

Institution: University of Leeds
Unit of Assessment: C19 Business and Management Studies
Title of case study: Using statistical analysis to support decision making by managers and coaches in elite team sports
<p>1. Summary of the impact</p> <p>This case exemplifies leading-edge practice in the coaching and management of elite sports teams in the UK, USA and Australia. Professor Bill Gerrard is one of the first to apply statistical analysis to the management of 'invasion'/tactical team sports. This original contribution has been to practices in both the boardroom and the locker room. The approach affects day-to-day decision-making in a range of areas, including recruitment of players, training priorities, team selection and game tactics. Application of the approach now extends to three continents and is applicable to all invasion team sports including football/soccer, rugby union and rugby league.</p>
<p>2. Underpinning research</p> <p>The underpinning research began in 1995 on Gerrard's appointment to the University of Leeds as Reader in Economics. Initially, Gerrard, in collaboration with Dobson, focused attention on the economics of the player transfer market in football – specifically how values were determined for players moving between clubs. Gerrard developed a statistical model to explain the variation in transfer fees for 1,350 player transfers between English professional football clubs during the period 1990 - 1996, [1], [2]. Using his unique combination of statistical, coaching and academic business skills, Gerrard has developed this initial approach in three key phases.</p> <p>Phase 1 – Comparative valuations (1997 – 2003)</p> <p>This phase extended the previous research on transfer fees to develop a composite measure of the quality of individual players, the Player Quality Index (PQI), based on their career statistics, including league appearances, number of goals scored, size and status of current club, and international experience. From these data, Gerrard identified a set of quality indicators that were combined into the PQI using weightings estimated from a statistical model of transfer fees (essentially a set of implicit 'hedonic' prices) [3]. One of the first academic uses of the PQI was with Dobson and Dawson in order to control for team quality when calculating the efficiency of managers [4]. Gerrard developed the PQI approach into a player valuation system for determining player wages and transfer fees [5].</p> <p>Phase 2 – Fundamental valuations (2003 – 2007)</p> <p>This phase applied discounted cash flow analysis to player valuation, relating players' impact on cash flow to their contributions on the pitch. Inspired by Gerald Scully's 1974 paper, 'Pay and performance in Major League Baseball' in <i>The American Economic Review</i>, Gerrard adapted the methodology for use in invasion team sports (those requiring tactical coordination and in which individual player contributions are not fully separable) as opposed to 'atomistic' team sports (those relying more on separable individual performance, e.g. baseball and cricket). Around the same time, companies specialising in the analysis of sports performance data were emerging, and Michael Lewis's book, <i>Moneyball: The Art of Winning an Unfair Game</i>, was published (WW Norton & Company, 2003) showing how analytics was being used in baseball by the Oakland Athletics to gain competitive advantage. Gerrard developed a hierarchical structural model to measure individual and team performance in invasion team sports [6]. Gerrard was one of the first academics in the UK to develop a methodology for the economic evaluation of players and teams in invasion team sports.</p> <p>Phase 3 – Measuring (sporting) production contributions (2007 – present)</p> <p>At the start of this phase, Gerrard was introduced to Oakland Athletics (the Major League Baseball team featured in <i>Moneyball</i>), which was diversifying into soccer. (The initial meetings with Oakland Athletics were financed in part by Enterprise & Knowledge Transfer seedcorn funding from the Business School.) Over a three-year period, Gerrard collaborated with Oakland Athletics to analyse their soccer team's performance as well as identifying performance trends across Major League Soccer. This was the first time that research on the analytical approach had been carried out in soccer in the USA. The approach has been developed and applied subsequently in rugby</p>

union and rugby league.

