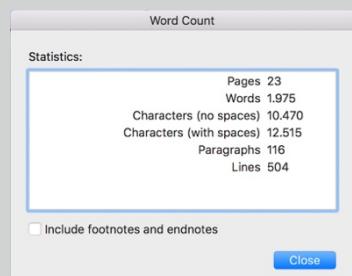




THE IMPACT OF DATA ANALYTICS AND AI ON CHELSEA F.C.



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Organisation

1.1 Overview

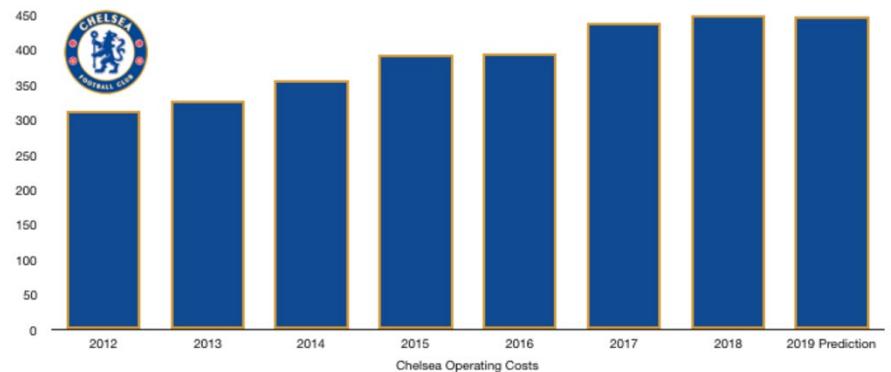
The Chelsea Football Club is an English billion-dollar football club that competes in the Premier League. With a total of 2291 wins and 8299 goals, Chelsea is considered to be the sixth most valuable football club in the world with a worth of £2.13 billion in 2019.



1.2 Key challenges

1) Increase in the operating costs

Chelsea has been witnessing a steady rise in the amount of their operating costs since 2012. In 2019, costs rose from £439.5m to £523.6m (19% increase). Amortisation followed a similar trend, rising from £90.0m to £127.3m¹ mainly due to player investments and new signings in the last season which resulted in a 11% rise in wages (from £220.9m to £244.1m). After two marquee signings in the summer, The Financial Football News is expecting a further rise in the costs and a decline in the profitability in 2020.



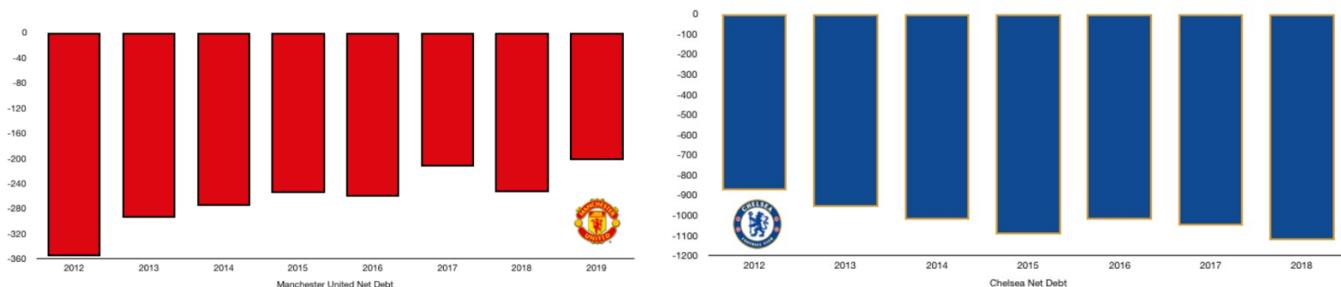
¹ FINANCIAL FOOTBALL NEWS, (2020), *Chelsea Archives*, 2020, [online] (financialfootballnews.com/category/Chelsea).

After two profitable years in 2017 and 2018, Chelsea recorded a loss of £96.9m for 2019 due to a number of player acquisitions with a lack of champions league football and the change of first team management.

In 2018, Chelsea doubled their Transfer net spend from £21.9m to £54.0m (147%). The club invested £280.6m in the playing squad including the acquisitions of Kepa Arrizabalaga, Christian Pulisic, Mateo Kovacic and Jorginho.

2) Increase in the Net Debt

The net debt rose from £1053.3m to £1123.7m. This figure is twice the net debt of their closest rival Manchester United which has fallen from £254m to £204m, making them more sustainable which in return has reduced the regulatory concerns for UEFA.



3) Rise of injuries

According to the annual Football Injury Index from JLT, during the 2018/2019 season, Chelsea was the 5th club with the highest injury costs (£11.5m) including a total of 50 injuries last season which is higher than some of their closest rivals such as Arsenal (49) and West Ham United (45)². On January 3rd 2020, Jody Morris confirmed that Marcos Alonso, one of their top defenders will miss out on involvement in the FA Cup due to injuries.

Top Players	Injury type
Marcos Alonso	Gluteal injury
Oliver Giroud	Ankle Sprain
Fikayo tomori	Illness
Marco Van Ginkel	Knee surgery
Ruben Loftus-Cheek	Calf/Shin/Heel

² Carter, B, *How Much Each Top 6 Club Spent on Injured Players During the 2018/19 Season*, 2019, (www.90min.com/posts/6435165-how-much-each-top-6-club-spent-on-injured-players-during-the-2018-19-season).

³ Chelsea FC Online, *Chelsea FC Injuries 2019/2020*, 2019 (<http://chelseafconline.com/chelsea-injuries>).

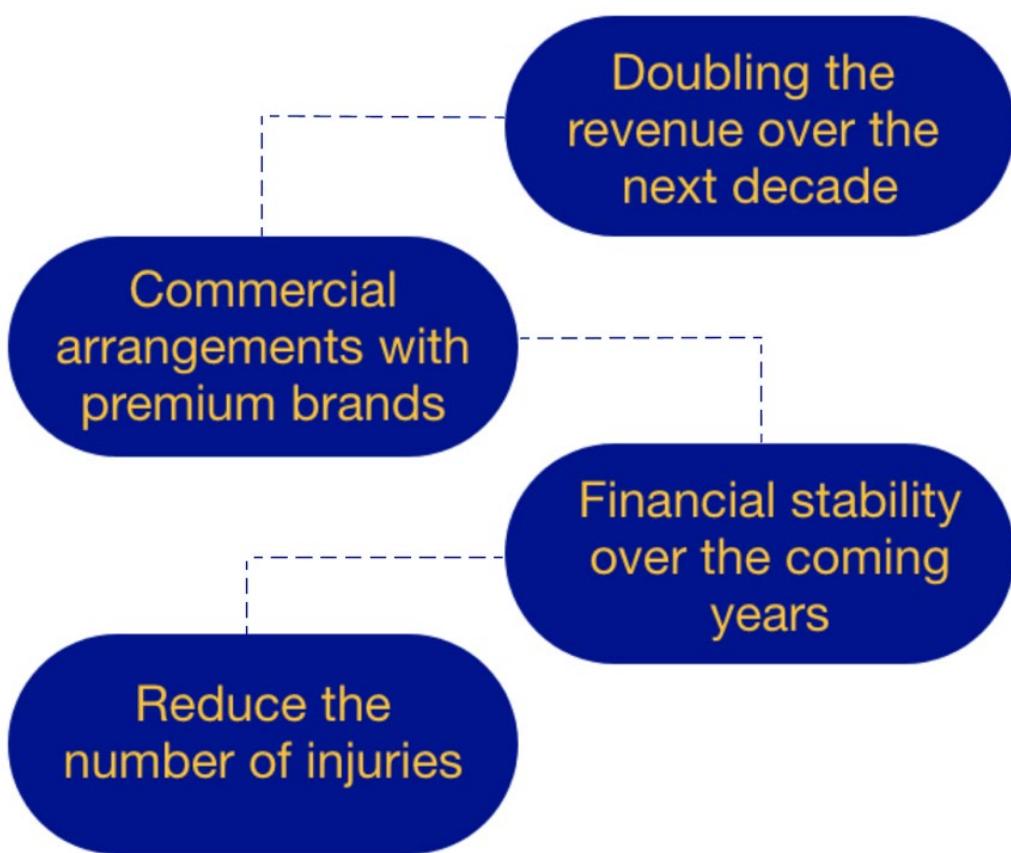
4) Losing top players

The Belgian top player Eden Hazard departed Chelsea for Real Madrid leading to a huge challenge in replacing the outgoing stars⁴.

5) Regulatory Issues

Chelsea is currently serving a two-window transfer-ban including a fine of £460,000 due to being guilty in 29 cases for breaching the rules regarding their dealings with under 18 overseas players and therefore, being unable to register new players until the summer of 2020⁵.

1.3 Key Objectives according to Chelsea



6

⁴ Aarons, E, *Eden Hazard shows what Chelsea will miss if this was his home farewell*, the Guardian, 2019 (www.theguardian.com/football/blog/2019/may/09/eden-hazard-chelsea-farewell-draws-near).

⁵ Hytner, D, *Chelsea to appeal after being hit with transfer ban for two windows by Fifa*, the Guardian, 2019 (www.theguardian.com/football/2019/feb/22/chelsea-transfer-ban-two-windows-fifa-foreign-players-under-age-18).

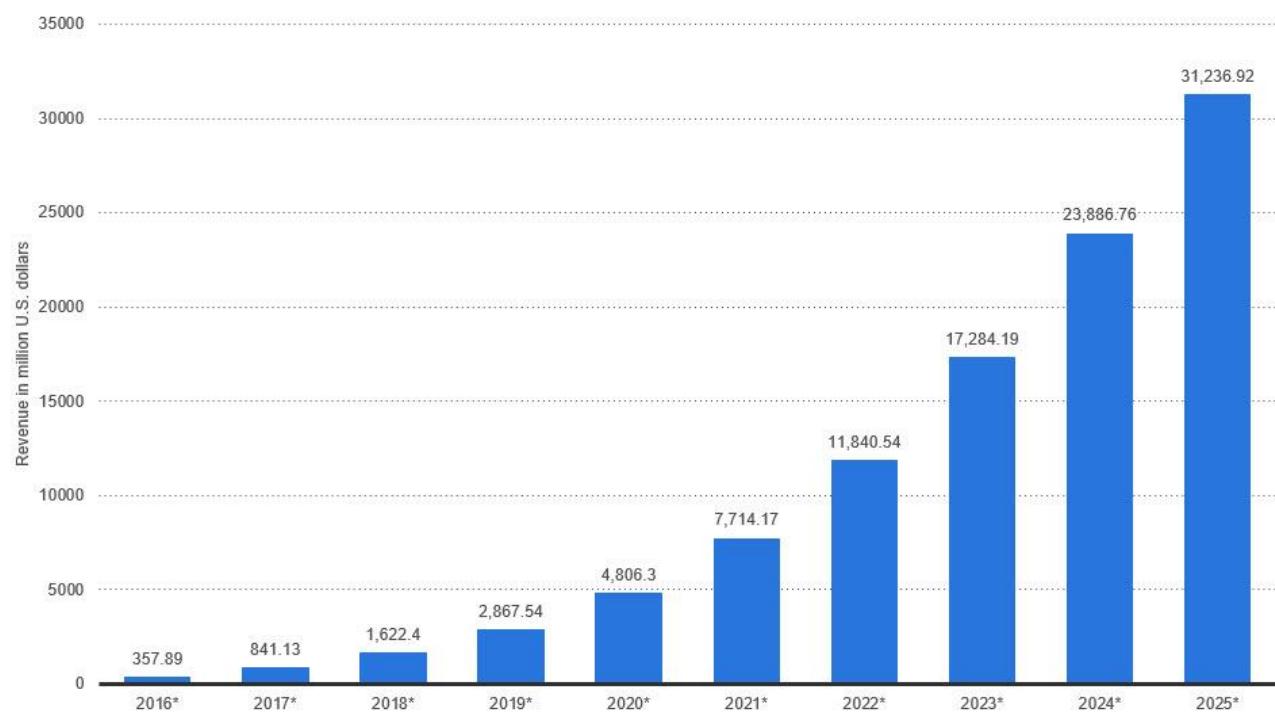
⁶ Deloitte Sports Business Group, *Football Money League*, 2018, (deloitte.com/content/dam/Deloitte/uk/Documents/sports-business-group/deloitte-uk-sbgsdfml2018.pdf).

2.1 What is data analytics and AI?

Data analytics can be defined as the process of analysing quantitative/qualitative information to generate conclusions and test hypothesis. This process can now be automated using AI technologies which can perform automated tasks at high speed to assist better decisions without human interaction. "These technologies mimic humans' ability to Sense, Think and Act"⁷. Global revenues from AI applications is expected to grow from \$1.62B in 2018 to \$31.2B in 2025 and due to the complex nature of football, data driven evaluations are becoming more crucial and clubs continuously search for data driven tools to assist coaches, players and management in their decision-making.

Enterprise artificial intelligence market revenue worldwide 2016-2025

Revenues from the artificial intelligence for enterprise applications market worldwide, from 2016 to 2025 (in million U.S. dollars)

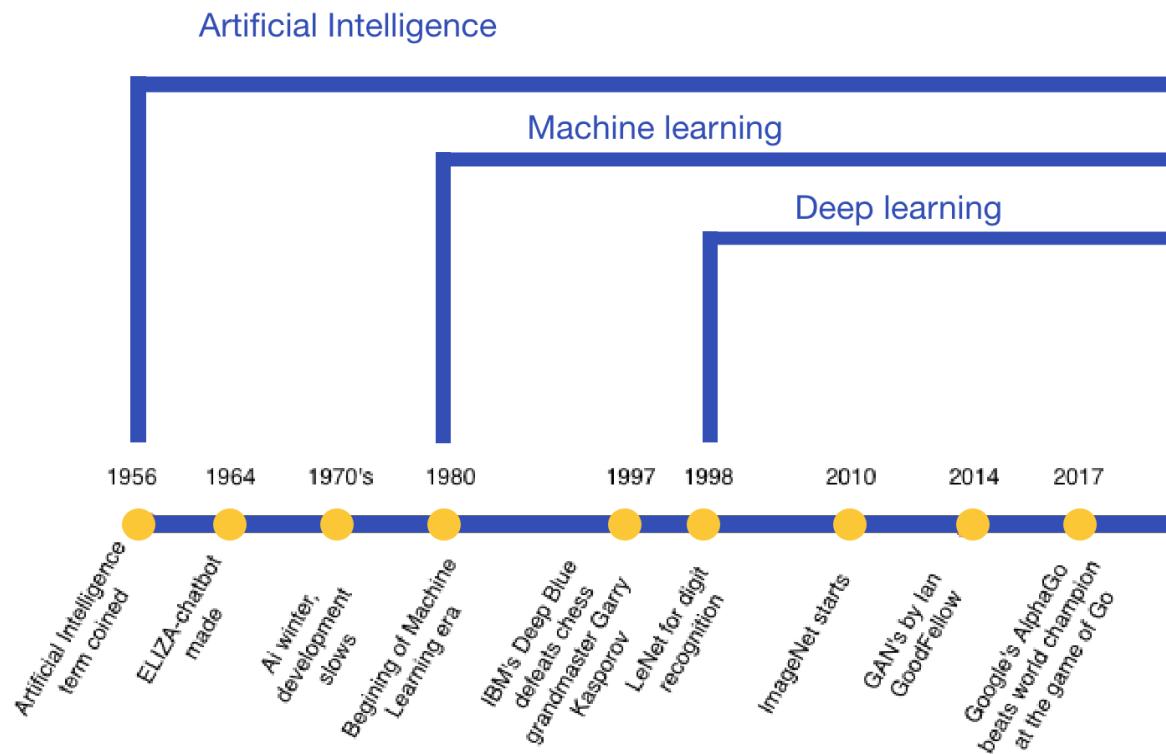


⁷ Barlow, A, and Sriskandarajah, S, *Artificial Intelligence Application to the Sports Industry*, PWC, 2019 (www.pwc.com.au/industry/sports/artificial-intelligence-application-to-the-sports-industry.pdf).

2.2 the process of Data Analytics with AI



2.3 Components of AI over time



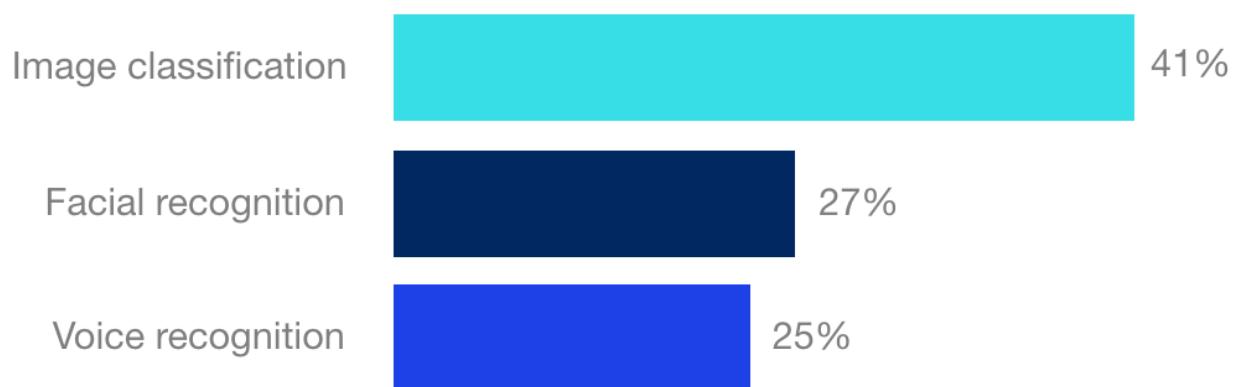
Machine-learning: is a category of algorithm that provides systems the ability to automatically learn and become more accurate in predicting outcomes without being explicitly programmed ⁸	Deep learning: where artificial neural networks and algorithms inspired by the human brain learn from large amounts of data ⁹
Machine learning algorithms are used to: <ul style="list-style-type: none"> • Detect patterns • Adapt in response to new data • Make predictions and recommendations • Improve efficacy over time 	Deep learning algorithms are used to: <ul style="list-style-type: none"> • Form neural networks • Process vast amounts of input data through multiple layers • Learn complex features of data at each layer • Make determinations about the data

⁸ McKinsey & Company, *An executive's guide to AI*, 2018 (www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/an-executives-guide-to-ai).

