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The future of intangible asset valuation for football clubs and analysis of current practices

Marc Arnau Navarro

Under the supervision of Professor Han Wu

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INTRODUCTION

This master thesis dives into the current accounting methods used in the football industry to value the clubs' intangible assets, which are the players themselves. As it has been stated in the extensive literature review, the historical cost accounting used nowadays -which amortizes a player's transfer fee over the years of contract- does not represent the real value of players nor their capacity to generate profits.

Solving this issue is important for several reasons: Firstly, financial statements should give an accurate view over how a club is performing based on the value of its assets, which currently doesn't happen, and this can mislead investors into thinking that management is doing a poor job at running the club. Secondly, it can negatively affect Financial Fair Play regulations and can generate misleading profits from player transactions liable for capital gains fraud. Finally, it negatively affects the capitalization of clubs who rely on youth teams and free transfers compared to heavily spending clubs.

Additionally, the research shows that alternative valuations like Transfermarkt are biased guesses which should not be referenced by clubs, which distort the negotiation processes, and sometimes create a "self-fulfilling prophecy" effect. Other methods of valuation like using videogame stats like those of EA Sports' FIFA have also been proven useless. Stats-based methods like using event data such as goals scored or assists proves to be too scarce in size to provide a full understanding of how a player and his/her team perform on the pitch and consequentially what is their value. Other more complex event data related metrics, like xG or xA, are a recent improvement in the understanding of player and team performance in certain game actions compared to the rest of players/teams in similar game actions, and while they create a larger and more complete database, they still do not manage to describe the interactions between different players in the game, as well as non-ball related actions like runs behinds the defence.

This is why this thesis proposes to use tracking data -which captures player movement, orientation, and other metrics several times per second- as the foundation to truly understand the performance of players, which arises an important question: How can we translate performance on the pitch to monetary value?

I propose that this should be done through the Goals Added metric: Goals Added is the right metric to use because a team's objective at the end of the season is to get the maximum number of points, and this is done by scoring more and conceding less (i.e. maximizing the goal difference). Goals Added consists of translating every action of the game (a pass, a run, a tackle, a cross...) into a measure of how much that action increased the probability of our team scoring a goal in a possession or how much it decreased the other team's probability of scoring. Goals Added is derived from tracking data, and it is especially interesting because it translates a cloud of statistics like pass accuracy, speed, area controlled, etcetera, into a single variable, finally allowing us to compare player performances in the same way that we'd compare two company's profits using a

currency. With this in mind, if a player has a higher number of Goals Added than another, it will mean that it has a higher value. So, the solution to player valuation is that clubs and/or federations use Goals Added as a performance measure and apply a Goals Added to currency (€, \$...) conversion.

Following this intuition, I wanted to check several things: Firstly, if event data related metrics such as xG, xA and others, had a relation with Transfermarkt values at individual player level. In other words, I wanted to see if there was a trend which proved that objective data could value players similarly to Transfermarkt with the aim of “decoupling” from biased estimates. The results showed that while there was some explanatory value when adjusting for player position, it was not enough to accept event data related metrics as a decent proxy to model Transfermarkt, whether it is because Transfermarkt is biased or because these metrics don’t fully gather all of football’s complexity.

Secondly, I wanted to see if Transfermarkt team values over seasons 12/13 to 20/21 performed better than Book Values at predicting Total Profits and Operational Profits (before player trading). The analysis also took in account the COVID 19 pandemic. As expected, Transfermarkt values did a better job than Book Values (even though they are greatly correlated) at predicting Operating Profits but was still far from explaining the majority of variance ($R^2 = 0.25$). Total Profits were too skewed by on and off-pitch investments to be relevant. This proves that Transfermarkt valuations are not a precise option to predict future Operating Profits.

Finally, I wanted to understand how these issues (player valuation and its consequences for a club) were perceived by football fans, studying the very relevant case of F.C. Barcelona financial crisis which exploded in the season 20/21. I interviewed 17 socios of the club in four different blocks: Current Events; Socio Awareness of Financial Statements; Player Valuation & Current Regulations; Financial Engineering & Club Governance.

The results were very interesting. In general, the socios didn’t pay much attention to the financial statements of the club, assuming that the board would be capable enough of handling any potential problems, as this socio said: *‘I vote for a president who chooses a board that should be competent enough to handle these things. I have my share of blame for putting such a bad president [Bartomeu] and board in place, but my job is not to look at financial statements [...] I do not have a financial education and cannot tell which numbers are good and which are dangerous, and that’s quite disheartening’*. Regarding player valuations and current regulations, all the interviewees agreed that it was a bad method of accounting: *‘If the best player in history is not an asset for the club, then the system is not just wrong, it’s stupid. Is there really no one fixing this at UEFA?’*. Moreover, many socios agreed that there was a need for more transparency and a better governance system, although they could not point out any specific actions.

LITERATURE REVIEW

The problem with current accounting methods

Under the current International Financial Reporting Standards (IFRS) and the several specific league policies, the procedure to account for a player's registration is carrying it at cost and amortizing over the length of the contract. Purchasing a player's registration right allows the buying club to prevent the player from playing in other leagues or clubs except from its own, and it is common that clubs will enter in negotiations to purchase or sell these registration rights. These negotiations, which are heavily influenced by the years of contract left for the player, commissions, performance on the pitch, etcetera, set a purchasing price that is directly input into the financial statements, but that does not necessary represent the real market value of the player. Moreover, this value will linearly diminish as the years of the player's contract run out, enlarging the gap between its book value and its real market value.

Furthermore, there are some player registrations that do not meet the *IAS 38 Intangible Assets* (International Accounting Standards) requirements and are eliminated from the financial statements, which can dilute their capacity to assess future cashflows (Maglio and Rey, 2017): This is because IAS 38 a) separates players between purchased and internally generated through the academy and b) denies companies of using the revaluation model to compare players' values.

When a player is purchased, it is recognized at cost and immediately capitalized as an intangible asset, but an internally generated player will be expensed over all its research/development phase and will only be capitalized if very strict criteria are met. Even though IAS 38 can allow for an eventual revaluation of intangible assets -purchased and internally generated- if they meet a Level 1 fair value criteria, IAS 38 itself recognizes that is extremely rare, since some assets are so unique that they cannot have a comparable unit (like music, film publishing rights, brands or in this case, football players). Level 1 assets must have a regular mark-to-market mechanism for setting a fair market value, must be reasonably liquid and transparent enough that their fair market value can be calculated. Regarding football players, the price paid for one asset may not provide sufficient evidence of the fair value of another and in addition, prices are often not available to the public.

However, even if a club could prove that an internally generated player is a Level 1 asset, there's a previous step before attempting to value him through a revaluation method: The player must be recognized as an asset before a revaluation can be attempted (IAS 38, para 76), which is a difficult to achieve due to the very strict criteria (IAS 38, para 57) like '*the technical feasibility of completing the intangible asset so that it will be available for use or sale*' which can be a struggle to prove for young academy players, amongst others.

In conclusion, non-purchased players are almost never recognized as intangible assets in the financial statement and as consequence, their capacity to generate cashflows -or more specifically to predict future cashflows- is undermined by the current accounting policies, which affects both the clubs and the shareholders who cannot correctly calculate the true value of the company nor the management's performance.

The three types of player acquisition:

Currently there are three main ways for clubs to acquire players' registration rights:

- **Internally Generated Players:**

This method does not require a transfer fee because the player has been developed through the academy youth teams and it is signed as if it was an out-of-contract player. Therefore, the player will not be recognized as an intangible asset and any related fee from its development will be expensed when incurred. According to IAS 38, the club can eventually recognize an internally generated player as an asset if it can *'identify incremental staff skills leading to future economic benefit from training [...] and expect that the staff will continue to make these skills available to the entity'*. The issue is that usually the club has insufficient control over these expected future economic benefits, preventing the player to become an intangible asset in the books.

- **Registering Free Players:**

Players whose contract has expired and that haven't renewed with their club or that are set free from their contracts are considered as free agents and do not demand a transfer fee. Usually, clubs avoid releasing players under contract, but it can happen if players have high salaries and/or are underperforming (i.e. Arsenal releasing Aubameyang to F.C.Barcelona in January 2022). In the contract negotiation process, there may be the customary signing bonuses which will be recognized as an expense incurred, as well as the discussed salary. Any additional expenditure for training and development will also be expensed in a similar way to the internally generated players.

- **Purchasing Players:**

This method is the most usual and entails the negotiations between to clubs to exchange the player's registration rights for a certain transfer fee, although there are other costs like agent fees and legal fees. All these costs, even the ones that cannot be directly attributed to the player's performance on the pitch, will be capitalized under IAS 38 requirements because they theoretically represent the *'expectations about the probability that the expected future economic benefits embodied in the asset will flow to the entity'* (IAS 38, para 25). One could argue that for a football club the best measure for intangible assets is not the *'expected future economic benefits'* but the performance on the pitch which will eventually lead to those, but this is out of the main scope of this thesis even though it will be briefly discussed later in the literature.

As mentioned before, the contracts for purchased players will be amortised over the contract's life and will be tested for impairment when there are impairment indicators, although impairments for underperformance or minor injuries are not an indicator of impairment for a player's registration rights. This is because an individual player is not a cash-generating-unit (CGU) (IAS 36). A club cannot estimate the recoverable amount of a single registration, because any cashflows generated are largely dependent on the whole squad performance (IAS 36 para 67). Even shirt sales of a specific player are linked to that overall performance, same as sponsorships, ticketing revenues and merchandise. Therefore, an impairment could be done only to the CGU, meaning the whole team.

In the eventual case that a player has a career threatening injury that separates him from the main squad and the management's judgment is that he will not play again, then the club can decide to assess the registration rights for impairment. This is because now the player's cash flows are independent from the main squad.

Consequences of the current method of accounting

Overall, the regulation requirements can lead to a situation where two objectively similar players making objectively similar contributions to a team can have widely different values in the financial statements (Lev 2018): *'The deficient accounting for intangibles—the sweeping expensing of internally-generated intangibles and the inconsistent capitalization of the **functionally similar** acquired intangibles, coupled with the absence of relevant disclosure of intangible investments [...]—indeed causes a serious harm to investors and the economy-at-large'*.

These two similar assets can have different book value because a) one has been amortised over a longer period of time and b) the transfer fees paid were vastly different (or there was no transfer fee at all).

Having such important gaps between the accounting and the market reality -like the difference between the book value vs. market value of an individual player and the different criteria for players valuation depending on their acquisition method which misvalues similar players (Maroun, W at al. 2022)- lead to mismatches that a) negatively affect clubs with a strong youth development strategy in contrast with heavily purchasing clubs with large capitalizations of intangible assets (Lev 2018) and b) can inflate profits due to an undervaluation of the cost of goods sold.

The cost of developing a player is higher in the early years, with no revenues and all the costs expensed, which can generate the impression that the managers are generating low returns (Barker et al. 2021). Moreover, when these development costs need to be financed, the statement of financial position excludes player contracts, making it seem as if their solvency/liquidity are deteriorating (Maroun,W. et al. 2022). For example, in Arsenal's Financial Statements 2018 the club states that *'[...] the net book amount of players registrations will not reflect, nor is it intended to, the current market value of*

these players nor does it take any account of players developed through the [Club`s] youth system` (Arsenal 2018, Note 11). Similarly, in F.C.Barcelona`s Financial Statements 2021, `No training costs for junior soccer players [...] will be capitalized` (F.C.Barcelona 2021, Note 4.1).

In the moment where homegrown players start to perform in the first team, contributing to the global revenue, or are sold to other clubs, the incomes are reported against costs that have been already expensed, which ends up distorting the real profits. Lozano and Gallego in 2011 studied this effect with Sevilla from 1999 to 2008 and found that the profit from the sale of homegrown players could end up accounting for 95-110% of the total intangible assets value of the club, and for 35-45% total asset value for a single period. For the 10-year period studied, Sevilla had an average of 44% non-purchased players in the main squad.

Let`s see how these factors can affect clubs with several hands-on examples. Take now the case of the sale of Neymar Jr. from F.C.Barcelona to PSG for €222m: The Brazilian player had been bought by FCB from Santos for a fee of -allegedly- €57m back in 2013, with a 5-year contract until the summer of 2018. Four years later, in 2017, the club sold him to PSG, with almost four years left on his contract, which would end the 30th of June of 2021 after renewing his contract in 2016. We can make an approximation of his carrying value after amortization in 2017 and check the profit that F.C.Barcelona made by comparing the fee received to the book value of the player. By amortizing linearly over all the years of contract, we have that in 2016 Neymar had a carrying value of $57/5*3=€22.8\text{m}$. This carrying value in 2017, amortised after his contract renewal, would then be of $22.8-22.8/5*1=€18.24\text{m}$. Therefore, the profit earned by this transaction was $222-18.24=€203.76\text{m}$.

