Soccernomics

By Simon Kuper and Stefan Szymanski

Introduction

The World Cup has just started. The event ranks on par with the Olympics in terms of popularity and media attention.

The most important question: Who will win the Cup? Here are some predictions by Goldman Sachs in a detailed report they have just published. Using some 200,000 probability trees, and 1 million simulations, Goldman predicts that England will meet Germany in the quarter finals, where Germany will win, as the great Gary Lineker once famously mentioned: "Football is a simple game; 22 men chase a ball for 90 minutes and, at the end, the Germans win." Germany's opponent in the final will be Brazil, who is expected to prevail. While Germany is more likely to reach the final, France has a marginally higher overall chance of winning the tournament. (France's performance in their opening match against Australia was, however, far from impressive.) But what goes against the French is that as per the draw, they may meet Brazil in the semi-finals. Goldman also expects Portugal to make it to the semifinals. Spain and Argentina are expected to underperform, losing to France and Portugal respectively in the quarter finals.

Goldman's model based on machine learning, considers factors such as team strength, individual players and recent momentum as measured by the ratio of wins to losses over the past ten matches and goals scored. The number of goals scored in recent games and the number of goals conceded by the opponent team help predict the probability of success in the next game. The model will keep updating its predictions as the tournament progresses.

Soccernomics

This article is not really about who will win the World Cup. It is more about some subtle aspects of football and how the game is changing, thanks to the use of data and analytics. The article is based on a very insightful book," Soccernomics" by *Simon Kuper and Stefan Szymanski, recent* coverage by *The Economist* and a few other articles and websites.

Corner kicks

Kuper and Szymanski start their book with the famous British club Manchester City's efforts to improve its scoring record from corner kicks. The club had not been doing particularly well in this area. A thorough analysis of 400 corner kicks from different leagues over several seasons threw up some interesting insights. Outswingers tend to create spectacular goals as the ball moves out and a player like Zinedine Zidane jumps smartly and heads the ball home. But it is the inswingers to the near post which tend to succeed more. The great thing about inswingers is that the ball goes straight into the danger zone, increasing the possibility of a goal. On rare occasions, the ball just goes into the net but more often, it creates an opportunity for one of the attackers to tap the ball into the goal. Manchester City's manager, Roberto Mancini, an ex-football player, did not initially buy the argument. But gradually, the club changed its strategy. In 2011-12, City scored 15 goals from corner kicks, more than any other team in English Premier League. Two of the goals came from inswingers including the goal by well-known Belgian star, Vincent Kompany against Manchester United. That goal effectively sealed a championship win for City.

Note: The Premier League is the most popular league in the world. There are 20 clubs in the Premier League. During the course of a season (from August to May) each club plays the others twice (a double round-robin system), once at their home stadium and once at that of their opponents, for a total of 38 games. Teams receive three points for a win and one point for a draw. Teams are ranked by total points, then goal difference, and then goals scored. If still equal, they occupy the same

position. 49 clubs have competed since the inception of the League in 1992. Six of them have won the title: Manchester United (13), Chelsea (5), Arsenal (3), Manchester City (3), Blackburn Rovers (1), and Leicester City (1). Following the 2003–04 season, Arsenal acquired the nickname "The Invincibles" as they became the only club to complete a Premier League campaign without losing a single game. The record of most points in a season is 100 by Manchester City in 2017–18.

Penalty kicks

A penalty, if awarded, is not only the defining moment of a match but also a memorable experience to watch. It is common for strikers to walk into the penalty area, fall down and pretend to be hurt. Teammates can demonstrate extraordinary acting skills in such situations and put pressure on the referee to make a wrong decision. Such referee misjudgments can have more impact in the game of football compared to other sports like basketball, rugby and American football. These are high scoring games where one decision may not matter so much but the result of football games often hinges on one goal. So a wrongly awarded penalty can make a big difference. Thus it is common for the losing team to lament about the unfair penalty. The winning team on the other hand claims that it would have won the match anyway. But as the authors of Soccernomics point out, the penalty kick may not be as unfair a way of deciding a match as it is made out. Only if a team has possession of the ball in the opponent's half, there is a possibility of winning penalty. A penalty may be wrongly given but it is essentially a reward for deep territorial penetration. Good teams get proportionately more penalties compared to weak teams.