⁹ Marr. B, What Is Deep Learning AI? A Simple Guide With 8 Practical Examples, *Forbes*, 2018 (www.forbes.com/sites/bernardmarr/2018/10/01/what-is-deep-learning-ai-a-simple-guide-with-8-practical-examples).

Deep learning can often outperform traditional methods

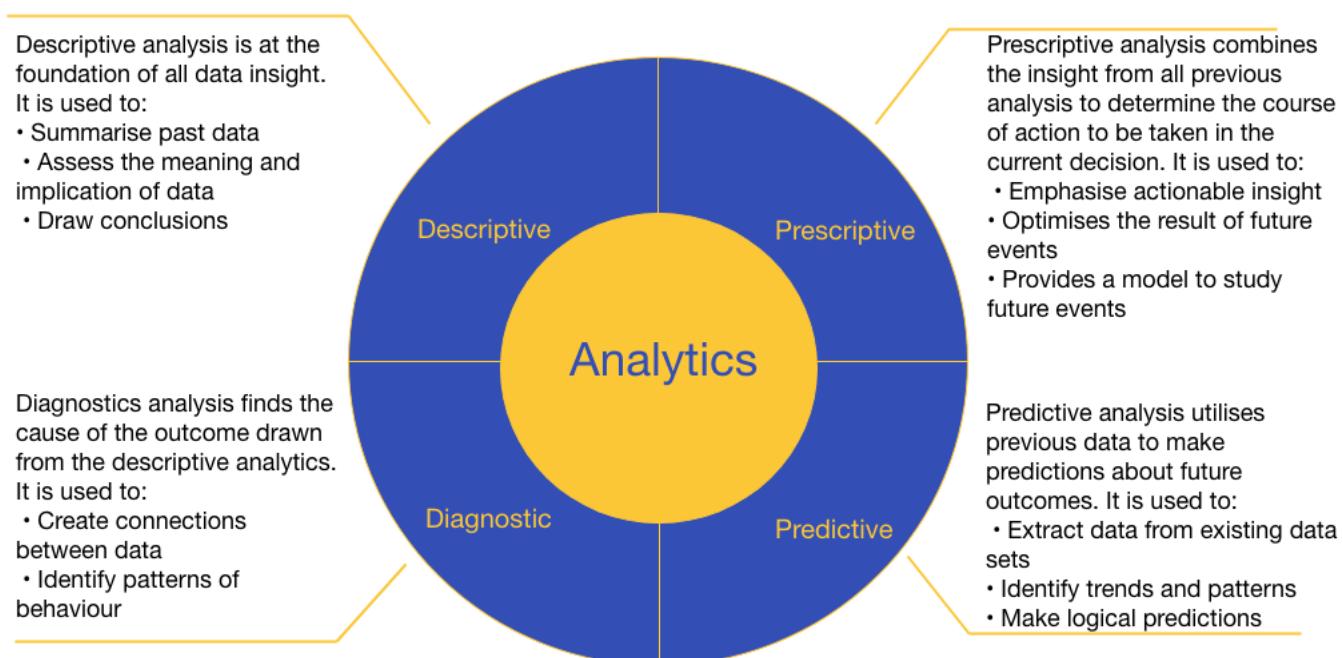
% reduction in error rate achieved by deep learning vs traditional methods



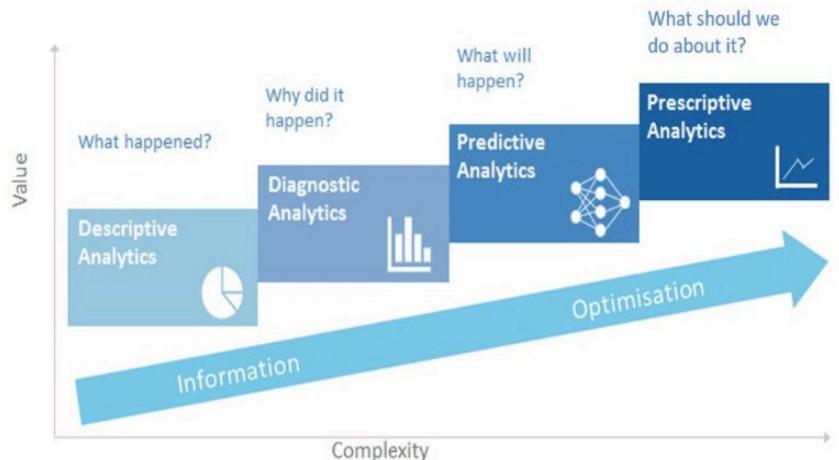
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2.4 Components of Analytics

Analytics refers to the process of using data to discover relationships, predict unknown outcomes, measure findings and make recommendations.

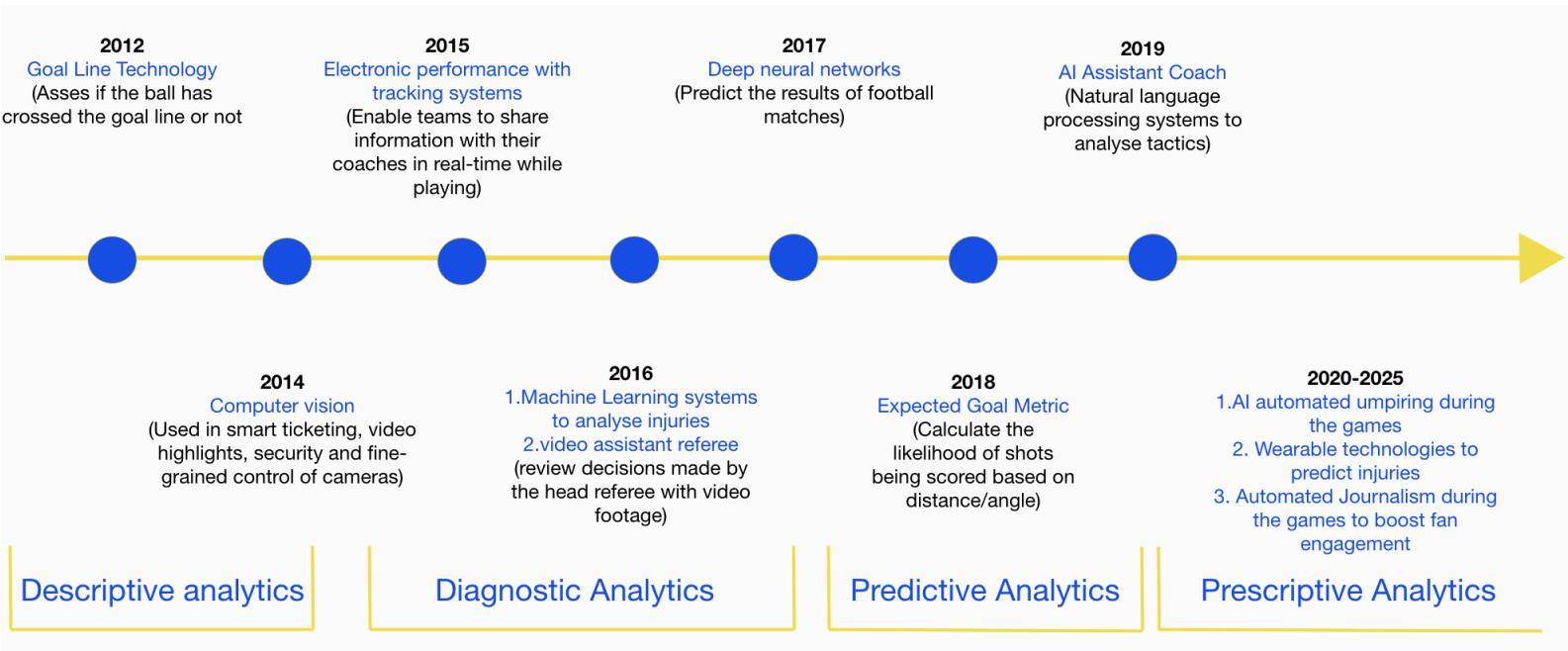


¹⁰ McKinsey & Company, *An executive's guide to AI*, 2018 (www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/an-executives-guide-to-ai).



2.5 Development of AI and Data Analytics in Football

Data Analytics with AI in Football is now focused on deep-learning algorithms with prescriptive analysis to recommend ideas to coaches, players and management to provide information in real time and improve the overall performance of the teams. This transformation however has greater complexity (since it analyses both quantitative and qualitative data at the same time) but has the potential to bring a higher added value to the football clubs.

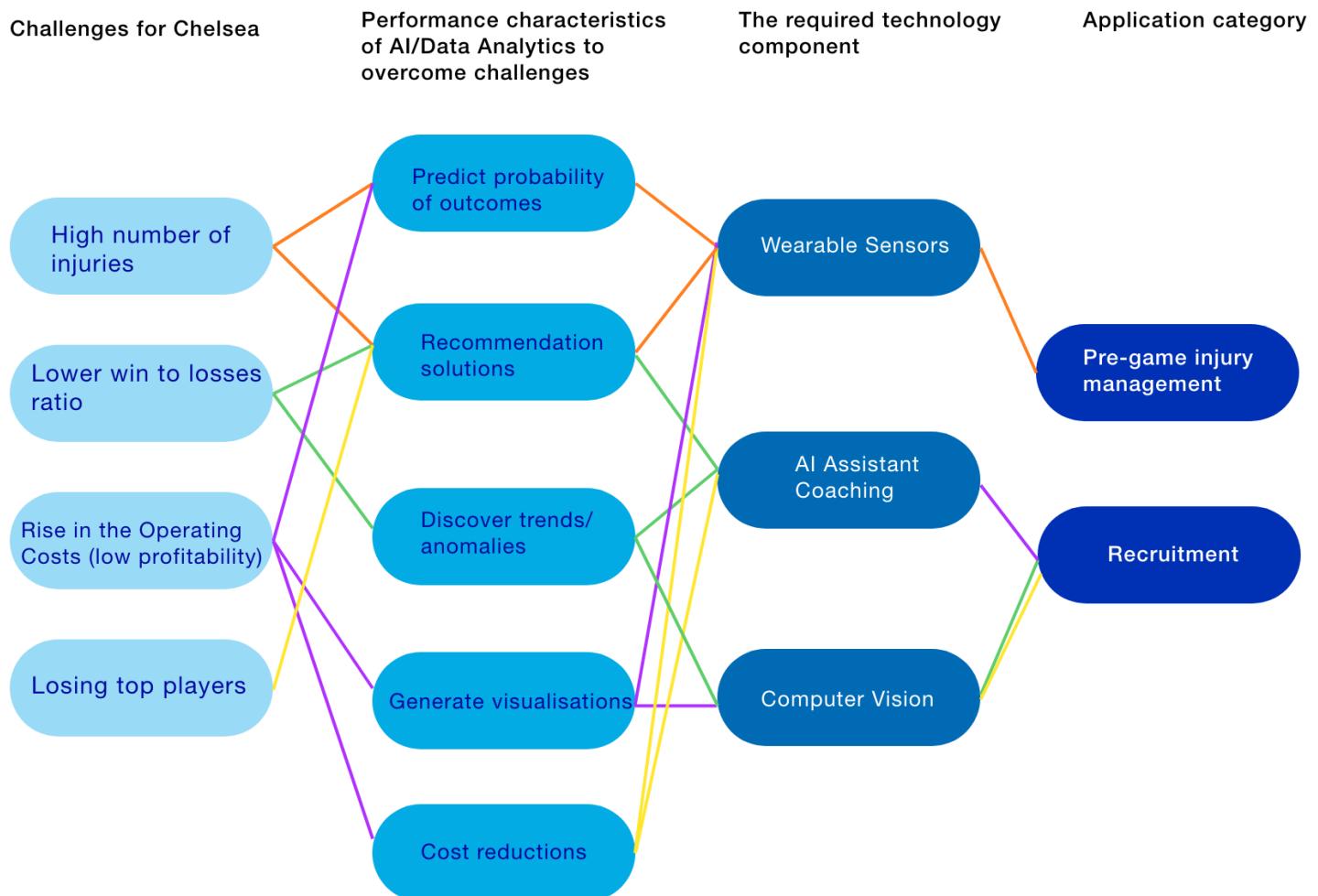


¹¹ Metapraxis, *Financial Analytics - Data Driven Success – Metapraxis*, 2014, (www.metapraxis.com)

We used this information to categorise the technology components with their performance characteristics in the table below:

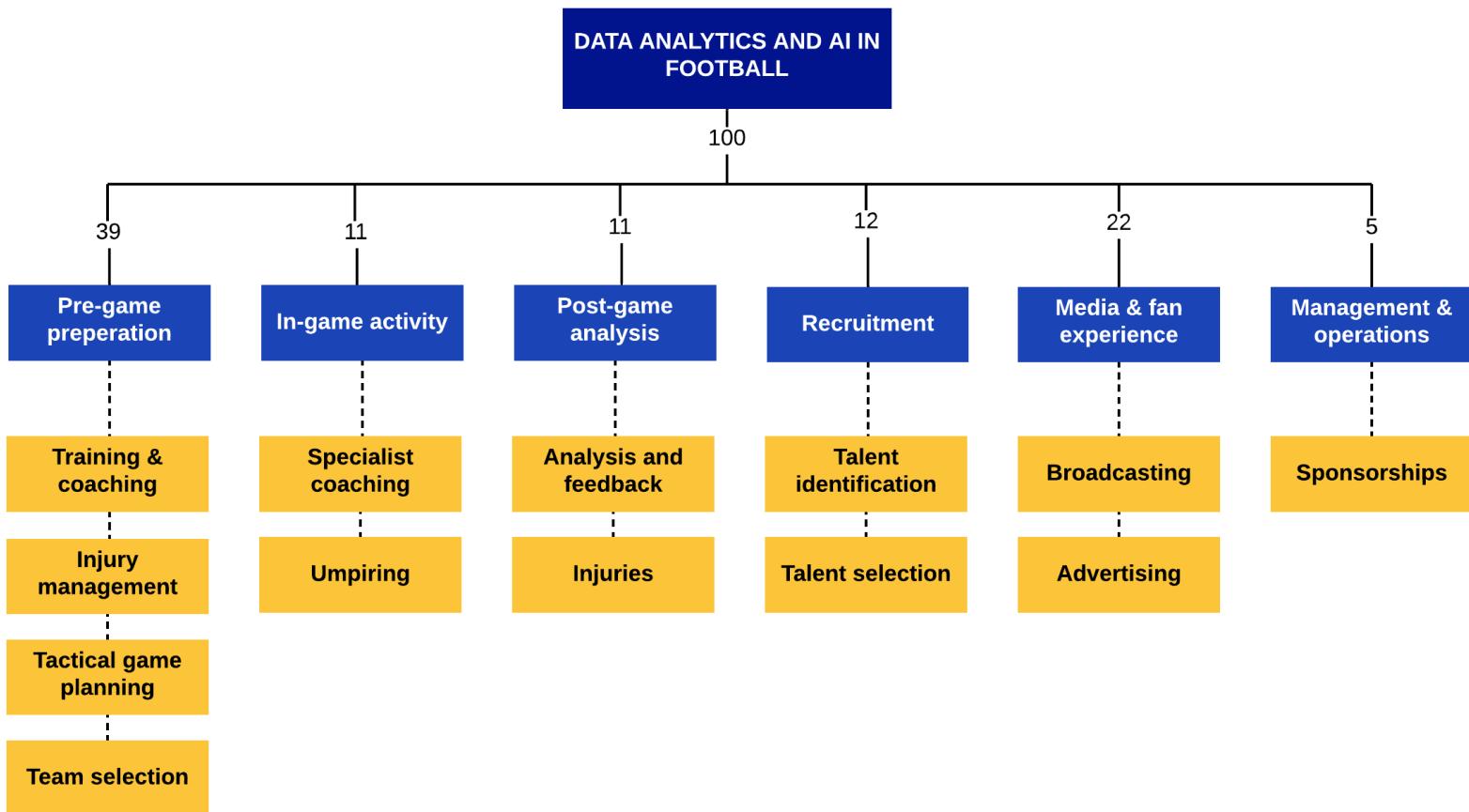
AI technology components in Football		Process	Key Performance Characteristics	
	Assistant Coaching	Sense Image and Video Analysis Facial Recognition Speech Analysis Text Analysis		Accurate/Intelligent Solutions
	Virtual Umpires		Recommendation Solutions	
	Automated Video Highlights	Think Machine Learning platforms Deep learning platforms	Discover new trends/anomalies	
	Computer Vision		Cost reductions in the long term	
	Chatbots/Smart Assistants		Visualise data	
	Wearable Sensors	Act Transform data into natural language	Forecasting	
	Drone Cameras for game footage			

We linked Chelsea's current challenges to the performance characteristics of these technology components and thus focused our attention on Wearable sensors and Computer Vision, both holding great promise for future growth to reduce injuries and improve the Recruitment process to boost profitability which is now an important goal for the new season for Chelsea.