It is clear to everyone that the book value of Neymar in Barcelona`s accounts was far away from reality. The actual market value of the player -as per the website Transfermarkt- was of ~€150m at the time of the sale. Even just 4 months later, his market value had already jumped to €180m. The profit from the sale of Neymar Jr. were inflated by inaccurate accounting requirements on intangible assets.

These regulations also impact the way players are amortised when purchased: In summer 2020, Juventus and Barcelona agreed to a swap between Arthur (moving to Juventus for €72 million plus €10 million in additional clauses) and Pjanic (going to Barcelona for €60 million and a maximum of €5 million in additional costs). On paper only €12 million exchanged hands, but the real value is different due to how the accounting regulations work: The incoming player`s transfer fee is spread out over the length of their new contract while the transfer fee for the player sold is immediate income. Juventus bought Pjanic in 2016 for a €32 million fee, and sold it to F.C.Barcelona after 5 years. According to Forbes, despite the apparent €12 million of difference between Arthur and Pjanic, the deal with F.C.Barcelona eventually created capital gains

for Juventus for the value of 60-32/5-12 ≈ **€41.8 million**. Currently, the inflated transfer values are being investigated for a fraud in “capital gains”, even though both transfer fees are fairly close to their Transfermarkt values (€60 million and 45 million respectively).

Another case is the move by Victor Osimhen’s €71.25 million move from Lille to Napoli. In that deal another four players moved to Lille (Goalkeeper Orestis Karnezis, defender Claudio Manzo plus forwards Luigi Liguori and Ciro Palmieri) priced at a combined total of €20.1 million. The four of them were priced at €4.5 million each, and only Karnezis ever managed to play a single match for Lille. The rest were set for a free release the next year, with Palmieri and Liguori playing in the 4th division and Manzo at non-professional level. With the combination of cash payment, performance clauses and the exchange of players, the newly appointed board from Lille realized that out of a +€70million deal the previous management had only extracted a €10 million profit and alerted the French authorities.

As a final example, let’s summarize how the UEFA Financial Fair Play works and how the current methods of accounting can affect it. At the moment, UEFA states that a club cannot spend more than €5M over their revenues over a 3-year-period (excepting some stadium, youth facilities costs, etc) and this number can extend to €30M in the case of highly wealthy clubs.

Imagine that UEFA was comprised of only 10 wealthy clubs and that they each generated €300M of revenue, €180 of payroll costs and €95M of operating expenses. Add in €15M in interest payments and €20M in taxes and suddenly each club operates at a €10M loss annually, perfectly complying with the regulation stated by UEFA. Then if each team (all of them, since this is a closed example) wants to sign a free player, they find themselves out of FFP room to cover the expenses. But now consider the scenario where each team signs a player of one of the other 9 teams and is willing to pay €30M in transfer fees for the player. Everyone transfers a player around, everyone pays a transfer fee and out of the blue each team suddenly doesn’t sit on a €10M loss, but on €10M net income: Each club has logged 30M of immediate income thanks to selling a player and will expense 10M of amortized transfer fee this season, assuming a 3-year contract for the transferred player, improving their profit/loss statement by €20M. By doing the same deal the next year, they’re at €0 breakeven (the +€30M of the sale minus €20M coming two one-year amortization expenses from the transfers). By doing it a third year, they’re back at a €10M loss and compliant with UEFA regulations (€30M of the sale minus three one-year amortization expenses which offset the sale).

This model assumes no growth in payrolls or revenues, but if you keep repeating this to perpetuity or even add realistic assumptions like 6-10% revenue and payroll growth, the capacity to pay larger transfer fees only increases (Tiototal Football, 2020a). Obviously, this is just a simplified model but clearly portrays how a club president struggling to

make the balances work on deadline day might decide to purchase a player and sell another of similar value just to solve the accounting problem the next year. Therefore, a league's accounting incomes can always go up by collectively growing their transfer fees rather than wages, and while the accumulated amortization expenses will go up too, they will always lag behind the increased income. So, as long as transfer fees keep growing, they will generate growing financial positions for the whole system thanks to accounting, and with regulating bodies capping spending based on these same financial positions there is no actual 'fair play'. And as Tiotal Football puts it, this is all before accounting for *actual* economic growth, which can be actually driven by accounting, which feeds the never-ending cycle and reveals the lack of solidity of FFP.

In essence, the current IAS 38 does not fully reflect the link between the player registrations' management and future cash flows, because the financial statements cannot provide a complete account of the intangible assets, and not all the incomes and expenses necessary for understanding performance may be included and matched with associated revenue in the measure of comprehensive income (Barker et al. 2021). This can eventually lead to a cycle that benefits high spending clubs, leveraging their stronger balance sheets to generate cash flows and be able to afford new players. On the other hand, inward looking clubs who take care of their youth teams may find that their comparatively lower intangible asset size will prevent them from raising the same levels of debt and equity to finance their operations as the high spending clubs, ultimately forcing them to scale down their investment in young players for more aggressive market strategies.

Studied alternatives for player valuation and reporting

Historical Cost vs. Fair Value

There are two main knowledge templates that could combine in order to make the accounting of sporting intangible assets better reflect their value:

The historical cost accounting provides information that allows users to judge the managements stewardship over the entity's resources. In this case, reliability and verifiability are prioritized over relevance, and therefore sticks to factors solely under management control. It is focused on the income statement to match incomes with cost allocations, and it only recognizes assets or liabilities in the case that it is probable that future economic benefits will be generated (very much in accordance with IAS 38). The historical cost uses methods like depreciation/amortization to match income and expenses, it is based on past transactions more than in the potential forecasting of future cash flows, since it's deemed too subjective to judge the management's performance.

On the other hand, the fair value accounting knowledge template allows users to assess the future cash flows and value of the entity. On the contrary to historical cost accounting, it prioritizes relevance over reliability and verifiability of information, including effects whether they are or are not under management's control. These factors make it balance-sheet oriented to maximize the assets and afterwards re-assess the liabilities to fair value reporting. There is an element of uncertainty, naturally, with changes in assets and liabilities recognized in the year that they occur. Finally, past transactions are seen as sunk costs that do not add any relevant information, since the emphasis is onto forecasting future cash flows.

W. Maroun et al. (2022) propose a player registration accounting model based on both methods described above, therefore still being compliant with IFRS and current UEFA rules and with enough information for the user to assess the relevance of the actual fair value.

10. Intangible Fixed Assets - Group And Company

	Total
	£'000
Cost	
At 1 July 2019	442,625
Additions in the period	113,082
Disposals in the period	(57,309)
At 30 June 2020	498,398
Amortisation	
At 1 July 2019	178,972
Charge for the period	99,232
Impairment of player registrations	26,324
Eliminated on disposals	(33,698)
At 30 June 2020	270,830
Net book value	
At 30 June 2020	227,568
At 30 June 2019	263,653

Figure 1: Intangible Fixed Assets reporting note from Everton (2019-2020)

Table 8 Reconciliation of player registrations – figures in GBP '000's

Item	Everton		Arsenal		Man-U	
	2015	2016	2015	2016	2015	2016
Closing balance at amortised cost	52 511	69 125	171 658	146 005	238 146	241 724
Add: amortisation expense during the year for unchanged squad	19 534	22 398	55 365	59 257	99 534	94 546
Less: accumulated amortisation of players disposed during the year	(7529)	(7054)	(32 780)	(18 089)	(80 075)	(55 495)
Add: disposals at cost	7683	10 370	34 693	19 897	97 881	124 460
Less: additions at cost	(38 026)	(42 328)	(113 950)	(35 412)	(150 914)	(167 089)
Opening balance of player registrations at amortised cost	34 173	52 511	114 986	171 658	204 572	238 146
Adjustment of opening balance to get to its fair value	67 741	89 259	201 342	189 018	156 161	110 890
Opening balance at fair value	101 914	141 770	316 328	360 676	360 733	349 036
Additions at cost as per Transfermarkt	34 140	40 305	99 230	24 695	127 833	124 270
Contract extensions capitalised	-	-	-	10 717	-	42 819
Development and training costs	-	-	-	-	-	-
Fair value movements of unchanged squad	10 493	28 947	(15 407)	26 258	(45 422)	(22 419)
Fair value movements of additions (day-1 gains)	(1797)	1775	(8280)	(9310)	(28 383)	(27 370)
Fair value movements of disposals	43	(430)	430	(170)	(4080)	-
Less: disposals at fair value	(3023)	(6546)	(31 625)	(7103)	(61 645)	(115 568)
Closing balance at fair value	141 770	205 821	360 676	405 763	349 036	350 768

Figure 2: Application of the W. Maroun et. al (2022) proposal for Everton, Arsenal, and Man-U for the seasons 2015 and 2016

They propose that player registrations are amortized over their contract length (as it's required now) but that at year-end they are re-measured to fair value through profit or loss. In the case that a player is sold during the year, the re-measurement to fair value would be done on the transfer date. Naturally, the difference between fair value and player registration's selling price would be recognized in profit or loss and disclosed separately in a note. Since this extra piece of information can be disclosed as a note and it will be audited, it will increase the credibility of the fair value (closing the gap between relevance and reliability).

Table 7 Analysis of management's player realisation strategy (figures in GBP 000's)

Item	Everton		Arsenal		Man-U	
	2015	2016	2015	2016	2015	2016
Profit / (loss) on sale of player registrations (per IAS 38)	3311	7815	28 944	2047	30 813	(9786)
Cost of disposed players	7683	10 370	34 693	19 897	97 881	68 965
Accumulated amortisation on disposed players	(7529)	(8732)	(32 780)	(18 089)	(80 075)	-
Proceeds on sale of players	3465	9453	30 857	3855	48 619	59 179
Proceeds from sale of players as per Transfermarkt	3465	10 540	21 430	2980	39 160	85 920
Costs to sell	-	(1087)	-	-	-	(26 741)
Add on proceeds received	-	-	9427	875	9459	-
Fair value of players disposed at date of disposal	(3023)	(6546)	(31 625)	(7103)	(61 645)	(115 568)
Profit / (loss) on sale per fair value model	442	2907	(768)	(3248)	(13 026)	(56 389)

For brevity, the split between cost and accumulated amortisation was not presented.
£9452k – £10 540k.
£30 857k – £21 430k.

Figure 3: Difference in profit/(loss) between current accounting methods and the proposed fair value model

In addition, they also propose the disclosure of *Day 1 Gains/Losses*. This is referencing to how the management of the club operates in the market to acquire players. For example, the study shows that Arsenal and Manchester United would have reported Day 1 Losses in 2016. Keep in mind that these clubs often search the market for well established players with large contracts and in consequence they pay a premium for their registration rights. The magnitude of these losses also points at the size of the future excess returns which the two clubs will have to generate in order to offset the cost of these contracts. On the other hand, Everton showed to have Day 1 Gains. This is not surprising, since Everton focuses more on signing emerging unknown players and developing them internally rather than paying outrageous fees. When comparing their transfer values to their fair value, it usually comes up as a gain, generating a return for their investors.

All of this said, this model only works if the fair value of players is regularly adjusted to portray how their potential capacity to generate cashflows has changed over time, rather than deferring eventual gains or losses to the moment where the players are being transferred. Moreover, while it is true that fair value includes volatility in the financial statements which may obscure internal measures of performance (Brousseau et al. 2014; Zhang and Andrew 2014), volatility is not always synonymous with unreliability and 'noise' (Whittington 2008b; Ravenscroft and Williams 2009; Brousseau et al. 2014: 1034). According to IFRS 13, fair value can become a decent indicator of the potential amount that can be obtained from a player's registration, even after considering any degree of volatility or estimation uncertainty, because the fair value reflects the characteristics of the asset being transferred. After all, changes in the fair value are necessarily capturing the changes in the risk-reward of the player contracts which are an integral part of any investment in a club. Moreover, there is nothing preventing a club from calculating internally the fair value of their player's registration to present it later with the total fair value movement at the end of the year (W. Mauron et al. 2022). Clubs could eventually disclose player-specific fair valuations in their financial statements, giving a certain degree of visibility to the management's opinion of the player and how it compares to the market's opinion. This is an interesting thought, because as we all know, players are suited differently depending on the type of playing style and this could affect their internal valuation. Let's give a quick example of this: Donny van de Beek is a Dutch midfielder that grew up as a footballer in the inferior categories of Ajax. After 4 years in the first team, he played an average of 3.306 minutes per season, which is approximately 36 *complete* games per season. Following incredible performances both in the domestic league and in the Champions League (where he was an essential player for Ajax during their semi-final run in the 18/19 season) Manchester United acquired him on September 2, 2020 for €39 million. At the point of the sale, his Transfermarkt value was of €44 million. Sadly, his performances for the English club never have been as notable as for Ajax. Donny van de Beek only played 511 minutes in

his first year despite being eligible for the whole season except for four weeks between February and March due to muscular problems. In his second year in Manchester, he only participated in 8 games for the club, amounting a total of 68 Premier League minutes before being loaned to Everton in the winter market, where he has managed to accumulate 430 minutes in 6 games and become the top passing accuracy player with 84.2% at the time of writing this piece. His market price at the moment has plummeted to €25 million.

