a best strategy for both players, provided both players have complete information about each other's intention and preferences.

The earliest example of a formal game-theoretic analysis is the study of a duopoly by Antoine Cournot in 1838. The mathematician Emile Borel suggested a formal theory of games in 1921, which was furthered by the mathematician John von Neumann in 1928 in a "theory of parlor games." Game theory was established as a field in its own right after the 1944 publication of the monumental volume *Theory of Games and Economic Behavior* by von Neumann and the economist Oskar Morgenstern. This book provided much of the basic terminology and problem setup that is still in use today. In 1950, John Nash demonstrated that finite games have always have an equilibrium point, at which all players choose actions which are best for them given their opponents' choices. This central concept of non-cooperative game theory has been a focal point of analysis since then. In the 1950s and 1960s, game theory was broadened theoretically and applied to problems of war and politics. Since the 1970s, it has driven a revolution in economic theory. Additionally, it has found applications in sociology and psychology, and established links with evolution and biology. Game theory received special attention in 1994 with the awarding of the Nobel Prize in economics to Nash, John Harsanyi, and Reinhard Selten (Aumann and, 1994).

At the end of the 1990s, a high-profile application of game theory has been the design of auctions. Prominent game theorists have been involved in the design of auctions for allocating rights to the use of bands of the electromagnetic spectrum to the mobile telecommunications industry. Most of these auctions were designed with the goal of allocating these resources more efficiently than traditional governmental practices, and additionally raised billions of dollars in the United States and Europe. Game Theory is a science dealing with decision making in conflict situations. A conflicting situation may occur in numerous cases. "The notion of a game in modern Game Theory has a very general meaning that involves both the drawing-room games such as chess or poker, but in principle, any conflicting situation among individuals, enterprises, armies, states, political parties and species". For a suitable analysis of individual situations, Game Theory uses mainly mathematical structures, psychology, sociology or economy. The game objective is a strategy based on the analysis of an aggregate of decision-making unit. "The one who takes an attempt in strategic behaviour should be clear about several aspects, the first one being the objective to approach" (Hazewinkel, 2001)

The first full scale account of game theory is due to von Neumann and Morgenstern in 1944, and a very Influential text by Luce and Raiffa appeared in 1957. Perhaps the greatest individual contribution to game theory is due to John Nash who, in 1950, expanded von Neumann's ideas into the so-called "Nash equilibrium" concept, proved a seminal existence theorem, and partitioned the theory into its two major branches, the "non-cooperative" theory that deals with egoistic self-centered decision makers and the "cooperative" theory that is concerned with the optimal allocation of resources within society.

### Historical Notes on Students' Unrest in Nigerian Higher Institutions

As in many developing countries, Nigerian higher institutions witness series of organizational conflicts. Many of the conflicts lead to anarchy on campuses; some disorganize timing of school activities, destroy properties and lives and in most cases, render school environments completely insecure for academic activities. In addition to these, many known school conflicts have resulted in protracted disharmony in school staff interpersonal relationship, increased indiscipline among students, disarmed school authorities, clogged channel of progressive communication and renders institutions of learning ungovernable (Agbonna, 2009; Alabi, 2002).

According to Agbonna (2009), Alabi (2002), Ajayi, and Ekundayo (n.d.) and Olugbile (2005) as cited by Fatile and Adejuwon (2011), Potentials for conflicts are multifarious in higher institution system. Some of which include Competition for scarce resources, perceived goal incompatibility, Drives for autonomy and academic freedom, Management style of higher institutions, Difference in values and lifestyles, Politics and national issues, and Communication barrier.

Ibukun (1997) observed that University governance in Nigeria today is nothing but crises management. Nigeria's university crises, some of which have been identified by the world bank (1994) as (1) decline public expenditure; (2) deteriorated infrastructure/facilities/equipment for teaching, research and learning. These are either lacking or very inadequate and in a bad shape to permit the universities the freedom to carry out the basic functions of academics; (3) the erosion of university autonomy and academic freedom; (4) the increasing rate of graduate unemployment; (5) brain-drain; and students' unrest and constant strikes by both students and academic staff.

Under Olusegun Obasanjo regime the conditions of services of University staff declined relative to that which was obtained in the public services and the private counterpart. In 1978, the Federal Ministry of Education (FME) increased charges for university students from fifty kobo (50k) to one Naira fifty kobo (₦1.50k) per day and accommodation fee from Thirty Naira (₦30) to Ninety Naira (₦90). These increases led to the 1978 students' protest and demonstrations popularly known as "All Must Go" riots which shook higher education to its very foundation.

