Technologies Growing Impact In Sport And Why Goal Line Technology Should Be Implemented In Football

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Abstract

This report will examine technology's influence throughout the sporting world and its current paramountcy on sporting matches and events. It will analyse current technological officiating methods concentrating on their level of success and how these could be imitated in football; using valued perspectives both for and against technological involvement in football. The paper will acknowledge each side of the argument in detail deciphering factors that cause such strong opinions to be held around the debate of goal line technology or indeed the lack of. The opinions of those whom are involved and will be effected by such a change in the world's most popular game will be discussed in conjunction with the vast list of questions and issues surrounding the debate.

Factors involving the various technologies available or in current development will be discussed as well as the way the politics, that have many believing are the sole source of football's lack of technological input, effect companies' and institute's researching and developing potential goal line technology. The head of the University of Loughborough's sporting development institute, Professor Mike Caine will speak of his personal stance on all of the controversy that has ignited the deliberation of the goal line technology debate in a phone interview conducted at the culmination of this dissertation.

The dissertation will conclude in successfully arguing for the implementation of goal line technology into the sport of football via video replay.

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"I cannot believe that we are still not using goal line technology, …as a boy one of my strongest memories was seeing a man walking on the moon, live on television. That was more than 40 years ago and yet we somehow cannot use technology to decide whether a ball has crossed the line." - former referee Dermot Gallagher (Taylor, 2010).

This paper will examine how the sporting world, in particular professional match officiating, has been affected by technological advancement. It will focus specifically on the issues surrounding 'goal line' technology in football. The aim of this dissertation is to present a strong case for the positive impact that goal line technology would have and to argue for its implementation in the game.

"In rugby and American football when the video decision is made, that's the decision… It's a fact that if technology had been in use we would be in the Champions League final now… It would help a lot what is a difficult job for the referee when they have to make crucial decisions. It's up to UEFA whether they act." - Guus Hiddink (London Evening Standard standard.co.uk, 2009).

One incorrect decision can cost clubs that have been denied major trophies or relegated millions of pounds, as well as managers, coaches and players their jobs. In extreme cases, referees have chosen to retire from their profession after being subjected to fan hatred and media criticism for their involvement in a wrong decision. UEFA president Michel Platini is on record saying, "You have to be a masochist to be a referee" (Bathgate, 2010)

The benefits that video technology offers football referees will be highlighted. In addition cases involving other sports' implementation of technology to aid officials will be analysed, in order to support this argument. The reasons why football has yet to open the door to technology will also be discussed, together with an analysis of the views of fans, players, managers and officials, both for and against the involvement of technology.

The issue of video technology is currently one of the most pressing matters in sport, and the constant arrival of new cases concerning 'incorrect' decisions only adds fuel to the controversy.

This dissertation, will explore in depth, how technological advancement is affecting sports. It will also consider how specific cases of incorrect decisions, with big implications, spark debate between those in favour and those against in the technology debate. However, certain opinions carry more weight than others. This dissertation will focus upon who holds the controlling power and influence within these sports, and evaluate their views and explanations.

While the main focus will be on football and goal line technology, other sports and officiating technologies will also be investigated in terms of how they were implemented, the complications that occurred during this process and how these were dealt with. The work will also look into the reactions of how different people view the technology in the sport and whether they believe it to be necessary or not.

The majority of the paper will focus on technology aid support in officiating sports; although technology's potential influence is not restricted to this. Also included will be an examination of other aspects of sports and how these have altered, or have the potential to be altered through the adaptations of technology. Cases where technological influence has been used, either intentionally or unintentionally to improve a player or a certain teams

performance will also be discussed. Ultimately concluding whether or not these alterations are unfairly changing the politically correct ‘level playing field’ that a sporting match ‘should’ be played on. This will enable a certain degree of controversy that technology has already caused within sport to be uncovered, and therefore aid in concluding whether or not football should have technological involvement implemented.

This dissertation will be a documentation that with the added support of facts and opinions will carry an extremely powerful argument against those whom oppose the implementation of goal line technology within the game of football. Informing and educating the reader of arguably the most pressing issue in sport over the last few years.
Its aim is to play a part in turning the heads of UEFA the governing body of European football that has chosen to be so resolutely against the adoption of the new technology.

It will focus its points around those who come from well-respected positions from the game of football, as well as the sporting world in general. Articles and extracts from written work around the world will further support and uphold these opinions.
In a time where such a massive issue is being made around goal line technology I will construct a paper that discusses both sides of the argument, hoping to demonstrate that the decision for technology specifically in the use of goal line decisions, will be for the greater good for everyone involved in the sport.

The dissertation will be broken down into three main chapters, all of which will discuss the issue of technology involvement. Overall the reader will have a strong outlook on the idea that it is essential and of a high importance to accelerate technology within football.

In chapter one, literature concerning technology's increase in sport over time will be analysed.
This chapter will focus on all aspects of technology in sport rather than just the way officiating has been affected, depicting how the whole technology input has changed the face of the professional sporting world as a spectacle as well as the 'game play' itself.

Chapter two will look into what officiating technologies are now currently implemented in specific sports. With the aid of articles and other literature this chapter will sum up the general level of success these technologies have had. The section will also analyse the method of how the decisions to implement the technology are made and who holds the major power in making these decisions. In the latter part of the chapter, the focus will be shifted towards why football has yet to introduce technologies, noting who are behind these decisions.

The final chapter of the paper will concentrate merely on why goal line technology is needed in football as well as looking into the use of other technologies in football and arguing whether or not they would be useful additions to the game.

Technology's rises in sport

Sport has rapidly developed from its humble beginnings at village festival events right up to the worldwide spectacle that is the Olympic games. Hugely wealthy sport stars have replaced the amateurs who once graced the highest levels of sport. The sporting world has been dramatically changed by modern technology. (Beashel et al. 2001)

Martin Polley, in his book 'Moving the goalposts: a history of sport and society since 1945' recalls his first memories of sport sparking his interest (in his acknowledgment section) where a football game consisted of just jumpers and a ball. (Polley, 1998) This is a typical childhood memory that seems to be becoming lost in the current day and age.

Olympics

To analysis technologies influence in sport there is no better place to begin than the Olympic games, an event that is currently held once every four years in a location around the world. Without question the Olympic games is the most recognized as well as being the oldest sporting occasion the world has ever known.

The first Olympics that are accounted for in the form of written records took place in Greece, 776 BC. However it is common belief that this was not the first. The ancient games spanned up until 393 AD. (Young, 2004). The Olympic games were abolished in 393 AD by Theodosius I. (Swaddling, 2000) Theodosius was the first Christian emperor of Rome, when he came into power the Christian church persuaded him to ban the practice of pagan cults.

The Olympic games were a causality of this movement. (Clayton & Price, 1988)

In the 19th century a Frenchman named Pierre de Coubertin campaigned for many fruitless years until he eventually managed to organize a congress that saw the formation of the International Olympic Committee (IOC) on June 23, 1894. In turn this saw the return of the Olympic games in 1896. (Guttmann, 2002).

Fittingly the event was staged in Athens. It was a huge success, with the opening ceremony boasting a turn out of over sixty thousand people; (Schaus, 2007), the largest participating sporting event to this date.

The Olympics games settled back to its original four-year cycle, although the modern age did bring about changes to the event. Unlike the 'ancient Greek' games, the modern games allowed team participation, increasing the competitive nature between nations. ('The Rotarian', 1948: 15).

Technological rise in Olympic swimming

Technological implementations quickly began to transform the Olympic games.
Damian Farrow describes the evolution of technology in swimming, as an Olympic sport, as demonstrating this most effectively. During what has been described as the first of the modern games, Athens 1896, (Farrow, 2008), swimmers competing were required to jump off boats out at sea and swim the required distance of the event in the 'Bay of Zea' whilst wearing long cotton bathing suits.