While it is arguable that maybe the player has had a sudden decline in ability, it seems unlikely given his reliability at Ajax and his new spell of games at Everton. As Michael Cox (2022) puts it in his piece for *The Athletic*, Manchester United's problems arise from the midfield and the direct style of play. Donny is a player that grew up in an Ajax team under the ball possession philosophy of Johan Cruyff, and he hasn't adapted well to a team that plays against these hard coded tactics in his brain. Therefore, in an eventual fair value disclosure from Manchester United, van de Beek would probably have a much lower price in the financial statements than in the market -or more accurately, than in a team which plays possession-based football-, given that his technical prowess and tactical positioning aren't well suited for how their team is playing at the moment.

This opens a new field of discussion: Is the benefit for shareholders coming from the disclosure of fair value information on individual players offset by the negotiating insight given to other clubs? In my opinion it is, and it is why I believe that clubs should publish only the total fair value movements and not the individual data, which should be used only for internal purposes, but that is out of the scope of this thesis.

Transfermarkt and crowd sourced valuations

Crowd sourcing types and theory

Guessing the value of athletes has been an incredible challenge for a long time, and still is. One of the main reasons is because the evaluation of a player's performance by a coach or a management team is highly subjective, because the player may not fit into the team coach's strategy, he might have personal problems preventing him to be focused on the game or there might be tensions between him and the coach (Herm et al. 2014). In this context, the German community of football supporters started Transfermarkt.de, a free an open website with more than 1 billion views per month (Follow The Money, 2020) for discussion of football and, most importantly, to argue about players' price tag through crowd valuation/crowdsourcing.

This concept has been described as an open call to identify innovative input from non-obvious sources (Jeppsen & Lakhani, 2010). Alternatively, in 2009 Adams and Ferreira compared guesses from individual participants to those of groups of participants and found that decisions were more accurate and more moderate in the groups. As an

explanation, they said *'either groups have to reach a compromise when members disagree or individuals with extreme opinions are less likely to be part of a group'*. Other studies (Charness & Sutter, 2012 and Wolfers & Zitzewitz, 2004) showed that groups produce more rational output than individuals and that crowds perform better when dealing with information aggregation tasks, which is what estimating the value of a player is: The users of Transfermarkt evaluate all the available data and information that they have on their hands and compact it into a single variable output. For this reason, crowdsourcing seems like a decent methodology to predict market values.

There are two different approaches that groups can use to give a final judgment (Schenk & Guittard, 2001). In the *integrative* approach, the group pools input whereas in the *selective* approach the client chooses an input from the different options that the group has provided.

Using these methods, we can calculate the market value of a player by simply calculating the mean or the median of all the suggested crowd inputs on the website. This would be an integrative approach to the problem, very democratic though rather inflexible.

On the other hand, we could use information aggregation applying the selective approach: weighting and selecting certain inputs from the set of options provided by the crowdsourcing. This is a slightly more hierarchic but flexible method to determine market values, called the *judge principle* (Herm et al. 2014). The judge in Transfermarkt can be an 'elder' member of the community, with relevant experience or a record of precise value guesses. This judge could eventually choose to evaluate the player slightly different than what the crowd has chosen as an output and therefore alter its final value using his/her better judgment on a case-by-case basis. Therefore, the judge can effectively eliminate outliers that affect the crowd's average or can attribute a certain weight to different opinions based on the quality of the member of the community (i.e. a member with a past in player scouting or with much experience in value guessing). Finally, judges can correct for biased opinions with hidden interests in the valuations (like sports agents who want to boost their representees or fans that want to plummet the value of a player for an easier acquisition by their favourite club).

These crowd sourced valuations with judges' implication were modelled by Brunswik in 1952, who conceptualized that observers do not rely on all possible data points when making judgments but only on a set of probabilistic cues or attributes. In the model, communities or members (Y_{eA} and Y_{eB}) have to make subjective recommendations in respect to a player's true market value (Y_t). These recommendations are based on a set of attributes (X_i), observable by all but not necessarily considered, and then pass the final suggestion to the judge, who makes the final decision (Y_f).

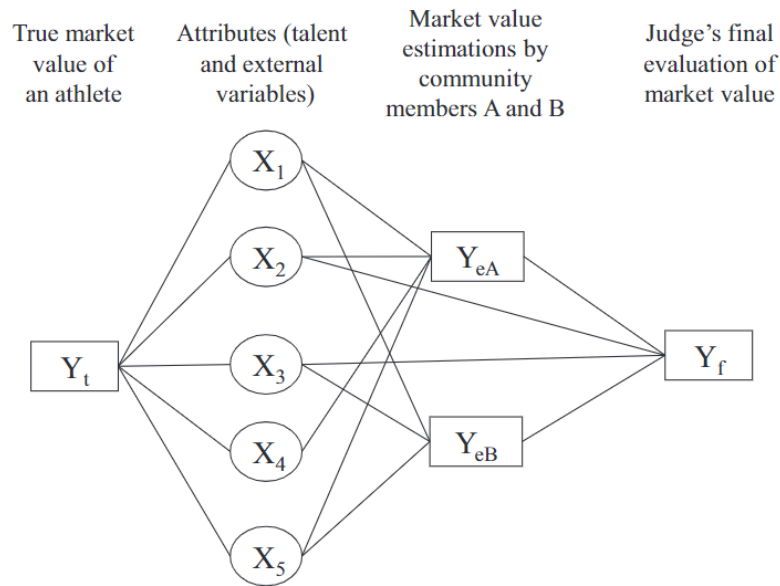


Figure 4: Brunswik's lens model of decision making for team decisions

According to the research on different information aggregation approaches by Bachrach, Graepel, Kasneci, Kosinski, & Van Gael (2012), a selective approach is better than an integrative approach when the crowd is heterogeneous in respect to knowledge and experience. Thus, it seems fair to say that in order to evaluate football players through an online community input like Transfermarkt who is open to any individual, a selective approach with judges' participation should outperform an integrative approach.

As per Transfermarkt's own definition *'the Transfermarkt market values are calculated taking into account various pricing models. A major factor is the Transfermarkt community, whose members discuss and evaluate player market values in detail [...]. Numerous factors [...] calculate market demand for a player [...]. Our goal is to reflect the demand for the player and adjust for special factors/framework parameters in the medium term'*.

Ideally, the judges are able to guess whether a market value is very dispersed in opinions by analysing the discussion threads, basically deciding if the community is sure of a player's value or if there's a dangerous degree of uncertainty. Moreover, the judge's input gains importance for little-known players with a small sample of valuation inputs by the community, similar to a prediction market with low liquidity (Herm et al. 2014). In these cases, the judge's knowledge and expertise in valuations is more valuable than for superstars with thousands of crowd inputs.

In summary, judges perform the filtering, weighing and aggregating information from the community based on the reasons given and their own estimates, making a more organized and flexible method than an average computation of all the market-value

suggestions. In addition, judges in Transfermarkt receive feedback when a player is transferred and the transfer value becomes public, hence allowing for a comparison between the estimated Y_f and the transaction price (remember that the final transaction fee might differ from the market value of the player, Y_t).

Crowd sourcing in Transfermarkt

Given that a priori Transfermarkt's valuations seem robust, they have had a relative success in the sports industry and now have a high economic relevance in transfer and salary negotiations, which is surprising given the statements from the international head of market values of the website himself, Christian Schwarz, after several players and clubs contacted him to complain about certain player valuations: "Clubs shouldn't make transfer decisions based on the figures on our website," he told Follow the Money. "Our method is not scientific". "There is no algorithm or spreadsheet", Thomas Lintz (managing director of Transfermarkt) said. "It is a qualitative approach. We weigh arguments, meet with our moderators, find a compromise". Despite these, Transfermarkt valuations have been cited in the fiscal reports of several clubs including Lyon, Marseille, Porto and Schalke, and former president of F.C.Barcelona, Josep Maria Bartomeu, cited the website (Tribuna, 2020) to justify the sale of Arthur Melo to Juventus for €72 million. Even UEFA used it in a 2016 report, and a court case between player agent Mendes and a consultant for Valencia was thrown out on the basis of Transfermarkt valuations.

One of the main reasons for taking some perspective with respect to Transfermarkt valuations is the previously mentioned conceptual difference between transfer fees and estimated market values. A transfer fee can differ from that value (which ideally should be only related to the performance on the pitch or the capacity of the player to generate cashflows for the club) due to the length of the remaining contract, agent commissions, strategic reasons (like buying a player for a premium to avoid him going to a rival club), bargaining power, etcetera.

Transfermarkt's staff members said they were sometimes contacted by clubs seeking to correct the fees — often never made public — they had paid for players. Transfermarkt staff reports that agents, families and even players themselves often get in touch. Most of the time, though, their "intentions are clear," said Tobias Blaseio, the site's area manager for Spain: "They want to influence their market values" (NY Times, 2021).

Despite these conceptual differences, Herm et al. (2014) found that real life transfer fees are a decent proxy to validate Transfermarkt's online community estimates. The regressions that the researchers did of the estimated market values on the transfers that happened in the German football league 'Bundesliga' during the winter transfer window of season 2011-2012 ($n=67$) showed that these market values explain most of the variance of the actual transfer fees ($R^2=0.90$, $p<0.01$). Therefore, they conclude that

Transfermarkt estimates are related to the actual transfer fees and may serve as predictors, being of great use for sports managers, although there is room for concern in case this is a case of a 'self-fulfilled prophecy'.

Finally, in the analysis of the relevant metrics to predict market value, the researchers used two main blocks: talent-related measures like age, precision, scoring, assertion, and flexibility, combined with external attributes like club management, team coach, sports agent, experts in media and public attention. The results showed that even though talent metrics are an important driver for a player's value, the external factors need to be given more attention, since they also have a large effect on players' market values. In particular, the variables club management (which comprised the sum of market value of all the teammates), experts in media (who provide grades) and public attention (measured by Google hits) have a significant impact, even more so for the top 5% of players in the league, considered the superstars.

That said, Coates and Parshakov (2022) went deeper into the capacity of Transfermarkt to predict market valuations. They state early in their literature review that Herm et al. (2014) analysis is hindered by the small sample size, and that despite raising interesting questions about the integrative and selective crowd sourcing they never fully address them. This was partially taken care of by Müller et al. (2017), who performed a similar analysis but with a much larger sample, agglutinating over 4.000 players from the top five football leagues in Europe over the period of 6 years between seasons 2009/10 and 2014/15. In total they ended up having a sample of 845 players who were actually transferred and for which a comparison to the Transfermarkt value could be made, using a model based on player characteristics (age, height, footedness), performance and skill metrics (goals, assists, passes, dribbles...), and measures of popularity (page views in Wikipedia, Google, Reddit and YouTube). This way, the authors could test their model against Transfermarkt and against real life transfers. The root mean squared error and the mean absolute error were computed for each of these differences, finding that the crowd sourced Transfermarkt valuations had a lower RMSE and MAE than their proposed model by approximately 3.5%. Nevertheless, the writers found that their model actually performed better than Transfermarkt for the lowest 90% of transfers (<€18 million), with Transfermarkt more accurately predicting the top 10% largest transfer fees.

[Fine tuning regressions with large datasets](#)

This difference of performance throughout the value distribution lead Coates and Parshakov (2022) to believe there had to be a better empirical method (i.e. a quantile regression model to allow the influence of a given variable to change depending on the percentile the transfer fee is in). Moreover, they studied the works of Kirschstein and Liebscher (2019) who used data from the videogame FIFA from EA Sports. In their case,

their explanatory variables cannot offer an economic interpretation of their coefficient estimates, so they are forced to rely on the goodness of fit of their model. In their predicted versus actual values, they found important outliers, which were an added mismatch to the undervaluation of players with small market value and overvaluation of players above €1 million.

It is surprising to see that there seems to be a lack of papers studying the relationship between player valuations and Football Manager attributes. Contrary to the videogame FIFA -which is mostly focused on the gameplay controlling the players-, Football Manager tackles the job of a general manager in a club with an outstanding precision. Their player database is so large (much larger than FIFA's in fact) that football clubs across the planet tap into it help them make decisions about players. "We have some clubs that will take every single aspect of data," Sports Interactive's head of business development, Tom Markham, said in an interview for PC Gamer. "One of the Champions League clubs we are working with will evaluate the composition of teams. They'll look back at older data and see what the actual makeup is—I'm talking nationalities, I'm talking characters—and they will use the attributes in terms of their evaluation". "There's another team in the Premier League that uses our data, and all they wanted was height and weight data. We've got clubs that will come to us and they're looking for player earnings and contract expiry dates. We've had Ray Houghton come in when he was working for the FAI, trying to find anyone who had an Irish passport who could potentially play for Ireland". Football Manager has over 1,300 scouts around the world compiling data for the game, with statistics on over 650,000 individuals. Each player has 40 'visible' attributes to the user, but behind that there's another 230 hidden attributes for each player. This massive database is incredibly helpful for professional football teams, as Lutz Pfannenstiel -director of football of Hoffenheim- explained in talkSPORT: In 2011, the German club signed Roberto Firmino from the Brazilian club Figueirense for £3.5million after discovering him in Football Manager. Four years later he would be sold to Liverpool for £30million.