Aluede (2005) observed that revolts, protests, unrests and violence, as well as incessant closure of schools for months in the wake of unrest or protest have become a regular feature of Nigerian universities. Already, Aluede, (1995 & 2001) had argued that, today, if there were anything most predictable about Nigerian universities is that the students who are enrolled in them would riot in any academic semester or academic year. Such incessant incidents of unrest seem to affect the scope of areas being covered and the content of courses in the school curriculum and. They have their contributory causative factors such as students' non-participation in decision-making processes, academic stress, Welfare problems brought about by lack of basic amenities, etc.

### Historical Background on Students' Unrest in Federal University of Technology Minna and Niger State Collage of Education Minna

Federal University of Technology (FUT), Minna is a Federal Government owned University in Nigeria. It was established on 1st February, 1983. The objective for its establishment is to give effect to the Nation's drive for the much-needed self-reliance in Science, Engineering and especially Technology. It is a specialized University of Technology.

The history of crises in Federal University of Technology can be trace to early 2000s having Prof. H. Tukur Sa'ad as the then Vice-Chancellor. Information acquired from the security department of FUT, Minna revealed that the then students union with Daniel Onjeh as the president requested for a vehicle from Niger State Government to transport Union members to Abuja where national election was going to take place. But when the time came for them to travel, the State Government with Late Engr. Abdulkadir Abdullahi as the State Governor bridged the agreement to release a vehicle for them as promised. Consequently, the students union decided to acquire a government

vehicle from the Niger State Transport Authority (NSTA) forcefully. Government took a repressive measure which led to the death of a female student and rather than helped to mitigate the problem, students crises erupted where properties owned by government and private individuals were violently destroyed in retaliation to the death of the student who was shot by the state security.

The most recent one was in year 2017 when Prof. Musbau Adewumi Akanji was the 6th substantive Vice-Chancellor of the University. A student slumped and died in the football pitch and was immediately rushed to the school clinic. According to the students, he was not given prompt attention when they arrived the clinic with the deceased. This led to the students taking austere measures by burning down the school clinic and properties of the school. Those of private individuals were also violently destroyed. The result of this unrest led to the closure of the University for 3 months before the students were called back to resume for their examinations.

Niger State College of Education Minna was established as an Advanced Teacher's College by the defunct North Western State Government when there was need to establish an additional Advanced Teachers College in order to meet the searing teacher needs in the state. The college was cited in Minna in 1975. The first batch of students that was admitted into the college reported in November 1975. In 1983, the college was upgraded to the status of college of Education by the defunct civilian government in the second republic through the Niger State edict N.S.L.N Number 3 of 1983.

The beginning of crises in Niger State College of Education was traced to year 2007 when Prof. Ibrahim Kolo was the Provost. The school security disclosed that the crisis was as a result of increase in tuition fee. The students reacted by destroying lecturers' offices among other properties. The consequences of this was that some students union executives were rightly punished based on their degree of involvement. The second and the recent one were 2010 and 2016 respectively which both occurred when a vehicle knocked down a student on each of the occasions and resulted to death. Both happened during the regime of Prof. Haruna Rasheed as the provost of the school. As part of the measures to curtail the crises the school authority employed mediation type of crises management where deputy Governor, the Provost, students union executives addressed the matter but the use of security agent was involved in the second crises which worsened the situation instead of calming the whole situation.

#### Definition of Terms

- i. Payoff Matrix: A payoff is a number, also called utility that reflects the desirability of an outcome to a player, for whatever reason. When the outcome is random, payoffs are usually weighted with their probabilities. The expected payoff incorporates the player's attitude towards risk.
- ii. Two Person Zero-Sum Game: A game is said to be zero-sum if for any outcome, the sum of the payoffs to the two players is zero.
- iii. Maxmin Value: The highest value of row's minimum.
- iv. Minmax Value: The lowest value of column's maximum
- v. Saddle Point: Is the value of entries of the payoff matrix which is simultaneously the minimum of its row and the maximum of its column
- vi. Optimum Strategy: A strategy is optimum if it always gives a better payoff to both players.
- vii. Dominance Strategy: A strategy dominates another strategy of a player if it always gives a better payoff to that player, regardless of what the other players are doing. It weakly dominates the other strategy if it is always at least as good.
- viii. Inferior Strategies: A strategy is inferior of another strategy of a player if it always gives a least payoff to that player, regardless of what the other players are doing.
- ix. Prisoners' Dilemma: Is a paradox in decision making in which two individuals acting in their own self-interest pursue a course of action that does not result in the ideal outcome