Moreover, with the increasing use of technology, referees on the field will have more support to ensure that they do not make wrong decisions so easily. In this world cup, we will see the use of VAR or Video Assistant Referee, very similar to the concept of third umpire in cricket. There are 13 officials who will all sit in a special hub in Moscow. Of those, one will be chosen for each game, with a team of three assistants. The VAR will be able to view the action from a number of

cameras – including slow motion ones. If the VAR sees something wrong, he can flag it to the referee; if the referee thinks something is wrong, he can consult the VAR. Either way, the VAR has only an advisory role. Any decision ultimately rests with the referee.

If a penalty during the course of the match is considered unfair, a penalty shootout is even more so for the losing team. In the world cup, a penalty shootout takes place when teams are tied in the knockout stage, at the end of extra time. For economists, the penalty kick is essentially game theory in action. The penalty taker and the goalkeeper must each choose a strategy, where to kick the ball and where to dive, respectively. The strategy of each will depend on guessing what the other payer will do. So data and homework can come in handy here.

The Germans have the best record in World Cup penalty shootouts, not because of luck but because of systematic preparation and homework. That was adequately demonstrated when they met Argentina in the World Cup quarter final in 2006. During the shootout, the German goalkeeper, Jens Lehmann carried with him a sheet of paper which had details of the kicking preferences of the various Argentine players. The sheet was based on a database of some 13,000 kicks developed by the Germans. Of the various players, only Ayala and Rodriguez were on the list. Both shot as expected. Lehman was able to save Ayala's shot. Rodriguez shot so well that the goal keeper despite diving in the right direction could not prevent the goal. The final kick was taken by Estaban Cambiasso, a completely unknown commodity for the Germans. Nevertheless, Cambiasso possibly became psyched by the sight of the German goalkeeper consulting the sheet. He fumbled and Lehman was able to save.
https://www.youtube.com/watch?v=VElemuvBGXo

In contrast to the Germans, England has a disappointing record of penalty kicks, losing six of seven shoot-outs in tournaments. Video analysis shows that players who rush tend to miss penalties. The English players seem to be particularly hasty while taking penalty kicks. The British under-17s, who won a shoot-out in their World Cup held in India last year (They also went on to win the tournament beating

Spain 5- 2 in the final after trailing 0-2.) worked on slowing down and practising a range of premeditated shots.

The most successful penalty takers build a randomness into their decision making process so that the goalkeeper cannot guess very easily which way the shot will come. The French striker, Franck Ribery is an outstanding example. Even as he ran to kick the ball, he himself did not know which corner he would choose!

The team that wins the toss before the shootout, gets to decide whether to go first. Unlike cricket, where the captain who wins the toss is often in a dilemma whether to bat or field first, it is an easy decision to make in football. The pressure is always on the team striking second. Even the best players succumb to the stress of having to score off the last kick to stay in the game. The best example is the superstar Roberto Baggio of Italy in the 1994 world cup final against Brazil.
https://www.youtube.com/watch?v=nGfzTBe5bQs
(By the way, as you might be aware, Messi missed the penalty against Iceland in the current world cup and so has Ronaldo!)

That is why some analysts have recommended that penalty shootouts should take the pattern ABBABAAB so that the team starting first will not have an unfair advantage.

And there is one strategy that kickers should use more often but unfortunately do not, according to the famous economist, Steve Levitt who wrote the book Freakonomics. That is to kick the goal right down the center. Usually, the goalkeeper will dive to one side. It is too embarrassing to just stand in the middle and do nothing as the ball goes into the corner of the net. But the dilemma for the kicker is that he too does not want to look foolish. What if he kicks straight and the goalkeeper is able to block the shot. In short, the penalty shootout is not just about scoring or saving goals. It is also about looking good in front of everyone.

The importance of data

Football is increasingly leaning heavily on data and analytics. Most leading soccer playing nations and clubs have in house analytics teams. Some of course leverage analytics more than the others. Manchester City has probably the strongest data science department. Data scientists at Manchester City have been very active since the purchase of the club by Abu Dhabi's ruling family.