[Crowd sourcing biases](#)

Due to the concerns that the paper published had raised, Coates and Parshakov (2019) decided to study if the crowd-sourced variable is an unbiased predictor of the transfer values or if just produces a guess of the true value which is simply better than some other ways of producing a guess. After all, it has been extensively proved that there is a correlation between the Transfermarkt estimates and actual transfer fees and salaries and the writers wanted to put the actual predictability of Transfermarkt to the test:

The true value of a player is represented by V_p , assumed to be a fixed unknown value. Each M individual sends a guess of the player's value, noted as $S_{ip} = V_p + \delta_{ip} + \epsilon_{ip}$. The guess is therefore the combination of the true player's value plus a measure of bias of

the individual towards the player's value δ_{ip} (in case the guesser has any hidden interest or simply fancies that player for un-sport reasons), plus a random component ε_{ip} . In the end, the overall guess is $S_p = (S_{1p}, S_{2p}, \dots, S_{Mp})$. With a heterogeneous crowd it can also be assumed that there is no correlation between δ_{ip} and δ_{jp} , and between ε_{ip} and ε_{jp} (the larger the correlation, the less diverse will be the crowd's opinions). In addition, the set of guesses S_p will need to be aggregated somehow, so a function $G(S_p)$ will be the operator that makes that aggregation. Coates and Parshakov (2019) argue that this function is commonly a weighted average of every individual signal which -in the case that weights are between 0 and 1, they sum one in total and they are constant, and that the random component ε_{ip} and bias δ_{ip} have a mean of 0 in expectation- would give the expected true value: $E(\sum_i^M W_{ip} S_{ip}) = V_p$

Since Transfermarkt's own description explains that they use judges/moderators who aggregate the different value suggestions and then weight them based on their previous experience or relevance, it is shown by the method's own construction that it is biased and that on average the Transfermarkt values cannot represent the true value of a player.

Even so, football managers and player agents may find important to know whether these biases tend to be higher or lower than the true player worth.

$$bias = \left[E \left(\sum_i^M w_{ip} \varepsilon_{ip} \right) + E \left(\sum_i^M w_{ip} \delta_{ip} \right) \right] \neq 0$$

Finally, there is no way to test the optimality of the weights chosen by Transfermarkt or if these weights improve the accuracy of a simple average.

In conclusion, they found that crowd-sourced metrics tends to underestimate the value of players. Moreover, these are biased estimates. The size of the biases is not constant as they differ from top to lower leagues and across the price range of the transfers. An interesting datapoint found in the results is that an extra year in the contract of a player makes the transfer rise by €643.000 to €953.000.

Overall, the research shows that while a decent proxy, Transfermarkt is still far from being a reliable source of information for clubs.

The rise of event data

So far, we have seen that historical cost accounting is not an ideal method to value football players and some propose that fair value should be used instead, but the calculation of this fair value is not straightforward either, with Transfermarkt and other stats-based data like FIFA being biased, unreliable and incomplete. Therefore, it seems

logical to think that for a player's value to reflect his/her abilities we must look directly at the performances and behaviour on the pitch instead of crowd sourced estimates and other "indirect" measures.

In a similar way that one would value a company based on the expected future profits, football clubs should value players based on the future pitch output. In order to predict this, an initial idea would be to count metrics like past goals, assists, etcetera to get an idea of how this player will keep performing. This though, has an important setback (as we'll see in the next section) and it is that actions like goals scored are very rare and scarce in football, which makes the sample size too small to make any relevant analysis. After all, football is mostly not about shooting a ball in the opponent's box and scoring, but about two teams struggling to move the ball and the players around the pitch in certain ways with the aim of putting the ball closer to the other's goal and preventing the opponent from doing the same thing.

With the objective of better understanding, analysing, and reporting these actions, event data was born. Event data mostly gathers on-ball-related actions like, shots, passes, tackles, crosses, dribbling, etcetera. This data is usually organized in rows together with the position of the player making the actions, sometimes the position of the other players on the pitch, and a timestamp. Data like this has been around since the early 2000's, but it has been after 2010 that it has become a small revolution in the world of football analytics. With such a database, suddenly you can look at goal attempts (like shots) instead of simply goals, you can look at pass accuracy and pass distance, etcetera, allowing for a much larger and rich database. Such a large database allows to look at similar actions -like shots from outside the box with a defender trying to block withing 2 meters distance- and *compare* the outcomes. Suddenly, you have a list of all the shots taken in those circumstances and their conversion rate, which can be translated into a number: If we have a record of 2.571 shots in that situation and 355 ended up in goal, then we can say that the expected goals (xG) from it is $355/2.571 = 0.13$. Same can be done with metrics like expected assists (xA), expected threat (xT is the likelihood of a shot occurring within the next 10 seconds if the pass is completed) and many more metrics, which brings us to the next advantage: a) now we can look at a player's performance in certain situations and see how they fare against the xG of a specific action and b) we can look at what makes teams win or lose games by analysing the total expected goals in a game (as well as other metrics, though expected goals is the most intuitive and used one).

If a player consistently scores more than their xG, it can mean two things: either that player is in a hot strike and his/her numbers will drop soon back to the mean, or their quality makes them stand above the mean. Messi and Ronaldo have been players who were consistently scoring more goals than their expected goals. The job of a good

football director is to be able to tell which one it is. Similarly, if a team's overall expected goals will give you an idea of the level of performance in a game, independently of the ending result. Having a larger xG than the opposition means that you *should* have won, even if in the end it doesn't end up happening. In fact, Liverpool's analyst Ian Graham mentions in several interviews how Jurgen Klopp was startled to see how Ian agreed with him that his last season at Dortmund, where Borussia finished 7th, had been the unluckiest season he had ever witnessed, but without watching a single game, just by analysing game data. While the German press insisted that Klopp's team was finished, Ian Graham said: "Our analysis showed something quite different: they were still clearly the second-best team in Germany but the performances did not match the results. I analysed ten seasons of Bundesliga performances and Dortmund were the second-unluckiest team in that ten-year history, it was just some terrible luck which cost Jurgen that season".

There is a setback, though, to event data related metrics like xG. They only give understanding of whether a team is good or not, if it has performed well or not. This is obviously interesting for many reasons, but if we want to precisely value players and teams, we need more than that, we need to know *how* or *why* these players/teams are good, and this is where event data falls short. You can link sets of event data to understand the steps a team managed to get the ball from one side of the pitch to the other and make a shot on goal, but you cannot look at whether those actions were the most efficient ones. To fully understand football in an analytic sense -and therefore valuing players-, you need to look at the game as a whole, meaning *off-ball* actions and player interactions... and this is done through tracking data, which stores locations of every player on the pitch 25 times per second, logging a set of vectors with orientation, speed, positioning... Only by combining event data and tracking data we can grasp the complexity of football with numbers. Here is an example of what it would look like:

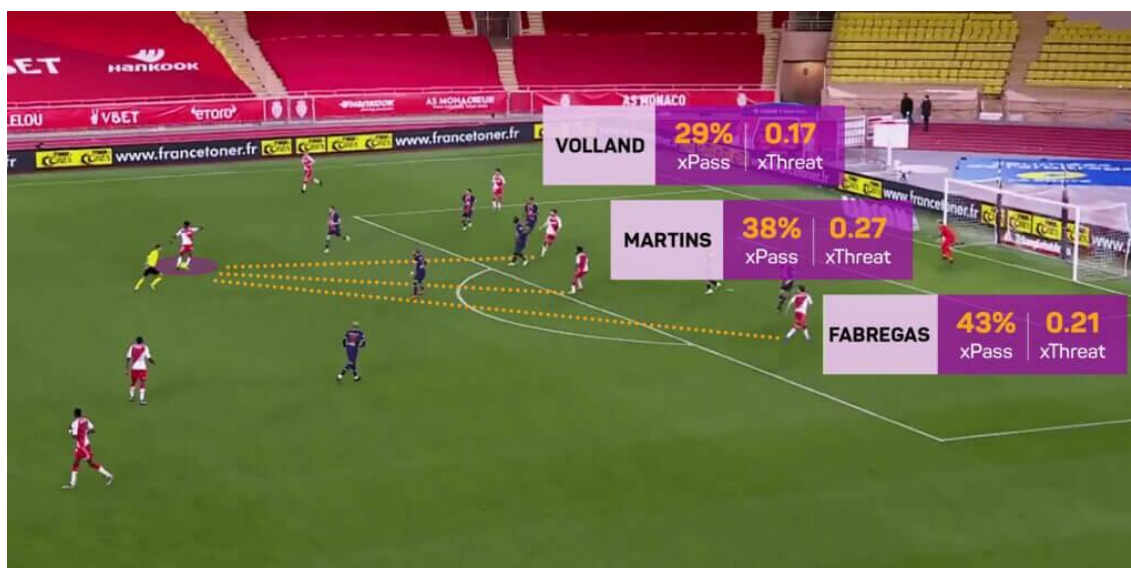


Figure 5: Example of event data and tracking data combination by Mark Carey (The Athletic, 2022)

In the image above we see Monaco's player Tchouameni with three pass options, all with less than 50% option of being completed. In a solely event data analysis, his final pass would be logged with a certain xPass followed by a certain xThread. Thanks to combining event data with tracking data, we can now analyse the pressure applied to the receiving players and well as their velocity, orientation, etcetera. We can understand *how* Tchouameni chose when faced with different options coming from off-ball movements and interactions from players. In this action, Tchouameni chose to pass to Fabregas in a sequence that ended up in a goal for Monaco.

Moreover, tracking data can also help looking at team positioning/shape on the pitch apart from individual actions. In here we can see that in season 2020-2021, Monaco achieved a better possession value (which measures the probability that a team in possession will score a goal in the next 10 seconds – similar to the xThreat metric, but focusing on goal probability rather than shot probability) when playing with a wider formation and their fullbacks in midfield positions:

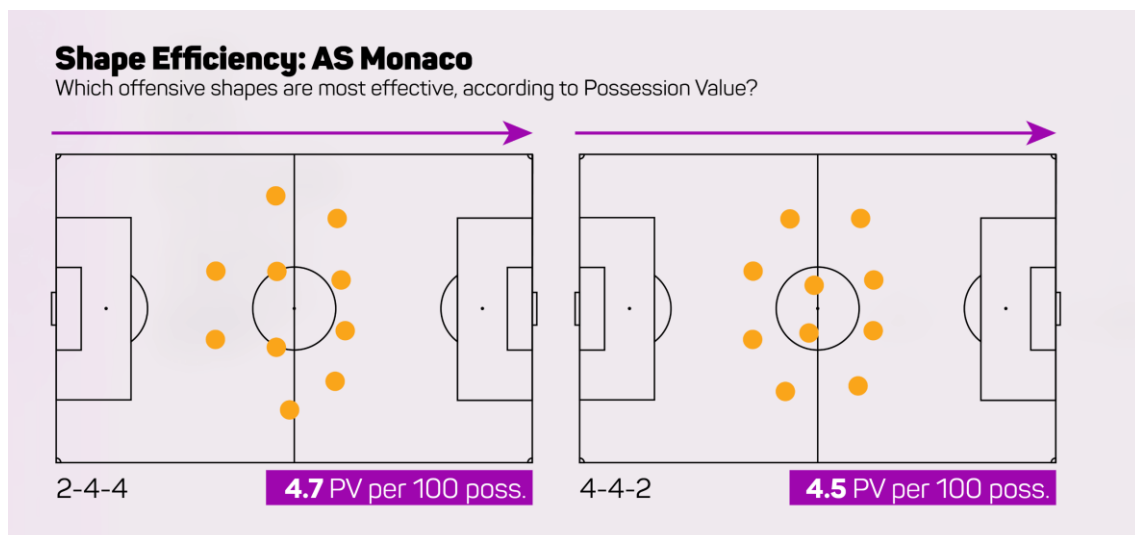


Figure 6: Monaco's Possession Value depending on team shape (Mark Carey, The Athletic, 2022)

So, now we know how we can model the complexity of the game into several metrics which will help us understand not only what makes teams win games but how it makes them win. The only thing left do is chose which of these metrics is the most relevant to value players, a “common language” to use when comparing players and valuing them.

Expected Marginal Goal Difference

Translating the currency of cashflows

Until this point, we have reviewed literature that explains to a certain degree that a) the current accounting methodology for intangible assets in football clubs is flawed and b) that the attempts at using an alternative to valuating football players through Transfermarkt and event-related metrics are biased or incomplete portraits of reality.

Tiototal Football (2020a) developed -with the help of other key figures in the world of data analytics in sports like John Muller and Jared Young- a corporate-finance-based framework to value the individual contributions of players to a team. Even though his analysis ends up focusing more specifically on the recruiting and transfer fee aspect of football as well as the organizational opportunities that arise from his proposal, it is still incredibly relevant for the purposes of this thesis.

