



Leadership network and team performance in interactive contests



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ABSTRACT

Over the years, the concept of leadership has experienced a paradigm shift – from solitary leader (centralized leadership) to de-centralized leadership or distributed leadership. This paper explores the idea that centralized leadership, as earlier suggested, negatively impacts team performance. I applied the hypothesis to cricket, a sport in which leaders play an important role in team's success. I generated batting partnership network and evaluated the central-most player in the team, applying tools of social network analysis. Analyzing 3420 matches in one day international cricket and 1979 Test matches involving 10 teams, I examined the impact of centralized leadership in outcome of a contest. I observed that the odds for winning a one day international match under centralized leadership is 30% higher than the odds for winning under de-centralized leadership. In both forms of cricket (Test and one day international), I failed to find evidence that distributed leadership is associated with higher team performance. These results suggest important implications for cricket administrators in development and management of working teams.

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1. Introduction

There exists a corpus of work about the benefits of working in teams, a trend which is gaining importance. In academia, it has been shown that works with highest scientific impact have been produced by teams (Guimerà et al., 2005; Uzzi et al., 2013). Team coordination is also prized in sports (Fewell et al., 2012; Kniffin and Wilson, 2010, 2005; Wolfe et al., 2005) and military (Hutchins and Fiedler, 1960; Levi et al., 1954), where team members coordinate with each other for a common objective of being more successful than the opponent. A recent survey conducted on high-level managers concluded that teams are central to organizational success (Martin and Bal, 2006). The effect of leadership on team performance has been a topic of interest for a long time. Previous works on leadership have dealt with role of leadership in coaching related activities (Manz and Sims, 1987; Wageman, 2001) or managing events in context of teams (Druskta and Wheeler, 2003). Some works have also focused on how leadership is shared in teams (Carson et al., 2007; Hiller et al., 2006; Pearce and Sims, 2002). However, earlier body of work on effect of leadership on

team performance was conducted at the level of survey analysis and narrow set of leadership activities (Burke et al., 2006; Zaccaro et al., 2001). One of the major drawback of such studies is that team performances were assessed in a subjective manner in which team leaders rated the performance of their own teams. An earlier work has shown that team leaders tend to over-rate team performance, since a team's performance reflects the ability of the leader (Sparrowe et al., 2001).

The decisive role of leaders in team's performance has been a long debated topic (Lipman, 2014; T-Far, 2013). Prior works focused on the paradigm of leader-centeredness, in which the leadership is viewed as a top-down process between the leader and the followers (Yukl, 1998). Recent works have also focused on the idea of shared leadership or distributed leadership in which other team members emerge as leaders (Mehra et al., 2006). An earlier meta-analysis of 37 studies of teams in natural contexts discuss how the network position of team leaders influences team performance (Balkundi and Harrison, 2006). It was observed that teams with stronger interpersonal ties are more successful and teams with leaders who are central in the intra-group networks display better performance (Balkundi and Harrison, 2006). One of the main limitations of the earlier studies is that they are restricted to cross-sectional data, primarily due to the limited availability of longitudinal data. To overcome the limitations of previous works, I employed the treasury of data available in sports (Mukherjee, 2013; Duch et al.,

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2010; Radicchi, 2012; Kniffin and Mihalek, 2014) and objectively investigate the association between leadership structure and team performance in interactive contests.

I applied the social network analysis approach to diagnose the role and qualities of a leader effectively. Leadership involving team activities is a relational construct. Again, social network analysis emphasizes on the relationship of social actors and subsequently elucidates the patterns and theories of such relationships (Meindl et al., 2003). Network analysis has been applied to explore the significance of structure of various relationship in organizations (Krackhardt, 1990; Krackhardt and Hanson, 1993). Social network approach to leadership demonstrated how would-be leaders perfectly perceives the relationship among team members in various organizations (Balkundi and Kilduff, 2005). Social network analysis provides an understanding of the dynamics of centralized leadership and distributed leadership (Mehra et al., 2006; Morgeson et al., 2010). Here, I quantified the extent to which leadership potentials are associated with games won across all teams in the history of cricket. Even though cricket is the second most popular game in the world after soccer, compared to other professional sports it has been relatively understudied by academics, although there is no dearth of match statistics.