Among coaches, Arsene Wenger probably believes most in data based decisions. Wenger, the famous and most successful manager of Arsenal from 1996 to 2018, found from his analysis that a player called Mathieu Flamini was running a phenomenal 14 kilometers a game, substantially more than the other players. Wenger who puts a lot of faith in such athletic skills, went to watch Flamini and signed him at an attractive price. Flamini blossomed at Arsenal, went to Milan, did well there, returned to Arsenal and again prospered. Wenger even paid £2.165 mn to buy an analytics company called StatDNA. Thanks to this company, Arsenal can use customized statistics such as the number of times a defender fails to spot an attacker running past him and each player's level of tiredness as measured by how long the foot is planted in the ground when he runs. StatDNA can also generate "expected goals" which estimates the probability of a given player generating a goal for or against his team in a given situation. But even Wenger does not blindly trust stats. Along with data, he likes to see a player for himself and gather verbal intelligence about the player's attitude and physique. (In contrast, Alex Ferguson of Manchester United had less use for stats even though he did employ a large data analytics department.)

One of the earlier instances of data analytics in action comes from Italy. AC Milan's in house medical outfit found that by studying a player's jump, it could make a 70% accurate prediction about whether the player would be injured. By collecting a lot of data around muscle weaknesses, heart rate, breathing, eye movements etc., the medical team was able to stumble upon the "secret of eternal youth". By 2013, the outfit had done several physical tests on the club's players and collected millions of data points. In the Champion's League of 2007, most of AC Milan's starting 11 were 31 or older. Paolo Maldini, the captain was in fact 38 and Filippo Inzaghi who

scored both of Milan's goals was 33. Milan won the match against Liverpool 2–1 to win their seventh Champions League title.

For the legendary Dutch player, Johan Cruyff, (best known for total football and the Cruyff turn, https://www.youtube.com/watch?v=CYtzf7YD80Y), the pass was the essence of football. A great teacher and coach, he would say that a ball must never be passed to a teammate's feet but always a meter ahead to maintain the pace. And when the first man was passing to the second man, the third man had to be in motion to be in the right place to receive the pass from the second man. For Cruyff, football was about making passing triangles on the field. If a player could do that, Cruyff would pick him in the side. Cruyff was the one who made Spain the global soccer superpower that it is today. Even today, leading football club Barcelona' s driving principle is:" Always the players must find triangles."

The top four teams in the Premier league have a higher percentage of pass completion in the final third of the match. An attacking midfielder must have a pass completion rate of 80%. By recruiting the right players, Manchester City was able to improve the ability to keep the ball in the final third significantly. Teams score on an average once every 180 possessions. A majority of the goals come from possession won in the final third of the field. Incidentally, on an average, a player has the ball only for 53.4 seconds. So the main job of a player is to occupy the right position for the remaining 89 minutes and 6.6 seconds. Leicester selected the French footballer, N'Golo Kante based on stats which indicated that he was great at interceptions and excellent at forward passing.

Data is providing good insights on how to increase the probability of a goal. For example, crossing is not a great strategy. A cross from a free kick may make sense because the player has space and time to achieve precision. But sending a man sprinting down the wing with a defender chasing and then counting on the cross being nodded in, usually does not work.

In the Premier League, only 2% of shots taken from just outside the penalty area become goals. Still players continue to take shots from outside the penalty

area. Probably because these are the goals that are remembered for a long time! Only one out of every 35 direct free kicks become goals. Whenever a free kick is awarded, the biggest name in the team like a Christiano Ronaldo will grab the ball, make a great show of placing it and then shoot the goal wildly above the cross bar. (But Ronaldo did shoot a brilliant goal from a free kick outside the box in the match against Spain.) Taking free kicks as the authors mention, seems to be a superstar's perk! The smartest thing to do would be to pass the ball and take advantage of the spaces that are invariably created when the "wall" is formed.