Application

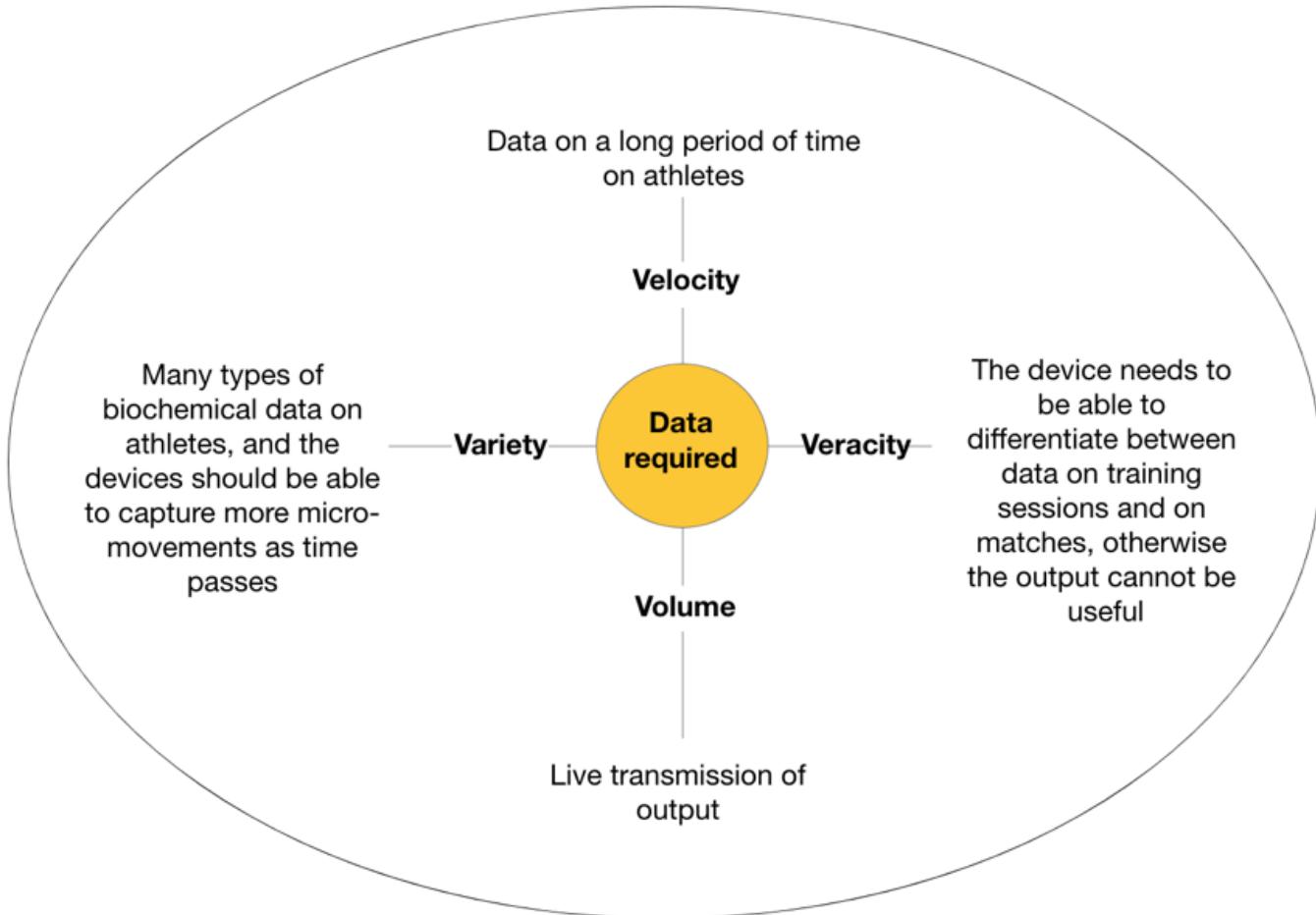
3.1 Categorisation potential applications of Data Analytics and AI in Football



We decided to focus on the two categories we have the most interesting technologies in: Injury Management and Recruitment.

3.2 Application 1: Pre-game preparation&Post-game analysis-Injury management

The use of data analytics in injury management is constantly growing as sports teams invest in the physical and mental well-being of players. They are using wearable technologies or satellite images to track player data and make better training plans to reduce athletes' injuries.



2015-2017: Descriptive analytics- can show what happened. OptimEye S5 shows graphs of players loads from which it can be said if the player is over-trained or under-trained

Future: Prescriptive Analytics- can tell what action to take. This is the most advanced stage of analytics and we predict it could happen in football in the near future. This means machines saying exactly when a player should stop training or train more, without the use of human statisticians to interpret graphs.



2018-2019:
Predictive Analytics- can show what will happen. 3Dimo can predict injury risk for football players.

(Timeline for performance of analytics made with wearables in injury management)

3.3 1st example chosen: 3DIMO's injury prediction technology



(Interviews in appendices)

Performance characteristic	The product can predict injury risk with an efficiency of 94%, but they are aiming on a 2% margin of error. (Rahman,2019). 3Dimo claims that by guiding athletes customized performance optimization, they can reduce their injury risk probability by 35%. (3Dimo,2020)
Data collected	The change in capacitance, contact force with combining some of the player's physical data (mass), the stress generated around the joint angle during contact (Interviews, appendices)
Analytics	Predictive. The technology is able to predict the risk probability of an injury.
Process	Predict injury risk by doing a ration of that stress versus the allowable stress at the joint of that player.
Components	The technology consists of wearables that capture player data and a mobile app. (Interviews, appendices)
Readiness	The product is not commercial yet, it is currently in beta stages and the company has done pilots with football clubs in South Africa. (Interviews, appendices) However, we have chosen this example because its performance characteristics exceed the ones of other already commercial products.
Price	The wearable comes in a pack of 4, which includes all the accessories and the mobile app, and it is priced \$900. (Interviews, appendices)

3.4 2nd example chosen: OptimEye S5

Components & Price:

- OptimEye S5 GPS Device - \$1500 (one for a player)
- OptimEye Charge Case- \$250 (for multiple devices)
- OptimEye Live Receiver + Tripod- \$250
- OptimEye Vests- \$0 (one for one player)
- Polar T31c Heart Rate Monitors-\$0 (one for one player)
- High-Spec Laptop (MSI)-\$0



Inertial sensors

Gyroscopes:

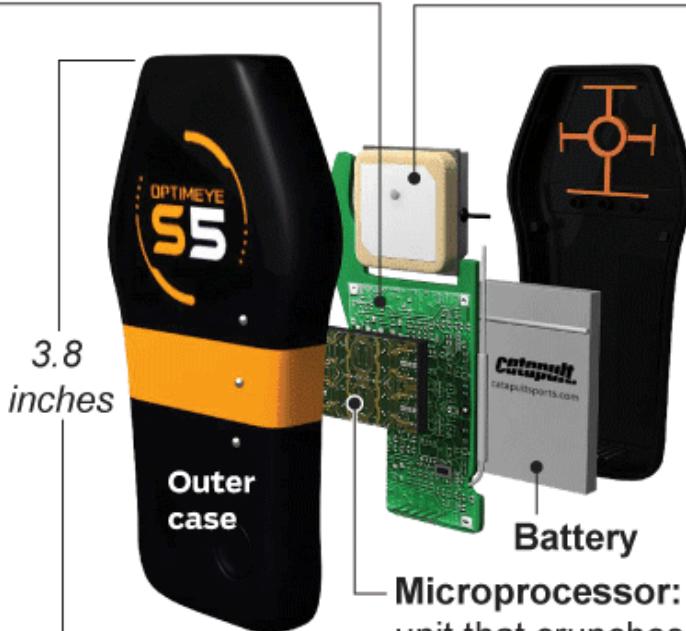
Measure the orientation of the athlete's body position.

Accelerometers:

Measure impact forces.

Magnetometers:

Measure direction like a digital compass.



Antenna:

Receives signals from GPS and GLONASS (Russian) space-based satellites for twice the tracking.

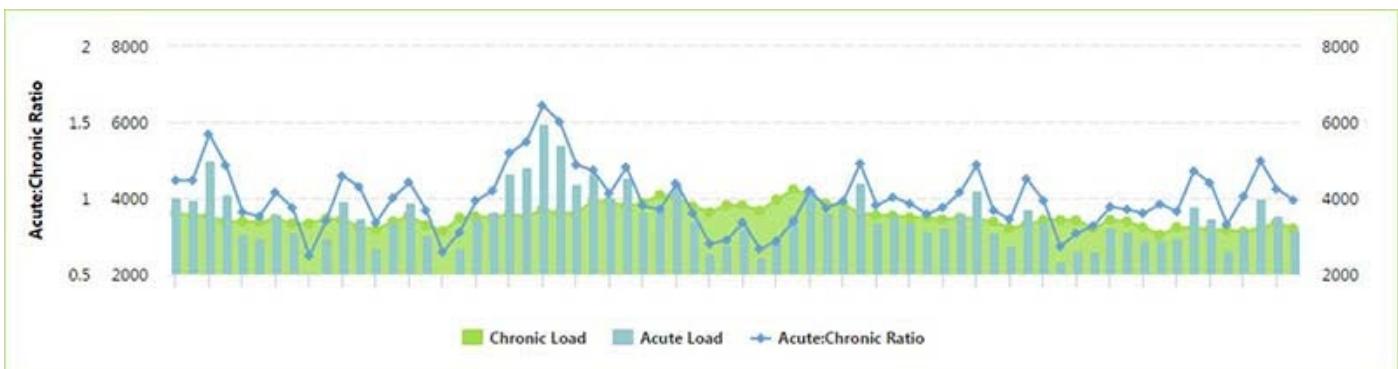
Microprocessor: Central processing unit that crunches the data.



(Alibaba, 2020)

Process: The device uses satellite reception and it is worn on top of the back, as shown above.(Creasey,2016).

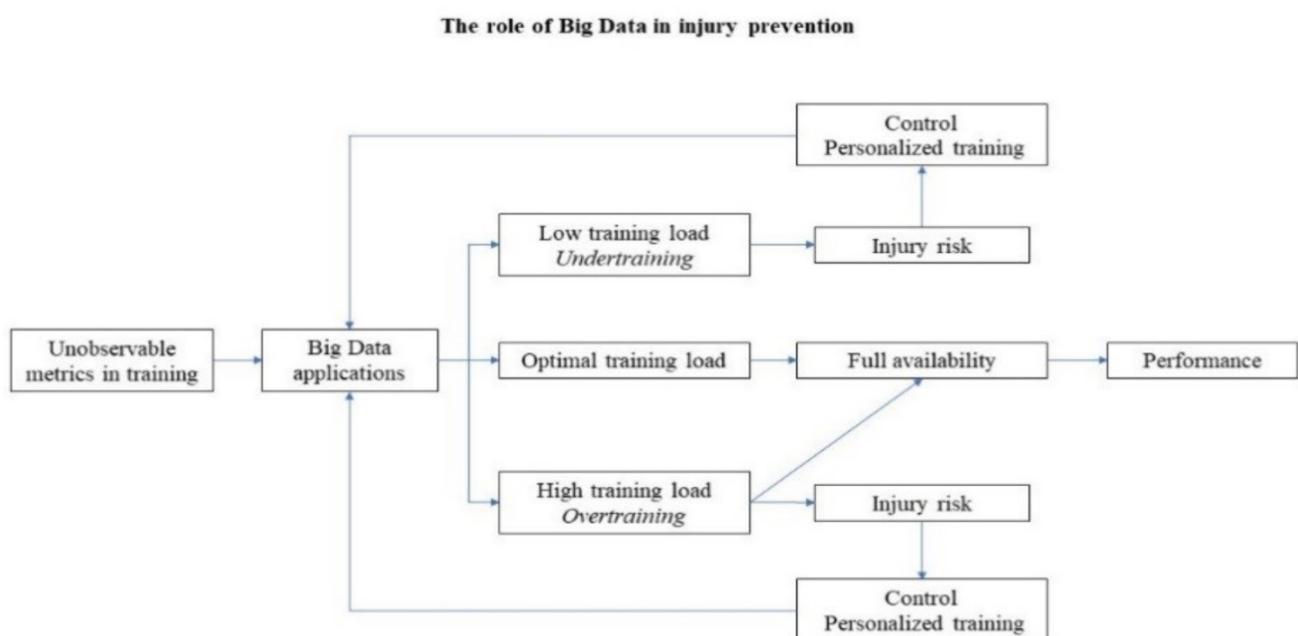
Here is an example of what the device can show:



This is the chronic load of a player over a few months.If the areas where the blue bars are higher than the green curve, the athlete is overloaded. The opposite goes for when the acute load is smaller than the chronic load (athlete underloaded).

(Keyes,2017)

As presented in the image below, both underload and overload can lead to injury, which is why this application of the device is so effective.



(Henriques,2018)

Moreover, coaches can identify if an injury occurred because of a certain stimulus.(Keyes,2017)

Data collected:

Volume: Catapult measures 1,000 data points a second.

It shows loads on a weekly, monthly and yearly basis and it can show data of more players, as seen in the image below.



The bigger the database (the more the device is used), more conclusions can be drawn from it.

Variety: heart rate, orientation of the athlete, magnitude and directions of any accelerations and decelerations, changes in direction, jumps, low accelerations, high accelerations (Keyes,2017)

Velocity: OptimeEye S5 sends live data to the computer (Channels Television,2017)

Veracity: The device needs careful planning for using. For example, measuring player data while warming up might not be relevant to the energy of a player during a match.

Analytics: Descriptive. It shows charts representing player loads and high IMA movements, high velocities, and time spent in a high heart rate zone

Performance:

- The comfort of the wearable could be improved. Catapult launched Vector, which is smaller and doesn't need the heart rate monitor, but it is not yet commercial. (Catapult,2020)
- GPS cannot pick up changes in direction, but this device can (Keyes,2017)
- The analytics is only descriptive, showing player loads. This means a statistician is needed to interpret the graphs.

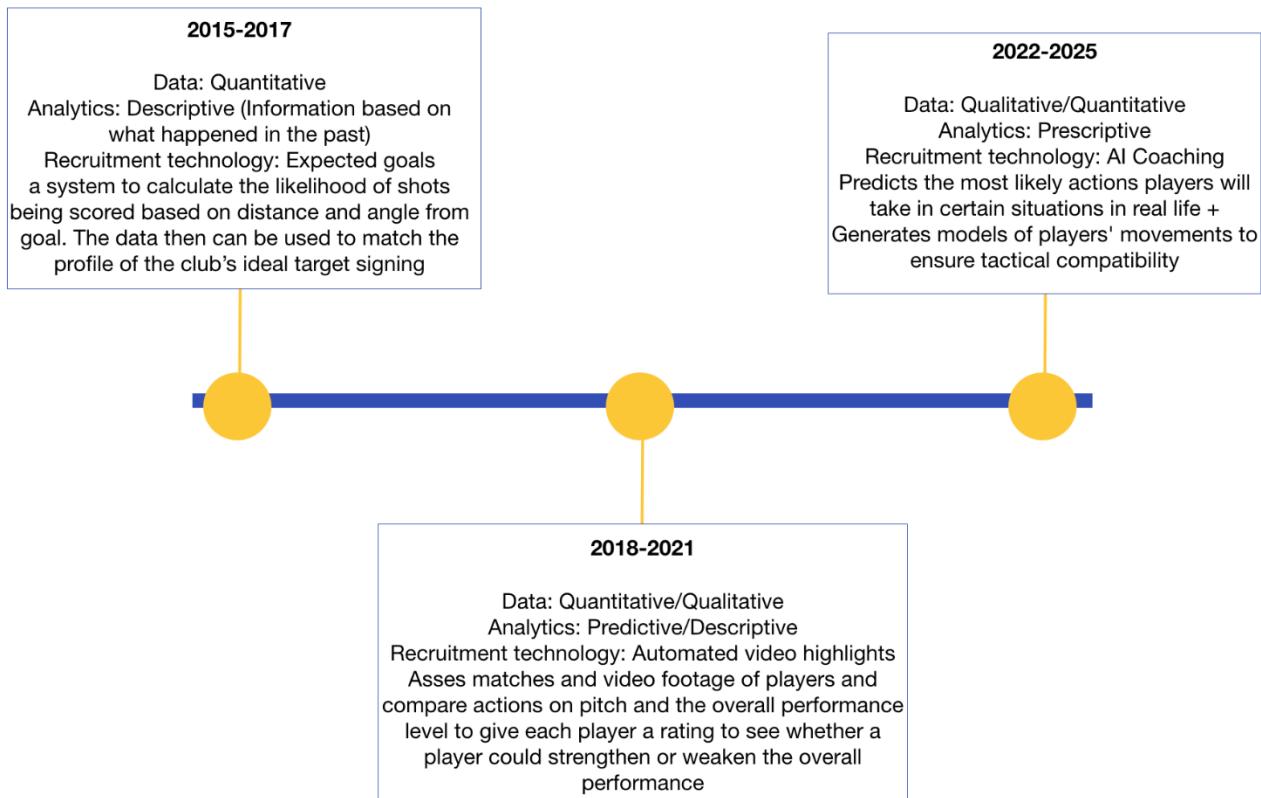
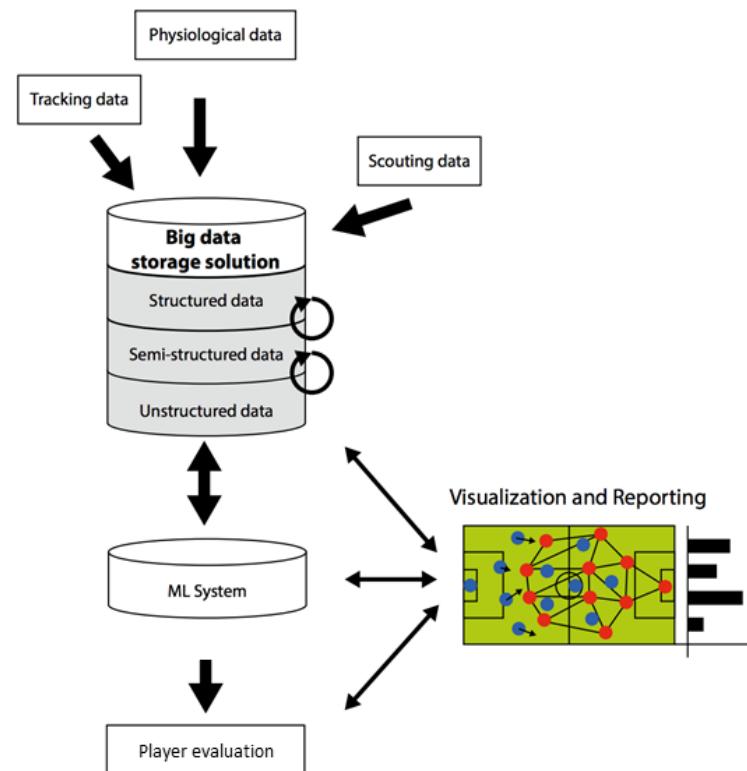
Readiness: The device was already purchased by football teams, but not by Chelsea FC. Some teams that purchased the device are: Leicester City FC, Swansea City FC, Newcastle United FC, Chesterfield FC (PerformBetter,2020)

3.5 Application 2: Recruitment

Every football club has enough data to make wiser signings with the help of AI, so the challenge now is to collect more data than the opponents and reduce the margin of error as much as possible.