In the 1912 games hosted in Stockholm, competition organisers made adjustments to transfer from the open sea to an outdoor pool, and most competitors also swam in the newly designed ‘short’ suits.
The change that really imprinted technologies footprint on the Olympics took place in the 1928 Amsterdam games where sport scientists employed high speed film to assess performance. The rise of technological involvement continued four years later with Los Angles hosting swimming events in an indoor pool; races were now timed using stopwatches. Los Angles was also the first Olympics to employ photo finishes in closely contested races.
Water based events at the Olympics continued to develop at pace with new inventions such as bubble machines to improve diver impact safety becoming regular features in the high dive swimming disciplines, and new lane barriers that cut turbulence between each swimmers lane. However the most significant development in improving performances was the introduction of Speedo’s ‘Aquablade’ suit in 1996. The new suit restricted drag and allowed the wearer to cut through the water in a more efficient fashion than before. (Farrow, 2008)
In order to justify just how these ‘new streamline technology suits’ have given the user advantages one simply has to cast their eye upon the 2009 World swimming championships. Each day a record was broken. All of the new records were set by a swimmer wearing a newly designed 100% polyurethane suit.

Technology’s influence in competitive eventing

Advances in technology have affected every competitive sport. There are those who embrace the changes technology have assisted in creating and those who are whole-heartedly against it.

While each argument differs depending on the individual sport the concept of technological advancement has undoubtedly enabled the advancement for many sports. (Ross, 2010)
While certain sports, particularly those considered mainstream were functioning in a viable state before technology influence. Others however owe their entire competitive capabilities to technological advancement, without which competitive events would not be feasible.

Competition in fishing

The sport of fishing sums up both sides of the debate, for instance in trout fishing technological involvement is kept to a minimum retaining the traditional techniques. However, the importance of technology in other forms of fishing, in particular deep sea and great lake fishing is very apparent, **(**Hummel, 1994) as Richard L Hummer states, “The sport, recreation, competitions of tournaments found in this form of fishing are only possible because of technology.” **(**Hummel, 1994).

Technology in football equipment

While the main issue of both this dissertation and current day football is goal line technology and its current absence from the game, there are many other technological changes that the sport of football has gone through in recent periods.

As Stewart Ross says “the most obvious impact of sporting technology is on the equipment we use”…. “In most sports the effect of high-tech equipment is dramatic.” (Ross, 2010)
There are currently around 300 sports in the world. (McComb, 2004)

Football being the most popular, currently boasting 240 million people who play the game. **(**McFee 2008)
As Football's popularity has grown so has the potential market for football related products and not just in the professional game. There are now high street stores and online retailers, who will purely sell products like football equipment, such as 'profootballboot.com' .

Marketing new technology

Major suppliers of football boots and other football related equipment such as gloves and shin pads will exploit the current superstars within the game to market their products. A recent Addis advertising campaign shows Jonny Wilkinson and David Beckham in a field kicking both football and rugby balls in their new Adidas boots. These individuals are worldwide sports athletes; it is evident that this is powerful marketing. Consumerists are clearly deceived into believing that this particular equipment is top of the range, as sportsmen of their ability are using it.

Despite the recent rise in professionals marketing certain brands' products, the idea of using athletes at the top of their game to market a product is not a new idea. It is a technique frequently employed by companies that have recently created a revolutionary new product, for example the jabulani 'roundest football ever'. (lborouniversity, 2009).

In 1951 Stanley Matthews received £20 a week in return for endorsing football boots made by CWS.
According to 'sports trader' the 1980s were characterized as a 'veritable soccer boom'. This 'boom' era saw Bryan Robson sign a £25, 000 a year contract with Balance Boots, while Gary Lineker also profited vastly in this

period signing a boot endorsing deal giving him 3% on the royalties from sales. According to his accountant he will earn around 1 million pounds from this. **(H**orne et al. 1999)

These contracts are somewhat dwarfed in the modern day, David Beckham's current figures published by the official British company registry show David Beckham's income via his Footwork Productions company during the year of 2008 increase by 91% from the year 2007 to £9.97m. (Guardian.co.uk, 2009)

Cause for technological development

As demonstrated, new technological advancements can cause big revenue opportunities.

With monies like this available from marketing a revolutionary product with a sport star it is no wonder that the big corporate companies have begun to spend huge amounts of revenue and time on the developing of the next revolutionary products in order to draw the elite athletes into the endorsing of such products.

It is not only retail brands that have begun investing copious sums of money in search of the most accurate football boot or dynamic football but also academic institutions. The University of Loughborough in England is a prime example. It is the proud owner of one of the world's foremost sport technology institutes; involved with world leading research projects. Such projects include their ProVantage golfing analysis enterprise partnered by current world number one golfer Lee Westwood and the ESPRIT (Elite Sport Performance Research In Training) program which compiles a number of institutions, governing bodies and industrial partners in Team GB's quest for gold in upcoming world championships through its development of innovative training regimes and revolutionary equipment. (Loughborough University., unknown).

The University of Loughborough football development

Along with current schemes such as ESPRIT, Loughborough have also been involved with ground breaking expansions in football.
In 2002 Adidas approached Loughborough sporting research department, with the hope of making some of their product development ideas a reality. The majority of the focus from that date to present has been centered on the development of footballs. Adidas has provided the match balls for football's last four major competitions; the two recent European and World Cups respectively. The first was introduced in the UEFA EURO 2004 Championship; the ball, named The Roteiro was the first football to ditch the traditional stitching of panel seams, replacing it with thermally bonding seams. Loughborough's influence in the success of the project in turn lead to them being sole research partners for the 2010 world cup ball, the Jabulani. (Harland, unknown).

The jabulani ball was revolutionary in its design; constructed through the use of 3D panels it boasts a perfectly round shape, allowing a more accurate flight and a truer consistent reaction to the contact of a player when compared to previous balls. This process was subject of many hours of testing in Loughborough's sporting technology institute using various tests involving the repeated identical kicking of the ball and its reactions. (**Iborouniversity**, 2009).

Jabulani football controversy

However, advances in technology and their implementation in official sport is not without controversy. One example of just how much disrepute a new technological implementation can have on a sport is the incident of the Jabulani 2010 world cup football.

Despite a number of high profile players from various playing positions having endorsed the ball before its use in the South African world cup it is the perfect example of how technology has and can complicate sports. (WeAreSBK1, 2010). (Wing, 2009). (Okwonga, 2010). (You and Yours, 2010).

Almost as soon as the world cup began on Friday 11th June 2010 there was no shortage of complaints aimed at the Jabulani ball from managers to goalkeepers to strikers. The comments are not just from average role players looking for excuses but from some of the most talented players on the planet. Julio Cesar, Brazil's first choice goalkeeper and current holder of UEFA's prestigious 'UEFA club goalkeeper of the year' award described the ball as "A ball you would find in a supermarket.." these comments were backed up further by fellow international goalkeeper David James who is quoted as saying the ball is "Dreadful and horrible". It was not just the goalkeepers that were publicly criticizing the ball, highly experienced and respected England manager and former Italian international midfielder commented that the ball was "The worse ball I have ever seen". Former Manchester City player and record breaking English transfer fee signing Robinho also voiced his displeasure saying "The guy who designed this never played football". (Johnston, 2010).
The opinions voiced above portray a very vivid image of the displeasure the apparent most accurate ball ever, a point given further ballast by German football captain Michael **Ballack** "Because the ball goes where you want you can't have excuses". (adidasfootballtv, 2009) (Wing, 2009).

The alteration of such a vital piece of equipment in sport, whether it be an improvement from the former product or not, is always likely to incite controversy as time is needed for players to adapt. England midfielder Frank Lampard clarifies this point during the testing of the ball, 'in the modern day,

the newer the balls are there's always a slightly different feel...' (lborouniversity, 2009).
This period of alteration raises another element of debate with the jabulani football at its epicenter.

Germans steal advantage

Once England had been dismissed from the world cup, the population looked around at whom could be blamed. The football that had caused many bad reviews already was the obvious choice, however it seemed certain players and therefore teams were more at ease with the jabulani football. An obvious example would be the Germans master class in the 4-1 humiliation of England, who had gone into the game as favourites.
During the later stages of the world cup it emerged that while the Premier League and other first class leagues around the world had contract deal with ball suppliers, in England's case Nike, the top tier of German football - the Bundesliga, had no such commitments enabling them to chose any ball of their choice. So by the time the world cup arrived in early June, the German's had been playing with the jabulani football for the previous six months. Germany striker Mario Gomez who plays his football in the Budesliga said: "Once you have learned to make proper contact with the ball, you can make it travel very fast… It's a case of catching it right. You learn how to do that with practice. We are confident about scoring with this ball." For what appears to be an adaption of technology to a product vital to the game, this extra game time with the controversial ball has clearly vastly helped certain players to become more at ease, a point backed up comprehensively by Mario Gomez's statement. (Edwards, 2010).