Cricket is chosen for the following reasons. First, cricket is a game in which an outcome depends a lot on the leadership. Compared with other sports the role of a captain is elevated in cricket. A cricket captain's direct involvement in the proceedings of a game can be viewed as team-leadership in the corporate world, leadership in politics, social capital (Lin, 1999) or organizational communication tactics (Yamaguchi, 2009). The captain chooses the batting order, sets up fielding positions and shoulders the responsibility of on-field decision-making and is also responsible at all times for ensuring that play is conducted within the Spirit of the Game as well as within the Laws. However, a coach in soccer or manager in baseball takes decisions off the field, which includes player substitution or deciding batting line-up. In cricket, the role of a captain is not restricted to off-the-field decisions but also to deliver winning performance for the team while playing (Cotterill and Barker, 2013). It is to be noted that in cricket, there is no substitution unlike Soccer or Basketball, where a player is substituted by the coach. To quote Sir Don Bradman "A captain must make every decision before he knows what its effect will be, and he must carry the full responsibility, not whether his decision will be right or wrong, but whether it brings success" (Bradman, 1958).

In cricket, the captains are appointed based on their performance and position in the team (often the role is given to batsmen). One of the key role performed by the captain is leading by example (Cotterill and Barker, 2013), a quality that is gaining importance in business domains (Lipman, 2014; T-Far, 2013). The captain is expected to win the match for his team, commonly referred by fans and commentators as 'captain's knock'. Legendary players like Sir Don Bradman, Richie Benaud or Sir Gary Sobers, were great performers and inspired their team through their own performance – example of centralized leadership. Even though in cricket there are always formally appointed captains, the emergence of leaders has been seen in many games. These emergent leaders were responsible for leading their team to victories. While captains like Mike Brearley or Ray Illingworth were not the best players in their side but were known to extract maximum performance from their players. Again, Sir Gary Sobers and Sachin Tendulkar were best players in their sides, they were not successful captains. In an earlier study it was shown that Steve Waugh was the most successful captain in the history of Test cricket (1877–2010) (Mukherjee, 2011). Again, presence of legendary performers like Adam Gilchrist, Shane Warne, Glenn McGrath and Ricky Ponting in Steve Waugh's Australian team, leads to the well debated topic

whether distributed leadership is more successful than centralized leadership. Secondly, in a team game like cricket, one can objectively assess the role of leader-position in the network and team performance. Motivated by the above observations I set to explore the role of leaders in a team game like cricket and the impact of leadership structure on the outcome of a match.

2. Materials and methods

2.1. Data

I analyzed the data of batting partnership (publicly available in cricinfo website (Cricinfo, 2014)) in Test cricket between 1877 and 2013 and also one day international cricket between 1971 and 2013. Cricinfo has recorded the information for all 3420 one day international matches played between 1971 and 2013 and all 1979 Test matches played between 1877 and 2013. For every match I recorded and analyzed the score-cards which contain the information of match outcome, amount of runs scored by a pair of batsmen and run-rate of each team after the game is over. In order to control for team talent, I also collected the information about the International cricket Council (ICC) points awarded to every player each year as well as the batting average of every player (including the captain) in a year. Data are available upon request.¹

2.2. Network representation

To articulate the social network analysis approach of studying the pattern of leadership in cricket, I first outline the methodology of identifying the leadership style between two competing teams. Next I discuss the nature of leadership networks and finally discuss the effect of centralized and distributed leadership on the outcome of a game. In cricket two batsmen always bat in partnership, although only one is on strike at any time. The partnership of two batsmen comes to an end when one of them is dismissed or at the end of an innings. Fig. 1 demonstrates the formation of batting partnership network.

Two opening batsmen *a* and *b* start the innings for their team. In network terminology, this can be visualized as a network with two nodes *a* and *b*, the link representing the partnership between the two players. Weight of the link reflects the amount of runs scored in partnership. Now, if batsman *a* is dismissed by a bowler, then a new batsman *c* arrives to form a new partnership with batsman *b*. Thus a new node *c* gets linked with node *b*. Subsequently one can generate an entire network of batting-partnership till the end of an innings. The innings comes to an end when 10 players are dismissed or when the duration of play comes to an end (Mukherjee, 2013). The score of a team is the sum of all the runs scored during a batting partnership.

The outcome of a match depends on the batting partnerships between batsmen. Long lasting partnerships not only add runs on the team's score, it may also serve to exhaust the tactics of the fielding team. Again, the concept of partnerships becomes vital if only one recognized batsman remains. It is therefore important to identify the key players in a team by constructing network of batting partners. Two batsmen are connected if they formed a batting partnership in the match. An undirected and weighted batting partnership network is generated for each team and for every match played through 2013. I examined two network metrics which captures the position of a captain in the batting partnership network in cricket. A similar approach using network metrics to capture team

¹ The author will share the data in an online repository post publication of the manuscript.

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