## Methodology

Primary source of data was employed for this study. The population of the study consisted of students from Federal University of Technology Minna and Niger State College of Education Minna. The total number of students in Federal University of Technology Minna as at 2017 was 18,855 ([www.futminna.edu.ng](http://www.futminna.edu.ng)) out of which 377 students were sampled. The total number of students in Niger State College of Education Minna in 2017 was 14,186 ([www.coeminna.edu.ng](http://www.coeminna.edu.ng)) out of which 375 were sampled. The method of sampling applied in this case was simple random sampling.

The tool employed for this research was questionnaire with 6 items. The respondents were required to tick (✓) the one that best represents their views as it applies to them in each of the item. There were four alternatives for strategies, the alternatives are; Agree (A), Strongly Agree (SA), Disagree (D) and Strongly Disagree (SD).

The research questions underlying this work were:

- (i) What are the individual factors in game theory that affect decision making especially, the control of students' unrest of Federal University of Technology Minna and Niger State College of Education Minna?
- (ii) What are the institutional factors in game theory that affect decision making especially, the control of students' unrest of Federal University of Technology Minna and Niger State College of Education Minna?
- (iii) What are the societal factor in game theory that affects decision making especially, the control of students' unrest of Federal University of Technology Minna and Niger State College of Education Minna?

The following three hypotheses were considered:

- i. There is no significant relationship between individual factors in game theory and control of students' unrest in FUT Minna and COE Minna.
- ii. There is no significant relationship between institutional factors in game theory and control of students' unrest in FUT Minna and COE Minna
- iii. There is no significant relationship between societal factors in game theory and control of students' unrest in FUT Minna and COE Minna.

## The Game Model and its Procedure

The game model (game of strategy) and Prisoner's Dilemma, employed as method of data analysis with the aid of a hand-held calculator has the following procedure:

- i. The data that was collated through the administered questionnaires to the two schools were used to form the payoff matrix having pairs' entries.
- ii. From the pairs in the payoff matrix, reconstruct another payoff matrix using the idea of two person zero-sum in each block.
- iii. Find the maximum of the minimum of the row entries i.e Maxmin. Similarly find the minimum of the maximum from the column entries, i.e. Minmax.
- iv. If the Minmax value = Maxmin value, we are done, which gives the saddle point of the game that gives the pure strategy for both players. Otherwise, we will apply the dominance theory and hence the payoff matrix for the game can be reduced to  $2 \times 2$  after successively deleting the inferior strategies from both row and column entries.
- v. Assume  $x_1, x_2, x_3, x_4$  ( $y_1, y_2, y_3, y_4$ ) as the row column probabilities by which Player I (Player II) select her pure strategy then the inferior strategies are equated to zero
- vi. Adding  $|Maxmin + 1|$  to each element of the payoff (effective) matrix
- vii. The player I's problems becomes

$$\text{Minimize: } X_0 = \sum_{i=1}^m x_i$$

Subject to

$$\sum_{j=1}^n a_{ij} x_j \geq 1 \quad j = 1, 2, \dots, n$$

$$x_j \geq 0$$

i. And the player II's problems become

$$\text{Maximize } Y_0 = \sum_{j=1}^n y_j$$

Subject to

$$\sum_{j=1}^n a_{ij} y_j \leq 1 \quad i = 1, 2, \dots, m$$

$$y_j \geq 0$$

- ii. Where  $x_i$  and  $y_j$  are the row and column probabilities respectively by which player I and II select their pure strategies
- iii. We now solve player II's problem using the Simplex Method where the starting basic variables are slack variables. Therefore, the player I's solution is obtained via duality theorem
- iv. The value of the game  $v = v^* - |\max \min + 1|$  where  $v^* = \frac{1}{x_0}$  or  $\frac{1}{y_0}$
- v. The optimal strategy for player I =  $X^*_i$  where  $X^*_i = V^* X_i$  while the optimal strategies for player II =  $Y^*_j$  where  $Y^*_j = V^* Y_j$

The Prisoner's Dilemma is determined under the following procedure:

- i. If the institution's security department have arrested the suspects for a crime.
- ii. They should tell each person that they will reduce his/her punishment if he/she confesses the crime.
- iii. Each victim must choose between two actions: cooperate with the security, i.e., confess the crime or defect (do not confess the crime).
- iv. Payoff matrix: As defined in section 6(iv), table 1 shows the payoff matrix of our prisoner's dilemma.