The corner stone of corporate finance is the discounted cashflow approach to value. Simplifying things, the value of something equals the sum of all the estimated incremental cash flows that it will generate in the future then discounted back to a present value doing some math. This discount rate takes into account the risk and timing of each cash flow as well as the opportunity cost associated with the investment. For a specific stream of expected cashflows, the higher the risk, the lower the cost.

$$\sum_{n=1}^t \frac{CF_n}{(1+i)^n}$$

CF = Cash Flow
 i = Discount Rate
 n = Years
 t = Time horizon of CF

In case that a company wants to make an investment, this investment will have an expected stream of cash flows associated with it at some point in the future, and because the future is uncertain there will be a risk level attributable to those cash flows (in case that these cashflows don't occur or they do in different amounts than expected). This very quickly takes us to the Net Present Value theory, which states that when a company is choosing between available projects to invest in, it will estimate the future cashflows associated with it and then use a required rate of return to discount them equal to the weighted average cost of capital (which essentially is the weighted average of the required rates of return its investors -return on equity- and creditors -return on debt- are demanding of the business as a whole. If once the cashflows have been discounted and the initial investment fee has been subtracted we have an NPV > 0, then the business can make the investment. This process of evaluating various available investment projects and allocating available capital when deciding in which projects to invest is called capital budgeting.

Mainly, what football general manager or a sporting director does when evaluating players for recruiting is capital budgeting. The only difference is that when a company has to make the go/no-go decision on a project, the net present value of it is denominated in local currency (whether it is €, \$, £...) whereas a manager doesn't usually have a solid framework of reference (usually the general manager receives a mix of qualitative and quantitative inputs from the scouts and the data analysts which are never translated into a single benchmarkable output). Tiototal Football cleverly suggests

that this currency should be 'marginal goal difference'. Signing players who will increase the team's goal difference will surely increase the overall value of the club itself (in its local currency).

The general idea is that in football operations (and in our case, accounting for intangible assets) the different departments should be using 'expected marginal goal difference' as their key metric rather than dollars. We'll expand on this later.

Consequently, in order to start valuing a player we need to project its future cash flows. In a very summarized way, the process to do this would be to gather the historical data, strip out of it the non-recurring noise, projecting these historical results forward with robust techniques, layering non-public information in the model and finally apply any other supportable adjustments. In the same fashion that this process can serve for a company or an asset, it can be used for a football player simply by 'adapting' these cash flows to our newly suggested currency. Instead of the usual cash flows in euros or dollars, a club's cashflows from a player will *initially* be stated as expected marginal goal difference.

The necessity of a unit of currency to speak about players

As Daryl Morey (GM of the Houston Rockets) said in the 2019 MIT Sloan Analytics conference: *'The reality is, [football] it's a very complex sport, 11 on 11, lots of free moving, not a lot of set things, and every time something happens you get zero so how are you concluding anything, everything leads to zero. You can do everything right, you get zero, you can do everything wrong you get zero. So, it's very hard to differentiate. In the NBA, you go back and forth 100 times and each time down you get a pretty good distribution of zero, one, two, three, lots of scoring, that allows us to differentiate things. I only listen to data when it really tells me something, and right now the sport isn't there...'*

Daryl Morey is stating two important facts about football: Firstly, the objective of the game (scoring goals) is a rare event because there's very few over the span of a game, and secondly there's a lot of players who actively influence a play but are never directly involved in it. The most commonly available match data in football is what is known as 'event data', which means that every time a player interacts with the ball there's an entry which usually includes the time stamp, the type of action (e.g. a pass, a dribble, a tackle, a goal...), the location of the ball (including the start and end location in case that it's a pass or a cross), the type of pass, the player in the action, the score at the moment, etcetera. This is the most basic form of understanding of the game, quite limited even though we can draw a relationship between any two or more events. These are the zeroes at the end of nearly every action that Daryl Morey referred to. Goal scoring is hard, and it's scarce. There is another type of data, almost never available to the public, called 'tracking data'. This data comprises the locations of all players on the pitch and the ball several times per second to record a more complete accounting record of every

moment in a soccer match. It is way more precise and interesting, but for now event data will serve as a proxy.

The concept of mapping a player's or a team's performance using data is not new at all, though it was not until 2002 that it became mainstream following Billy Beane's 'Moneyball' (a data supported approach to recruiting players for his below average baseball team). But, contrary to the simplicity and individualism of baseball, soccer is too chaotic. Apart from the events described above, there's also long sequences of play where players fight for a loose ball, with constant movements of overlapping teammates and opponents trying to win valuable spaces waiting for passes, all to end up with an unexpected rebound starting a counterattack. As Total Football puts it '*how do you account for that?*'. Well, many executives in the world have to make decisions using rich yet incomplete data for their predictions and will still be held accountable for the things that may happen in the future.

There is an important difference between accounting data and football data that makes the difference for our study: Accounting data has money as a unit of account. This is something that now we take for granted but it hasn't always been like this, which gives hope for our football datasets. Graeber -in the same line of thought as Keynes, Knapp, Innes, Lerner and Mynsky- believed that the whole barter theory of money in the ancient world is completely wrong. Back then a transaction would be accounted for as a 'gift' in the seller's book and would write it down for it as a debt to be received in his ledger as 'the baker took 30Kg of flour'. Notice how there is no monetary unit to level the expected debt payment. Essentially, when the baker had something to repay (an appropriate number of extra loaves of bread) this debt would be considered repaid. It was not until kings and governing entities enforced the use of money to pay for taxes that it slowly became the means of transactions to avoid the violence of the authorities. Acquiring money became a necessity, and therefore the unit of account became the norm. The moral of this historical information is that using money as the unit of account for financial accounting data isn't any more natural occurring in economics than it might be in football.

Now imagine that an analyst is trying to study the financial statements of a company which have no monetary unit. This analyst might eventually understand the chain of value of the company, its inner-workings, strengths and weaknesses, but in the end, it would be unable to produce a valuation for that company in dollars, despite being an absolute expert on the company and how it operates. This is analogous to football data. You can quite precisely understand how teams and players perform in matches by studying the passing networks, expected goals, space usage, pressing structure, etcetera, but without a unit of account to tie them all together it is impossible to provide a valuation. In a fictional conversation between an analyst and a general manager, the analyst would probably present a potential player signing by exposing his expected goals, his percentage of correct passing, number of minutes played... but eventually the

general manager -a good general manager- would think *'this is all very nice, but I cannot use this to compare it to other players. How do I weight these data points?'*. A more eloquent general manager might even say *'what is the unit of account of these data points?'*. Of course, this unit of account has to be expected marginal goal difference. This is the unit of account -the ultimate common language- that should be spoken in football operations.

In essence, the true unit of account of football data is 'goal', but given that almost all actions in a match are not attempts to score -more likely attempts to increase your team's chances of scoring by making a forward pass or positioning yourself as a receiver outside the reach of the defender, or to decrease the chances of the other team of scoring by tackling the rival or closing in on the pressure- the need arises for an accounting of every individual action which increases (or decreases) these chances of scoring.

The concept behind goals added

So, we have seen above and in previous sections that focusing solely on shot or goal related events (like xG, xA, Goals, etc) is a very incomplete set of information and the reason why expected marginal goals added must be our unit of accounting. The ASA team (American Soccer Analytics) developed a machine learning algorithm (Goals Added or 'g+') that adds up all the events in a play and translates them to our unit of account by adding a probability of scoring on the current possession and conceding on the next possession each moment before and after a recorded action in a match (similar to a balance sheet snapshot of a business' assets and liabilities at a point in time). The changes in these probabilities can be attributed to the actions themselves, which move the match forward from one moment to another (similar to a business' income statement, showing the changes in the business' assets and liabilities), as per Total Football.

Let's take an example: A centerback with the ball controlled at his feet might have a 1.5% probability that his team might score in this possession, according to the model. The probability that they will concede in the opponent's next possession is also 1.5%. Therefore, the net value of the centerback's possession is zero ($0.015 - 0.015 = 0$). If the centerback then makes a risky pass forward to his right winger and completes it, the team now has a 2.5% probability of scoring in this possession, while the contrary has a 1.2% of chances of doing so in the next possession. Therefore, the net value of this pass is 0.013, and compared to the net value of 0 previous to the pass, this has an impact of 0.013 added goals to this possession. Add these probabilities up play after play and you can get a very relevant and rich dataset with attributable actions to individual players (using an allocation algorithm that would share the +0.013 between passer and receiver, depending on the model) under a single unit of account.

The allocation of these goals added would probably be incomplete without tracking data (i.e. understanding the run from the winger to get away from his marker and receive the

ball), but these are datapoints that clubs can record and can be fed into any model. One extra useful property of this method of accounting is its disaggregation ability: We can pull apart every action that contributes to a single player goals added and allocate it to any number of buckets that we might think of to help facilitate the visualization of a certain player's strengths and weaknesses. This also mirrors the structure of financials statements where it is important to disaggregate the revenues to understand deeply where they come from, in what quantity, when, and how certainly. Here is an example translated to football:

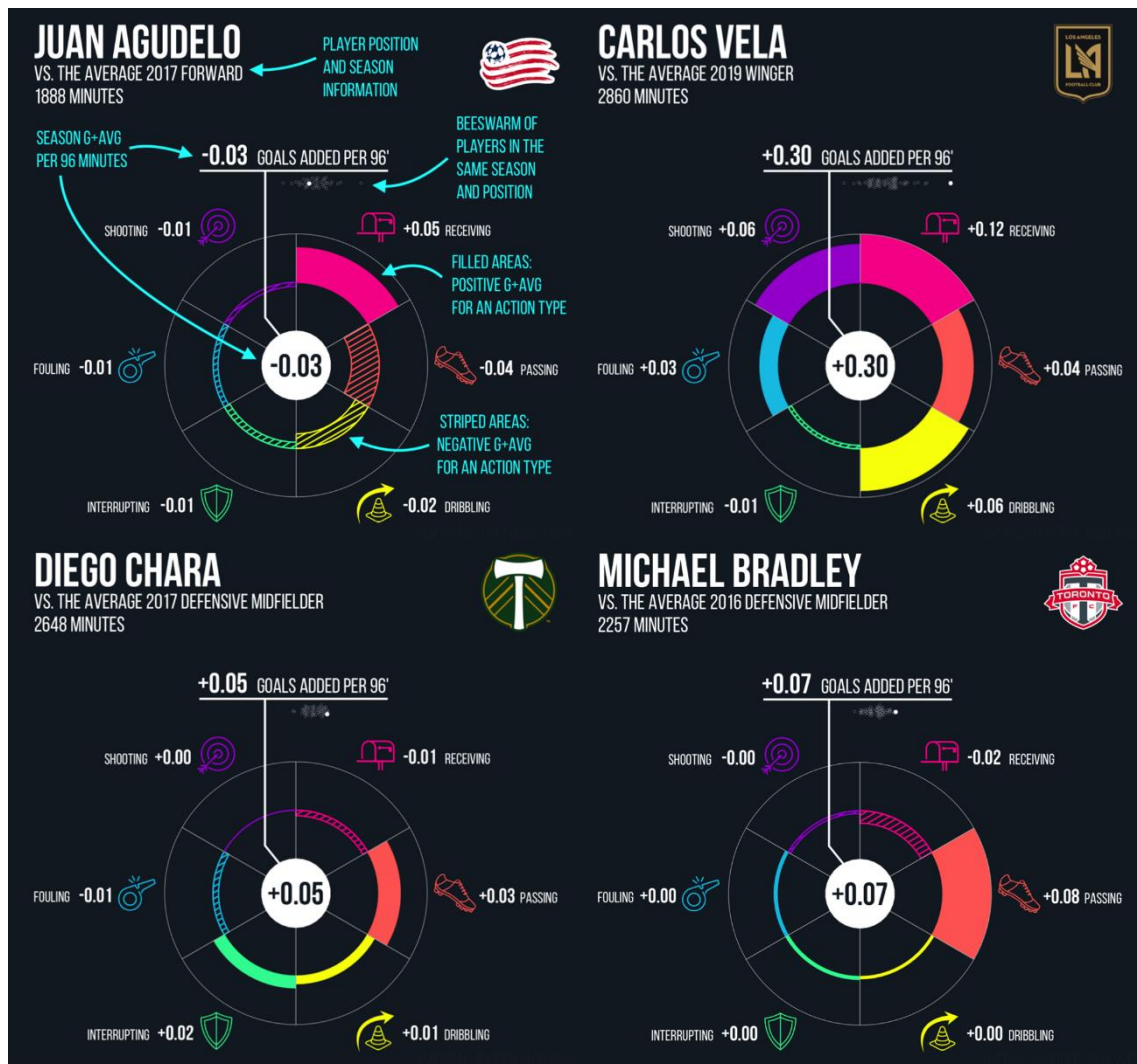


Figure 7: Visualization of the goals added allocation

With this kind of data visualization, a general manager can easily spot the different types of players in his control. With a quick look we can see that Juan Agudelo is a very good receiver whose qualities get mostly offset by a lack of passing precision and dribbling, Diego Chara is a complete defensive midfielder, whereas Michael Bradley is a very specific kind of player who contributes to the team mainly with his superb passing.