There is no question that technology has dramatically increased both the success and general popularity among sports, but incidents similar to that

mentioned previously in the case of the jabulani football, go to demonstrate that so called ‘revolutionary’ breakthroughs can and do not always go as planned.

The jabulani football is just one example of technological implementation in sport that caused more issues than it solved. Further examples, aimed more specifically at technological officiating techniques rather than equipment of the game will be explored in the second chapter of the paper.

Officiating technology in sport

Chapter two of this dissertation will examine current methods of officiating technologies involvement in sport. Specific examples will be used to represent both positive and negative aspects the implementations have had.

Chapter one, while focused very broadly has already depicted how vividly the rise of technology has influenced the professional sporting world.
There are many forms of technology that can and have been incorporated into the aiding of officiating in sports. A perfect example is in cricket and how the 'third umpire', the term used for referring a decision to an off field official with technology aid, can be called upon in a variety of situations. There are then specific technologies that are at the third umpire's disposal in order to give him the data needed to come to a decision on the specific play.

Technology's implementation in cricket

The sport of cricket shows just how different technologies can be shaped in order to allow 'correct' decision-making.
Currently it is one of the most technological advanced sports in the realm of officiating.
Cricket's first step into technology led to a simple three light system being installed alongside the scoreboard, these lights would respond to the fading of the natural light. When three lights are on this indicates to an umpire that the playing conditions have deteriorated to a level where continuing to play becomes dangerous. (Ross, 2008).
Recently cricket also began using a third umpire system. Explained in detail below, a simple instant replaying of the questioned event is part of this. However, there is also a list of what could be seen as more advanced

technological conquests that can also be called upon. These technologies such as the snickometer (a machine that can read even the faintest noises such as a bat's edge on the ball); hot spot (a heat sensitive camera that shows where the ball has made contact, e.g. on the edge of the bat) and Hawkeye (a simulation of where the ball would have ended up, used in LBW, leg before wicket, decisions). These technologies have dramatically increased the ability to come to the 'correct' decision. (Ross, 2008).

Technological umpire aid

Cricket is played with two umpires on the pitch, one in front of the stumps and the other at the position of square leg; both umpires can call upon technology; there are various situations that allow them to do so.

A cricket umpire may refer to the third umpire if they are unsure whether or not a batsman has been caught out or not. The third umpire will review the situation through replays and then contact the on field umpires with the decision.

In a case where the fielding team has appealed for a run out or stumping and the square leg umpire is not entirely sure whether or not the batsman in question has successfully grounded their bat or a part of their body behind the crease line, the umpire has the authority to call for a reply of the situation to be looked at in depth by the third umpire. The decision of whether the batsman is in or not before the stumps were hit has to be made and then filtered back through to the umpire.

The third umpire will also review cases where it's not visually clear at first sight whether of not the cricket ball has crossed the boundary rope or if it bounced before hand. These factors affect the runs awarded. The third umpire is quickly able to contact the umpire informing them of the correct score to award. This process is incredibly quick as the human eye can depict

the event by simply watching a slower replay of the event. (Knight & Bull, 2006).

The issue of confirming just how many runs have been scored, as explained, it is a quick and easy process. This process has been made available in such a trouble free manner thanks to the great advancements in the technology of cameras. Cameras that can now record and play back in high definition complete with a zoom function that enables the event in question to be witnessed at an increased ratio without the loss of picture quality **(**Aizawa et al. 2004).

Video technology advancement key for football

The rapidness and quality of the advancement in camera technology and its use as an off pitch-refereeing judgment tool has led to many experts and pundits to call for its implementation in football. In an interview conducted by myself with Professor Mike Caine, Institute Director and Head of the Sports Technology Research Group at Loughborough University. Loughborough University is owner of the world's largest university-based Sports Technology Research Group. (The Complete University Guide, 2010).

Mike Caine explains that while there is a technology needing to be developed for complete 100% goal line technology accuracy, 99% of the time a quick video reply would be able to show whether or not the ball has or has not crossed the line. He goes on to back up the advances made in cameras by expressing that the technology is already there, and used in other sports with similar needs of decision making. “I can’t see why we don’t have an instant reply scenario just like they do in rugby league, just like they do in rugby union.”

Implementation of officiating technology in sport

Since technological implementation in the sport of American football; the board believes their officials now get a staggering 98% of decision right. (Ross, 2008).

Converse to this, many still have the opinion that officiating technology is doing as much harm to the game as it is good.
A view expressed is that it is believed that the element of errors and bad judgment calls adds character and excitement to the game. **(**McCann, 2007).
Despite these perspectives, technology in sport will continue to grow and make no doubt that 'incorrect' decisions will eventually be redundant. (Clarey, 2005).

There is little doubt that technology is making sports fairer for both competitors and fans. However it has not always been and is still not all controversy free. (Beloff, 2004).
In the early stages of technological implementation to aid human officials there were many issues; in America it took the NHL (National Hockey League) a number of years to successfully install a working system. After a previous failed attempt the successful launch took place in 2001. (McKee, 1986). (Proudfoot, 1989). (Elliott, 1985).

It is not just the implementation of technologies that provides problems, but also their place in the game after implementation.
In the interview with Professor Mike Caine he speaks of the main issue in his opinion as being, not so much the decision to use technology in sports but how it is then implemented.

Needed football technologies

While the main aim of this dissertation is to conclude whether or not goal line technology would be a good addition to the game of football there are also many whom call for technology to also be used in football to police other aspects of the game.
Ian Holloway, manager of premier league club Blackpool speaks of his 'heartbreak' at the referee and linesmen's decisions or lack of decisions after his sides defeat at the hands of Manchester City. He goes on to make a case where he believes technology needs to be implemented to stop these costly errors.
(BBC Sport, 2010).
Another high profiled member of the football community expressed their want for technology in the area of diving. This was Sir Alex Ferguson; arguably one of the most respected and influential men in the world of football.
(Guardian.co.uk, 2009).

UEFA president Michel Platini has expressed his thoughts on the implementation of goal line technology: "Then we will have PlayStation football." (Guardian.co.uk, 2009). Comments like this clearly illustrate the concern of the potential impact technology inclusion could have in changing the face of the game, losing its human touch and interaction. Northern Ireland, Wales and the FIFA president, Sepp Blatter has also has given his opinion that football must retain its "human face" – Sepp Blatter (Gibson, 2010).

Changing face of sport

The key is to contain the technology and not give it the license to completely change the face of a sport. Games like rugby, cricket and tennis are already

fairly, stop, start and therefore the reviewing of decisions does not seem to affect the flow of the sport. (Inverdale, 2010).

Many who voice concern, most notably Michel Platini and Sepp Blatter do so with the worry that decision referral technology will cause the match to be slowed down and interrupted. A valid element of apprehension and one those involved with tennis have expressed their annoyance at. Players believe opponents are using the review system technology tactically, trying to disrupt the momentum of the match. This of course is mainly directed at the fairly newly adopted review system in the power of each player's hands. (Crowther, 2007), **(**Garland et al. 2000). The hawk eye referral system was first introduced during the 2006 US Open, (Pratiyogita Darpan, Nov 2006: Vol. 1, No. 5: page 22). Player/team reviewing will be further discussed in depth towards the end of the chapter.

Both current world number 2 and 3, Roger Federer and Novak Djokovic, have both conveyed their opinions against the use of Hawk eye in tennis. (Independent.co.uk, 2010).

Federer, arguably the greatest tennis player of all time and a long time critic of the hawk eye system says: "We have electronic line calling even though we don't need it… One forehand down the line doesn't change the outcome of the match.." – Roger Federer. (Davis, 2010).

Taking in to account the breaking down of the flow of the game the technology may cause, John Inverdale, (TV broadcaster for the BBC and columnist) has reported on the issue with a view that the stoppage needed for technology referral would not impair the game in the slightest.

Using his experience of watching an experimental implementation of video referral technology in international hockey, he claims the time it takes for the event to be viewed via a monitor is less than the period taken up from mass protests the referee has to deal with from players over the alleged incident. "A goal is awarded but a member of the defending team is convinced an infringement took place. He asks the officials to refer it to the video evidence.

