Toward a Model of Collective Intelligence of Sporting Teams: Examining Data from the 2014 Soccer World Cup

A.TOMASZ JARMOSZKO, Central Connecticut State University
CHESTER S. LABEDZ JR,, Central Connecticut State University
ROBERT P. SCHUMAKER, University of Texas at Tyler

1. INTRODUCTION

For much of the 2014-15 Premier League season Leicester City Football Club floundered at the bottom of the table and narrowly escaped relegation. Its performance was deemed so bad that in August of last year London bookies gave odds of 1500:1 for the Foxes to reach top of the table by the end of 2015. (J.T. 2015) Yet, this is precisely what happened: Leicester City FC has lead the Premiership for most of the current 2015-16 season. They have done this with essentially the same players – most graduates of lower English leagues. Could insights from the newly emerging field of Collective Intelligence be helpful in rationalizing examples such as this one?

People have always acted in groups: fossil evidence shows that small bands of individuals hunted and gathered for much of early humanity. (Hill, Walker et al. 2011) Collective intelligence must have existed even then, as bands of early humans competed for resources. The recent attention paid to the concept has been, primarily, a consequence of Surowiecki's work (Surowiecki 2005) on wisdom of the crowds and increased data collection on various aspects of human behavior (big data). Sporting teams have been no exception. Following the documentary and cinematic successes of Moneyball (Lewis 2004), the discipline of sports analytics has gained in popularity and influence.

2. DATA AND METHODS

Our study sets out to understand factors leading to success of teams playing the game of association football, otherwise known as soccer. Success in soccer comes primarily from the ability to score goals. Goals cannot be achieved unless a team engages in a "shooting event" or an attempt to score a goal. In the most common shooting event, the attacking team moves the ball toward the end line of the opposing side -- primarily by passing it among the attacking players -- until a position is reached from which one player is able to propel the ball – with an allowed body part – toward the frame of the goal. This is known as regular play and is distinguished from a fast break by speed and surprise. In a fast, break one team surprises the other by taking the ball away and moving it toward a shooting position quickly in an attempt to limit the number of defenders who are able to stop the fast break from proceeding. The third type of a shooting event results from something known as a set-piece. In this type of play, the normally continuous nature of soccer is interrupted as a consequence of the ball going out of bounds or a foul being committed. Play is resumed, following referee's whistle, from a designated position: a fact which makes it possible for the attacking team to execute a previously prepared play. There are five types of set-piece plays: corner, throw-in, indirect free kick, direct free kick and penalty kick.

For this study we have collected and acquired data on the games played during the 2014 World Cup in Brazil. Thirty-two teams played 64 matches during the month-long tournament and we have video recorded all games for the purpose of analyzing shooting events. We have also purchased a data set from Opta and analyzed the websites of FIFA and ESPN for any complementing statistics. The

principal research method was to apply techniques of bivariate analysis to identify shooting event factors that had statistically significant association with winning, losing and drawing teams. Specifically, we used Pearson Chi-Square tests and assumed the significance level of >0.05. For purposes of better comparison, we considered a match a draw even if it was decided by a penalty shoot-out. Of the 64 matches played, 13 concluded as draws, giving us 26 drawing teams. The remaining 51 matches had 51 winners and 51 losers, giving us a total of 128 teams with designations of winning, losing or drawing (W-L-D).

Our shooting event database consisted of 1,732 shooting events from which we eliminated penalty kicks because those are essentially battles between the shooter and the keeper and do not involve the rest of the team. The analysis consisted of looking for associations between characteristics of the 1690 shooting events and the W-L-D designations of the team that executed the shooting event.

3. RESULTS

Most chi-square tests resulted in significance (p) values greater than 0.05, which in effect indicated lack of statistically significant association. In particular, the following variables and variable categories showed no statistically significant association with winning, losing or drawing teams: Possession (Approximately Even Possession, Less than Opponent, More than Opponent); Tackles (High, Medium, Low); Set-Piece (Corner, Indirect Free Kick, Direct Free Kick, Throw-In); Body Part Used to Shoot (Head, Left Foot, Right Foot); Field Zone of Shot (Back, Center, Left, Right); Shot Teamwork (Assisted, Individual); Shot Strength (Strong, Weak); Shot Swerve (Left, Right, Moving).

Two variables, however -- Attack Mode (Fast Break, Regular Play, Set-Piece) and Shooting Event Outcomes (Goal, Missed Close, Missed Wide, Posts or Bar, Saved – did have significant values indicating statistical association.

		ATTACK MODE (AM)						
		Fast Break	**Regular Play**	**Set-Piece**	**Total**	**Pearson Chi-Square**	**Degrees of freedom**	**Significance**
Drawing	Count	10	230	96	336	13.253	4	.010 (<.05)
	% of Drawing	3.0%	68.5%	28.6%	100.0%			
	% of AM Category	18.9%	19.6%	20.8%	19.9%			
Losing	Count	9	427	181	617			
	% of Losing	1.5%	69.2%	29.3%	100.0%			
	% AM Category	17.0%	36.3%	39.2%	36.5%			
Winning	Count	34	518	185	737			
	% of Winning	4.6%	70.3%	25.1%	100.0%			
	% of AM Category	64.2%	44.1%	40.%	43.6%			
	TOTAL	53	1175	462	1690			

Table 1: Attack Mode Comparison for Win-Loss-Draw Outcomes

SHOOTING EVENT (SE) OUTCOMES										
		Goal	**Missed Close**	**Missed Wide**	**Posts or Bar**	**Saved**	**Total**	**Pearson Chi-Square**	**df**	**Sig.**
Drawing	Count	16	33	109	3	175	336	64.689	8	.000 or <.001
	% of Drawing	4.8%	9.8%	32.4%	0.9%	52.1%	100.0%			
	% SE Outcome Category	10.1%	19.3%	21.4%	13.0%	21.1%	19.9%			
Losing	Count	30	67	213	5	302	617			
	% of Losing	4.9%	10.9%	34.5%	0.8%	48.9%	100.0%			
	% SE Outcome Category	18.9%	39.2%	41.8%	21.7%	36.5%	36.5%			
Winning	Count	113	71	187	15	351	737			
	% of Winning	15.3%	9.6%	25.4%	2.0%	47.6%	100.0%			
	% SE Outcome Category	71.1%	41.5%	36.7%	65.2%	42.4%	43.6%			
	TOTAL	159	171	509	23	828	1,690			

Table 2: Shooting Event Comparisons for Win-Loss-Draw Outcomes

4. DISCUSSION

Table 2 portrays data on statistical significance of association between shooting event outcomes and winning, losing and drawing teams. Of particular importance is the direct comparison between winning and losing teams. The data shows that creating more scoring opportunities (737 versus 617 respectively) is associated with winning games. Furthermore, one by-product of the relatively obvious inference that scoring more goals is associated with winning games is the ratio for scoring efficiency. Winning teams needed 737 shooting events to score 113 goals, whereas losing teams required 617 shooting events to score merely 30 goals, and drawing teams 336 shooting events to score 16 goals.

The principal, somewhat unexpected, inference from Table 1 is the association of fast break mode of attack to winning games. Winning teams created 64.2% of all fast breaks, whereas losing teams only 17%.

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