Data Required:

- **Volume:** this is the key to having the edge in the industry. More data means wiser and less risky decisions.
- **Variety:** event data together with physical and statistical data have been around for a while, whilst newer technologies are starting to track player movements.
- **Veracity:** the data collected is usually reliable, especially for optical tracking. Accuracy is key.
- **Velocity:** talent scouting is extremely competitive in football, so newer technologies need to be able to crunch data in a matter of seconds.



(Timeline for AI/Data analytics technologies in Football)

3.6 3rd example : AutoSTATS

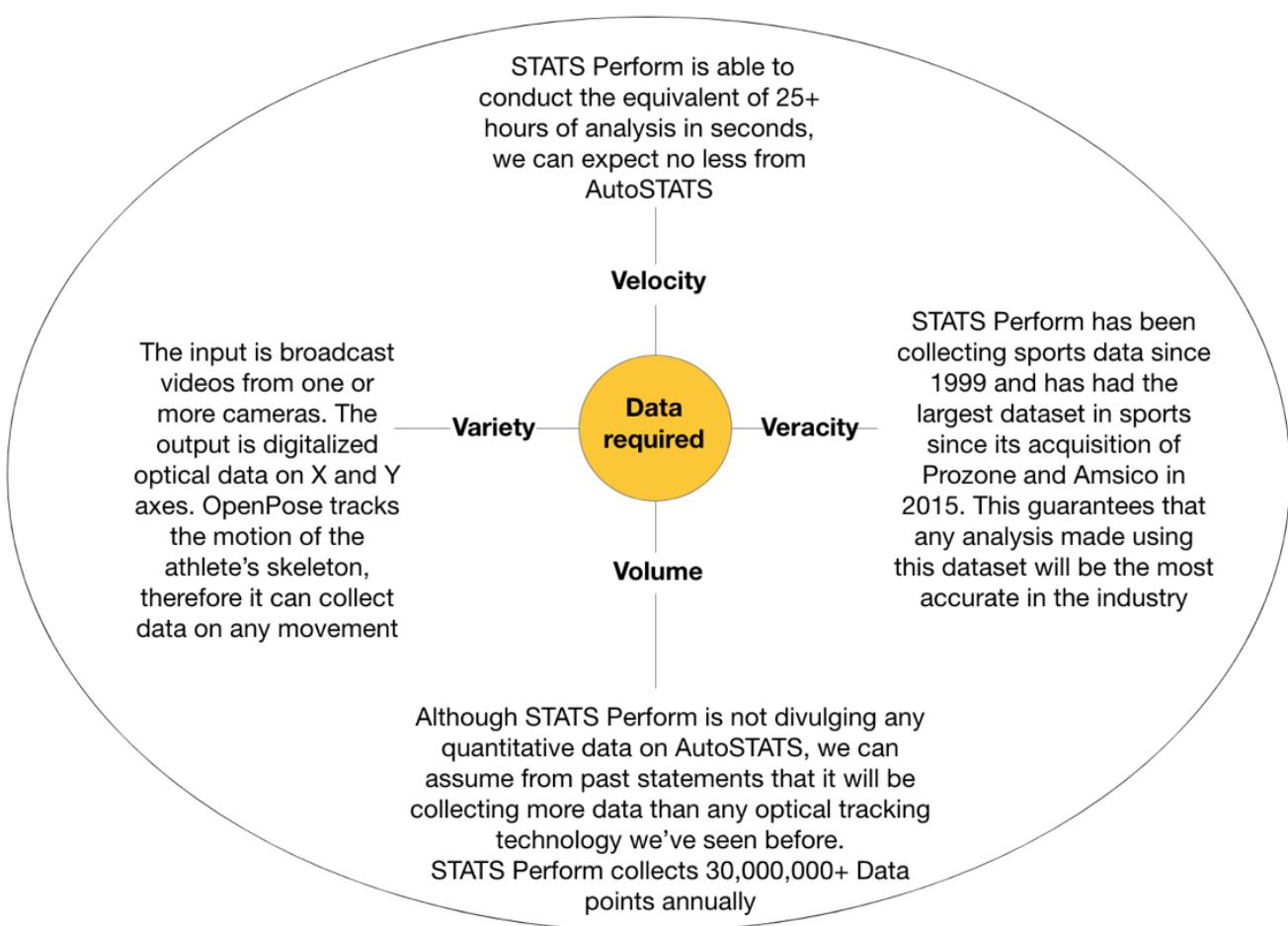
”The first AI-powered technology to capture sports tracking data via broadcast video”¹²

Launched in March 2019 and still only used in basketball, AutoSTATS delivers fine grain player tracking data directly from video, becoming a crucial part of the player evaluation process.



¹² Murphy, B, *STATS Launches AutoSTATS, the First Patented AI-Powered Technology to Capture Sports Tracking Data via Broadcast Video*, Stats Perform, 2019, (www.statsperform.com/press/stats-launches-autostats-the-first-patented-ai-powered-technology-to-capture-sports-tracking-data-via-broadcast-video).

Process	AutoSTATS uses AI and machine learning to automate optical tracking data in X and Y coordinates. Its OpenPose technology is able to collect layers of body pose information, providing AutoSTATS with deeper player tracking data like shot form and body position.
Data Footprint	The real innovation in AutoSTATS is its ability to collect an outlandish amount of tracking data from any broadcast video. This means that, unlike STATS Perform's other optical tracking technology "SportVu", AutoSTATS doesn't need its own in-venue cameras to collect data.
Readiness	AutoSTATS is still in an early stage and it likely won't be used in football before 2021. However, although the tool is currently only being used in basketball by the Orlando Magic, there is evidence of its potential application in football. The OpenPose technology is already being used to collect data from goalkeepers, and from previous statements by STATS Perform's Director of Computer Vision Sujoy Ganguly we can assume STATS won't waste any time bringing their product into the football industry.



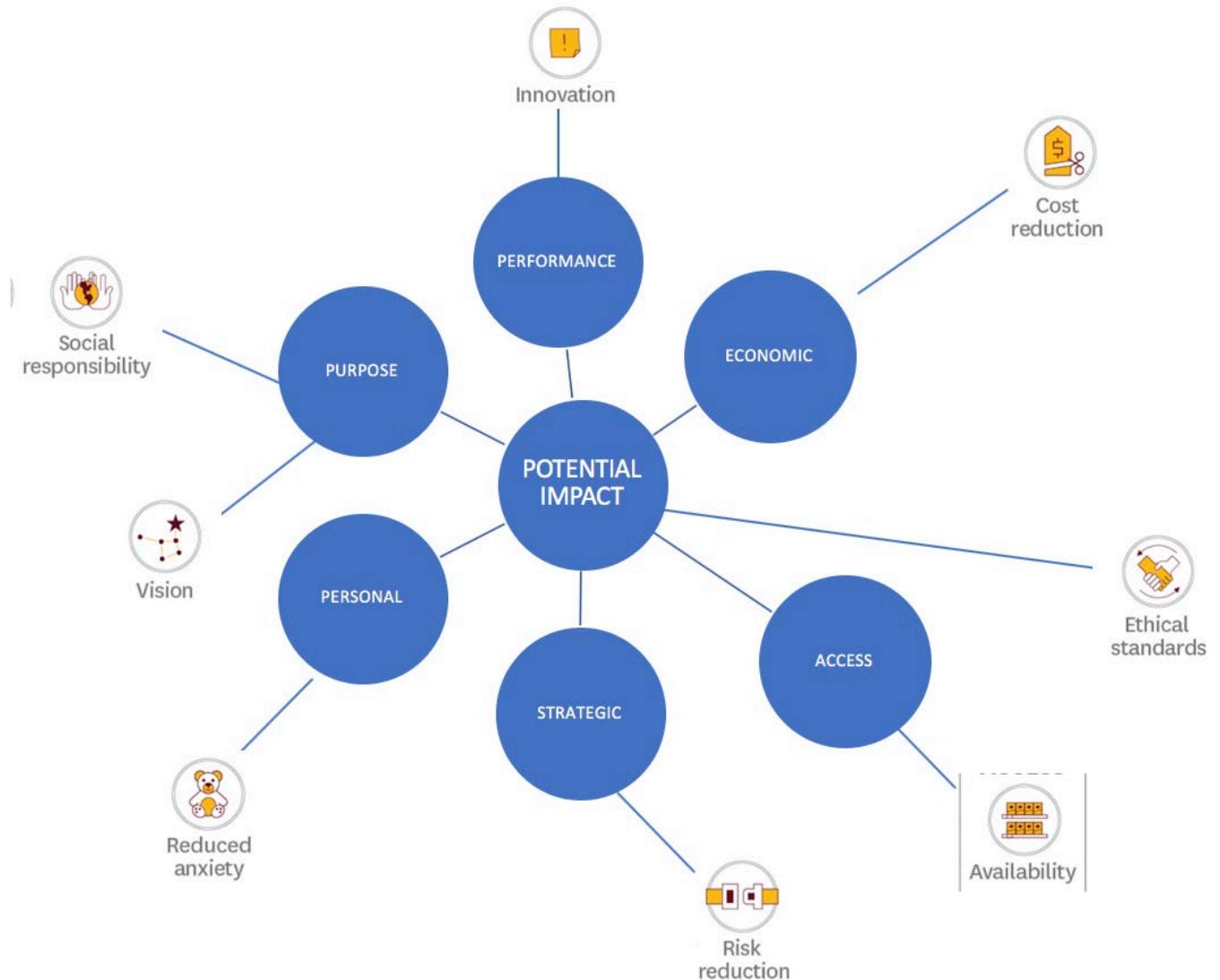
Impact

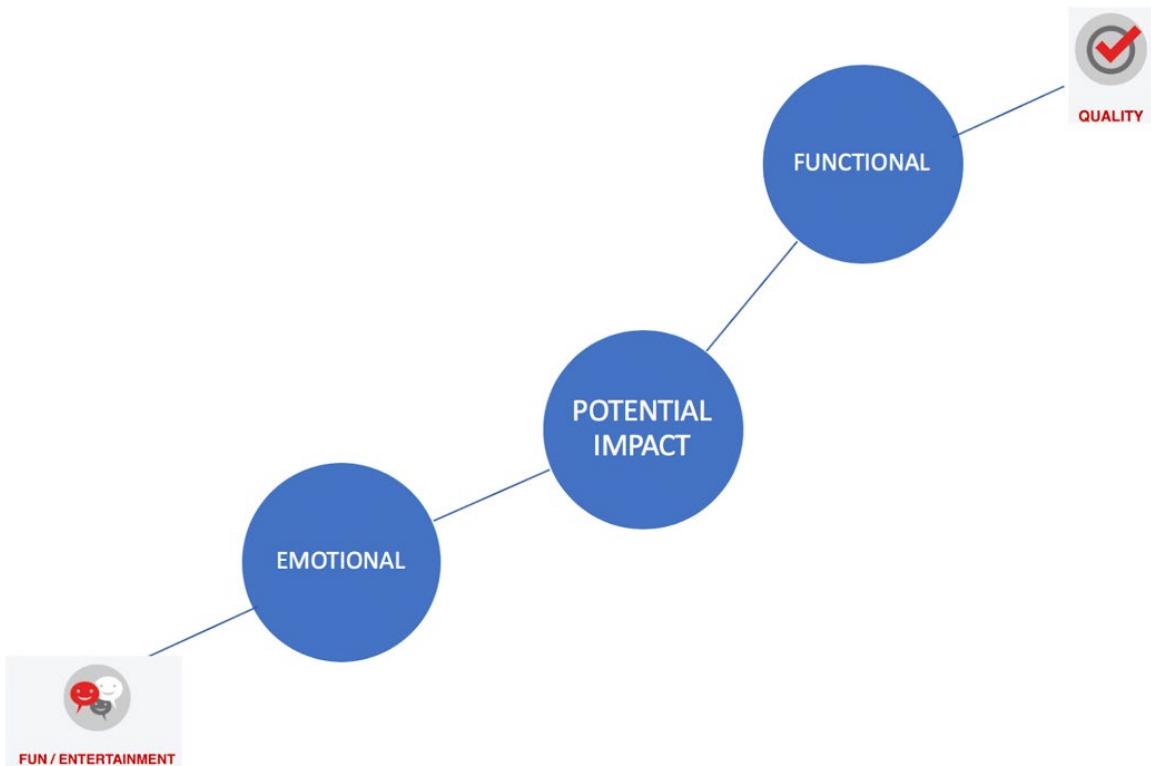
We decided to focus on 2 categories for impact, injury management and recruitment.

4.1 Pre-game preparation & Post-game analysis-Injury management- OptimEye S5

We decided to use Bain's elements of value to understand the potential impact of OptimEye S5 on injury management for Chelsea FC.

B2B





B2C

As mentioned in the Organisation part, one of the key challenges for Chelsea is injuries: during the 2018/2019 season, Chelsea was the 5th club with the highest injury costs with a record of £11.5m with a total of 50 injuries. Also, top players are injured and because of the transfer ban, the team cannot get other players.

Leicester City has used this technology in 15/16 and had the fewest injuries at the end of the season (18), so the coach was able to pick the same starting 11 for the majority of time.(Creasey,2016)

We calculated the impact on injury costs based on the previous claims: Leicester had 32 less injuries than Chelsea (64% decrease in injuries for Chelsea), and that could mean a 64% decrease in injury costs (a decrease of 7.35 m)

Cost of buying the technology: We calculated this from the components and price section, for 11 players-\$17000

In the long run, buying the product means a decrease in costs of over 7 m.

Challenges: -Players can refuse to wear the devices because of data privacy. For example, 20% of Swansea's players refuse to wear devices during matches because they find them invasive. (Sveltik,2017)
-Sometimes there will not be any conclusions to draw from the data.

4.2 Recruitment-AutoSTATS

Current impact

In 2019 the Orlando Magic went into the NBA Draft with more data than any team in the history of basketball.

NBA teams are only allowed to scout college players a handful of times, so ultimately the team's decision is based on very little information.

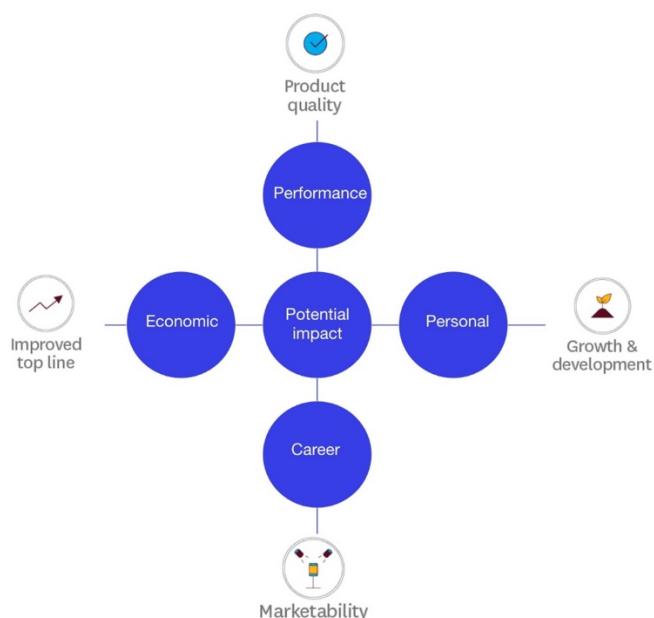
Whilst other teams made their picks based on averages, physical traits and scout intuition, Orlando picked their player after analysing granular data from 72 of his college games with the help of the largest basketball data set in the world.

Potential impact

Selling players at a profit has always been a key element in Chelsea's business model, with £450m profit made over the last decade. The numbers, however, are in decline, as the year 2019 saw a decrease of £52m in player sales profit (£60.5m).

Making use of STATS Perform's AutoSTATS tool could drastically improve Chelsea's player evaluation process, leading to better scouting and better signings. This would allow Chelsea to groom young players with great upside and potentially make a profit of [£113m+](#) off their sale.

B2B Elements of Value



4.3 Conclusion

Implementing Data, Analytics and Artificial Intelligence into Chelsea will have a significant impact on Recruitment and Injury Management, and also on the way the organization operates. We presented this impact by showing potential changes on Chelsea's Business Model Canvas.