The answer comes back. The goal stands or it doesn't." -John Inverdale. (Inverdale, 2010).

The argument of technology in sport being 'good or bad' is at the forefront of many sports currently, however in the interview conducted with Professor Mike Caine he says "you can't say technology is good or bad its just a tool, and its how the tool is implemented that determines whether you get a positive or negative outcome".

Future for sports

Realistically there are three possible routes to embrace within sport currently. "One, at present taken by football, is to keep things as they are, accepting that mistakes are part of the game and, since that game is the most successful in the world, it would be foolish to tamper with it. The second option, currently adopted by a number of sports, is to admit a limited amount of technology into the process of adjudication: for instance, deciding tries in rugby, whether a catch is held in cricket or whether an athlete has false started. The third option is to embrace the technology of adjudication wholeheartedly." – Ross S., (2008).
Explained by Stewart Ross, the option that the majority of sports are employing is the second of the three.

Challenging the call

Many sports have introduced a 'challenge system', briefly touched on earlier in the chapter. The basic idea of the challenge system is that an individual or team; depending on the sport, gets a limited number of challenges that they can call upon whereby a decision will then be reanalysed using technology at

the disposal of the video referee/third umpire for the particular sport if they believe the incorrect decision has been made. The number of challenges allowed vary from one sport to the next. A similar system has also been incorporated into games like rugby, where the decision to use video referees is at the on field referees discretion. An example of how the system works is shown via the YouTube link referenced. (flyer1111, 2007).
There are two real types of technology that are used in challenges, the first being an off pitch official such as a third umpire in cricket or a video referee in rugby union who looks over a video replay and comes to a conclusion. The second is the use of artificial intelligence systems such as hawk eye used in both tennis and cricket, using a variety of cameras to show the position of where the ball would of or did land.

Challenging authority

Obviously the use of technology has drastically decreased incorrect decisions, but many are worried about the impact this has upon the authority of referees. **(**Gardiner, 2006). **(**Ch'ng et al. 2008).

“Many argue that allowing tennis players to challenge the officials calls.. Undermines their authority and brings the sport into disrepute” – (Ross, 2010) (Beloff, 2005).

Tennis is arguably the scene of the most vivid outburst in professional sport history. Here we are referring to the infamous John McEnroe umpire dispute. However, it is now the general opinion that the accuracy of the hawk eye technology has aided the game to diminish outbursts such as this, **(**Henshaw, 2006). The interview conducted with Professor Mike Caine demonstrates how he believes the technology helps prevent players from psychologically

believing all the calls are going against them, making for a more respective approach when opposed to the official.

“I mean if you think about the use of line calls in tennis, I’m thinking of Wimbledon now, there’s a very straight forward procedure whereby the players have a challenge system in place and because its very straight forward the ball is either in or the ball is either out, I don’t think it undermines the officials at all. They appreciate that it’s a subjective call and that the human eye isn’t infallible and whilst the technology’s not infallible either, it is certainly unbiased if that makes sense. I think one of problems a player has, think about a McEnroe scenario, is that they get it into their mind that they’re being victimised all the positive call are going in favour of their opponent, all the negative calls are going in favour of them or against them rather and so it upsets them psychologically and therefore they have an outburst at the particular umpire. Since the technology has been implemented there’s no outburst at the umpire; instead of undermining you’ve actually got something that’s complimenting the authority of the official…” So despite the opposition from some of the top players in the world that it is not an aspect that is particularly essential in the game, there is a very limited lobby that believes the technology can cause ‘incorrect’ decisions.

The issue of being certain about a decision is still subjective in the case of the third umpire (Ross, 2008). This issue arises because even with the technological components at their disposal it is still down to the third official to make a judgment call. Compare this to tennis where there is a technology that shows whether a ball is either in or out. **(**Gardiner, 2006).

Referring again to Professor Mike Caine “when you look at say a sport like cricket where they’ve followed a similar procedure but effectively it is a more complex call where there are multiple facets to whether a person is out or not. The umpire is making a judgement, the players can then challenge it but there’s then still subjectivity in the technology, so unlike in tennis when its in

its out everyone moves on very quickly, there is then a debate about whether the 3rd official…is looking at the right things…now what's happening is the player's are challenging the interpretation of the technology..."

The reference to the ashes is aimed at the captain of the Australian cricket team, Ricky Ponting who made an outburst after the third umpire ruled out a catch. (TheMasterBucks, 2010).
In this case an umpire then becomes the middleman who feels the wrath of the abuse when it is not even they who has come to the decision.
Cricket is not a sport known for its outbursts and seen as to many as the 'gentleman's' game, (Poll, 2010). However since the introduction of the technology and the ability to review decisions it's an addition to the game seen a lot more of recently.

Lack of respect in Football

Graham Poll, writer of the article (Graham Poll: Players undermine officials in football all the time... but even I was shocked by Ponting's show of dissent) and former world cup referee seems to have accepted the status of football being the most disrespectful sport in relation to referees. (Poll, 2010).
Is it fair that so much responsibility is put on one man in the middle of a game and we as millions of fans hold that person responsible for an incorrect decision? Giving out some much hatred and abuse that they no longer feel safe and have to quit their profession. Is it fair that this one man isn't given the technological opportunities that those of us at a pub or home are?

In chapter three, the answer to these questions will be discussed.

Technology implementation in football

In the first stages of chapter three the level of strain we, as fans and players put football officials under will be divulged further. Using both examples and opinions of those involved within the game the level of abuse referees are subjected to will be vividly demonstrated.

Chapter three will further explore the issues surrounding implementation of goal line technology in the game of football, demonstrating how it would benefit not only the 'fairness' of the game itself but aid those whom are involved within the game also.

Technology undermining human officials

As stated at the end of chapter two, much of the concern when it comes to introducing technology into a sport is that it will undermine the authority of the 'on field' human officials. Examples such as the most recent ashes cricket series have been enclosed to express first hand the increased level of dispute. However, in some sports such as football the authority of referees is already seen to be at a low. (Poll, 2010).

"You have to be a masochist to be a referee" – Michel Platini, president of UEFA, speaking after witnessing an old firm derby in Scotland with a very hostile crowd. Thirteen arrests were made shortly following the game. The President is the man who ultimately has the say in decision making in European football, yet despite this view he quickly dismisses the idea of goal line technology, which would undoubtedly take some of the negative attention away from the officials (Bathgate, 2010). Technology would ease the pressure off the referees as well as abolishing the feeling of fans and players injustice after an incorrect decision. (Grotticelli, 2009).

Referee abuse

Referees in the Scottish league recently went on strike. They claim, and the majority of the football community as well as the sporting community would agree with them that they are at the focal point of heavy criticism from club chairmen, managers and players on field. (Syed, 2010).
Although obviously not all of this abuse is down to goal line decisions being given or not given it is definitely an issue that can and has caused high levels of abuse to be aired at the on field officials.
Here we have highlighted Scottish league referees stance on what they believe is a grave injustice in their working environment, however the issue is universal throughout the world game. An example of just how grave the volley of abuse can reach takes us back to the 2005 Champions league knockout match between Chelsea and Barcelona. After the game Chelsea manager Jose Mourinho made many negative remarks aimed at the official, Anders Frisk, whom it seemed had had a good game. The subsequent emails to Anders Frisk from Chelsea fans that followed these comments from their manager were of such an intense magnitude that he believed his life to be in danger and subsequently permanently withdraw his participation in football. (Witzig, 2006)

There are currently hatred groups on global networking sites aimed at an official for a single incorrect decision that they have had to make in a split second, unlike those who can sit back watch replays and then judge. (Facebook Admin, 2010).
There have even been cases where death threats have been sent to officials for their parts in incorrect decisions. (Cass & Lyttleton, 2009).

The goal that never was

Understandably a lot of passion is created via football, and because of this it has the status it does at the highest level of sport. The level of frustration when you see your team wrongly disallowed a goal is sometimes incomprehensible, even Sepp Blatter president of FIFA and a heavily opposed figure to goal line technology, felt the need to apologise after television replays clearly showed Frank Lampard's goal crossing the line after play was allowed to continue in the 2010 World Cup last 16 game between Germany and England. He also went on to say that FIFA would reopen the discussion of goal line technology implementation, clearly realizing how damaging and embarrassing situations like this can be to the sport and its governing bodies. "I have expressed to them apologies and I understand they are not happy and that people are criticizing." - Sepp Blatter (BBC Sport, 2010).