Table 1: Payoff Matrix for our Prisoner's Dilemma

|               | Confess | Don't Confess |
|---------------|---------|---------------|
| Confess       |         |               |
| Don't Confess |         |               |

- v. Each player has only two strategies, each of which is a single action
- vi. Non-zero-sum
- vii. Imperfect information: neither suspect knows the other's move until after all suspects have moved.

Problem Formulation

Payoff Matrix Formulation

PLAYER I → Federal University of Technology Minna

PLAYER II → Niger State College of Education Minna

Strategies (General Measures)

A-► Immediate closure of institutions with an ultimatum instructing students to vacate their halls of residence and premises

B-► Use of security forces like the police/army to maintain law and order in the affected institution

C- ► Mediation: Engaging the students union officials and other relevant parties in discussion for possible intervention

D► Suspension or dissolution of students' unions and their executives

Table 2: Payoff Matrix for General Measures

|          |   | Player II |   |   |   |
|----------|---|-----------|---|---|---|
|          |   | A         | B | C | D |
| Player I | A |           |   |   |   |
|          | B |           |   |   |   |
|          | C |           |   |   |   |
|          | D |           |   |   |   |

Prisoner's Dilemma (Disciplinary Measures)

- C: CONFESS: If the suspects confess the crime, they should pay for the damages without involving the innocent students.
- D: DON'T CONFESS: If the suspects do not confess the crime, all students should pay for the damages and the convicts be expelled from the school.

Table 3: Payoff Matrix for Prisoner's Dilemma

|          |               | Player II |               |
|----------|---------------|-----------|---------------|
|          |               | Confess   | Don't confess |
| Player I | Confess       |           |               |
|          | Don't confess |           |               |

## Data Presentation

### Raw Data Collected

The opinions were collected from 377 randomly selected students of Federal University of Technology Minna and 375 randomly selected Students of Niger State College of Education Minna.

Table 4: Summary of questionnaire administered to students of FUT Minna

| Strategies (General Measures) |                                                                                                                          | A   | SA  | D   | SD  |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|
| A                             | Immediate closure of institutions with an ultimatum instructing students to vacate their halls of residence and premises | 119 | 36  | 117 | 105 |
| B                             | Use of security forces like the police/army to maintain law and order in the affected institution.                       | 156 | 99  | 73  | 49  |
| C                             | Mediation: Engaging the students union officials and other relevant parties in discussion for possible intervention      | 163 | 182 | 29  | 3   |
| D                             | Suspension or dissolution of students' unions and their executives                                                       | 57  | 21  | 152 | 147 |

Table 5: Summary of questionnaire administered to students of COE Minna

| Strategies (General Measures) |                                                                                                                          | A   | SA  | D  | SD |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----|-----|----|----|
| A                             | Immediate closure of institutions with an ultimatum instructing students to vacate their halls of residence and premises | 182 | 82  | 49 | 62 |
| B                             | Use of security forces like the police/army to maintain law                                                              | 203 | 115 | 34 | 23 |

|   |                                                                                                                     |     |     |     |    |
|---|---------------------------------------------------------------------------------------------------------------------|-----|-----|-----|----|
|   | and order in the affected institution.                                                                              |     |     |     |    |
| C | Mediation: Engaging the students union officials and other relevant parties in discussion for possible intervention | 154 | 173 | 41  | 7  |
| D | Suspension or dissolution of students' unions and their executives                                                  | 117 | 65  | 112 | 81 |

Table 6: Summary of Prisoner's Delimma in the questionnaire administered to students of FUT Minna

| Strategies                                                                                                                                        | A   | SA  | D   | SD  |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|
| C: Confess: if the suspects confess the crime, they should pay for the damages without involving the innocent students.                           | 109 | 234 | 28  | 6   |
| D: Don't Confess: if the suspects do not confess the crime, all students should pay for the damages and the convicts be expelled from the school. | 85  | 56  | 119 | 117 |