3. References to the research

All references except [5] are peer-reviewed journal articles

- [1] Dobson, S.M. and Gerrard, B., (1999), 'The determination of player transfer fees in English professional soccer', *Journal of Sport Management*, Volume 13, 259–279.
- [2] Gerrard, B. and Dobson, S.M., (2000), 'Testing for monopoly rents in the market for playing talent: evidence from English professional football', *Journal of Economic Studies*, Volume 27, 142–164, DOI: 10.1108/01443580010326049.
- [3] Gerrard, B., (2001), 'A new approach to measuring player and team quality in professional team sports', *European Sport Management Quarterly*, Volume 1, 219–234, DOI: 10.1080/16184740108721898.
- [4] Dawson, P. M., Dobson, S.M. and Gerrard, B., (2000), 'Estimating coaching efficiency in professional team sports: evidence from English Association football', *Scottish Journal of Political Economy*, Volume 47, 399–421, DOI: 10.1111/1467-9485.00170.
- [5] Gerrard, B., (2004), 'The measurement and valuation of player quality in association football', in J.J.Gougnet (ed), *Professional Sport after the Bosman Case: an international economic analysis*, 143–164, Limoges, France, IASE/Pulim.
- [6] Gerrard, B., (2007), 'Is the Moneyball approach transferable to complex invasion team sports?', *International Journal of Sport Finance*, Volume 2, 214–230.

4. Details of the impact

The type of impact on external organisations has changed over time in content and in the nature of the academic-practitioner relationship as the research has developed. Initially the impact was principally arm's length in nature with analysis commissioned on a recurrent or one-off basis to provide evidence to inform specific decisions. Research on player valuation [5] has supported squad valuations used by football clubs to inform decisions on wage contracts, squad planning, transfers and insurance. It has also proved useful to financial institutions to determine the security value of playing squads. Gerrard has provided evidence in tax and legal disputes (such as those between Fulham Football Club (FC) and Jean Tigana in the High Court [EWHC 2585 (2004); EWCA Civ 895 (2005)], and between the tax authorities and Southampton FC).

Detailed analysis of football performance data employing the hierarchical structural model of invasion sports [6] was undertaken for the Vice President & General Manager, Oakland Athletics [A], resulting in the production of a series of reports between 2008 and 2010. Oakland Athletics stated that the research had "not only benefitted [Oakland Athletics] but the sports industry as a whole" [A].

As the focus of the research has moved towards developing an evidence-based approach to support day-to-day operational decision making, the impact has become more permanent, embedded in changes in organisational practice. This has required a more integrated academic-practitioner partnership involving the co-production of data and analysis on an on-going basis. The process of embedding evidence-based practice within organisations goes way beyond the normal external consultancy model and has required Gerrard to become immersed with specific organisations in order to fully understand their specific needs as well as developing a high degree of mutual trust and respect. This has culminated in the two principal current impacts at Saracens RUFC and Sky Sports.

Impact at an elite British sports team

Saracens RUFC, one of the leading teams in English professional rugby union, were reinvigorated in 2009 with the appointment of a new Director of Rugby [B], a South African international and qualified medical doctor, and a strong advocate of evidence-based practice. Gerrard formed a close working relationship with the Director of Rugby and an analytics approach was introduced to Saracens in 2010; it offered a perfect fit between the organisation's recognition of the importance of embedding an evidence-based approach into the management of the club and its lack of in-house analytical skills. Through a close working partnership with the coaching staff, statistical

Impact case study (REF3b)

analysis has now been embedded in the day-to-day decision making of the coaching staff [C], [D]. Since 2010 Gerrard has effectively become an adjunct member of the coaching staff, building up a high level of trust with one of the most progressive and successful coaching groups in world rugby. Saracens have described Gerrard as becoming “*an extension of the club’s coaching team*” [C]. He has developed the reporting structure and templates and is gradually facilitating the development of in-house capabilities to undertake the collection, analysis and interpretation of data.

There are four key elements of the analytics approach as co-produced by Gerrard and the Saracens organisation:

- i) Pre-game analysis: detailed analysis of the opposition, using data from previous games, to identify its strengths and weaknesses. Opportunities and threats are identified, allowing Saracens to develop an appropriate game plan tailored to that specific team [E].
- ii) Post-game analysis: a game report is produced including key performance indicators (KPIs) for the team which have been identified by working collaboratively with the coaches. A traffic-light performance management system has been developed to categorise team performance as excellent, satisfactory or poor [F].
- iii) Training priorities: KPI ratings are used to help set training priorities for the team and individual players so that coaches can better tailor their coaching input to the particular strengths and weaknesses of individual players.
- iv) Strategic planning: the KPIs and other related analysis of player and team performance are used to support more strategic decisions on future player recruitment and playing strategy.