Carlos Vela, stands as an incredibly good player at the top of the league, contributing goals in almost every faced of the game in great volumes.

ASA found a strong relationship between player wages and g+ scores, found that at the macro-level g+ (and several different slices of g+ metrics) performed better than shots, goals and expected goals at predicting future team performance (Tiotal Football, 2020b) and found that at the micro-level, g+ tended to agree with video analysts' interpretations of match sequences (John Muller, 2020).

In an analysis of Lionel Messi's performances over the years, the g+ model managed to clearly explain how his abilities changed and how he adapted his game depending on the type of players that surrounded him, evolving his added goals from receiving (when he played alongside Xavi and Iniesta) to a more dribbling role when he didn't get the same kind of assists sent to him.

The football complexity and future uncertainty challenges when valuing a player

At this point we have defined a unit of account and a system that lets us individually assign it to player performances. There are a few steps left for a true valuation of a player, and the most important is that, leaving out that the future is uncertain and that a player is constantly evolving, he's part of a team which interacts and plays as a whole, the actions of every individual intertwining with those of the rest. The contributions aren't fully discrete from one another, even considering the coach, which leads us to valuating a player *according to whom*? Well, obviously for the purpose of this thesis it is according to us (our imaginary football team). While this is of interest also in the transfer market valuations, budgeting and player benchmarking, it sets us up for a monetary valuation (yes, finally monetary) of our players. Keep in mind that this expected marginal goals added to money translation is somehow already a part of what clubs do, even if inadvertently. When a club signs a player (and I am obviating the transfer fee here) they evaluate the expected output of that player for the club (both economically and sportively) and reflect these expectations with a contract offer containing a wage. This translation, in my opinion, is obviously inaccurate, because it is biased by the context of the negotiation (budgeting, agents, other clubs trying to sign the player...).

Let's assume the case of a club trying to sign a player in the summer transfer window to see what are the different steps that it needs to take for a final, precise, and complete goals added valuation that can be confidently translated into money for the financial statements of the club:

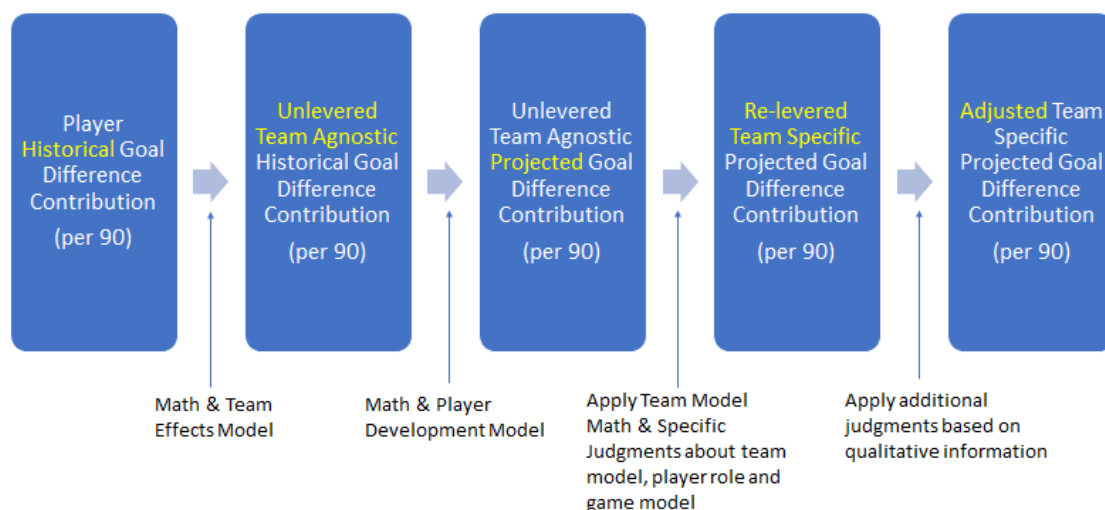


Figure 8: Player contribution rates projection using a 5-step process

We have already seen the first step - to gather and add up the historical goal difference contribution of a player. Now the next steps for the club are to un-lever the data to strip the goals added from any influence from the previous team, then apply a systematic growth rate assumptions based on skills, aging curves and other factors (agnostic of team effects), then re-lever the goals added to adjust for the new teammates influence and effects as well as the manager's playing style and finally adjust for any qualitative data or additional information that the systematic mathematical model might be missing. Some of this un-levering, growth rate assumptions and re-levering might sound abstract, but there are already several models (Michael Caley, Statsbomb, Zack Beery for age performance projections) that tackle them.

The un-lever/re-lever follows the same concept as the Beta from Corporate Finance, which simply put explains how volatile the returns of a company are relative to the entire market, calculated by taking the covariance of a given company's returns versus the overall market's returns and dividing it by the variance of the overall market's returns. A company with Beta of 1 has returns equally volatile to the market and directionally correlated with it. Another with Beta 1.5 is 50% more volatile than the market, and one with a Beta of -1 is equally volatile but has inversely correlated returns with those of the market. Now, the returns of a company might differ in volatility from the overall market not only because of its business risks relative to those of the market, but also because of the chosen capital structure. Companies with more debt are riskier and the returns more volatile, meaning that in good times the shareholder's returns are higher thanks to the debt, but in bad times the shareholders can be stripped of any returns at all due to the company's obligation to pay the creditors. This leads us to the fact that, if you want to purchase a company (in our case, a football player of which we expect certain returns) by calculating its Beta you are basically trying to understand the business risk it has, and furthermore, how large will this risk be once it has been

embedded into your company's operations (your football team) once it has been un-influenced by its previous capital structure. This step is the un-lever of the Beta (or in our case, the un-lever of the previous team effects in our player). At this point we would have a 'neutral' Beta for the individual player, sort of an asset Beta. But, since this asset will interact with our own capital structure (again, our football team) it will need a re-lever to reflect its impact on the team.

For un-levering, Tiototal Football proposes a top-down model based on high level characteristics of team style or performance, something quite straightforward and automated that takes into account the previous teammates' possible interactions with our player and their added contribution to goals added.

For re-levering -which is a much more important step given the amount of info that a club has on its own team- he proposes an analogy of Porter's Value Chain Analysis to build a 'Team Performance Model' solely focusing on the sports part of the business.

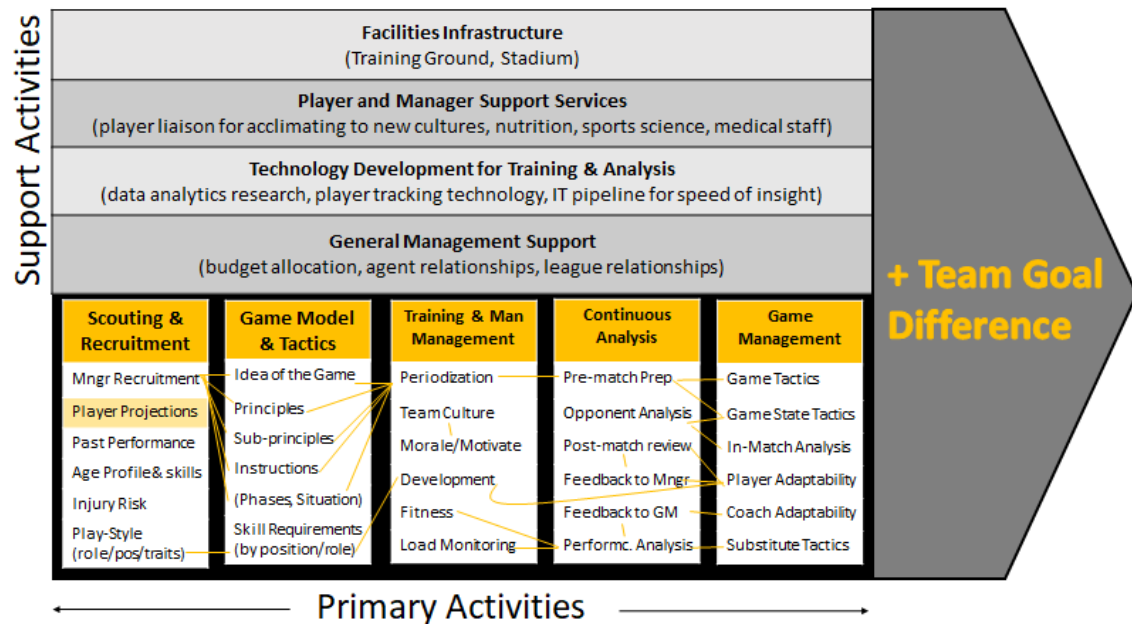


Figure 9: Tiototal Football's proposal for 'Team Performance Model'

Following these steps, companies can determine the correct discount rate to use to price the expected cash flows of the purchased asset, and in this particular case to value the player we are trying to sign (in terms of goals added).

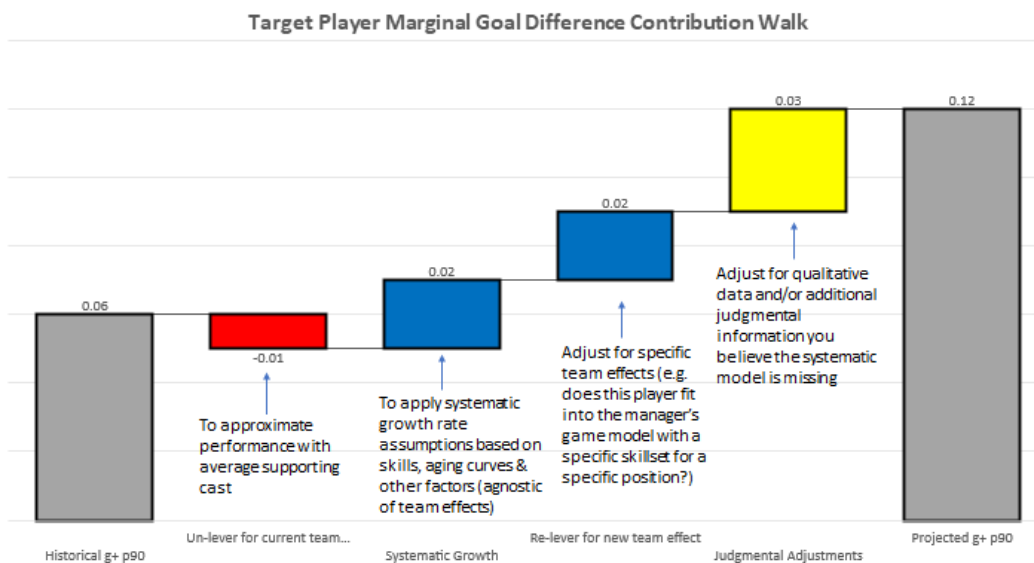


Figure 10: Waterfall representation of what the process of valuing a player looks like. Total Football, 2020

In this case we were talking about signing a player with relevant historical performances. If we wanted to assess the goals added value of a youth prospect coming from the academy, projecting his expected contribution based on the few minutes that he might have player is pointless, and the step-by-step process proposed above is useless. For these kinds of players, the valuation should resemble that of a start-up company. It now becomes important to identify key indicators of future 'revenues' (goals added). Here the data analysts cannot offer much insight and it's where the scouts must come in for early valuations based on more qualitative aspects of the game.

With this framework now we can value our own players, transfers, free transfers, and youth prospects coming through our academy thanks to a single unit of accounting. Of course, some clever clubs have already realized that it is necessary to exploit all the data available and to use a single currency measure to benchmark players against each other. Liverpool is probably the first club which has implemented a framework that resembles what we have explained, though in their case it's mostly used for targeting signings and team performance. In an interview with Simon Austin, the Liverpool's Director of Research, Ian Graham, revealed that the club was using a metric called 'goal probability added' (similar in name and concept to the goals added model from ASA). He explains that they use optical tracking to gather the data, and that it has helped them sign players like Andy Robertson, an acquisition Ian Graham is proud of since it showcased the power of the goals added for the club: Liverpool unexpectedly signed Robertson from a relegated Hull City, and the explanation was that "he was the best young full-back in Britain at the time. He was a really strange case of a really attacking full-back playing in a really poor defensive team".

One last example of the capacity of models like goals added is the piece written by Statsbomb back in 2019 after the signing of Griezmann by F.C.Barcelona, “Barcelona’s Griezmann Signing Makes No Damn Sense”. In there they don’t analyse the ‘goals added’ metric of the player, but they tackle the re-levering step (as a reminder, that is the adaptation capacity to the new team). It clearly showed that Griezmann would not fit into the style of play of Barcelona, and they were right.