Table 7: Summary of Prisoner's Delimma in the Questionnaire Administered to Students of Niger State COE Minna

| Strategies                                                                                                                                        | A   | SA  | D   | SD |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|----|
| C: Confess: if the suspects confess the crime, they should pay for the damages without involving the innocent students.                           | 170 | 155 | 37  | 13 |
| D: Don't Confess: if the suspects do not confess the crime, all students should pay for the damages and the convicts be expelled from the school. | 117 | 74  | 106 | 78 |

#### Problem Formulation and Data Analysis

##### General Measures

- I. We formulate the above view into payoff matrix  
We construct another payoff matrix using the idea of two persons zero sum game
- II. We form another payoff matrix for player I's outcome
- III. We find the minimum values of the respective rows and also the maximum values of the respective columns
- IV. We find the maximum between the minimum and minimum between the maximum in (IV) above, name them as Maxmin and Minmax respectively
- V. We compare the values of Maxmin and Minmax. If these values are equal, term them as saddle point, these values may appear more than once, if so choose one.
- VI. The value(s) in (VI) gives the optimum strategy to adopt in other to control students' unrest in Nigeria Tertiary Institution.

##### Prisoner's Dilemma

- I. If the institution's security department have arrested the suspects for a crime.
- II. They should tell each they will reduce his/her punishment if he/she confess the crime.
- III. Each victim must choose between two actions: cooperate with the security, i.e., confess the crime or defect (do not confess the crime).

##### Results

Using game of strategy to solve the problem under investigation

Table 8: Number and Percentage of Students who Agree as well as Strongly Agree with the Strategies in the Questionnaire Administer in FUT Minna

| Strategies (General Measures)                         | A and SA | % |
|-------------------------------------------------------|----------|---|
| A Immediate closure of institutions with an ultimatum | 155      |   |

|   |                                                                                                                     |     |    |
|---|---------------------------------------------------------------------------------------------------------------------|-----|----|
|   | instructing students to vacate their halls of residence and premises                                                |     | 41 |
| B | Use of security forces like the police/army to maintain law and order in the affected institution.                  | 255 | 68 |
| C | Mediation: Engaging the students union officials and other relevant parties in discussion for possible intervention | 345 | 92 |
| D | Suspension or dissolution of students' unions and their executives                                                  | 78  | 21 |

Table 9: Number and Percentage of Students who Agree as well as Strongly Agree with the Strategies in the Questionnaire Administer in COE Minna

| Strategies (General Measures) |                                                                                                                          | A and SA | %  |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------|----------|----|
| A                             | Immediate closure of institutions with an ultimatum instructing students to vacate their halls of residence and premises | 264      | 70 |
| B                             | Use of security forces like the police/army to maintain law and order in the affected institution.                       | 318      | 85 |
| C                             | Mediation: Engaging the students union officials and other relevant parties in discussion for possible intervention      | 327      | 87 |
| D                             | Suspension or dissolution of students' unions and their executives                                                       | 182      | 46 |

Table 10: Payoff Matrix of the Two Players

|          |        | Player II |          |          |         |
|----------|--------|-----------|----------|----------|---------|
|          |        | A (70)    | B (85)   | C (87)   | D (46)  |
| Player I | A (41) | (41,70)   | (41, 85) | (41,87 ) | (41,46) |
|          | B (68) | (68, 70)  | (68,85)  | (68,87)  | (68,46) |
|          | C (92) | (92, 70)  | (92,85)  | (92,87)  | (92,46) |
|          | D (21) | (21, 70)  | (21,85)  | (21,87)  | (21,46) |

Two Person's Zero Sum.

We convert Table 10 into two persons' zero-sum game by considering the winnings and losses of player I in relative to player II winnings and losses.

Table 11: Two person zero sum pay off matrix of the two players

|          |   | Player II  |           |          |            |
|----------|---|------------|-----------|----------|------------|
|          |   | A          | B         | C        | D          |
| Player I | A | (-29 , 29) | (-44,44)  | (-46,46) | (-5, 5)    |
|          | B | (-2,2)     | ( -17,17) | (-19,19) | (22, - 22) |
|          | C | (22,-22)   | ( 7,-7)   | (5,-5)   | (46, -46)  |
|          | D | (-49,49)   | (-64,64)  | (-66,66) | (-25,25)   |

### The Payoff Matrix of Player I's Winnings and Losses

$$\begin{array}{c} \text{PLAYER I} \\ \text{PLAYER II} \end{array} \begin{bmatrix} -2 & 9 & -4 & 4 & -4 & 6 & -5 \\ -2 & & -1 & 7 & -1 & 9 & 2 & 2 \\ 2 & 2 & & 7 & & 5 & & 4 & 6 \\ -4 & 9 & -6 & 4 & -6 & 6 & -2 & 5 \end{bmatrix} \quad (4.1)$$