Speaking in regards to the Frank Lampard 'missed goal', Tottenham manager Harry Redknapp said FIFA president Sepp Blatter should be "embarrassed…we've all seen it on the replay - it was just amazing. That was a clear-cut goal and it was absolutely vital to England and it wasn't given. Technology has got to come into games." – Harry Redknapp (BBC Sport, 2010). Comments reiterated by Fabio Capello, England's national sides manager: "It was the most important moment of the game,…Where is the technology? Instead we are talking about goal or no goal." – Fabio Capello (BBC Sport, 2010).
Many errors were made during the World Cup 2010, some were catastrophic. The solution seems simple (Beloff, 2004).

Foolish football's lack of technology

Since 1994 the German football association have ordered three league games to be replayed because of refereeing mistakes. (Giulianotti, 1999). This could have been easily avoided with a simple review system, holding the game up for a matter of seconds.

Professor Mike Caine explains that he cannot understand why a review system is not in place, football is a game where often one goal is the decisive mark of a win or a loss, when sports like ice hockey, tennis and basketball known for their high scoring have systems implemented.

As previous spoken of, there are those who oppose technology in their own sport, however when it comes to their view of football's stance it simply makes no sense to them, and are baffled by its lack of involvement.

Current world number two Roger Federer when comparing the technology in tennis to the lack of it in football said: "One forehand down the line doesn't change the outcome of the match; whereas one goal changes the entire mindset of a team, of a strategy." – Roger Federer. (Davis, 2010).

A view synonymous to the NHL (National Ice Hockey league) league's vice president: "It's crucial because a goal in soccer is even more important than in hockey because there are fewer (scored)." - Mike Murphy (James, 2007).

Why is there no goal line technology?

The quotes and statements from both those involved in the game of football as well as those who follow it portray an almost unanimous consensus that goal line technologies implementation into football would only have a positive effect on the sport. Can the overwhelming majority's opinions continue to be ignored?

During the dissertation it is apparent that the key powers in football's decision making, such as FIFA and UEFA presidents Michel Platini and Sepp Blatter

are less than enthusiastic about goal line technology. There are claims that perhaps there are yet to be technologies available that would provide a 100% guaranteed success rate (Caine, 2011). Technology in football has been the subject of many projects from all over the world. These ventures range from microchips in shin pads (Reilly & Araújo, 2005) to microchips in balls (Caine, 2011). So is the technology really the focal predicament behind the absence of a goal line review system? Professor Mike Caine confirms that technologies guaranteeing a 100% successful reading are predominately still in the pipeline. Due to "confidentiality agreements" - (Caine, 2011) he was unable to speak of what specific contracts entailed, however he did say that he has been involved in a number of developments within goal line technology, "probably the most relevant and high profile would be the relationship that was initiated between FIFA and adidas with respect to integrating tracking technologies into the ball" - (Caine, 2011). He goes on to say that Loughborough University has spent a great deal of time looking into the packaging and logistics of tracking technologies, and recognized that the system needed would be fairly complexed and many factors needed to be explored before a finished working product could be produced. "When you mount electronic or any body inside a ball what happens under different impact conditions so if you place lets say the electronics in the center of the ball, when the ball strikes the goal post and is compressed what happens to the position of those electronics at its centre does it remain where it was initially in which case its now closer to the side of the ball that's been compressed or does it move to the new centre position of the ball…in a tracking technology or a monitoring technology, you've just got to be careful that you don't get them out of balance with each other". It is unclear how much money and time FIFA had given to these projects and due to confidentiality agreements an aspect we were unable to extract although Mike Caine did have to say "you'll recognize the technology is one part of the equation but also the politics and the cost are all big factors within FIFA and other organizations enthusiasm for the technology, we had a fairly substantial role albeit in a narrow area but we have a very active interest in goal line technology"

It is very apparent that if a technology to decipher whether or not the ball has crossed the goal line was given FIFA and UEFA's, footballs two main governing bodies, seal of approval it would more likely be chipping technology rather than video.

FIFA and UEFA are more inclined to give chip technology a place in the game believing that the ability to know almost instantly if the ball has crossed the goal would prevent any loss of and disruption of flow to the game. "Fifa is strongly against the use of video evidence to decide the referees' decisions….The only thing that could be considered is the technology to decide whether the ball has crossed the line or not if - and so far it is not the case - a suitable technological solution is found." - Markus Siegler FIFA's director of communications. (Guardian.co.uk, 2005).

It is the disruption of the 'game flow' that seems to be the primary concern of video review goal line technology, however as has been previously stated the time needed is often less than a typical substitution and the creator of Hawkeye is on record saying "Goal line incidents are the only decisions which are entirely definitive and the answer can be provided to the referee within 0.5 seconds of the incident happening," – Paul Hawkins (Gibson, 2010). It seems very naïve that football portrays this attitude, one only has to cast their eye upon the growing success of video technology in other sports.
Mike Caine has acknowledged that if a technology that gives an impeccable reading is wanted then FIFA should look further afield than video technology, however he disputes that it would be a worthwhile process "it might be one in a million games before you need that level of decision" – (Caine, 2011). The technology is there that will enable "99% accuracy…I personal think simple technologies or just implementing technologies that already exist rather than perhaps thinking about instrumenting a ball are sufficient for the particular sport." – (Caine, 2011).

FIFA finally listens

After what has seemed to be a relentless torrent of appeals for video technology FIFA eventually agreed to invite Hawk Eye innovators to exhibit a demonstration of their goal line technology system. Unfortunately they didn't make the task easy, in fact far from it, making inconceivable demands and restrictions. "FIFA say the demonstration has to be on their pitches, which are Astroturf, which means embedding our chipping equipment won't be easy,' said Hawkins. 'And we only have access to the site for preparation at 8am for a 3pm demonstration, when four days' preparation is standard" In addition to this FIFA were also asking that Hawk Eye be the ones who stump up the £133,000 cost of the independent assessor of new technologies. (*Harris, 2011).* Further evidence showing just how unenthusiastic FIFA's approach to the specific technology is. It almost suggests that those involved from FIFA were trying to encourage the technology to fail.

Technology development not the issue?

Despite the discussion of what technologies are needed/wanted it is clear that creating the technology and implementing is not a major factor, "Our system for football is easier than for cricket, technically," Paul Hawkins The man behind the success of technological implementations in both cricket and tennis. (Skinner, 2010).

So if technology isn't the issue what is? There are still a number of people whom believe that the element of controversy within the game adds to the popularity and excitement. Without which people won't be going into work or the gym the next day talking about it. **(**Grotticelli, 2009).

Technology's implementation increasing sporting excitement

An opinion quickly distilled by Stuart Cummings, Match Officials Director of the Rugby Football League, when speaking for the implementation of technology - "If anything, it adds to the theatre of the sport," he said. "For a few moments, every pair of eyes in the stadium is focused on the same place." (Baker, 2009).

A perspective shared across the sporting world as review technologies have been implemented in various sports, the whole crowd focused on the big screen to see what fate lays in front for the players on pitch/court while the video officials review a specific event.
Further more if it is the worry that the implementation will affect the games global popularity the host of ESPN SportsCenter Michael Kim warns Sepp Blatter that it is indeed quite the adverse and that with out the introduction of video technology they risk losing all of the recently boasted interest of the game in America. He argues that nobody wants to see athletes who are the top of their game be restricted by the performance of referees. (Daily Mail, 2010).

The issue has become such a universal topic that even British Prime Minister David Cameron has expressed his view on technology in sport after Frank Lampard's 'goal that never was'. "I do think that technology in sport is beneficial. I'm a keen follower of cricket and I'm a fan of the third umpires" – David Cameron. (Porter, 2010).

Sport is a method of connecting many people all over the world, whether through playing or watching. Debates about sports often dominate conversations and there is no doubt what the majority think when it comes to asking whether goal line technology should be implemented into the game of

football.

