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Patronage of Two Radio Stations in Kumasi

Using Game Theory

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Abstract

The objective of the study was to use the concept of game theory to analyze the patronage of two Radio Stations in Kumasi and suggest how the stations could plan some of their programmes to enable them receive higher patronage. Data of all the programmes aired by the two radio stations were collected. The two stations had ten (10) common programmes. After interviewing one hundred (100) purposively selected

listeners in Ashanti Region of Ghana to find their patronage preferences for the two radio stations named Station A and Station B based on the common programmes, a matrix was constructed. A critical analysis of the matrix revealed that Station A did better in sporting programmes than station B and Station B did better in news broadcasting and musical programmes than Station A. It is recommended that the two Stations should not air two similar programmes simultaneously to enable them receive higher patronage.

Keywords: Game Theory, Optimize, Two-Person Zero-Sum Game, Two-Person Constant-Sum Game, Saddle Point

INTRODUCTION

Life is full of conflicts and competitions, examples being military battles, political campaigns, advertising and marketing campaigns by competing business firms, and so forth. These scientific fashions generically known as game theory can be approached in a structured and systematic manner.

Game theory deals with decisions under uncertainty involving two or more intelligent opponents in which each opponent aspires to optimize his or her own decision at the expense of the other opponents (Kumar and Reddy, 1999). In game theory, an opponent is referred to as a player. Each player has a number of choices, finite or infinite called strategies. Different players may be allowed different moves, but each player knows the moves available to the other players. The outcomes or payoffs of a game are summarized as functions of different strategies for each player where if one player wins, another player loses, the game is called a Zero-sum game. Hence, a game with two players, where a gain by one player equals to a loss to the other, is known as Two-person Zero-sum game. In a two-person zero-sum game, it suffices to express the outcomes in terms of payoffs to one player. A pay-off matrix is used to summarize the payoffs to the player whose strategies are given by the rows of the matrix. A two-person constant-sum game is a two-player game in which, for any choice of the players' strategies, the rewards of the players add up to the same value. The interested reader is referred to Hillier and Lieberman, 2000 pp. 726 – 733; Kelly, 2009 pp. 77-97 and McCain, 2010 for detailed discussions of Two-person zero-sum and Two-person constant-sum games.

A number of papers in the theory and applications of games have been reported in the literature. Some of the earliest were published in 1921 by Borel, a French mathematician. Borel's ultimate goal was to determine whether a best strategy for a given game exists and to find that strategy. Since then, a number of applications have appeared in the literature; such as the paper by Caywood and Thomas (1955) which is concerned with application to military combat and provides a framework in which to evaluate future or proposed weapon systems. Benedetto and Anthony (1987) considered 'Modeling rationality in marketing decision-making. Mathiesen and Kay (1999) said that game theory is not contrary to ethics, although it may not be able to offer a complete ethical theory. Dekker and Rooy (2000) viewed optimality itself as a solution concept for a game. Flitney and Abbott (2002) noted that the application of the methods of quantum mechanics to game theory provides the ability to achieve results not otherwise possible. According to Hati and Lamb (2003), game theory is used to develop a technique for finding optimal solutions to air quality problems that involve multiple objectives. Other interesting applications of game theory in sports science, international relations, agriculture, linguistics, medicine, and robust optimization are respectively discussed by Mizrahi et al. (2006), Özdamar (2007), Agrawal and Heady (2008), Jaeger (2008), Martin and Elena (2009) and Luo et al. (2009).

Some radio stations in Ghana do not receive optimal patronage as a result of how they schedule their programmes and this problem affects the stations immensely. This paper used the concept of game theory to analyze the patronage of two Radio Stations in Kumasi and discussed how the stations could plan some of their programmes to enable them receive higher patronage. Since the Stations require anonymity, they are identified by the surrogate names A and B throughout this paper.

MATERIALS AND METHODS

The concept of game theory was applied to find the levels of patronage of two Radio Stations A and B in Kumasi. The programmes aired everyday by the two Radio Stations A and B were collected. An analysis of the data revealed that, the two Radio Stations had ten (10) common and simultaneously aired programmes (See Table 1).

Table 1 (Ten common and simultaneously aired programmes of Stations A and B)

PROGRAMME	ABBREVIATION	TIME
Morning News	MN	6.00 am – 6.30 am
Breakfast Sports	BS	6.30 am – 7.00 am
Morning Show	MS	7.00 am – 10.00 am
Mid-day News	MDN	12.00 noon – 12.30 pm
Evening News	EN	6.00 pm – 6.30 pm
Saturday Sports	SS	9.00 am – 12.00 noon
Saturday 'Adadamu'	SA	12.30 pm – 2.00 pm
Sunday Gospel Bells	SGB	6.30 am – 10.00 am
Sunday 'Emotuo' Delight	SED	10.00 am – 12.00 noon
Sunday Sports Commentary	SSC	3.00 pm – 5.30 pm

For the sake of convenience, one hundred (100) regular listeners of the two stations in the Ashanti region of Ghana were purposively sampled and interviewed to find their patronage of the ten (10) common programmes of the stations. Their responses led to a two-person constant-sum game with the constant being 100 listeners.