### Determination of Row Minimum and Column Maximum

Player II Minimum:

$$\begin{array}{c} \text{PLAYER I} \end{array} \begin{bmatrix} -2 & 9 & -4 & 4 & -4 & 6 & -5 \\ -2 & & -1 & 7 & -1 & 9 & 2 & 2 \\ 2 & 2 & & 7 & & 5 & & 4 & 6 \\ -4 & 9 & -6 & 4 & -6 & 6 & -2 & 5 \end{bmatrix} \begin{array}{l} -46 \\ -19 \\ 5 \\ -66 \end{array} \quad (4.2)$$

Maximum: 22 7 5 46

For player I, the values -46, -19, 5 and -66 are its row minimum, using its strategies A, B, C and D respectively. This gives the maximum of the minimum (that is Maxmin) value to be 5. For player II, the values 22, 7, 5 and 46 are its column maximum, using its strategies A, B, C and D respectively. This gives the minimum of the maximum (that is Minmax) value to be 5. In this game, minmax value = 5 = maxmin value and hence the value of the game is equally 5 which represent the saddle point of the game. This value corresponds to a pure strategy for both players, that is strategies C.

### Disciplinary Measure

Table 12: Number of Students who Agree as well as Strongly Agree with the Strategies in the Questionnaire Administer in FUT Minna and COE Minna

| Strategies                                                                                                                                        | FUT Minna | COE Minna |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|
| C: Confess: if the suspects confess the crime, they should pay for the damages without involving the innocent students.                           | 343       | 325       |
| D: Don't Confess: if the suspects do not confess the crime, all students should pay for the damages and the convicts be expelled from the school. | 141       | 191       |

Table 12 shows that 343 respondents and 141 respondents, out of 377 respondents in FUT Minna agree as well as strongly agree with strategies C and D respectively, while 325 respondents and 191 respondents, out of 375 respondents agree as well as strongly agree with strategies C and D respectively, in COE Minna.

Table 13: Percentage of Students who Agree as well as Strongly Agree with the Strategies in the Questionnaire Administer in FUT Minna and COE Minna

| Strategies                                                                                                                                        | FUT Minna (%) | COE Minna (%) |
|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|
| C: Confess: if the suspects confess the crime, they should pay for the damages without involving the innocent students.                           | 91            | 87            |
| D: Don't Confess: if the suspects do not confess the crime, all students should pay for the damages and the convicts be expelled from the school. | 37            | 51            |

Table 13 shows that 91% respondents and 37% respondents, out of 377 respondents in FUT Minna accepted strategies C and D respectively, while 87% respondents and 51% respondents, out of 375 respondents accepted strategies C and D respectively, in COE Minna.

#### Recommendations

- i. This study recommends that "Mediation: Engaging the students' union officials and other relevant parties in discussion for possible intervention" as the optimum strategies to control students' crisis in Nigerian Higher Institutions since the respondents agreed with the strategy.
- ii. All necessary information concerning students should be passed across to them through the institutions house organ such as information bulletin newsletter and magazines. Information should be free and clarified; exchange and shared as it will remove doubts and suspicions. A free flow of information reduces misunderstanding or impulse and crisis emanating from communication gap.
- iii. Students should be less confrontational in their demands and it is only in extreme cases that suppression as management skill be used as the instrument of power and force to push away issues pertaining to students under the carpet or impose solution that is not sustainable.
- iv. The use of negotiation as a process of dialogue was also recommended. Conflicting parties should attempt to reach an agreement and take joint decision that will assist in resolving crisis.
- v. School authorities should establish functional professional counseling units in all institutions of higher learning to provide counseling and psychological needs of the students to reduce excess behavioral activities that counter the societal and institutional expectation.
- vi. Responsible students should be nominated to serve in committees (e.g. disciplinary committee) and indirectly use them as informants to school authority to timely inform management when students plan riot or intending to take laws into their hands;

#### Conclusion

Riots by students of Nigerian Tertiary Institutions will be curtailed if the management of the institutions employ the preferred strategy in this research which is engaging the students' union officials and other relevant parties in discussion for possible intervention when crisis occur. According to the findings of this study, this will help in resolving matters of disputes easier and faster than any other strategy.

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