Having in mind all the processes explained above, the best course of action -in my opinion- is that clubs should start valuating their players using a model like the G+ from the ASA (or similar one internally generated like what Liverpool has), and then establish a conversion between an individual player’s goals added and a monetary valuation. Ultimately, this would create a much better representation in an eventual annex in the financial statements of a club than only stating the book value of the players or their estimated market value from Transfermarkt. Any necessary adjustments could be made afterwards regarding any special individual contributions that the club feels necessary to end up having a true team valuation that helps explain the generated cashflows. A process like this would end with the unfairness of accounting for youth-centred clubs and it would shed light to all the bad practices currently being overlooked in football accounting. It would not just help improve the team performance and scouting, but also the budgeting allocation when it comes to transfer fees and salaries (specially in clubs with a structured payroll). Overall, it is an accounting method based on the true value generation of the assets (making as many goals as possible) that can then be translated into monetary terms for reporting, not the other way around.

METHODOLOGY

Following the literature review is clear that there is still a gap between the financial accounts European football clubs and the true value of their players. Therefore, I will first make a study aiming to close this gap by studying the influence of several event data related metrics like xG, xA and several others in the current market values of the players of 11 Premier League clubs for the season 2020-2021. These clubs are Arsenal, Chelsea, Everton, Leeds, Leicester City, Liverpool, Manchester City, Manchester United, Southampton, Tottenham and West Ham United. The objective is to see if the current Transfermarkt values -which we have seen are just a proxy and far from an objective reality- can be modelled into a multiple linear regression model that in time can help decouple the market values of players from Transfermarkt and into more objective metrics. The analysis will be made first for all the players and later for players in specific positions to account for the different weights of metrics depending on the place on the pitch (i.e. it is plausible that successful tackles will have a better explanation percentage for defenders than for attackers in case that they are a significant metric). My hypothesis is that even though some of the metrics will have some amount of explanatory value, it will still be too little to be able to consider them as an alternative more objective model,

given that fact that -as seen in the previous literature-, expected metrics like xG, xA, etcetera are a better representation of reality than actual goals and assists, but still lack a lot of the factors that influence football.

Secondly, there will be an analysis of the difference between squad market values according to Transfermarkt and squad book values according to the financial statements of each of the 20 clubs in the Premier League 20/21, from seasons 2012/2013 to 2020/2021. In addition to the clubs mentioned before, the following have been included in the analysis: Aston Villa, Brighton, Crystal Palace, Fulham, Newcastle, Sheffield, Wolverhampton and West Bromwich. The objective is to see whether these values, while different, are correlated and somehow grow and shrink similarly across teams and years or they behave separately. Moreover, a regression will be made to assess the confidence with which Transfermarkt or Book Values can predict Operating Profits before player trading and Profits. For this analysis, there will be two analyses: one taking COVID seasons (19/20 and 20/21) out of the dataset and one including them. The intuition here is that the analysis without COVID will render more accurate results. Also, the intuition is that given the nature of current accounting rules, the book value of teams should not necessarily be a good explanatory variable, while market values should be slightly better, even if not a proper explanatory variable either.

Thirdly, I'll conduct research on how F.C. Barcelona socios feel about these facts (and other relevant Barça topics) by polling them. This is especially relevant since now, for the first time in the club's history, the Statute Reform has been open to discussions to the socios and not just to the Board. Moreover, since F.C. Barcelona is owned by the socios, it's important to understand how they interact with the accounts published and the current governance model in place. Even though the socios do not participate in the day-to-day operations of the club, they elect the president and must vote on relevant aspects like new sponsor deals, large infrastructure investments like the new renovation of Camp Nou and the sale of non-sporting assets like Barça Studios or BLM. Therefore, they should be aware or at least up to date with the accounts and financial stability of the club.

They will be asked qualitative questions regarding their perception of the club's transparency, governance, previous deals and current accounting practices, with the aim to understand their opinion on how the club is managed and what might have led to its current status today.

RESULTS

Event Data related metrics to predict individual player value

In this first part of the analysis, the objective was to see whether the publicly available data from FBref.com could help us model a player valuation strategy based on Transfermarkt in order to later 'decouple' from it. After all, every player valuation model

must take one arbitrary point of measure to build from and in this case it was the player valuation at the end of season 20/21.

Firstly, a multiple linear regression was calculated for the total number of field players in the analysis (265). There was a total of 30 metrics in the calculation for field players (see Appendix). The results show that a 59% of the variance in value can be explained by factors that a priori seem logical: Age being a negative value driver and non-penalty expected Goals, percentage of passes completed and expected assists driving the value upwards, amongst others.

```
Call:
lm(formula = Mkt_value ~ Age + npxG + PrgDist + perc_cmp + xA +
    Drib, data = test)

Residuals:
    Min       1Q   Median       3Q      Max
-43.094  -8.493  -1.435    7.887   46.477

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  3.552932   8.333230   0.426 0.670203
Age          -1.318770   0.217737  -6.057 4.89e-09 ***
npxG         2.164149   0.417865   5.179 4.50e-07 ***
PrgDist      0.001426   0.000280   5.093 6.80e-07 ***
perc_cmp    43.966715   9.000059   4.885 1.82e-06 ***
xA          2.639127   0.676917   3.899 0.000123 ***
Drib        1.601994   0.456895   3.506 0.000536 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 14.18 on 258 degrees of freedom
Multiple R-squared:  0.5932,    Adjusted R-squared:  0.5838
F-statistic: 62.71 on 6 and 258 DF,  p-value: < 2.2e-16
```

Figure 11: Multiple linear regression to predict Market Value (as per Transfermarket) of all the players, regardless of their position

That said, it seemed wrong to make an analysis for the total number of field players given that they have different characteristics and not all of them behave the same way within a team.

Therefore, the analysis was extended to forwards, midfielders, defenders and lastly goalkeepers. The player positions were extracted from FBRef.

Forwards: We find a very good explanatory value of $R = 0.83$. Surprisingly to me, dribbling was not an explanatory variable, but in hindsight it can be because dribbles are very sporadic actions that also highly depend on defensive positioning. I was glad to see that non-penalty expected goals was not an explanatory variable, rather the difference between actual non-penalty goals and non-penalty expected goals, meaning that the strikers who score more than they are supposed to have a higher valuation. Age keeps behaving correctly in the model, and players who have a high expected assist value also get rewarded in the model. There are a few variables that I'd consider deleting given the counterintuitively in the model (like the negative progressive distance, blocks or defending actions leading to shot), but given their significance I chose to keep them in, accounting for the different types of strikers that play, press and defend in different ways.

```

Call:
lm(formula = Mkt_value ~ Age + nineties + npG_min_xG + Cmp +
    PrgDist + xA + Prog + Fld + Def + Blocks + Clr, data = forwa)

Residuals:
    Min       1Q   Median       3Q      Max
-27.029  -7.289   2.657   8.014  24.501

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 30.065758   7.959625   3.777 0.000362 ***
Age         -0.995464   0.315240  -3.158 0.002472 **
nineties    -1.459723   0.591969  -2.466 0.016495 *
npG_min_xG  2.630771    0.742986   3.541 0.000771 ***
Cmp         0.090689    0.019696   4.605 2.15e-05 ***
PrgDist     -0.026856   0.005403  -4.971 5.72e-06 ***
xA          5.521921    1.567397   3.523 0.000815 ***
Prog        0.859022    0.170141   5.049 4.29e-06 ***
Fld         2.978135    0.639366   4.658 1.78e-05 ***
Def        -7.243736    2.053198  -3.528 0.000802 ***
Blocks     -0.656923    0.218952  -3.000 0.003902 **
Clr         0.912948    0.262110   3.483 0.000923 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 11.92 on 61 degrees of freedom
Multiple R-squared:  0.8345,    Adjusted R-squared:  0.8046
F-statistic: 27.95 on 11 and 61 DF,  p-value: < 2.2e-16

```

Figure 12: Multiple Regression to predict Market Value (according to Transfermarkt) for forwards

Midfielders: For midfielders age was not an explanatory variable. I attribute this to the fairly small sample, even though nowadays midfielders can play until very old ages and are still valued for their touch and vision rather than their physicality. It could be a matter of omitted variable: Midfielders who relied on their physicality and turn old are already retired, while those who keep their precise foot can still play the game. Again, overachievers are systematically valued higher in case of the number of assists compared to the number of expected assists (even though p-value > 0.05, it is close enough to stay relevant in such a position). Fouls drawn leading to a shot is also an interesting explanatory value that the model rewards. Overall, these variables explain 71% of the variance.

```

Call:
lm(formula = Mkt_value ~ nineties + npxG + Cmp + Ast_min_xA +
    Prog + PassLive + Fld + Int, data = midfielders)

Residuals:
    Min       1Q   Median       3Q      Max
-27.706  -6.085  -0.469   6.702  32.930

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 5.803420   2.448908   2.370 0.02034 *
nineties    -2.690992   0.452903  -5.942 7.98e-08 ***
npxG        3.202990   1.089195   2.941 0.00434 **
Cmp         0.039732   0.007624   5.211 1.56e-06 ***
Ast_min_xA  2.108006    1.297165   1.625 0.10828
Prog       -0.223645   0.071919  -3.110 0.00264 **
PassLive    0.595955   0.132454   4.499 2.41e-05 ***
Fld         3.960863   0.892062   4.440 3.00e-05 ***
Int         0.834203   0.166067   5.023 3.27e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 12.49 on 76 degrees of freedom
Multiple R-squared:  0.7129,    Adjusted R-squared:  0.6827
F-statistic: 23.59 on 8 and 76 DF,  p-value: < 2.2e-16

```

Figure 13: Multiple Regression to predict Market Value (according to Transfermarkt) for midfielders

Defenders: The defenders' case is a difficult one, because even though there's an R=0.63, there aren't many defender-specific metrics driving their value variation. While age keeps being a decent metric in terms of significance, Goal Creating Actions and pass

percentage completion are important variables, which is surprising given the a priori offensiveness of them. An explanation might be that most of the passes that defenders perform are easy horizontal or backward passes. Moreover, in these cases if a defender loses the ball it usually creates a dangerous action for the opposition, which eventually might mean that defenders who make unforced errors in passing see their value drastically fall. Similarly, GCA is a variable that is scarce for defenders. When a defender regularly participates in goal actions, it boosts their value. This could be the case for defenders like Alexander-Arnold, Van Dijk or Ruben Dias. That said, it was surprising to see that the number of total tackles was not very explanatory, even if significant. Successful tackles aren't even in the explanatory variables. A reason might be that tackling -while spectacular on TV- is not a type of action that difficult to perform. Finally, it's interesting to see that Press actions are highly significant, although negative to the overall value. I am not confident in this value, and it could be a result of the 'small' sample size. Alternatively, it might mean that the market, knowingly or not, is rewarding defenders who do not step up to block shots or follow players out of their natural position to avoid conceding spaces. This theory has already been proposed by Chris Summersell (2022) when he studied the behaviour of Liverpool defenders when facing the threat of a shot, choosing to stay put and cover their space rather than step forward and attempt the block. Virgil van Dijk is one of the best -if not the best- defenders in the world, and he is just at the 12 percentile in terms of Pressing actions for defenders.

```
Call:
lm(formula = Mkt_value ~ Age + perc_cmp + TotDist + PrgDist +
    Prog + GCA + Tkl + Press, data = defenders)

Residuals:
    Min       1Q   Median       3Q      Max
-24.844  -6.094  -0.750   5.523  45.435

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 15.0737981  10.3651578   1.454  0.149065
Age          -1.1262304   0.2843295  -3.961  0.000142 ***
perc_cmp     23.0960559  11.3377219   2.037  0.044336 *
TotDist       0.0015508   0.0003208   4.835  4.94e-06 ***
PrgDist      -0.0041767   0.0011703  -3.569  0.000557 ***
Prog          0.2320522   0.0541074   4.289  4.21e-05 ***
GCA          26.6882994  10.7331105   2.487  0.014590 *
Tkl           0.3073423   0.1278594   2.404  0.018108 *
Press        -0.0970278   0.0252808  -3.838  0.000220 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 10.46 on 98 degrees of freedom
Multiple R-squared:  0.6304, Adjusted R-squared:  0.6002
F-statistic: 20.89 on 8 and 98 DF, p-value: < 2.2e-16
```

Figure 14: Multiple Regression to predict Market Value (according to Transfermarkt) for defenders

Goalkeepers: The same kind of analysis was done for goalkeepers. In their case, the metrics used were different. To name some of them, expected goals against, pass conversion and sweeping actions were some of the datapoints considered. In their case, given the specificity of their position and the scarcity of their actions (in most of the cases), there was not a relevant result for the linear regression.

Transfermarkt and Book Values to predict Operational Profits and Total Profits

In the second part of the analysis, we looked at the relationship and differences between the total team value according to Transfermarkt and to the book value reported by each team in their financial reports, from season 12/13 to 20/21 (except for West Brom, Crystal Palace and Brighton who still haven't published their 20/21 accounts).