Conclusion:

To once again reiterate, the main aim of this dissertation was to provide a compelling argument of just how much the implementation of goal line technology in football would benefit the game. With the use of various sources from diverse backgrounds and interviews conducted, I believe I have provided a well-structured and informative document that identifies all the possible routes football can currently explore; expressing problems as well as advantages for each leaving the reader in little doubt where the future of technology in football should look. The paper contains the views of the most powerful and influential people within the football world, while clearly there are differences of opinions, the majority, bar those involved in FIFA and UEFA, quite passionately and openly speak of their displeasure over the current lack of goal line technology.

The majority want technology even those in other sports have spoken of their amazement at football's lack of goal line technology and expressed their desire to witness the implementation. While this dissertation has overwhelmingly shown that the technology is there to justify its involvement it has also vividly depicted how technology can affect the game negatively. This negative impact may not be directly linked to the number of 'correct' decisions that the new technology has enabled but more to the attitude change of a sport and its flow. The example most emphasized during the paper would be cricket. Often regarded as a gentleman's game it now finds itself struggling to contain on pitch outbursts courtesy of its newly employed 'challenge system'.

This dissertation leaves the reader in no doubt that goal line technology would only champion the game of football further however it accentuates that the choice of how the implementation of a specific technology is much more of an imperative issue than indeed whether or not to incorporated technology into the sport or not; an aspect that may surprise a lot of readers. However the examples contained within this report further prove that it is not just a case of saying yes or no and then allowing technology to be at the disposal of all decision making. This would be a dramatic error of judgment and one that would do little to improve the spectacle of a sport.

In conclusion, yes football should see the implementation of goal line technology; this paper has examined all the arguments against implementation and has answered each specific potential problem with the appropriate solutions. The key is implementing the technology in the correct way so that it is there to be at the aid of the on pitch official rather than dictating their decisions. It is because of this that any decision to implement technology in football should keep strictly to the issues of goal line decisions. “You can’t say technology’s good or bad its just a tool, and its how the tool is implemented that determines whether you get a positive or negative outcome” – Mike Caine

Referencing:

Books:

- Aizawa K., Nakamura, Y., Satoh, S., (2004). *Advances in multimedia information processing: PCM 2004 : 5th Pacific Rim Conference on Multimedia Tokyo, Japan, November/December 2004 Proceedings, Part III*. New York: Springer. 467-468.
- Beashel P., Sibson A., and Taylor J.,(2001). *The world of sport examined*. 2nd ed. Cheltenham: Nelson Thornes ltd. 7.
- Ch'ng A., Canagasabai K., Quek S., (2008). *Physical Education Upper Sec*. South Asia: Pearson Education South Asia. 206.
- Clayton P,A., Price, M., (1988). *The seven wonders of the ancient world*. London: Routledge. 76.
- Farrow D., (2008). *Developing sport expertise: researchers and coaches put theory into practice*. Oxon: Routledge. 194.
- Gardiner S., (2006). *Sports law*. 3rd ed. London: Routledge. 73.
- Garland J., Malcolm D., Rowe M., (2000). *The future of football: challenges for the twenty-first century*. London: Routledge. 211.
- Giulianotti R., (1999). *Football: a sociology of the global game*. Cambridge: Wiley-Blackwell. 144.
- Guttmann A., (2002). *The Olympics, a history of the modern games*. 2nd ed. Champaign: University of Illinois Press. 1-10, 115.
- Henshaw J. M., (2006). *Does measurement measure up?: how numbers reveal and conceal the truth*. Baltimore: JHU Press. 69.
- Horne J., Tomlinson A., Whannel. G., (1999). *Understanding sport: an introduction to the sociological and cultural analysis of sport*. London: Routledge. 50.
- Hummel R.L., (1994). *Hunting and fishing for sport: commerce, controversy, popular culture*. Bowling Green State: Popular Press. 55.
- Knight J., Bull, S., (2006). *Cricket for Dummies*. New York: John Wiley & Sons. 137.
- Macionis D., (2009). *When the Robin Stopped Bobbing: Charlton's Journey from Old Trafford to Oldham*. Milton Keynes: AuthorHouse. 82-83.
- McCann L., (2007). *Cricket Facts, Figures & Fun*. Surrey: AAPPL. 78.
- McComb D.G., (2004). *Sports in world history*. New York: Taylor and Francis inc. 45.
- McFee S., (2008). *Let's Play Soccer*. New York: The Rosen Publishing Group, Inc. 4.
- Polley M., (1998). *Moving the goalposts: a history of sport and society since 1945*. London: Routledge. x.
- Ross S., (2008). *Higher, further, faster: is technology improving sport?*. Chichester: John Wiley & Sons. 87.
- Ross S., (2008). *Higher, further, faster: is technology improving sport?*. Chichester: John Wiley & Sons. 88.
- Ross S., (2008). *Higher, further, faster: is technology improving sport?*. John

Wiley & Sons: Chichester. 97.
- Ross S., (2008). *Higher, further, faster: is technology improving sport?*. Chichester: John Wiley & Sons. 333.
- Ross S., (2010). *Sport Technology*. London: Evans Brothers ltd. 20.
- Ross S., (2010). *Sport Technology*. London: Evans Brothers ltd. 6.
- Ross S., (2010). *Sport Technology*. London: Evans Brothers ltd. 8.
- Schaus G.P., (2007). *Onward to the Olympics: historical perspectives on the Olympic Games*. Canada: Wilfrid Laurier University. Press. 223.
- Swaddling J., (2000). *The ancient Olympic games*. 2nd ed. Austin: University of Texas Press. 100.
- Thomas Reilly., Duarte Araújo., (2005). *Science and football V: the proceedings of the Fifth World Congress on Science and Football*. Oxon: Routledge. 611.
- Witzig R., (2006). *The Global Art of Soccer*. New Orleans: CusiBoy Publishing. 394.
- Young D.C., (2004). *A brief history of the Olympic games*. Oxford: Blackwell publishing ltd. 2.

Newspaper:

- Bathgate S., (26th Oct 2010). 'You have to be a masochist to be a referee', says Michel Platini. The Scotsman.
- Elliott H., (1985). NHL Seeks to Improve Officiating. *Los Angeles Times (1923-Current File) - Los Angeles, Calif.*
- Gibson O., (28th June 2010). *World Cup 2010: Stubborn Fifa rules out using goal-line technology*. Guardian.
- *Harris N., (9th January 2011). FIFA leave Hawk-Eye stumped. The mail on Sunday.*
- Inverdale, J., (9th April 2010). *Hockey shows why video ref is way forward*. London Evening Standard.
- McKee K., (1986). Much research remains for NHL use of replays. *[FIN Edition] Toronto Star - Toronto, Ont.*
- Poll G., (27th Dec 2010). Graham Poll: Players undermine officials in football all the time... but even I was shocked by Ponting's show of dissent. Mail.
- Proudfoot, J., (1989). NHL flashes green light on TV replays for '91 Cup. *Toronto Star - Toronto, Ont.*
- Syed M., (24th Nov 2010). Refrees on strike? Now that is a bad decision. The Times

Magazines:

- ('The Rotarian', 1948: 15).
- ("Pratiyogita Darpan", Nov 2006: Vol. 1, No. 5)

Journals:

- Beloff M J., (2004). International Law Review. I.S.L.R. 1, 1.
- Beloff M J., (2004). International Law Review. I.S.L.R. 53, 1.
- Beloff M J., (2004). International Law Review. I.S.L.R. 77, 1.
- Beloff M., (2005). International Sports Law Review. *Is there a lex sportiva?*. (I.S.L.R. 53), 4.