Over time, data analysts in football have learnt to separate noise from the signals and develop the right conclusions. They have realized that the data they have traditionally used such as number of passes, tackles and kilometers ran, can be misleading. For example, a brilliant pass is quite different from a sideways push to a colleague. The great Italian defender, Paolo Maldini positioned himself so well that he made only one tackle every two games. Rather than looking at kilometers covered, clubs now look at distances run at top speed. In 2009, Tottenham decided to retain Gareth Bale because of his sprinting abilities. Another metric that is being used is high intensity output, the ability to reach a threshold speed of 7 meters per second. The famous French player, Thierry Henry would do this effortlessly. Yet Juventus made the mistake of selling him to Arsenal in 1999. Another crucial skill is the ability to make repeated sprints. Earlier, goalkeepers were judged by the percentage of shots stopped. This metric favored the keepers of the big clubs with tight defense who ensured that the goalkeepers would get easy shots to save. The new metric is expected save value, the chance of a keeper making a save from a certain shot taking into account the difficulty of the host. That is how the brilliant German goalkeeper Manuel Neuter was spotted.

Note: If you compare all this with how cricket is played in India, it is a stark contrast. In India, what matters is the opinion of a coterie. Data and objectivity have a limited role to play in the IPL, India's equivalent of the Premier League, except maybe when buying an expensive foreign player. And if you hear Indian commentators, you will know very quickly who they are backing and who they are not. So it is quite common to see some undeserving players making repeated

comebacks while others struggle to make an entry into the national team. Mumbai Indians may lose all its initial 5 matches but will still be tipped to reach the playoffs. What matters in IPL is not recent performance but hope and the opinions of a set of people who think they are very clever! Where data is used, it seems to be superficial metrics, like the number of sixes or boundaries hit, that really do not tell the full story.

Transfers and salaries

In the summer of 2017, clubs world over spent $ 4.71 bn on transfers, including the £198 mn that Paris Saint Germain paid Barcelona for Brazil's superstar, Neymar. The authors point out that much of the money spent on transfers is wasted. Spending heavily on transfers does not seem to do much to improve the performance of teams. In contrast, player salaries are a much better predictor of success. In the decade up to 2016, for the English Premier League, wage spending explained about 90% of the variation in the league position. The explanation is simple. High pay attracts good players. And over the long run, most footballers earn what they deserve.

A rare exception seems to be Leicester which in 2016 won the League against odds of 5000-1. In terms of wage bill, the club ranked only 15th. The authors attribute Leicester's victory to a very good goalkeeper, great defenders and luck. The club's performance was not exceptional, with a goal difference of 32 against the average of 53 for the winners. During the season, all the favorites performed badly. Keeper Kasper Schmeichel saved 4.6 goals more than expected over the season. The club also had great defenders like Christian Fuchs and N'Golo Kante. Kante was truly hardworking and in the word of the manager, Claudio Ranieri, he had a "pack full of batteries hidden in his shorts."

Note: The value of goalkeepers is even today not adequately understood. They are underpaid compared to the strikers. According to one website, the typical goalkeeping salary in the Premier League has dropped from 79% of the league average in 2006 to 69% last year. Only five goalkeepers have had a top-three finish in voting for the Ballon d'Or, an annual award given to the world's best player. The

Russian great, Lev Yashin, whose phot has been displayed all over Russia during the current world cup, remains the only keeper to have won the prize in its 62-year history, claiming the title in 1963. One of the biggest challenges that goalkeepers have faced has been a lack of data. An interested fan can quickly discover how many goals celebrated attackers like Pelé or Diego Maradona scored. But there is no estimate of how many goals Yashin prevented in his career.

The role of the coach

The authors studied the performance of coaches over the period 1973-2010. The criterion used was their ability to do better than what the wage bills would suggest. Thus a manager whose team is ranked 90 among all the teams, based on the wage budget, but ensures the team gets a rank of 80 would have done well. A manager with the fourth largest budget who makes the team win the Premier League would have done even better. The study revealed that only about 10% of the managers were overachievers. Bob Paisley, Alex Fergusson, Bobby Robson, Arsene Wenger and Kenny Dalglish were on top of that list. The vast majority of coaches do not matter. And the market for coaches is not as efficient as that for players. Markets work efficiently when they are transparent, people can see who is doing what and can place a value accordingly. The performance of the players is very visible but not of the managers.