RESULTS AND DISCUSSIONS

Based on the responses of the selected persons, a pay-off matrix as shown in Table 2 was constructed.

Table 2 (Pay-off matrix of patronage of Stations A and B).

		S T A T I O N B										
S		MN	BS	MS	MDN	EN	SS	SA	SGB	SED	SSC	***Row minimum***
T	MN	**40**	48	32	40	42	31	49	48	54	25	25
	BS	65	**68**	54	70	60	68	80	59	67	70	54
A	MS	50	48	**44**	54	46	39	60	45	63	40	39
	MDN	29	30	40	**37**	42	45	49	38	61	36	29
T	EN	41	37	45	48	**45**	35	50	52	60	39	35
	SS	65	70	57	76	70	**72**	75	80	79	50	50
I	SA	48	42	30	48	45	38	**47**	46	53	29	29
	SGB	31	46	45	49	50	35	60	**49**	62	40	31
O	SED	36	39	25	50	44	31	48	40	**49**	29	25
N	SSC	70	69	60	74	71	61	78	75	80	**63**	60
A	***Column Maximum***	70	70	60	76	71	72	80	80	80	70	

Stations A and B were the players of the game which was a two-person constant-sum game. In a two-person constant-sum game, a matrix is used to summarize the payoffs to the player whose strategies are given by the rows (Station A in this case) and pay-offs to both players add up to a constant. From Table 2, the following deductions were made:
(i) When forty (40) persons were listening to Morning News (MN) from Station A,
100 – 40 = 60 persons were listening to Morning News (MN) from station B since it was a two-person constant-sum game with the constant being hundred (100) persons. Similarly, when 68, 44, 37, 45, 72, 47, 49, 49 and 63 persons were listening to Breakfast Sports (BS), Morning Show (MS), Mid-day News (MDN), Evening News (EN), Saturday Sports (SS), Saturday 'Adadamu' (SA), Sunday Gospel Bells (SGB), Sunday 'Emotuo' Delight (SED) and Sunday Sports Commentary (SSC) respectively from Station A; 32, 56, 63, 55, 28, 53, 51, 51 and 37 persons were respectively listening to the same programmes from Station B.
(ii) When Station A was airing Breakfast Sports (BS) and Station B decided to air Morning News at the same time period, sixty-five (65) and thirty-five (35) persons listened to Station A and Station B respectively. Similarly, when Station A was airing Morning Show (MS) and Station B decided to air Evening News (EN) at the same time period, forty-six (46) and fifty-four (54) persons listened to Station A and Station B respectively.

(iii) Since maximum (row minimum) = minimum (column maximum) = 60, the game had a saddle point of sixty (60) listeners (Washburn, 2000 pp. 4-7). A saddle point is the point at which maximum of row minimum equals minimum of column maximum. The saddle point is the smallest entry in its row but the largest entry in its column. That implied that, the value of the game to Station A was sixty (60) listeners and the value of the game to Station B is 100 – 60 = 40 listeners. That is, more people listened to Station A than Station B.

It follows from table 2 that Station A was stronger in sporting programmes (Breakfast Sports, Saturday Sports and Sunday Sports Commentary) than Station B. On the other hand, Station B was stronger in musical programmes (Saturday 'Adadamu', Sunday Gospel Bells and Sunday 'Emotuo' Delight) and news broadcasting (Morning News, Mid-day News, Evening News and Morning Show) than Station B.

CONCLUSION AND RECOMMENDATIONS

In this paper, the concept of game theory has been applied to find the patronage of two Radio Stations A and B in Kumasi. Data collected from the two Radio Stations revealed

ten (10) common programmes of the two. After purposively interviewing one hundred (100) listeners in Ashanti region of Ghana to find their patronage for the two radio stations based on the common programmes, a pay-off matrix was constructed. A critical analysis of the matrix revealed that Radio Station A was stronger in sporting programmes (Breakfast Sports, Saturday Sports and Sunday Sports Commentary) than Radio Station B. In other words, Radio Station A had a higher level of patronage in sporting programmes than Radio Station B. On the other hand, Radio Station B was stronger in news broadcasting (Morning News, Mid-day News, Evening News and Morning Show) and musical programmes (Saturday 'Adadamu', Sunday Gospel Bells and 'Emotuo Delight) than Radio Station A. That is, Radio Station B had a higher level of patronage in news broadcasting and musical programmes than Radio Station A. It is therefore recommended that the two Radio Stations should not air two similar programmes simultaneously to enable them receive higher patronage.

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