INJURY MANAGEMENT / RECRUITMENT

NEGATIVE/ POSITIVE

 Key Partners <p>No new suppliers. Catapult is already a supplier for Chelsea, but they did not sell this product to them (Perform Better, 2020). Chelsea FC can attract new sponsors if the top players are not injured and they perform better in matches.</p>	 Key Activities <p>Improved Youth Academy with better player evaluation.</p> <table border="1"> <thead> <tr> <th>Key Resources</th></tr> </thead> <tbody> <tr> <td>Top players, because of the decrease in injuries</td></tr> <tr> <td>New jobs needed, statisticians will be needed to interpret the graphs of the device</td></tr> <tr> <td>Young quality players.</td></tr> <tr> <td>Time and resources needed to adapt to a new recruitment process.</td></tr> </tbody> </table>	Key Resources	Top players, because of the decrease in injuries	New jobs needed, statisticians will be needed to interpret the graphs of the device	Young quality players.	Time and resources needed to adapt to a new recruitment process.	 Value Propositions <p>B2C: If the top players are not injured, fans can benefit from quality games and also have fun. This means more fans will come to watch the game or will watch the game from home. B2B: The technology offers Chelsea vision and risk reduction. It reduces the risk of players getting injured so it reduces the risk of unexpected changes in games planning made by the coach. It also means improved performance, a better chance of winning games. Players: The value offered to players is reduced anxiety because of reduced injuries and less stress.</p> <p>Young talent bring excitement and fresh entertainment to stadiums</p>	 Customer Relationships <p>A younger team with good potential is generally more appealing to fans.</p>	 Customer Segments
Key Resources									
Top players, because of the decrease in injuries									
New jobs needed, statisticians will be needed to interpret the graphs of the device									
Young quality players.									
Time and resources needed to adapt to a new recruitment process.									
 Cost Structure <p>In the long run, buying the product means a decrease in costs of over 7 m. Wages costs increase as they need to hire statisticians Younger players generally expect lower wages. The cost of the product (AutoSTATS) is confidential.</p>		 Revenue Streams <p>More than 50% from broadcasting and matchday (Financial Football News, 2020). And both of these should increase if the fans can watch their favourite players who are not injured, and their team with an improvement in performance. £113+ in player sales, based on Chelsea's past profit.</p>							

APPENDIX

1.1 ORGANISATION (Detailed Business Model Canvas)

Business Model Canvas -

Key Partners	Key Activities	Value Propositions	Customer Relationships	Customer Segments
 Principal Partners -Nike -Yokohama Tyres	 Youth Academy -Develop young and upcoming players in their academy. Currently 12 youth teams. Merchandise - Megastore - 3 different types of kits - Balls - T-shirt, scarves, magnets - Special Offers	 Consistent UEFA competitor Top level football Consistently among top UK teams Customer Fan Experience - 2 tours - 1 museum - 1 megastore - 1 fan club - Over 120 official supporters club	 Social Media -Instagram: 14.4m followers (7th) -Facebook: 47.7m likes (5th) -Twitter: 12.3m followers (5th) Hospitality - Hotels & host different events	 Fanatical Fans (25k season ticket holders in 2016) Devoted Fans Temporary Fans - Global Fanbase with the U.K is the 10 th country with the most blue fans (Based on Facebook Likes)
Official Partners -Beats -Carabao energy -EA sports -Hublot -Hyundai -Levy restaurants -Singha -Fiserv. -Vitality -Sure -MSC cruises -Millenium hotels -Premier league	 Key Resources 2 principal partners 1 Stadium Top level players -Can be the face of the team (25) Fan favourite manager Lampard		 Channels - 5 th Stand App → official mobile app -Chelsea TV - Official website → https://www.chelseafc.com/en Stamford Bridge - Hold 40,834 fans in the stadium	
Charity Partners -Plan International -Soccer Aid (Unicef)				
Cost Structure Transfer Fees -Kovacic - £40M -Pulisic - £58M	Annual Player Wages £104.185M -Total Salaries - £125.687M	Stadium management and maintenance -Expand - 60K seats. Project on pause for 12 months -Original cost - £500M, now it has almost doubled. Injury costs 2016-2017 → 21 injuries w/ £6.6M 2017-2018 → 14 injuries w/ £11.5M	Revenue Streams 2017/2018 Revenue -Matchday: £73.9m -Broadcast: £204.2m -Commercial: £169.9m	2016/2017 Revenue -Matchday: £65m -Broadcast: £162.5m -Commercial: £139.8m
Manager -£4M per year for 4 years + bonuses	Total Costs: 2018: £424M 2017: £382M		2019 Player Sales £60.5M	Annual Revenue -2018: £448M -2017: £367.8M -For 4 years in a row, it has been the 8 th leading club in the business of football

Value propositions

What attracts fans? Why do they come and support Chelsea F.C?

Chelsea Football Club is an English professional football club based in Fulham, London. Founded in 1905, they compete in the Premier League, the top division of English football. Chelsea are among England's most successful clubs; they have been league champions six times and won 32 competitive honours, including 16 European trophies, making them a consistent UEFA competitor, showing their fans a great deal of top level football. A customer fan experience is great at Chelsea, they are able to visit or participate in the following: 2 Stadium Tours, a Museum, one Stadium Megastore, a Fan Club and over 120 Official Supporters Clubs all over the world.

Customer Segments

What type of supporters are there? Where are they?

Here we will be segmenting consumers of professional soccer in different categories depending on the loyalty of a supporter of the club. There is the fanatical fans view being a fan as part of their self-image, are dedicated to the club as an entity, and collect memorabilia although there will still be loyalty churn even within the segment, 25k season ticket holders in 2016. Devoted fans take enjoyment from watching a variety of games as well as their own, due to a love of the sport rather than one club. Temporary Fans tending to use football to promote their social self-image by backing the underdog (Bristow and Sebastian, 2001) or basking in the team's glory. Chelsea F.C has a very global fanbase, the UK, where the football club is based, is only the 10th country with most Blues fans (Based on the amount of likes on the Facebook page and where the followers come)

Customer Relationship

How does Chelsea F.C make the fan feel like they are part of a club? How do they retain customers?

Chelsea F.C have a great reputation in the football world thanks to their large trophy cabinet, which is quite remarkable. Thanks to this, they have been gaining a larger fanbase, not only in their hometown and home country, London and England, but in the rest of the world. In order to have a more loyal fanbase, they must be willing to share some exclusive footage that could be accessible to anyone to create an intimate relationship to make them feel included, that they belong somewhere, and that they have a role with their team. The only way to share bits of the team practices, travelling or anything interesting is by using social media like Instagram, Facebook, Snapchat, and Twitter, which the majority of their fans have access to and can keep track of their team. One can see how they have gained a large amount of followers/likes on their social through the following:

- 7th most followed football club in the world on Instagram with 14.4 million followers
- 5th most liked football club in the world on Facebook with 47.7 million likes.
- 5th most followed football club in the word on Twitter with 12.3 million followers.

For those fans who do not know London well, but come to visit just to watch a game, Chelsea F.C suggests to stay at the Millennium and Copthorne Hotels, who are their partners, which is located right next to Stamford Bridge, the football club's stadium. Chelsea also allows their fans, and to anyone to come host events at the stadium which could range from business meetings to birthday parties.

Channels

How does Chelsea F.C keep their customers satisfied?

Stamford Bridge has been the home of Chelsea Football Club since formation in 1905, making it unique for a fanatical's experience. It has a capacity over 41,000 seats. Live Streams on Chelsea TV include exclusive interviews with head coach Frank Lampard, every pre-match press conference, matchday shows with special guests and occasional live Women's and Academy matches. The Chelsea Megastore is the official location for all Blues merchandise from authentic Chelsea FC kits to crested souvenirs direct from Stamford Bridge. The 5th Stand - Chelsea FC's official mobile app: interact with Chelsea fans around the world, post thoughts and discuss all the goings on in 'Hot Topics' forum.

Key Activities

What are the strategies that Chelsea F.C undertake to deliver its proposition?

Chelsea's main key activity is their youth academy. In this academy, Chelsea develop their youngest players by having an under-9's team until an under-23's team to give time for these juniors to reach their full potential. If they do not reach the club's expectations, they will most likely be sold or loaned out to a lower-level club, or worse, they will be released. If they do reach the expectations of Chelsea F.C., they will be promoted to the senior squad or sold to one of their rivals in order to create profit off of the transfers of their sold players. They also sell merchandise from their Megastore to create a different stream of revenue. The merchandise consists of the three different kits of the Chelsea F.C 2019-2020 season, casual t-shirts, and other objects such as magnets, mugs... The Chelsea F.C Megastore also has special offers for a limited amount of time. Currently, to celebrate the 50th anniversary of their 1970 F.A Cup victory, they have brought back the commemorative kit.

Cost Structure

How does Chelsea spend their money? Do they need to re-evaluate their financial needs?

As seen in the Business Model Canvas, Chelsea invests in some players by buying them to improve the squad and its performances, but also keeping their players by paying their wages on time does not come cheap as one can see that the Total Salaries of the Men's Senior Squad is £125.697 million, as well as the manager, Chelsea needs to be able to attract the best managers financially in order to coach the team to becoming one of the greatest teams in Europe by giving £1 million per year + bonuses to Frank Lampard. However, while doing their financial report Chelsea puts pause on some of their projects, such as broadening Stamford Bridge since the

costs of the project initially presented, doubled when they wanted to put it in place. Chelsea F.C. must also see which sectors is costing them the most money since their total costs have augmented greatly from 2017 (£382 million) to 2018 (£424 million), which one can see for the budget of injuries, which is a key challenge for the organisation. In the span of a year, the number of injuries have decreased by one third, however the budget to handle the issue has almost doubled.

Key Resources

What assets Chelsea F.C must have in order to stay a Top European Club?

There are three key resources for Chelsea F.C. The first one is the stadium which is the location where the players of the senior roaster plays and where the majority of the fans pay to come and watch. Without this key activity, they are not able to run this organisation with no place to come and watch the team play for the supporters, and no place for the players to play. The second one is to have a good manager, in this case, Frank Lampard. The club's manager needs to not only satisfy the CEO, Roman Abramovic, and his board, but also the fans. He has the difficult task of maintaining a consistently good performance to please his bosses and his supporters. In Chelsea's case, Frank Lampard who is the club's manager fits perfectly this position as he is a fan favourite for being an old player for the club, but also having some previous professional experience that went well. Chelsea also wants the best players, either producing them and/or buying them. Out of their 25-man squad, Chelsea wants a few superstars than can carry the greatness of Chelsea, and become leaders of the team. Finally, financial support is always a valuable asset to Chelsea to remain a Top European Club with their two principal partners who do activities that the football club does not need to worry about (look in Key Partners for more information about what they do more precisely).

Key Partners

What importance come from the different type of partners Chelsea F.C have? What do the partners do, so that Chelsea F.C. does not need to focus on?

For Chelsea F.C, their principal partners, Nike and Yokohama Tyres, do the biggest jobs to be done that the club does not need to worry about, hence their elite statue of importance amongst the other partnerships Chelsea has. Nike is the official kit supplier and helps the club's image worldwide by supplying a large number of different markets the sport's association apparel. Yokohama Tyres is the club's shirt sponsor since it brings up the brand awareness 95% among the club supporters (according to the Japan Times). It is also an immense company with influence in the Asian market where huge Chelsea fanbase lives. Chelsea's 13 official partners propel the brand's image as well has the principal partners, but do not have the same impact for the organisation, however they principal job is to entertain

Chelsea fans, and make them happy. For example, the partnership with the Millennium hotel lets Chelsea supporters have the same meals Chelsea players have, and give them a chance to win tickets for a game. The Charity partners Chelsea have is to bring more brand positivity towards the football club, demonstrating its care to the world by hosting different charity events, giving money to these charities, and convincing their other partners to donate as well.

Revenue Stream

How does Chelsea F.C earn revenue from value proposition?

Matchday revenue rose from £65.0m to £73.9m (13%) with Chelsea having more home games due to a return to European football following a 1-year hiatus. Broadcasting revenue rose significantly from £162.5m to £204.2m (26%) as a return to the Champions League after a season of no European football boosted revenue substantially. Commercial revenue rose from £139.8m to £169.9m (22%) after new deals with Nike and Sony came into effect, having a large, positive effect on revenue. Revenue rose from £367.8m to a record breaking £448.0m (22%), primarily due to a return to the Champions League. For 4 years in a row, it has been the 8th leading club in the business of football, even with some minor setbacks.

1.2 SWOT ANALYSIS

<p>Strengths</p> <ul style="list-style-type: none"> • Strong fan base and consciousness throughout social media • Using academy players to demonstrate the effectiveness of Chelsea's youth academy to please the CEO and the supporters • Using an old fan favourite Chelsea player as manager to please everyone • Having sponsorships from big brands like Nike, EA Sports, Yokohama Tyres..., to be able to diffuse Chelsea F.C 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Lack of experienced players might prove difficult to move forward in cup races. • Lost crucial squad players which resulted in brand dilution • Bad distribution of the budget with it spending too much money on injury recoveries. • Not being able to diversify the squad, because of the transfer ban. Only can bring in players from one place which is their youth academy
<p>Opportunities</p> <ul style="list-style-type: none"> • Exploring different markets where Chelsea have spread to yet such as the American markets and emerging ones. • More advertising and brand visibility would help brand equity and make Chelsea F.C as known globally as Manchester United or Real Madrid 	<p>Threats</p> <ul style="list-style-type: none"> • Not participating in the UEFA Champions League hurts Chelsea's revenues as shown in the revenue streams of the BMC. • Change of team ownership or leadership. • Insufficient funds to improve the squad or broaden Stamford Bridge due to Chelsea's financial debt by spending too much on players • Growth of other European leagues because of top team members leaving Chelsea to join them.

1.3 PESTLE ANALYSIS

Political

- Chelsea operates on an international scale by participating in international tournaments as well as making international affairs with other clubs to acquire or lose a player. With the effects of Brexit, the English Football Association would like to establish a new policy to decrease the maximum of foreign players at 12 as opposed to 17, which was originally permitted. This would impact Chelsea's first team especially since out of their 28 first team squad players, 11 players are from the U.K, meaning if this policy comes into effect, Chelsea F.C would have to let go 5 of their current 17 foreign players.
- Bringing players to the Premier League will be more difficult to do and cost more because of the working visas.
- Due to the CEO of the company not living in the U.K due to the withdrawal of his visa application back in May 2018, some major projects such as expanding the stadium has been put on pause until the return of Roman Abramovic.

Economical

- As Chelsea buys or sells players to different leagues, meaning that they deal with international markets, it is affected by the fluctuations in the exchange rate, producing pressures related to income and revenue.

Social

- The social image of Chelsea F.C. is crucial to keep an outstanding reputation so it is not related to negative aspects of football such as racism or discrimination so it does not impact the brand's image negatively. Unfortunately, Chelsea F.C has been both victim and offender towards this matter. In the game against Tottenham Hotspur F.C on 22nd December 2019 with fans making monkey noises towards Antonio Rudiger, a Chelsea centre-back. As well as on the 9th December 2018 with Chelsea demonstrating abhorrent racist behaviour towards a Manchester City player, Raheem Sterling.
- To also uplift the club's image, Chelsea involves their players in diverse activities such as volunteering for Charity, answer Q&A's of a football magazine or youtube channel..., to make them closer to the The Blues supporters, so their fanatics are always kept entertained, and continue loving the club.

Technological

- The introduction of VAR into the Premier League allowing the referees to watch the play again, and decide to make a final decision vis-a-vis to the play.
- Chelsea recording statistics to show which players are currently at the top of their form, which players are underperforming as well as overperforming to avoid injuries, so they can be able to assemble the best team possible against their adversaries.

Legal

- With the recent UEFA rules about financial fair play, it has become increasingly harder for the big clubs to decide how to spend their money since they are constantly being regulated. Unfortunately, Chelsea has been found breaching those rules. They broke the rules of transferring and proper registration for 14 players under the age of 18 out of their 19 signings. In consequence, they were hit by a transfer ban for two years, and they received a fine of £45,000.
- For the fans, the Premier League warns them for any of the purchases for their clubs since they are a lot of counterfeiting enterprises that sell the clubs merchandise, as well to be well-informed from where they buy their tickets since there are unauthorised ticket websites.
- If the fans are not able to watch the match live, they should be prepared to watch it from a proper source and not an illegal source of commercial broadcasting, or else there could be consequences for the viewer as well as the person illegally broadcasting.

Environmental

- Although there is no implemented rules to protect the environment by FIFA or the Premier League, according to their website, Chelsea have joined forces with the Premier League and Sky Ocean Rescue to reduce plastic by using reusable cups at their stadium.
- To compensate for the total emissions, the organisation has planted more than 3,500 trees and shrubs around the training ground. They have also uptaken other measures to become an eco-friendly club by using LED lights, installed a building management system to control the heating, lighting, air-conditioning, and their facilities are equipped with movement sensors which automatically turns on/off their lights

2.1 TECHNOLOGY COMPONENTS

1) Assistant Coaching

Data: Qualitative

Analytics: Prescriptive/Predictive

This technology uses deep learning algorithms to analyse players during the games to find common mistakes and strategic insights. Since coaching requires many years of experience and it is an imperfect science, this technology can assist coaches at a faster rate and give tactic recommendations for competitions. However, this technology is in a pilot phase and not readily apparent but is being experimented in the NFL.

"For example, knowing how players move during a game could help coaches plan an athlete's training so he reaches peak performance. It could also shed light on the best matchups between receivers and cornerbacks and measure the contribution of each player to every play." – Alan Fern, a computer science professor at Oregon State University

2) Virtual Umpires

Data: Qualitative/Quantitative

Analytics: Descriptive/Diagnostic

These computer vision referees use AI software and camera hardware to analyse any umpire uncertainties once a team requests a review/replay. More recently, this technology is being used during the games to make critical decisions before the teams ask for a review. Such technologies use earpieces to inform the referee about the current decision to eliminate the time spent re-watching the play.