And now a more detailed look at Alex Fergusson, the famous manager of Manchester United from 1986 to 2013. Between 1991 and 2000, United spent 5.8% of the total wage budget among the Premier League teams and secured a creditable 1.8th ranking on an average. Why did Ferguson do so well? Ferguson was well served by the Beckham generation. Beckham, the Neville brothers (Gary and Phil), Paul Scholes, Nicky Butt and Ryan Giggs were excellent players. And because they were young, their wages had not peaked. Moreover, since Ferguson was in charge for a long period between 1986 and 2013, he pretty much chose most of the side. He did not have the burden of carrying unwanted players signed at high prices. From 2000 onwards, Ferguson's performance became less spectacular as teams like Chelsea, Manchester City, Arsenal and Liverpool also started to pay more to attract the best players. Compared to Ferguson, his successors, David

Moyes, Louis Van Gall and Jose Mourinho have not done as well. But the authors point out that Moyes inherited older players like Patrice Evra and Rio Ferdinand who should have been transferred out. Also, Moyes did not have the same status as Ferguson and hesitated to make big changes in the team. Despite his sterling record with Everton, he did not have the larger than life image of Ferguson. Under the stewardship of Moyes, United faltered and finished 7th in the Premier League. Moyes certainly cannot be blamed entirely for what happened. But the media was quick to focus on the absence of Ferguson and his motivational abilities. The authors of Soccernomics feel that any player good enough to play for United would be able to motivate himself. Moreover, public relations skills do matter in the case of football coaches. Unlike Ferguson who could successfully deflect the blame of defeats to others, Boyes' body language seemed to convey an admission of guilt.

Arsene Wenger's record at Arsenal in his first few years was also exemplary. From 1996-97 for his first 7 seasons, he spent 7.5% of the Premier League's wage budget but achieved an average position of 1.6. Between 2004 and 2011, he achieved a position of 3.3 while spending 8.8% of the EPL wage budget. Since 2012, the results have been less impressive. The reason for Wenger's big impact in his first few years was the knowledge he brought along with him- healthy diet, use of data and scouting for talent in foreign markets. Thus Wenger was the only manager in the Premier League who knew that Patrick Vieira and Thierry Henry were great players. But as other managers started copying Wenger, the performance gap closed.

In general, managers of football clubs do not have that much of a role to play in the success of their teams. While managers may not really influence performance, they should be able to explain the results at the press conference. Popular ex-players get coaching jobs because they are more easily accepted by fans, media, players and sponsors.

Managers of national teams have a better chance of making a difference. They have to get teams ready in a short period of time unlike clubs, where they can do

this more gradually. They can play the motivational role. As Carlo Ancelotti, the former Italian player mentions in the Goldman report:" A club manager has the time to build a good playing style, a good philosophy, and good tactics. By contrast, the manager of the national team doesn't have the time to do this because he cannot train the team every day. So, you have to be really focused for one month to prepare for this kind of competition, and sometimes more than the technical and tactical aspects, the psychological aspect is important, in order to motivate the players for this short period."

Managers can also bring foreign knowledge their teams may not have. The Dutch manager, Guus Hiddink is an outstanding example. He became an exporter of football knowledge from Western Europe to different corners of the earth. In 2001, he joined as manager of the South Korean team. The Koreans had an inferiority complex because they were short. The Korean culture also emphasized hierarchy. The players were quiet and used to taking instructions. Hiddink realized the players had to take more ownership. Under Hiddink, the confidence of the team shot up. At the 2002 world cup, the Koreans played with an intensity that is rare. Korea became the only team from outside Europe and South America to reach the semifinal of a world cup since 1934. Hiddink became a national hero. Korean cities planted statues in his honor. In July 2005, Hiddink was appointed manager of the Australian team. Australia not only qualified for their first World Cup in 32 years but also reached the knockout stages, the first time in the Socceroos' history. Australians woke up at unearthly hours to watch their sporting heroes in action! Hiddink then moved to Russia where he replicated his magic. Like in Korea, he tried to unshackle the players and encouraged them to think for themselves. He wanted them to make riskier passes, and move into new positions without being told. In Euro 2008, in what was probably Hiddink's greatest triumph, Russia beat the Netherlands 3-1 in the quarter finals. The Russian players seemed to enjoy themselves and had a lot of fun even as they won the game. (For Johan Cruyff, that moment probably came when Spain beat the Netherlands in the 2010 World Cup finals.)