Radio:

- You and Yours., (2010). Broadcast: BBC Radio 4., (27th Dec 2010) Available: http://www.bbc.co.uk/programmes/b00wr6qp

Websites:

- adidasfootballtv., (2009). Creating the perfect flight - JABULANI 2010 FIFA World Cup Match Ball. Available: http://www.youtube.com/watch?v=frqjlVfD1M0&feature=related Last accessed 30th March 2011.
- Baker A., (2009). *Football's refusal to adopt video technology out of step with other sports.* Available: http://www.telegraph.co.uk/sport/football/teams/republic-of-ireland/6608749/Footballs-refusal-to-adopt-video-technology-out-of-step-with-other-sports.html. Last accessed 28th March 2011.
- BBC Sport. (2010). *Ian Holloway wants technology help for referees.* Available: http://news.bbc.co.uk/sport1/hi/football/eng_prem/9100410.stm. Last accessed 17th March 2011.
- BBC Sport. (2010). *World Cup 2010: Blatter apologises for disallowed goal.* Available: http://news.bbc.co.uk/sport1/hi/football/world_cup_2010/8771294.stm. Last accessed 18th March 2011.
- BBC Sport. (2010). *World Cup 2010: Fifa evades technology questions.* Available: http://news.bbc.co.uk/sport1/hi/football/world_cup_2010/8766423.stm. Last accessed 28th March 2011.
- Cass B., Lyttleton B., (2009). *Death threats referee won't be forced out after battle of Stamford Bridge Read more: http://www.dailymail.co.uk/sport/football/article-1179929/Death-threats-*

referee-wont-forced-battle-Stamford-Bridge. Available: http://www.dailymail.co.uk/sport/football/article-1179929/Death-threats-referee-wont-forced-battle-Stamford-Bridge.html. Last accessed 18th March 2011.

- Clarey, C., (2005). *Removing the human factor from sports officiating.* Available: http://www.nytimes.com/2005/10/20/sports/20iht-ARENA.html?_r=3. Last accessed 17th March 2011.
- Crowther, N., (2007). *Tantrums and technology.* Available: http://news.bbc.co.uk/sport1/hi/tennis/6227096.stm. Last accessed 27th March 2010.
- Daily Mail. (2010). *Michael Kim's US sport column: Unless Sepp Blatter brings video technology to soccer, he risks losing the battle to win over America Read more: http://www.dailymail.co.uk/sport/othersports/article-12.* Available: http://www.dailymail.co.uk/sport/othersports/article-1290555/Michael-Kims-US-sport-column-Unless-Sepp-Blatter-brings-video-technology-soccer-risks-losing-battle-win-America.html. Last accessed 18th March 2011.
- Davis T,. (2010). *Soccer needs technology, tennis does not: Federer.* Available: http://www.reuters.com/article/2010/06/28/us-tennis-wimbledon-federer-technology-idUSTRE65R45820100628. Last accessed 27th March 2010.
- Davis T., (2010). *Soccer needs technology, tennis does not: Federer.* Available: http://www.reuters.com/article/2010/06/28/us-tennis-wimbledon-federer-technology-idUSTRE65R45820100628. Last accessed 28th March 2011.
- Edwards, J., (2010). *Germany men have used controversial Jabulani ball SIX months before World Cup Read more: http://www.dailymail.co.uk/sport/worldcup2010/article-1286613/Germany-men-used-controversial-Jabulani-ball-SIX.* Available: http://www.dailymail.co.uk/sport/worldcup2010/article-1286613/Germany-men-used-controversial-Jabulani-ball-SIX-months-World-Cup.html. Last accessed 17th March 2011.
- Facebook Admin., (2010). Dear Linesman, how didn't you see that this IS a goal? (Germany vs England.) Avaliable: http://www.facebook.com/pages/Dear-Linesman-how-didnt-you-see-that-this-IS-a-goal-Germany-vs-England/127994767236582?ref=ts Last accessed 17th March 2011.
- flyer1111., (2007). England vs South Africa, disallowed try. Available: http://www.youtube.com/watch?v=0OVuDMYSJ7M Last accessed 17th March 2011.
- Grotticelli M,. (2009). Should video be used to referee all sports?. Available: http://broadcastengineering.com/news/video-used-to-ref-all-sports-20091125/ Last accessed 17th March 2011.
- guardian.co.uk,. (2005). *Fifa rules out video evidence.* Available: http://www.guardian.co.uk/football/2005/jan/05/newsstory.sport8. Last accessed 17th April 2011.
- guardian.co.uk., (2009). *David Beckham earns £10m in sponsorship in first MLS season.* Available: http://www.guardian.co.uk/football/2009/nov/06/david-beckham-sponsorship-deals-la-galaxy. Last accessed 17th March 2011.
- guardian.co.uk., (2009). *Sir Alex Ferguson says referees need additional help*

to catch divers. Available: http://www.guardian.co.uk/football/2009/aug/28/alex-ferguson-referees-additional-assistance. Last accessed 17th March 2011.
- Harland, A., (unknown). *Official Match Ball Development with adidas.* Available: http://sti.lboro.ac.uk/adidas.aspx. Last accessed 17th March 2011.
- Independent.co.uk., (2010). *Djokovic resists hawk-eye calls.* Available: http://www.independent.co.uk/sport/tennis/djokovic-resists-hawkeye-calls-1990418.html. Last accessed 27th March 2010.
- James S., (2007). *NHL sets example for FIFA with video technology.* Available: http://www.reuters.com/article/2007/03/09/us-soccer-technology-nhl-idUSN0530641320070309. Last accessed 28th March 2011.
- Johnston, C., (2010). *CJ Mr Blatter Letter re Jabulani Ball July 2010.* Available: http://www.docshare.com/doc/223643/CJ-Mr-Blatter-Letter-re-Jabulani-Ball-July-20. Last accessed 17th March 2011.
- lborouniversity., (2009). Research - adidas JABULANI Official Match Ball of the 2010 FIFA World Cup™. Available: http://www.youtube.com/watch?v=-Nz8MOe4XQY Last accessed 30th March 2011.
- London Evening Standard standard.co.uk., (2009). Hiddink calls for video technology. Available: http://www.thisislondon.co.uk/standard-sport/article-23688209-hiddink-calls-for-video-technology.do. Last accessed 30th March 2011.
- Loughborough University., (unknown). *Project ESPRIT (Elite Sport Performance Research in Training).* Available: http://sti.lboro.ac.uk/ESPRIT.aspx. Last accessed 17th March 2011.
- Loughborough University., (unknown). *ProVantage - a service for elite golfers.* Available: http://sti.lboro.ac.uk/University-home/sportstechnologyinstitute/athletes/athletecasehistories/Provantage.aspx . Last accessed 17th March 2011.
- Okwonga, M., (2010). *When Wayward Ball Meets an Unyielding Defense.* Available: http://goal.blogs.nytimes.com/2010/06/16/when-wayward-ball-meets-an-unyielding-defense/. Last accessed 17th March 2011.
- Porter A., (2010). *World Cup 2010: David Cameron supports video technology.* Available: http://www.telegraph.co.uk/sport/football/competitions/world-cup-2010/7858132/World-Cup-2010-David-Cameron-supports-video-technology.html. Last accessed 18th March 2011.
- Skinner J., (2010). *Hawk-Eye 'can make goal-line calls in half a second'.* Available: http://news.bbc.co.uk/sport1/hi/football/9112630.stm. Last accessed 28th March 2011.
- Taylor L,. (2010). *Goalline technology moves closer with 17 companies vying for contract.* Available: http://www.guardian.co.uk/football/blog/2010/oct/20/goalline-technology-fifa-step-closer. Last accessed 17th April 2011.
- The Complete University Guide., (2010). *Loughborough.* Available: http://www.thecompleteuniversityguide.co.uk/single.htm?ipg=6545. Last accessed 17th March 2011.
- TheMasterBucks., (2010). Angry Ricky Ponting Argues With Aleem Dar - Ashes 2010/2011. Available: http://www.youtube.com/watch?v=8nK9U9kLIH0&feature=related Last

accessed 17th March 2011.
- WeAreSBK1., (2010). Amazing swerving Jabulani World Cup Ball Test Footage. Available: http://www.youtube.com/watch?v=nJ1Y1Fq9XhI Last accessed 17th March 2011.
- Wing, J., (2009). *adidas "JABULANI" Official Match Ball of the 2010 FIFA World Cup™.* Available: http://www.lboro.ac.uk/service/publicity/news-releases/2009/169_adidas-jabulani.html. Last accessed 17th March 2011.

Interview transcript:

Rich (me): “As you know I am writing a dissertation surrounding the issue of goal line technology in football. As one of the worlds foremost leading sporting research institutes I believe you to be in a highly respected position where your opinions and research are of great value to this field and therefore my study. So I’ve got a few questions, the first one is during your time at Loughborough have you or your department embarked on any goal line technology projects and if so what were these and how did they work out?”

Professor mike Caine: “ok you appreciate that quite a lot of the projects we work on are comically sensitive and often we are bound to confidentiality agreements in the undertaking of such research so I need to say that because I can’t tell you that much about the detail of what we’ve been involved in.”