3) Automated Video Highlights

Data: Quantitative

Analytics: Descriptive

This technology uses cognitive computing systems to highlight key moments during the games by gathering data from the players and can be used in different areas of sport such as advertising and game analysis with the analysis of players movements, crowd noise and match data. In 2017 IBM introduced this system for Wimbledon to accelerate the process of analysing video highlights and automatically create visualisations for the teams.

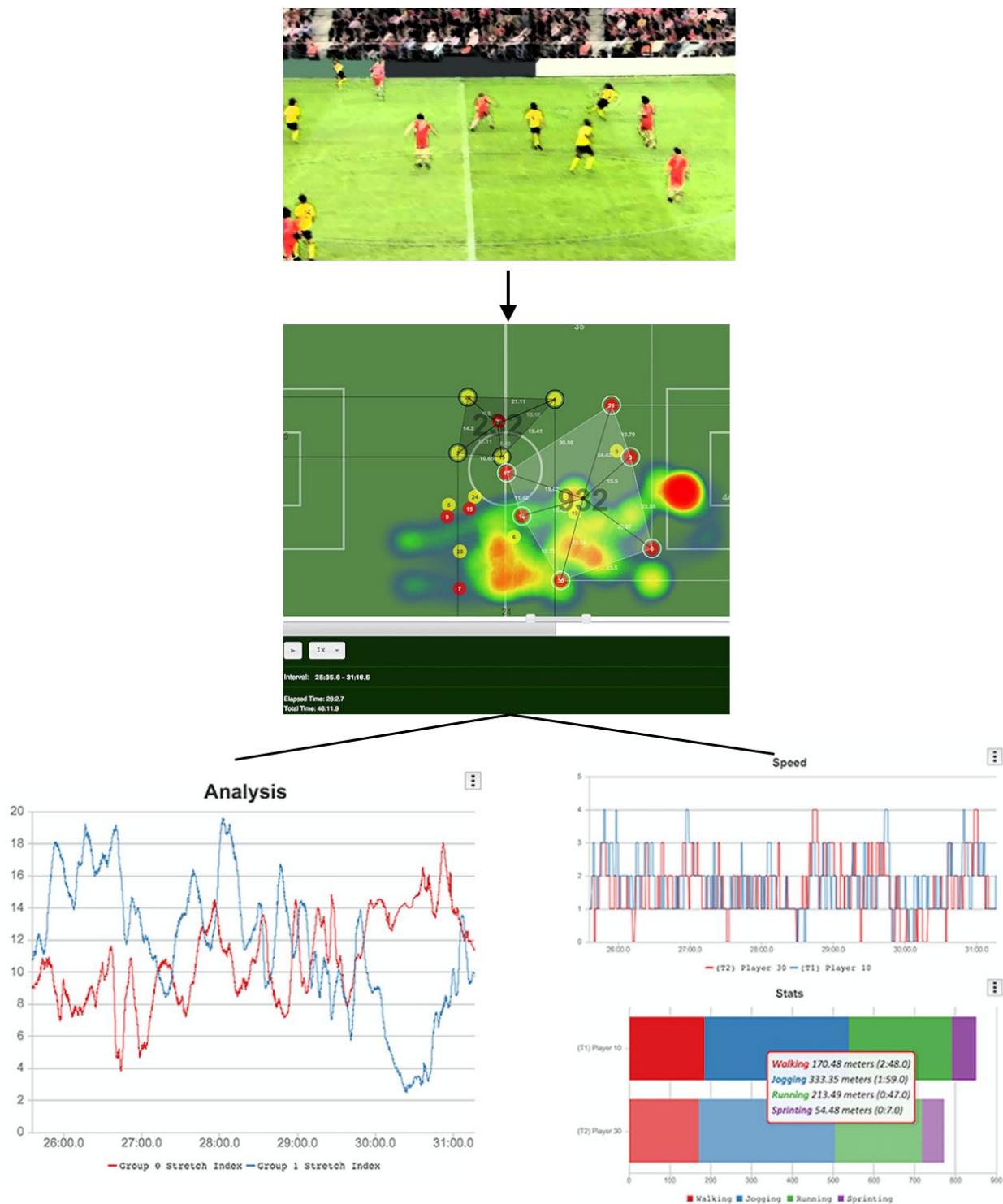
4) Computer Vision

Data: Qualitative/Quantitative

Analytics: Predictive

Computer vision technologies use video coverages installed in the stadium to analyse players during the games and gather quantitative/qualitative data. Teams can use this information for their recruitment where they can see if a player's skills match their needs. "The Wyscout Platform currently delivers all the

relevant data and helps famous football clubs, Real Madrid and Juventus, to make better purchasing decisions".



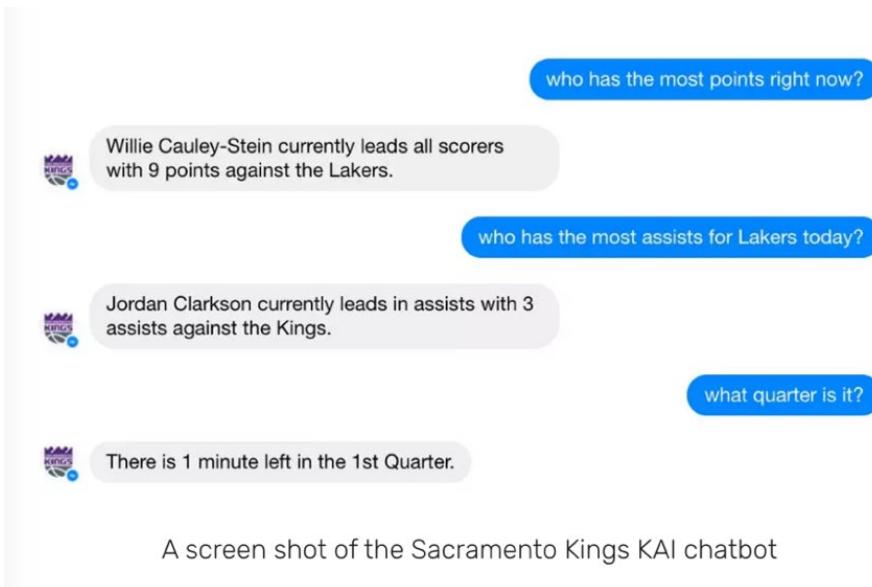
5) Chatbots

Data: Qualitative

Analytics: Descriptive

"Sports teams are using virtual assistants to respond to fan inquiries across a wide range of topics including live game information, team stats and arena logistics". In 2016 JiffyBots introduced KAI chatbot which uses Facebook messenger platform to answer fan inquiries to boost fan engagement.

"Stadium owners and teams that provide more personalized digital experiences through stadium apps, digital offers direct to mobile phones, and game information on digital boards can increase fan engagement and generate new revenue opportunities." – Connected Sports Fans 2016 report by Avaya



6) Wearable Sensors

Data: Quantitative/Qualitative

Analytics: Prescriptive/Predictive

Through machine learning algorithms, these sensors will be able to go beyond tracking and use the performance data to recommend different types of training based on each players physiology but also identify the possible injuries that might occur while playing. The U.S. Olympics director of technology Mounir Zok stated that wearable sensors have contributed to the team USA earning 121 medals at the 2016 summer Olympic games.

7) Drone Cameras

Data: Quantitative

Analytics: Descriptive/Diagnostic

drone cameras are used to record training sessions and games for coaches to better analyse their tactics and compare their performance over a certain period.

2.3 SUBCATEGORIES OF AI

Supervised learning: It refers to a class of machine learning algorithms that determine a predictive model using data points with known outcomes.

Unsupervised learning: It refers to a class of machine learning algorithm used to draw inferences from datasets consisting of input data without classified/labelled responses.

Reinforcement learning: It refers to a class of machine learning algorithm which learns to perform a task by trying to maximise rewards it receives for its actions.

Convolutional neural network: It refers to a multilayered neural network used to extract complex features of the data at each layer to determine the output.

Recurrent neural network: It refers to a multilayered neural network commonly used in speech recognition and natural language processing. This network stores information in context nodes, allowing it to learn data sequences and output a number or another sequence.

APPLICATION

3.1 Pre-game preparation & Post-game analysis-Injury management

Performance required for components:

The images and videos of players need to capture as many movements as possible in order to show an accurate version of the player's load. Particularly for wearables, the performance required is to be worn during games not only trainings, so the team can have more data about players. 2015-2016 was the first time players were allowed to use wearable devices during matches. (Svetlik,2017) Moreover, the number of wearables should be as small as possible in order to increase comfort for players. The data needs to be transmitted live to the device. The battery of the device needs to be active long enough to capture a whole training or match day.

IMPACT

AUTOSTATS

£113m is the profit made off player sales in Chelsea's most profitable season of the decade (2017/2018). „The price of AutoSTATS is confidential”: we interviewed an employee at STATS Perform who explained that they're not allowed to divulge information on AutoSTATS, as it's their newest technology.

QUID

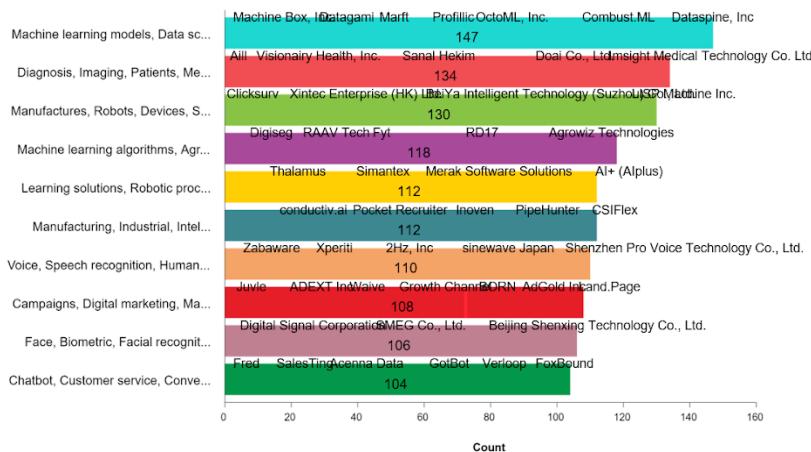
Quid has been a very useful tool in our analysis as it helped us with our research of AI trends in sports and also with visualisations. We have 11 Quis searches in all 3 databases: Companies, News&Blogs, Patents.

1st Quid search

Firstly, we used the Company database to find the main sectors where AI is involved with.

Here is our Quid Query: "algorithms" OR "imitation learning" OR "data science" OR "deep learning" OR "machine learning" OR "artificial intelligence" OR "facial recognition" OR "vocal recognition" OR "image classification" OR "neural network"

Company bar chart with 1181 companies. Colored by clusters. Labeled by company name.



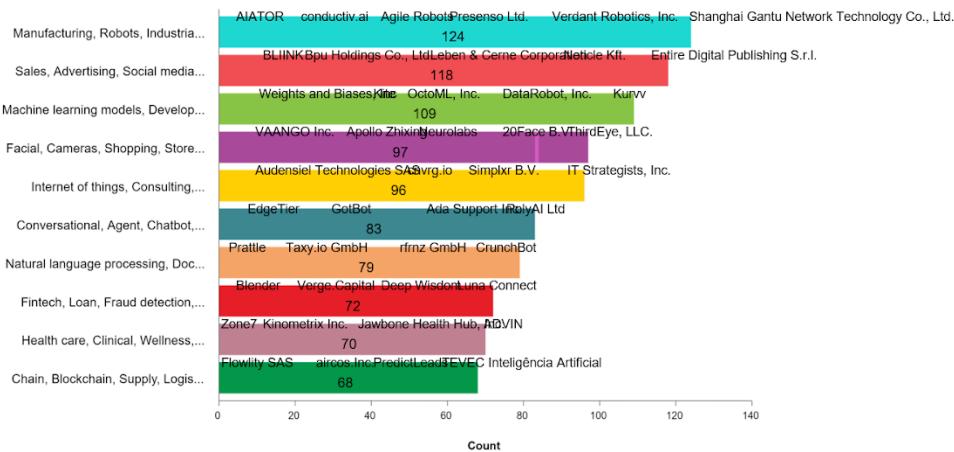
Source: [Quid®](#)

2nd Quid search

Secondly, we used the Company database to find the links between AI and football, and we used as timeframe 10/12/2018 to 10/12/2019 (the past year)

"algorithms"~10 OR "algorithms scouting data"~10 OR "algorithms european football"~10 OR
"algorithms soccer"~10 OR "imitation learning"~10 OR "imitation learning scouting data"~10 OR
"imitation learning european football"~10 OR "imitation learning soccer"~10 OR "data science"~10 OR
"data science scouting data"~10 OR "data science european football"~10 OR "data science soccer"~10
OR "deep learning"~10 OR "deep learning scouting data"~10 OR "deep learning european football"~10
OR "deep learning soccer"~10 OR "machine learning"~10 OR "machine learning scouting data"~10 OR
"machine learning european football"~10 OR "machine learning soccer"~10 OR "artificial intelligence"
~10 OR "artificial intelligence scouting data"~10 OR "artificial intelligence european football"~10 OR
"artificial intelligence soccer"~10 OR "facial recognition"~10 OR "facial recognition scouting data"~10
OR "facial recognition european football"~10 OR "facial recognition soccer"~10 OR "vocal recognition"
~10 OR "vocal recognition scouting data"~10 OR "vocal recognition european football"~10 OR "vocal
recognition soccer"~10 OR "image classification"~10 OR "image classification scouting data"~10 OR
"image classification european football"~10 OR "image classification soccer"~10 OR "neural network"
~10 OR "neural network scouting data"~10 OR "neural network european football"~10 OR "neural
network soccer"~10

Company bar chart with 916 companies. Colored by clusters. Labeled by company name.



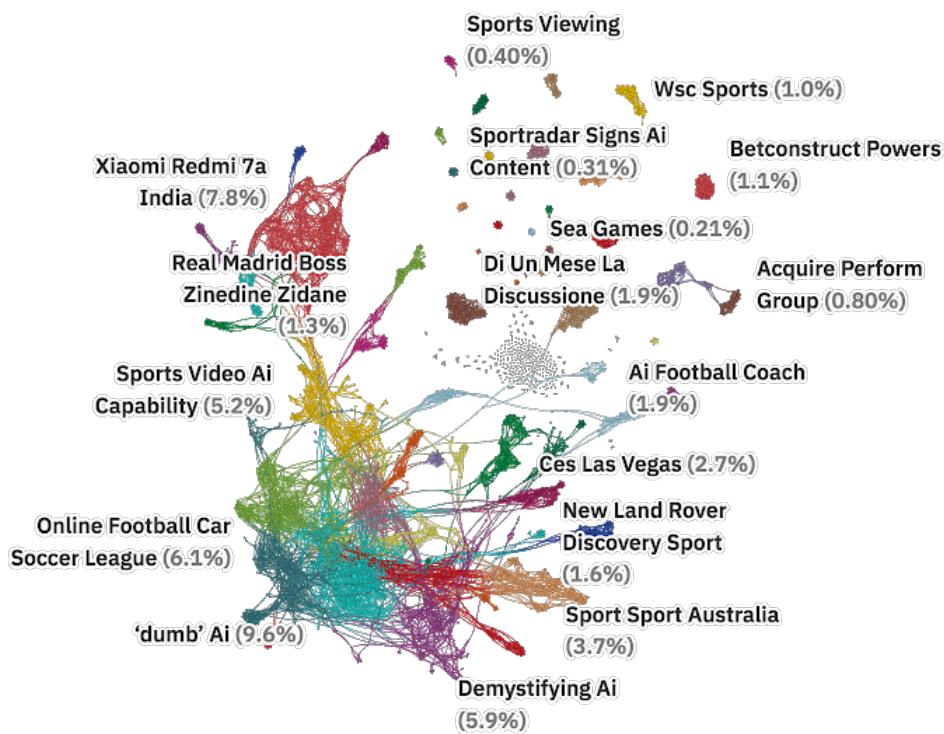
Source: [Quid®](#)

As we can see with the bar chart above us, there is a lot of artificial intelligence in the world of football, and it finds itself mainly in these sectors. It differs quite a lot from the first bar chart.

3rd Quid search

We used the News&Blogs database to identify examples of applications of AI in sports using the following query:

```
" sport AI"~10 OR " sport artificial intelligence"~10 OR " sport ML"~10 OR " sport machine learning"~10 OR
" sport deep learning"~10 OR " footbal AI"~10 OR " footbal artificial intelligence"~10 OR " footbal ML"~10
OR " footbal machine learning"~10 OR " footbal deep learning"~10 OR " soccer AI"~10 OR " soccer
artificial intelligence"~10 OR " soccer ML"~10 OR " soccer machine learning"~10 OR " soccer deep
learning"~10 OR "future sport AI"~10 OR "future sport artificial intelligence"~10 OR "future sport ML"~10
OR "future sport machine learning"~10 OR "future sport deep learning"~10 OR "future footbal AI"~10 OR
"future footbal artificial intelligence"~10 OR "future footbal ML"~10 OR "future footbal machine learning"~10
OR "future footbal deep learning"~10 OR "future soccer AI"~10 OR "future soccer artificial intelligence"~10
OR "future soccer ML"~10 OR "future soccer machine learning"~10 OR "future soccer deep learning"~10
OR "current sport AI"~10 OR "current sport artificial intelligence"~10 OR "current sport ML"~10 OR "current
sport machine learning"~10 OR "current sport deep learning"~10 OR "current footbal AI"~10 OR "current
footbal artificial intelligence"~10 OR "current footbal ML"~10 OR "current footbal machine learning"~10 OR
"current footbal deep learning"~10 OR "current soccer AI"~10 OR "current soccer artificial intelligence"~10
OR "current soccer ML"~10 OR "current soccer machine learning"~10 OR "current soccer deep
learning"~10 OR " sport AI"~10 OR " sport artificial intelligence"~10 OR " sport ML"~10 OR " sport machine
learning"~10 OR " sport deep learning"~10 OR " footbal AI"~10 OR " footbal artificial intelligence"~10 OR "
footbal ML"~10 OR " footbal machine learning"~10 OR " footbal deep learning"~10 OR " soccer AI"~10 OR
" soccer artificial intelligence"~10 OR " soccer ML"~10 OR " soccer machine learning"~10 OR " soccer
deep learning"~10
```



4th Quid search

We used the previous Quid search but we focused on this specific cluster: Predict Recovery Time, to find examples of applications for maintaining player health.