The German coach, Otto Rehhagel is another great example. He did wonders for Greece which was a struggling team when he took charge. Rehhagel's approach was a little different, compared to Hiddink. Not surprising because of his German pedigree. Rehhagel would say:" Now that I am coaching Greece, I want to make one philosophical statement: Please write it down. Man needs nothing more than other people." Soon teamwork began to improve and the Greeks started to play like the Germans. They reached the finals of Euro 2004 and beat Portugal 1-0. Rehhagel had demonstrated that a good national coach given enough time, could enable even a marginal team to do well.

Note: For Europeans, great football means combining Italian defence, German work ethic and Dutch passing.

Built to last

Football clubs are also far more enduring than the Fortune 500 companies. In 1923, the English Football league consisted of 88 teams spread over 4 divisions. In the 2016-17 season, 84 of the clubs still existed and 72 remained in the top 4 divisions. Attendance in the League did indeed fall by 12% during the great depression between 1929 and 1931. But by 1932, the crowds were growing again despite the struggling economy. At the same time, the stronger clubs knowing they could not thrive without opponents, also helped the weaker clubs.

During the Thatcher recession of the early 1980s, many fans lost their jobs. The League's attendance fell from 24.6 to 16.5 million between 1980 and 1986. Football seemed to be in terminal decline. Take the case of Bristol City. By 1981, the club's average attendance had collapsed to 9700 per game. The club was relegated to third division. In early 1982, as expenses significantly overshot income, the club seemed to be on the verge of liquidation. But local businessmen led by Deryn Coller came up with a rescue plan for the club. They floated shares, raised capital and created a new ownership structure. Eight expensive players agreed to forgo their contracts worth 290,000, a princely sum those days. As the authors of Soccernomics mention," The eight really deserve statues outside Ashton Gate. They gave Bristol city a future." Between 1982 and 1984, many other struggling

clubs including Derby survived in pretty much a similar way. "Phoenixing" allowed the clubs to survive. While the directors escaped the consequences of their decisions, the creditors, players, banks and the taxman had to bear heavy losses.

One way to explain this phenomenon is to argue that football clubs and players have an emotional appeal that companies do not have. That explains why people do whatever is needed to keep the club going despite financial pressures. Also the success of clubs is measured less by the financials and more by the results. So clubs can take a much more long term view, compared to companies which are focused on quarterly results.

Note: In India, the well-known Calcutta based football clubs, Mohun Bagan and East Bengal have been around for a long time though many of the companies based in Bengal have gone bankrupt!

Concluding notes

There are other interesting facets of football. As a recent edition of the Economist pointed out, football and democracy seem to go together. Countries run by autocratic governments find it difficult to nurture the game as it involves a lot of creativity and flair. Only four countries without a democratic government have qualified for this year's world cup. The last country with a non-democratic government to win the World Cup was Argentina (then under military rule) in 1978.

Football is also a truly global game. Countries and clubs often look for coaches outside their country. Teams also tend to be global. Knowledge moves across countries. That is how Western Europe leads in this game today. Latin America is still a distant second.

Football offers important lessons to corporates on spotting and nurturing talent. Companies would be better off recruiting young entry level talent based on hackathons and analytics rather than stereotyped written tests and interviews.

Investments in the game are required for any country serious about becoming a major soccer playing nation. But investments alone may not be adequate. China has hired an expensive coach and is getting a lot of children to play football with its typical top down approach. But that alone may not do the trick. The Germans on the other hand have world class youth football academies where training sessions focus on building creativity. The German team which won the world cup in 2014 played with a lot of imagination thanks to the training they underwent. So an important lesson from football for companies. The best talent should be left alone to display their creativity, instead of being" managed".

Like many other industries, football faces major business risks because of technology, in particular smartphone and Paytv. Technology as we know can be a threat as well as an opportunity. Global TV viewing of sports peaked in 2012. But on the other hand, people can now watch a match from anywhere and Amazon and Facebook may buy streaming rights. In 2017, Facebook did announce it would be live streaming Champions League football. Social media and Virtual Reality could also change the way we watch football. Imagine thinking we are on the field along with our friends, almost standing next to Neymar and Messi as they go about trying to score another goal! Which means there are exciting opportunities for technology services providers.