Rich (me): “ok that’s cool, no worries”

Professor mike Caine: “but if I said today that we have been involved in a number of goal line technology developments and probably the most relevant and high profile would be the relationship that was initiated between fifa and adidas with respect to integrating tracking technologies into the ball.”

Rich (me): “ok”

Professor mike Caine: “I imagine that you have read about that and quite familiar with both the technologies and the outcome would that be a fair assumption”

Rich (me): “yeh its one of the things I’ve read about definitely, alright that’s cool yeh I didn’t know about the confidentiality thing”

Professor mike Caine: “That project, what we were concerned with, when you mount electronic or any body inside a ball what happens under different impact conditions so if you place lets say the electronics in the center of the ball, when the ball strikes the goal post and is compressed what happens to the position of those electronics at its center does it remain where it was initially in which case its now closer to the side of the ball that’s been compressed or does it move to the new center position of the ball, do you see what I’m saying”

Rich (me): “yeh”

Professor mike Caine: “so we spent and this wasn’t me directly but colleagues of mine spent a lot of time looking at the logistics of if you like the packaging of center technologies within ball to understand the dynamic durability and that was really the key of our focus in that work but also your recognize the technology is one part of the equation but also the politics and the cost are all big factors within FIFA and other organizations enthusiasm for the technology, we had a fairly substantial role all be it in a narrow area but we have a very active interest in goal line technology, I’m very

happy to give you my opinion about them and things like that but I can't say too much more about exactly what we've done because its under confidentiality agreement."

Rich (me): "that's cool no worries, if you can't answer this no worries but my research has lead me to believe that UEFA are the organization that are blocking the implementation of goal line technology into the game, are you aware if this is the case and whether there are also other organizations whom have power in the decision?"

Professor mike Caine: "I'm not confident that I know the political landscape sufficiently to give you a good answer, I think what I have seen and what is pretty clear is that there are lots of stock holders, you know its not just one single organization or one single individual although there have been outspoken senior people talking about technology for a number of years now, my feeling is that there is a lobby for and a lobby against and that no single person or single organization is solely responsible for blocking the technology or potential technology, its complicated would be my view"

Rich (me): "how accurate do you think goal line technology can be?"

Professor mike Caine: "well I think that depends on the technology solution that you go for, I think if your looking to instrument the ball then that would give you one level of decision. If your looking at visual technologies, you know cameras high speed cameras something like that, then your likely to have a different level of decision but nobody really knows what could be achieved or what would be necessary I think that's one of the key issues, you know, how confident do you want to be about a particular decision, if you think about the England goal in the world cup very crude technology, I mean the technology is already there, you needed a simple broadcast replay of the incident to make a decision, you know that technologies there its just a case of changing the policy but if you want to know to within a millimeter whether the whole of the ball is over the whole of the line. But when you think about it its quite complex because the ball is not a uniform sphere it may be deforming the surface so you've got quite a strange set of parameters the line is still a white wash line on grass"

Rich (me): "yeh"

Professor mike Caine: "I'm laughing because there's a white wash line on grass where the turf deforms and the ball compresses and then we're talking about high level of decision"

Rich (me): "yeh"

Professor mike Caine: "in a tracking technology or a monitoring technology, you've just got to be careful that you don't get them out of balance with each other, so I think there's no simple answer because there are technologies that are capable of giving a very accurate 3D position of the ball in time and therefore in space, but

whether its worth while pursuing them is a different matter because it might be one in a million game before you need that level of decision."

Rich (me): "ok, yeh do you think that sports technology will inevitably lead to the authority and dignity of human or active officials being undermined?"

Professor mike Caine: "I don't know, its possible. It really depends on the implementation I think these some good examples and bad examples I mean if you think about the use of line calls in tennis, I'm thinking of Wimbledon now, there's a very straight forward procedure where by the players have a challenge system in place and because its very straight forward the ball is either in or the ball is either out then I don't think it undermines the officials at all, they appreciate that it's a subjective call and that the human eye isn't infallible and whilst the technologies not infallible either it certainly unbiased if that makes sense I think one the problems a player has, think about a McEnroe scenario, is that they get it into their mind that they're being victimised all the positive call are going in favour of their opponent, all the negative calls are going in favour of them or against them rather and so it upsets their physiology and therefore they have an outburst at the particular umpire of whatever, since that technologies been implemented there's no outburst at the umpire, you've got I think instead of undermining you've actually got something that's complimenting the authority of the official, now it doesn't really matter to me whether the ball is in or out I mean clearly it should be accurate more often than it isn't and I believe that is the case, but what it does it gives an independent unbiased ruling that is then seen to be definitive and I think that's really important but when you look at say a sport like cricket where they've followed a similar procedure but effectively it's a more complex call where there are multiple facets to whether a person is out or not the umpire is making a judgement the players can then challenge it but there's then still subjectivity in the technology so unlike in the tennis when its in its out everyone moves on very quickly, there's then a debate about whether the 3rd official whose looking at the technology is looking at the right things and so again I don't think its sort away with; Its like watching the ashes recently its not got away with because now what's happening is the player's are challenging the interpretation of the technology because its still complex if that makes sense."

Rich (me): "yeh"
Professor mike Caine: "so I think to sort of cut a short summary to my answer, the technology itself can either undermine or reinforce the status and authority of the officials but it really is down to how the technology is implemented the law makers need to be really clear and the governors of the sport need to think about implementation, not just the technology. So I think there no good thing or bad thing, you can't say technologies good or bad its just a tool, and its how the tool is implemented that determines whether you get a positive or negative outcome"

Rich (me): "ok cool, personally what is your stance on goal line technologies implementation into football and do you think its an aspect that would improved the game or do you not feel there's need for it, do you feel video referee employed in sports like rugby would be sufficient?"

Professor mike Caine: “In terms of the first part of your question, I think its ludicrous that you can have football matches where the sole factor that determines the outcome of the game is a goal, its not free kicks its not fouls its not red cards its goals, and often because it’s a low scoring game unlike say basketball, two teams that are well balanced typically win by one goal margin and so the importance of a goal can’t be overstated in a in a sport like football and its fairly straight forward through a stare whether the ball did or did not pass the line so situations like the England goal and there’s been numerous examples, there’s normally a couple or three every year in the premiership for example where just about everyone saw the ball cross the line you know you get the keeper sort of embarrassed because he has to pretend it didn’t and yet he knows it did and its only a couple of people in the whole place that didn’t see it, and that’s the linesman and the referee and as soon as they replay it there’s an immediately obvious conclusion it either did or did not cross the line, with 99% accuracy so I can’t see why we don’t have in high level games an instant reply scenario just like they do in rugby league, just like they do in rugby union. Yes I understand that it wouldn’t be implementable in Sunday park football, but who cares about Sunday park football if that’s about having fun, recreation you know friendly competition but if you play a world cup final and its decided by such a fundamental error then its not good for anybody and we’ve got the technology, its there the broadcast media are there, they’ll happily replay it seconds later by the time the referee’s walked back to the center of the of the pitch or just paused the game or what ever your going to get it; somebody can be pitch side look at a monitor and they can have the wireless comms to the referee, which they already have, saying it’s a goal or it’s not a goal, so I personal think simple technologies or just implementing technologies that already exist rather than perhaps thinking about instrumenting a ball are sufficient for the particular sport.”

Rich (me): “Could you suggest any other useful sources or information to help me with my investigation?”

Professor mike Caine: “no, but I think what you should probably try and do is get in touch with umm my colleague Andy Harland I know he hasn’t yet been back in touch with you,”

Rich (me): “yeh”

Professor mike Caine: “but its only been a few days and I know the guys been you know he’s obviously busy with stuff but”

Rich (me): “yeh”

Professor mike Caine: “I would I would drop him an email with specific questions like if your aware of any good source information cause he’s done loads of work in this area”

Rich (me): “ok”

Professor mike Caine: “so if you sort of summarize a few key questions on an email I’ll be surprised if he doesn’t respond, just give him a few days”

Rich (me): “awesome, thank you very much its been a huge help”

Professor mike Caine: “alright no problem”

Rich (me): “cheers”

Professor mike Caine: “nice to talk to you, bye now”

Rich (me): “thank you again, bye”