In the first year of this process being fully implemented (2010/11), Saracens won the Aviva Premiership. Saracens continue to be one of the top clubs in both domestic and European competition. Saracens said Gerrard’s contribution is “*seen by the entire club as a unique point of difference that has made Saracens one of the leading clubs in European rugby*” [B], “*a game changing impact on conduct*” [C], and “*an integral part of the sustained success*” [D].

Impact at a major media organisation

Sky Sports has adopted Gerrard’s methodology [6] developed through this research to enhance its televised coverage of rugby league. During the 2012 season, Sky Sports introduced the ‘Stats Wall’ as a regular feature in its weekly rugby league magazine programme, Boots N’All. Presented by a Director of The Sports Office UK Limited (which provides performance management software to national governing bodies and professional sports clubs) [G], the feature used a traffic-lights system of KPIs devised by Gerrard to review games for viewers. This has been further developed in 2013 as a separate 20-minute weekly programme, ‘Stats Pack’, available via the ‘red button’ facility. Gerrard has developed an in-game ‘Performance Gauge’ to track changes in momentum during live televised games. Gerrard has also introduced pre-game statistical briefings for the presenters. These developments are changing the way in which the television viewer experiences sporting events. Sky Sports has confirmed that “*the impact of Gerrard’s work on the sporting landscape has been highly significant*” [G].

Impact for other sports in other countries and continents

Through being promulgated in keynote addresses at international industry conferences [H] and workshops, this research has broadened its impact both in its geographic spread (United States and Australia) and in the sports to which it has been applied beyond football and the two rugby codes and now including other invasion sports such Australian Rules Football (ARF). The High Performance Coach at Hawthorn Football Club, a leading ARF team visited Gerrard in October 2011 along with the Head Coach and other members of the coaching staff. The meeting “*stimulated some really good discussion*” and resulted in the team taking “*a more objective approach to strategic coaching decision making*” [I]. In the two seasons since the adoption of a thoroughgoing evidence-based approach, Hawthorn have been 2012 finalists and 2013 winners of the ARF Grand Final. The Senior Director for Competitive Analysis, Research and Innovation, at the US Olympic Committee met with Gerrard in July 2013. He described the meeting as “*incredibly valuable*” and wants “*to stay in touch and discuss opportunities to collaborate as part of your sports analytics program*” [J].

Impact case study (REF3b)

Impact on professional practice

In terms of the contribution of the approach to professional practice, there is evidence of a permanent change taking place, as the method is embedded into the culture and practice of sports organisations. For example, Saracens consider the practices developed with Gerrard as having “*profoundly altered the preparation landscape of Saracens and have considerable implications for the wider elite sporting community*” [C].

5. Sources to corroborate the impact

- [A] Letter of Testimony: Vice President & General Manager, Oakland Athletics, California, USA
- [B] Letter of Testimony: Professional Rugby Union Coach, Saracens RUFC
- [C] Letter of Testimony: Elite Sport Professional, Saracens RUFC
- [D] Letter of Testimony: Club Captain, Saracens RUFC
- [E] Report: Saracens, Opposition Analysis: London Irish, April 2012
- [F] Report: Saracens, Team KPIs Report: Vs London Irish, April 2012
- [G] Letter of Testimony: Director of Sports Office UK Ltd and commentator for Sky Sports
- [H] Conference Programme: IE Sports Analytics Innovation Summit, London, March 2013
- [I] Confirmation of engagement with High Performance Coach, Hawthorn Football Club, Melbourne, Australia, September 2011 – April 2012
- [J] Confirmation of engagement with Senior Director, Competitive Analysis, Research & Innovation, US Olympic Committee, Colorado Springs, Colorado, USA, July 2013