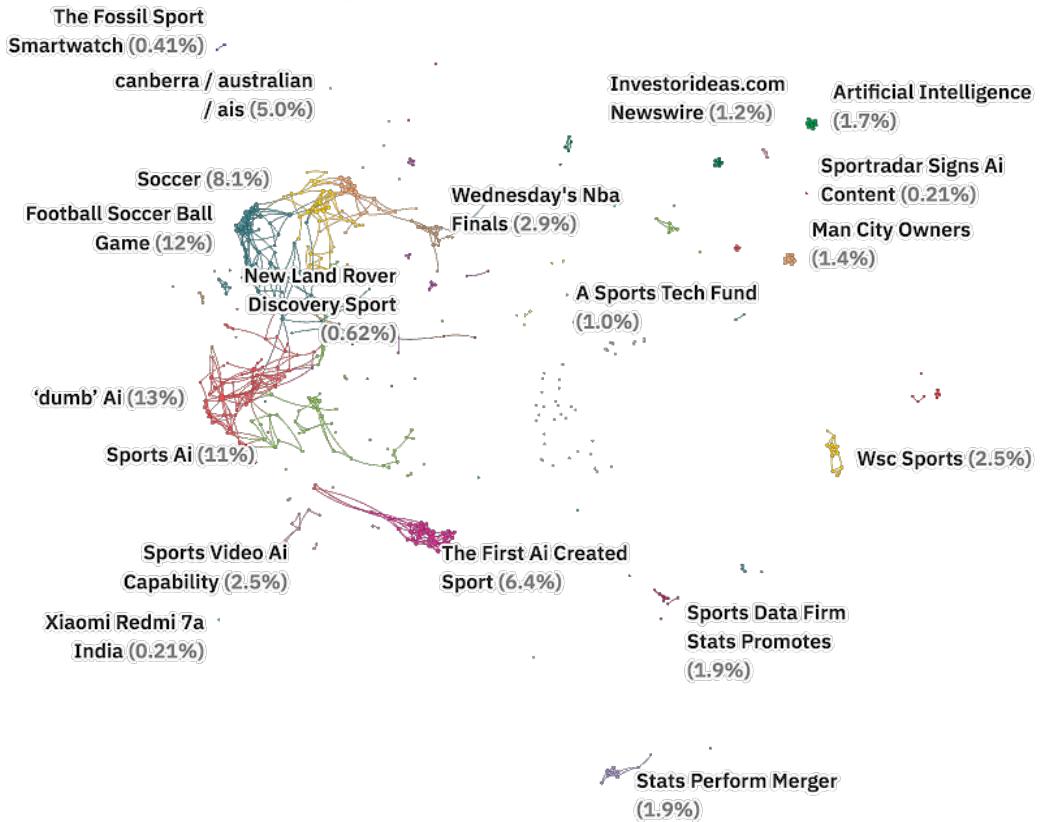
This map helped us find articles and extract 14 examples of applications in one of our main categories: maintaining player health and fitness in sports.

Maintaining player health and fitness	
1	tracking overall health of the player in football
2	nfl injury aws in american football
3	manage the 'load' on players-GPS and Glonass
4	prevent concussion
5	Nutrition after workout
6	predict injuries before they occur in football using ML
7	AI in baseball
8	AI in swimming
9	AI in basketball
10	player profile/injury
11	use of AI to carry out physical tests using swarm AI technology
12	wearable technology-track players' movements and physical parameters during practice to help them keep track of overall player health-identify the signs that are indicative of players developing musculoskeletal or cardiovascular problems
13	decide when an athlete can return to the game after a head injury.-to predict recovery time from sports-related concussions
14	help guide them to know when it's enough and to stop- 3DIMO- o alter players' training routines and keep them fit using athlete-specific biomechanical data.-reducing the recurring costs-detecting injury risks

5th Quid search

We wanted to start dividing our examples. To do that, we start creating different tags.

Our first tag: soccer

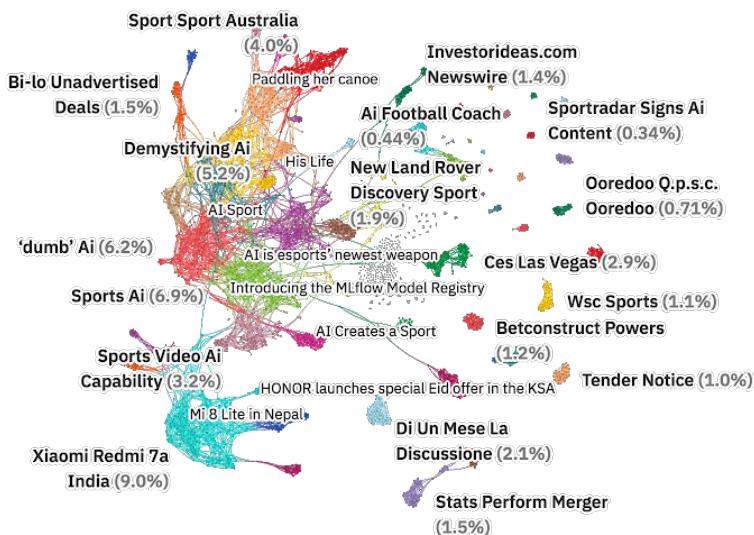


This output helped us find examples of AI in soccer. This tag contains 484/3262 stories.

6th Quid search:

We used the previous search but this time with another tag in order to identify examples of AI in sport.

Our tag: sport



This output contains 2970/3262 stories.

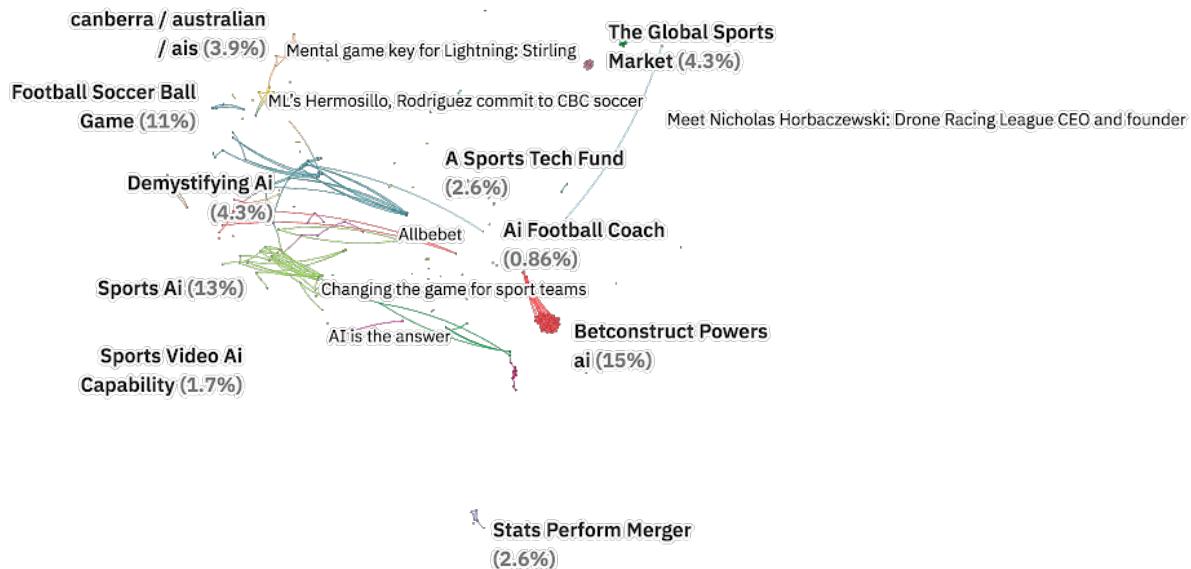
This map helped us find articles and extract 11 examples of applications of AI in sports.

	Technology
1	Cricket win for England
2	predict the outcomes of football matches-expected goals (xG) model
3	A sport made completely by AI
4	teach AI how to think and make split-second decisions on the go-imitation learning
5	Cricket Aussie Algorithm
6	ai in future
7	AI in swimming
8	breakdown of data
9	state of data analytics in sport
10	how data is changing sport industry
11	use of AI by MLB to offer a greater number of real time statistics to fans-baseball

7th Quid search

We used the previous search but this time with another tag, to find examples in our main application categories of AI.

Our tag: scouting OR recruiting



This output contains 233/3262 stories.

This map helped us find articles and extract 13 examples of applications in one of our main categories: scouting and recruiting in sports.

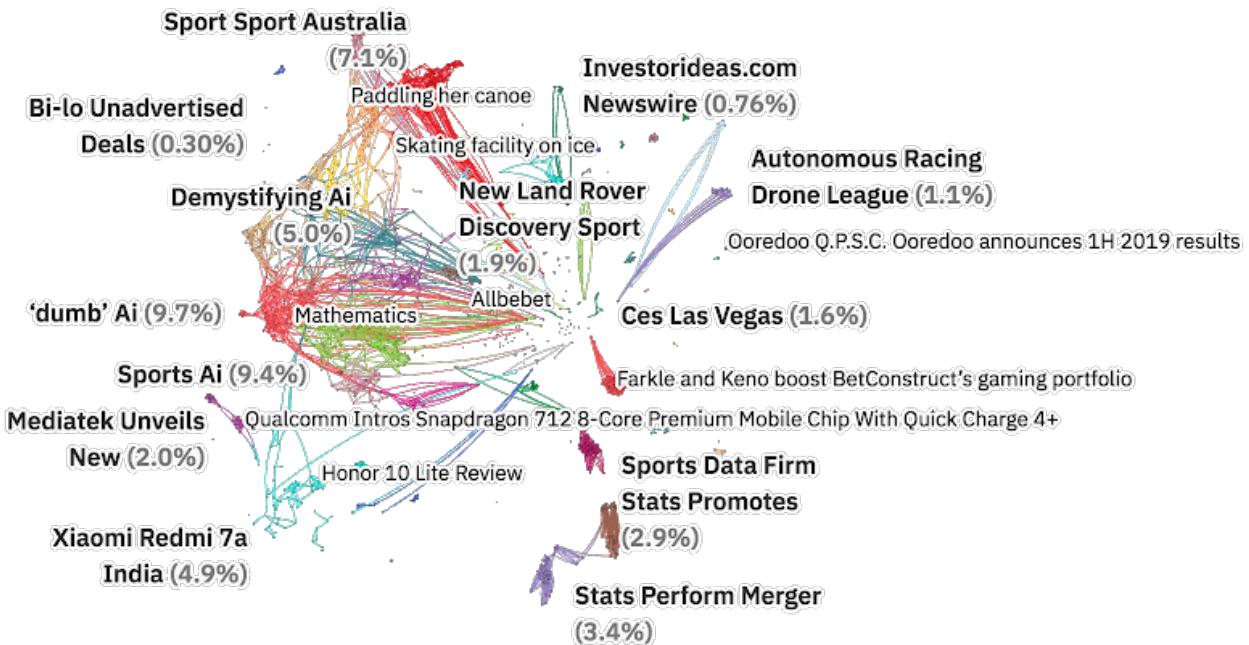
	Scouting and recruiting
1	U.S. women's soccer team
2	zdnet eng
3	scouting
4	recruitment
5	college football recruitment
6	Italian team finding young talent
7	Chelsea/ Loughborough Uni
8	Isthmian League Premier Division's Wingate & Finchley FC-AI coach- from GreenShoot Labs- learn from the games and become better and better at dealing out specific tactics- 2 nd use- predict when replacements should be made
9	use historical data to predict the future potential of players before investing in them
10	estimate players' market values to make the right offers while acquiring new talent.

11	recruitment process
12	use of AI for scouting and recruitment
13	use of AI by Liverpool club to find new players

8th Quid search

We used the previous search but this time with another tag in order to identify examples of AI in training and performance, an useful application in sport.

Our tag: training OR performance



This output contains 1324/3262 stories, which is why this is our biggest category. The most applications of AI are in training or performance.

This map helped us find articles and extract 43 examples of applications in one of our main categories: training and performance in sports.

Training and performance	
1	AutoSTATS Ganguly POSE tech in basketball
2	Openpose in basketball
3	statsperform gk in football
4	Zebra in NFL in American football
5	use of AI to check out rivals and analyse player performance in football
6	Amazon data NFL in American football
7	AWS NFL in American football
8	the team can access data from Opta's Pro Portal at half-time
9	impact of data on performance
10	case study for Chelsea
11	NFL team
12	AWS MLB in baseball
13	data to improve basketball players
14	Football AI app-betting tips-analyzing form, past meetings, squad quality and injuries; predicts the outcomes of the games
15	Hazard in football
16	seedorf w/ VAR in football
17	AI in the olympics
18	NBA Homecourt
19	Baseball players improve pitches

20	develop a training program that better prepared players for the rigors of the 34-game season
21	Olympics
22	tennis prediction
23	man city real time data-football
24	training in football

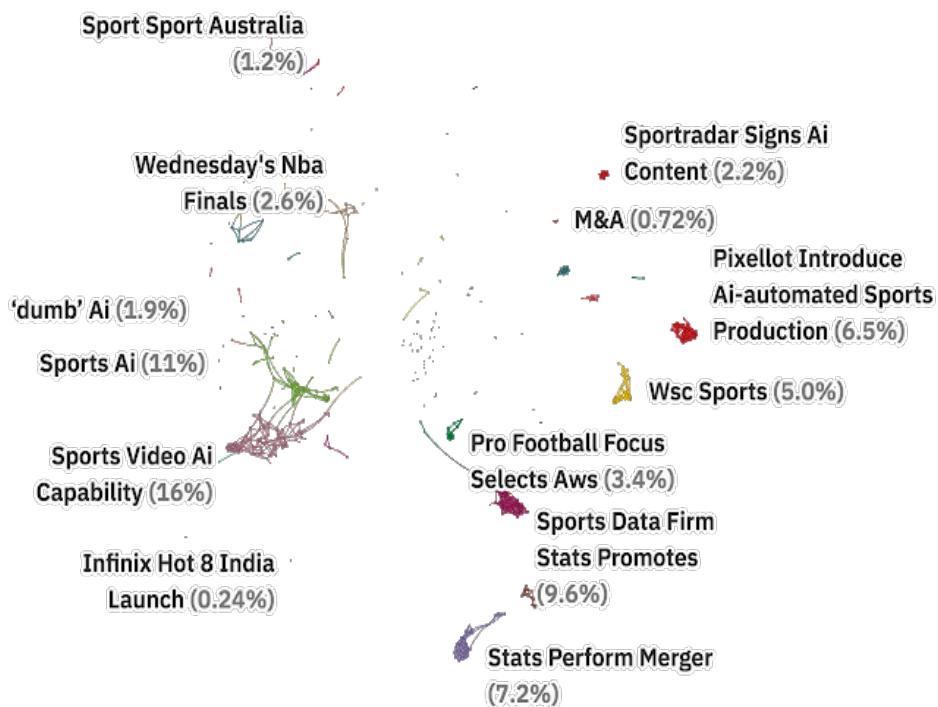
25	training
26	Athlete monitoring OM - video
27	analysis of players
28	ncaa intel keemotion in basketball
29	predicting games
30	performance tactics
31	assigns numerical scores to everything that happens to everyone-video tracking
32	measure the performance of individual players independent of the actions of other players-computer model
33	predicting games
34	performance improvement
35	performance tactics
36	Leatherhead FC -Watson technology by IBM-ask questions: searching for recent shots on target by the club's strikers-2nd use: all the video clips recorded by IBM at games, alongside key data points.
37	Isthmian League Premier Division's Wingate & Finchley FC-AI coach- from GreenShoot Labs- learn from the games and become better and better at dealing out specific tactics-1st use : predict the best formation and style of play against a given opponent
38	computing performance
39	use of AI to provide better training in tennis

40	Leatherhead FC -Watson technology by IBM- 1st use: analyse Leatherhead's opposition-players and tactics
41	use of AI to allow batters to practice
42	use key performance indicators of forwards or offensive players are different from those of midfielders (creative players) and defenders (defensive players) to measuring those variables to predict the corresponding qualitative value of players.
43	identify patterns in opponents' tactics, strengths and weaknesses

9th Quid search

We used the previous search but this time with another tag in order to identify examples of AI in broadcasting and advertising, an useful application in sport.

Tag: broadcast OR advertising



This map helped us find articles and extract 21 examples of applications in one of our main categories: broadcasting and advertising in sports.

	Broadcasting and advertising
1	IBM successfully taught the Watson supercomputer to better recognize player emotions and crowd noise to help screen through video clips and identify key moments of the tennis tournament, which it was then able to serve up via its AI highlights solution
2	quantifying how many times a brand logo appears over a season's worth of TV, online and across other mediums-image recognition
3	virtual assistants to respond to fan inquiries across a wide range of topics including live game information, team stats and arena logistics-facial recognition
4	virtual assistants to respond to fan inquiries across a wide range of topics including live game information, team stats and arena logistics-AI "chatbots"
5	expand their sports coverage capabilities-Automated journalism
6	automatically choosing the right camera angle to display on the viewers' screens

7	automatically provide subtitles for live events in different languages based on the viewer's location and language preferences
8	identify the right opportunities to present ads based on crowd excitement levels in sporting arenas
9	Fans watching the same live stream or archived video can be served ads based on their personal preference and behaviour
10	The San Francisco Deltas, a new soccer team, is believed to be trying to leverage AI to improve fan engagement
11	logistics powered by AI can impress both participants and the fans
12	advertisers would be recommended time slots where their ads, if displayed, could earn optimum engagement.
13	tennis zdnet
14	bundesliga loc video-football
15	J.League w/ WSC Sports-football
16	tennis insights for fans
17	automatically choosing the right camera angle to display on the viewers' screens
18	automatically provide subtitles for live events in different languages based on the viewer's location and language preferences
19	identify the right opportunities to present ads, enabling broadcasters to effectively utilize monetization opportunities through ad sales

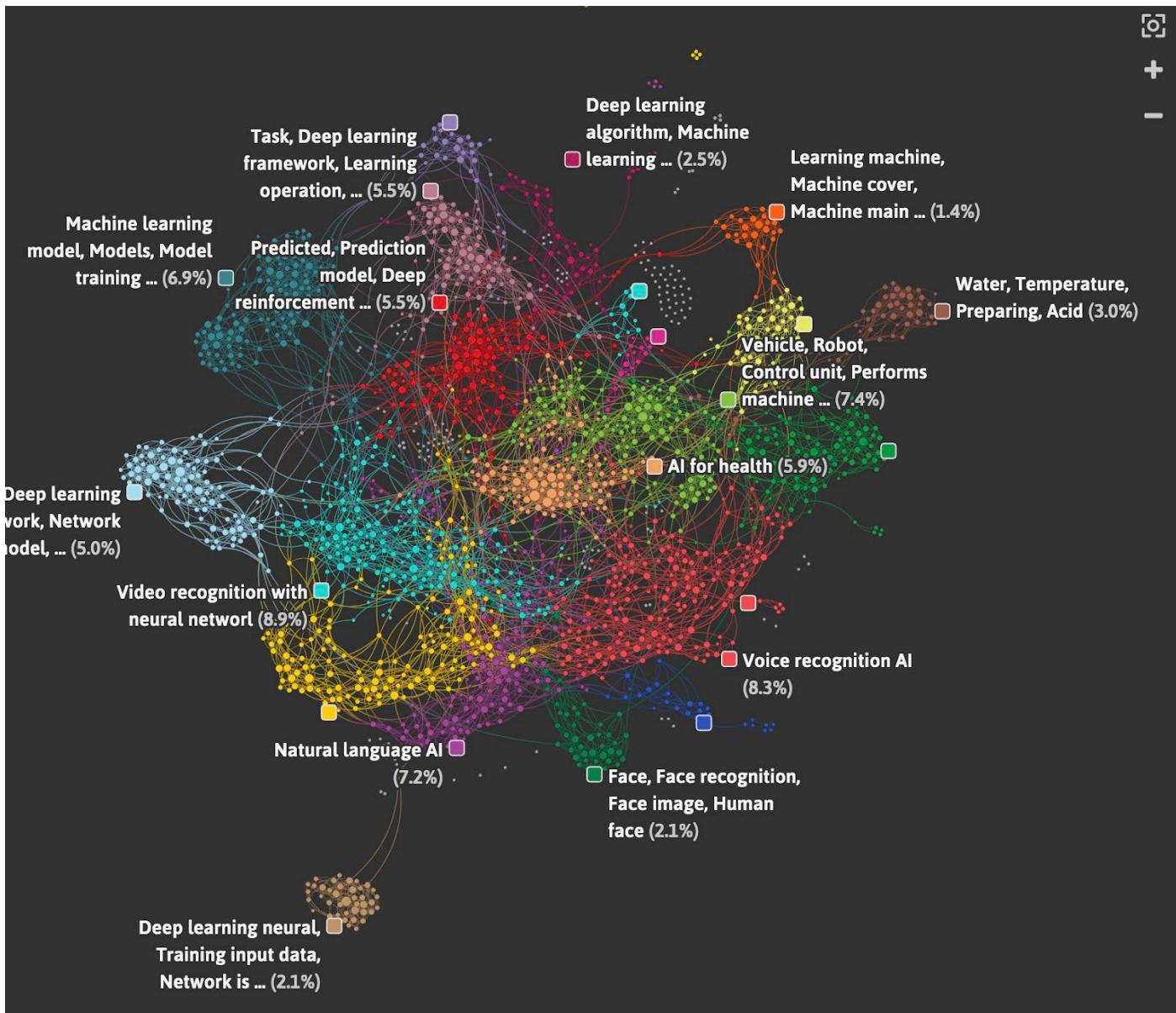
20	use of data by Wimbledon to create highlight reels for each match-tennis-IBM's watson
21	enhance fan experience-augmented vision

10th Quid search

We used Patents database to see which AI area has seen more patent activity in the last 5 years.

Query:

```
" AI"~10 OR " artificial intelligence"~10 OR " ML"~10 OR " machine learning"~10 OR " deep learning"~10
OR " footbal AI"~10 OR " footbal artificial intelligence"~10 OR " footbal ML"~10 OR " footbal machine
learning"~10 OR " footbal deep learning"~10 OR "future AI"~10 OR "future artificial intelligence"~10 OR
"future ML"~10 OR "future machine learning"~10 OR "future deep learning"~10 OR "future footbal AI"~10
OR "future footbal artificial intelligence"~10 OR "future footbal ML"~10 OR "future footbal machine
learning"~10 OR "future footbal deep learning"~10 OR "current AI"~10 OR "current artificial
intelligence"~10 OR "current ML"~10 OR "current machine learning"~10 OR "current deep learning"~10 OR
"current footbal AI"~10 OR "current footbal artificial intelligence"~10 OR "current footbal ML"~10 OR
"current footbal machine learning"~10 OR "current footbal deep learning"~10 OR " AI"~10 OR " artificial
intelligence"~10 OR " ML"~10 OR " machine learning"~10 OR " deep learning"~10 OR " footbal AI"~10 OR
" footbal artificial intelligence"~10 OR " footbal ML"~10 OR " footbal machine learning"~10 OR " footbal
deep learning"~10
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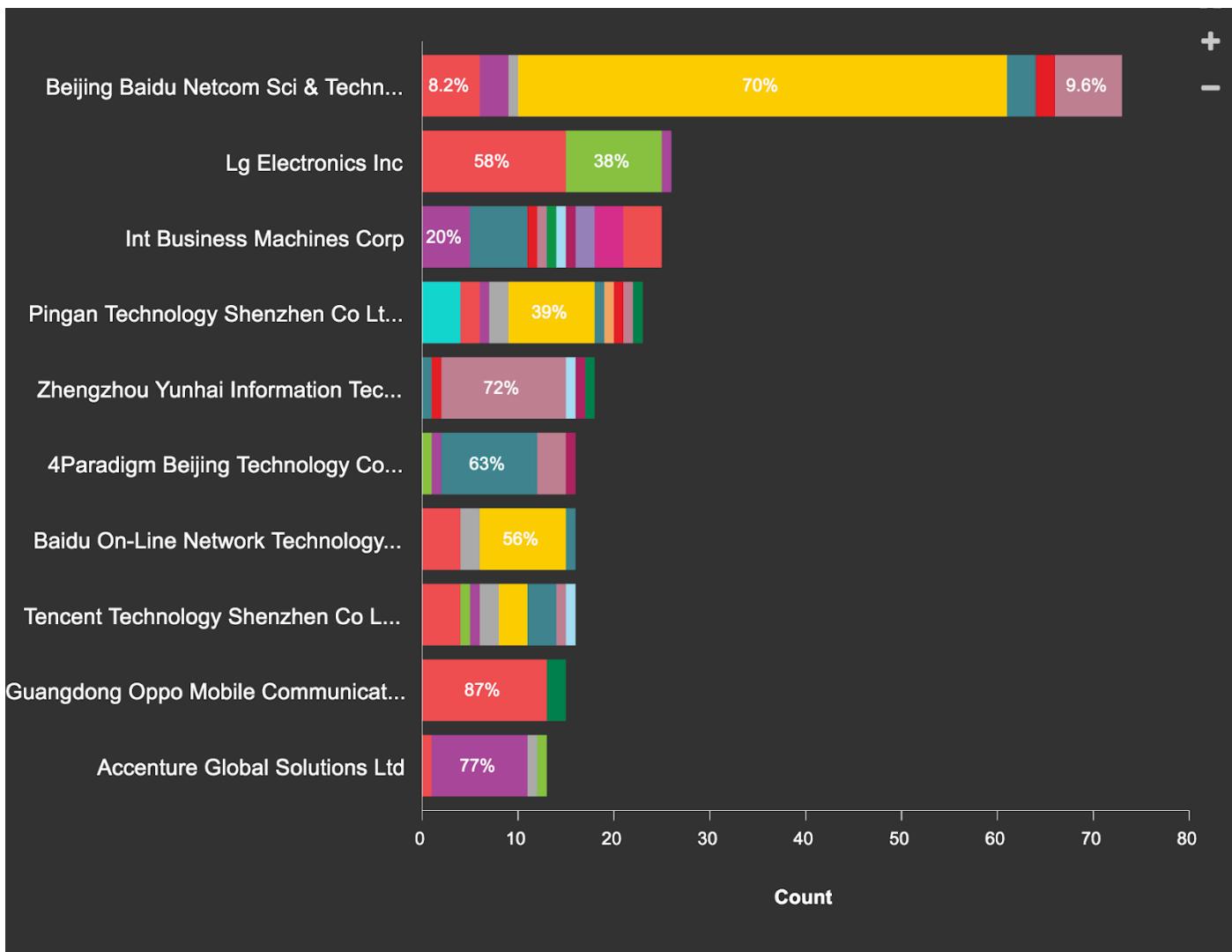


We renamed a few clusters for better visibility and found 2 more examples for Broadcasting and Advertising:

Broadcasting and Advertising	
1	based staff emotion monitoring method
2	method for analyzing and planting advertisement of video image by using AI technology, involves reporting play record of best matching advertisement to distribution system, and implanting best matching advertisement in real time

11th Quid search

We used the previous query, but changed it as a bar view showing top 10 companies in AI patents. We wanted to see which company filled the most patents in AI and in which sector. The sectors are visible in the previous view.



We found 3 examples of patents in AI:

1	Beijing Baidu Netcom Science Technology Co Ltd has the most AI applicable in sports patents in the last 5 years
2	LG Elecotronics Ink has the most patents (58%) in deep learning and predicting in the last 5 years
3	Accenture Global Solutions Ltd has the most patents (77%) in natural language processing in the last 5 years

INTERVIEWS

Nneile Nkholise

Nneile Nkholise is the founder of 3DIMO, the start-up which created one of the technologies we use for our main applications. We approached her to get a better understanding of the technology which can predict injury on football players.

This is our interview:

1. Did you sell your product to football teams? If yes, which teams and what was the impact? (injury reduction rate)

We have not been commercial with our products as we are currently in beta stages and have done pilots with football clubs in South Africa. We will be relocating to the Netherlands and when commercial will be deploying most of our products to clubs in the Netherlands and also looking at neighbouring countries.

2. Did you sell your product to Chelsea F.C.?

We have not sold any of our products to Chelsea as yet, we have however been doing research study on injury impact on Chelsea football club. There are 3 layers to our business, we do research, customized services and product development. Most of our business growth in the past year has been from our research and we support a number of football clubs with research support for them to better make informed decisions.

3. What is the price of buying your product?

The stress sending wearable comes as a pack of 4 and it is priced at \$ 900 - that includes all the accessories and our mobile App

4. How does the analysis work? (What data of players you collect and what do you exactly predict)

The wearable picks up the change in capacitance, contact force which combining some of the player's physical data (mass), we can compute the stress generated around the joint angle during contact and from then can predict injury risk by doing a ration of that stress versus the allowable stress at the joint of that player. We don't primarily tell that an injury has occurred, we just predict injury risk and give the club's medical team the power to conclude an occurrence of an injury or not.

5. Any other information you consider is helpful for the report

Apart from injury information, we give off some data of player's performance in our web-based application (please see picture below)



FEEDBACK

Our Team's Feedbacks	Other Teams' Feedbacks
<ul style="list-style-type: none"> More precise categories and sub-categories 	<ul style="list-style-type: none"> Metropolitan Police → good mind maps, and breakdown of AI using a timeline.
<ul style="list-style-type: none"> Added technology performance and performance characteristics 	<ul style="list-style-type: none"> Sainsbury's → keeping applications relevant and updated, and not going beyond 2016 as well as predicting too far in the future.
<ul style="list-style-type: none"> Quantified the Business Model Canvas 	<ul style="list-style-type: none"> Tower Hamlet's Council → to not get lost in our applications, must be relevant to our organisation.
<ul style="list-style-type: none"> Redo the Key Challenges 	

TEAM FEEDBACK

Organisation:	Chelsea F.C.
<p>Organisation</p> <p>1. The report should include a Business Model Canvas for the organisation (which can be included in the Appendices). A good answer will demonstrate a clear understanding of each element and be supported by appropriate quantitative and qualitative information. The analysis of the organisation should identify the key challenges that the organisation faces. A very good or excellent answer will include information from multiple sources and demonstrate clear connections between the information included and the logic and analysis of the report. It should also identify any regulatory issues relevant to the organisation.</p>	<p>The report includes a BMC before and after the potential impact. The explanation of each element is included in the appendix with a SWOT and PESTLE analysis. It also analyses key challenges from multiple sources.</p>
<p>Organisation – Rating (0-10)</p>	<p>7.5</p>
<p>Technology</p> <p>2. The report should include an analysis of how data, analytics and artificial intelligence is developing over time and how fast. A good answer will include a clear identification of relevant technology components, and an identification of key performance characteristics and timeline for at least one technology component. A very good or excellent answer will include an identification of key performance characteristics and</p>	<p>The report includes the analysis of how fast data analytics and AI is developing overtime with explanation of each category and timelines for both data analytics and AI. It then explains how fast data analytics and AI is developing in football specifically. It includes a table of key technology components and the performance characteristics (full breakdown is in the appendix). It then</p>

timeline for multiple components and will link these performance characteristics to the application categories.	links key challenges of Chelsea to performance characteristics of technology components to application categories to explain the examples we focused on in the application.
Technology – Rating (0-10)	7
Applications 3. The report should include an analysis of potential applications of data, analytics and artificial intelligence relevant to the organisation, based on the example applications identified. Relevant existing application "maps" created by leading consulting firms/analysts should be identified and included in the report. A good answer will include a clear breakdown of potential applications into application categories and an identification of the type of analytics required and details of the type and scope of data required for at least one application category. A very good or excellent answer will explore the data required in more detail, exploring the characteristics of the data (volume, variety, velocity, veracity), identifying different levels of data that are currently/could be available, and linking the performance of the analytics to the levels of data available.	The report includes a categorization of our 100 examples in 6 categories and 13 subcategories. We explained two categories and 3 examples in more detail, focussing on factors such as performance characteristics for data exploring the 4 vs, and for other technology components in the application categories, using timelines. We also talked about the analytics required, how the technologies work, and the economic factors of applications. Moreover, we have found more information on our examples conducting interviews with one company's founder and one's employee.
Applications – Rating (0-10)	8
Impact 4. The report should include an analysis of the impact of data, analytics and artificial intelligence. A good answer will include an analysis of the impact of at least one application category and will link the impact clearly to the elements of value. A very good or excellent answer will include an analysis of the impact of multiple application categories and will include some analysis to try to quantify the scale of the impact.	The report identifies the potential impact of two applications, backed up by quantitative data. The examples are linked clearly to the elements of value, both B2B and B2C. We visualized our data on graphs and mind maps. Moreover, we showed the overall potential impact on Chelsea FC by making a new business model canvas and comparing it to the original one.
Impact – Rating (0-10)	7
Quid	The report includes 11 quid outputs in 3 databases. We used advanced queries,

<p>5. The report should include evidence of how the Quid Intelligence Platform has been used to conduct the research for the report. A good report will demonstrate appropriate searches of at least two databases (companies and news) and include appropriate Quid outputs in the main report and in the appendices. These outputs should demonstrate the ability to frame appropriate queries and carry out key Quid analysis tasks, e.g. relabelling clusters. A very good or excellent answer will record the question(s) that were being explored, show the iteration of queries used, and demonstrate a wider range of Quid analysis tasks. It is expected that detailed examples of the Quid analysis carried out will be included in the Appendices.</p>	<p>relabelled clusters, used tags to categorize the articles. We described the purpose and the findings for each quid output.</p>
Quid – Rating (0-10)	8
<p>Logic</p> <p>6. The report should demonstrate independent critically argued opinions, based on data and expert opinion.</p> <p>A good answer will include multiple sources to support each conclusion and not base its conclusions directly on one source. A very good or excellent answer will demonstrate critical judgement on the choice of sources and the ability to draw conclusions based on incomplete and/or contradictory information.</p>	<p>The report includes multiple sources to backup each argument and analysis based on consulting firms such as McKinsey, PWC, Deloitte and Forbes. The choices for application are based on an analysis of Chelsea's key challenges and the performance characteristics of the technology components in a table which is in the technology section.</p>
Logic – Rating (0-10)	7
<p>Structure</p> <p>7. The structure you use for the report should reflect both the intended audience and the purpose of the report. All sources used should be identified and included in a reference list (included as an Appendix).</p>	<p>The structure is as followed:</p> <p>1)Organisation which includes an overview of the Chelsea with key challenges and a Business model canvas with all elements explained in the appendix with SWOT and pestle analysis. 2)technology which describes each element of technology with timelines 3)application which explains potential examples that Chelsea could implement 4)impact is quantified with B2B /B2C elements of value with a BMC which explains both negatives and positives of each impact based on applications The report also includes the iteration of our quid searches in the appendix. The report includes a reference list based on the alphabetical order in the appendix.</p>
Structure – Rating (0-10)	8

Overall Mark (%)	73
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