The most impactful result is that, as expected, the book value of teams in general underestimates that of Transfermarkt, which is a better proxy than the purely accounting value.

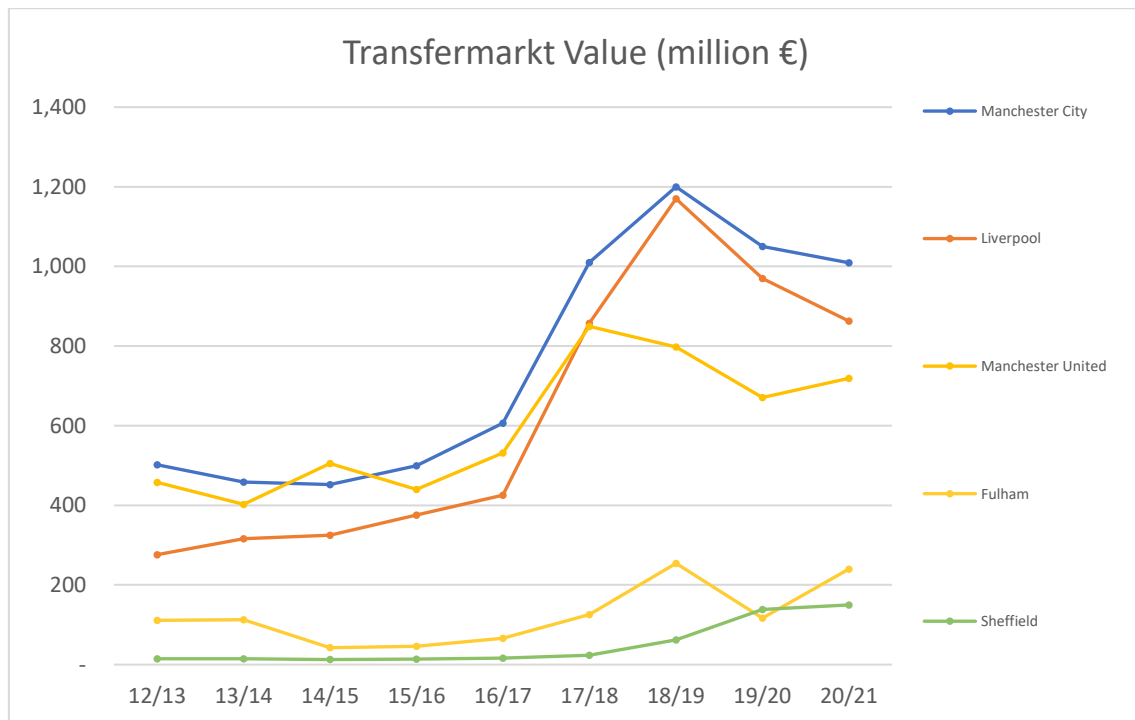


Figure 15: Transfermarkt Value (€m) of the 20 Premier League teams in the season 20/21 since season 12/13

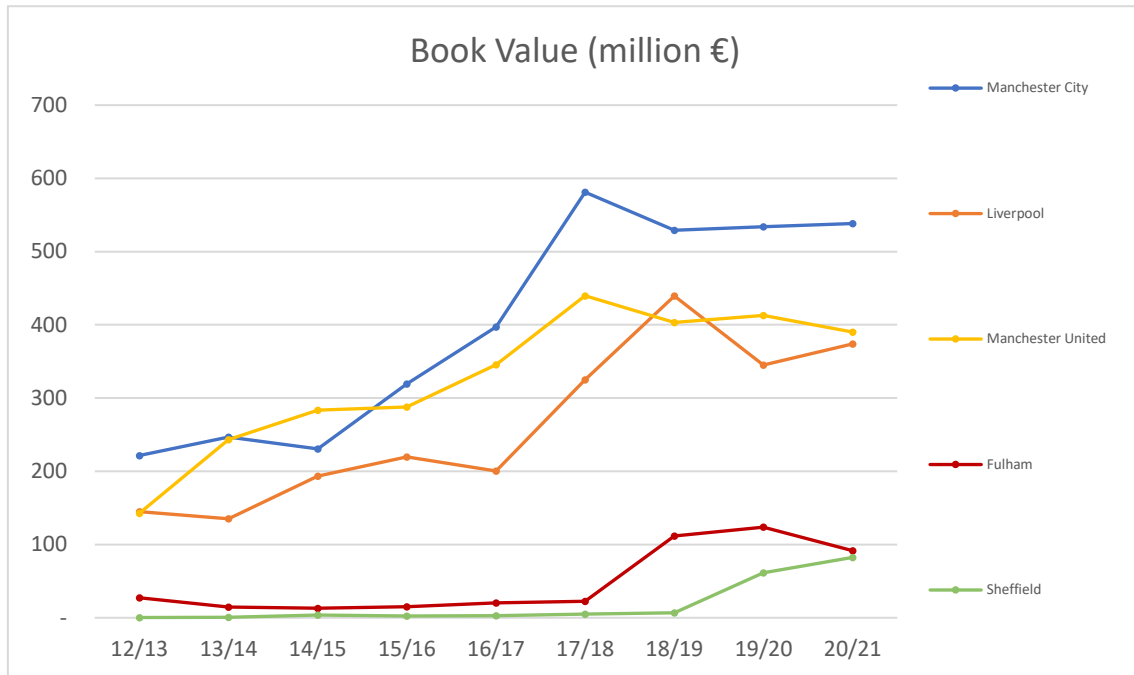


Figure 16: Book Value (€m) of the 20 Premier League teams in the season 20/21 since season 12/13

On average, the book value of teams in season 20/21 is only a 49.7% of the total Transfermarkt Value, though it seems that there is a slight upward trend since season 12/13 (36.6%). It is worth noting that even though high spending teams like Manchester United or Manchester City are consistently on the top in book value, there doesn't seem to be a general trend showing that they consistently have more book value percentage than others.

Moreover, league promotions have huge impacts on this ratio: Sheffield United increased theirs from 11% (season 18/19) to 44% (season 19/20) after their promotion to the Premier League. This is due to the fact that when a team gets promoted to the Premier League, it gets an additional ~£200 million in broadcasting and advertising. Therefore, they had a transfer window balance of -€70.15 million after promotion, when in the previous seasons since 12/13 in the EFL (2nd tier division) they never had a negative balance below €6 million (actually most of the time they had slightly positive balances). In addition, the Premier League has a parachute payments system for relegated teams, aiming to keep them solvent and competitive during the first 3 years after relegation. These payments are a 55% of their potential Premier League broadcasting rights in the first year, a 40% in the second, and a variable percentage on the third. This is why Sheffield United managed to increase their 44% ratio to a 55% even after getting relegated in the 20/21 season, when they spent €62.7 million.

Another interesting case of this is Fulham, being the only club over the years studied to ever manage to get a book value above their Transfermarkt value. This is again due to

their promotion-relegation cycle from seasons 17/18 until now. They increased from 18% in 17/18 to a 44% in 18/19 (with a transfer window negative balance of -€111.15 million), but after a very disappointing season where they finished 19th and got relegated to the EFL again, the Transfermarkt value of their players plummeted making the heavy investment in their players reflect an inflated book value.

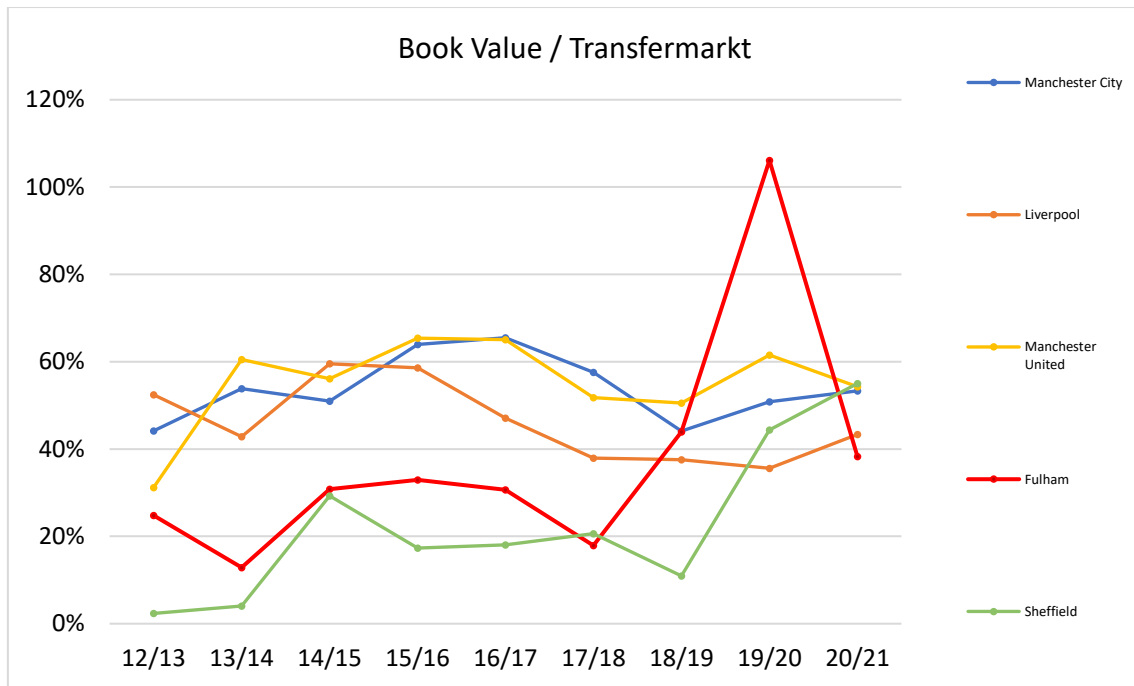


Figure 17: Ratio between Book Value and Transfermarkt Value

Finally, it's been shown that there's a large correlation ($R=0.94$) between Transfermarkt values and Book Values, which isn't a surprise given the fact that book values derive directly from transfer fees which are usually benchmarked against Transfermarkt.

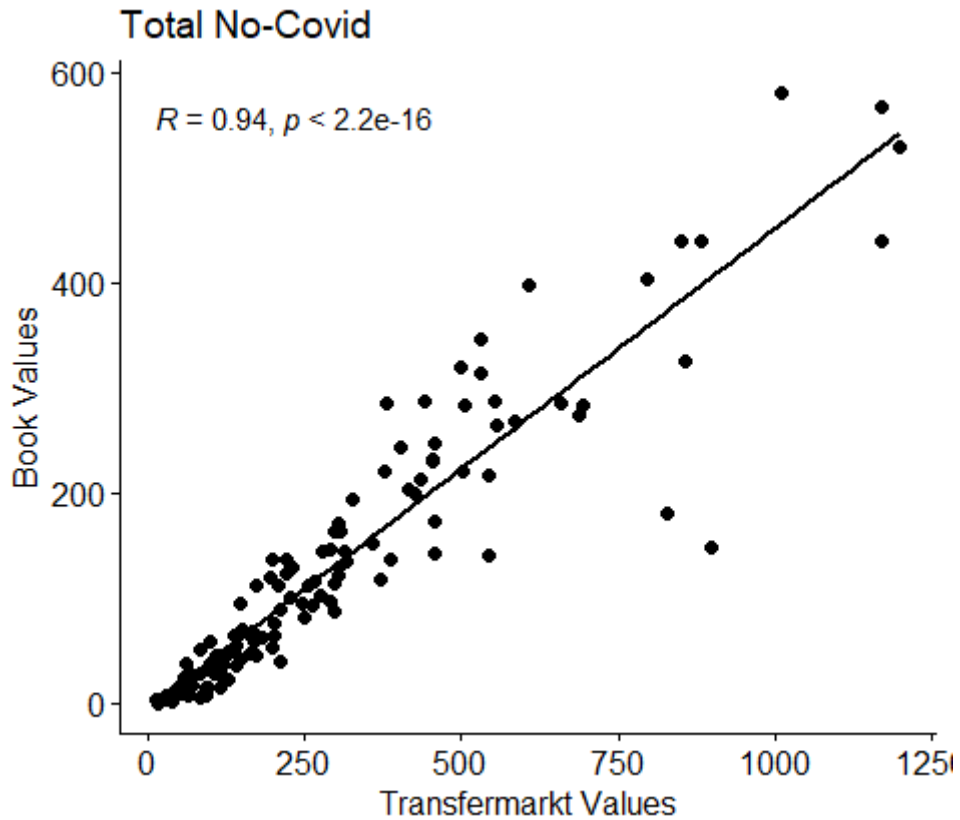


Figure 18: Correlation between Book values and Transfermarkt values

Regarding the predictive capacity of operational profits coming from team valuations, the results show that the current valuation methods offer little predictive power. The most relevant model is the linear regression between operational profits and Transfermarkt value (excluding the seasons 19/20 and 20/21 where operational profits were greatly skewed by the pandemic. Total operating profits for the teams studied went from £166 million to -£447 million). In this case, the statistical analysis shows that Transfermarkt values explain a 25% of the variation in Operating Profits.

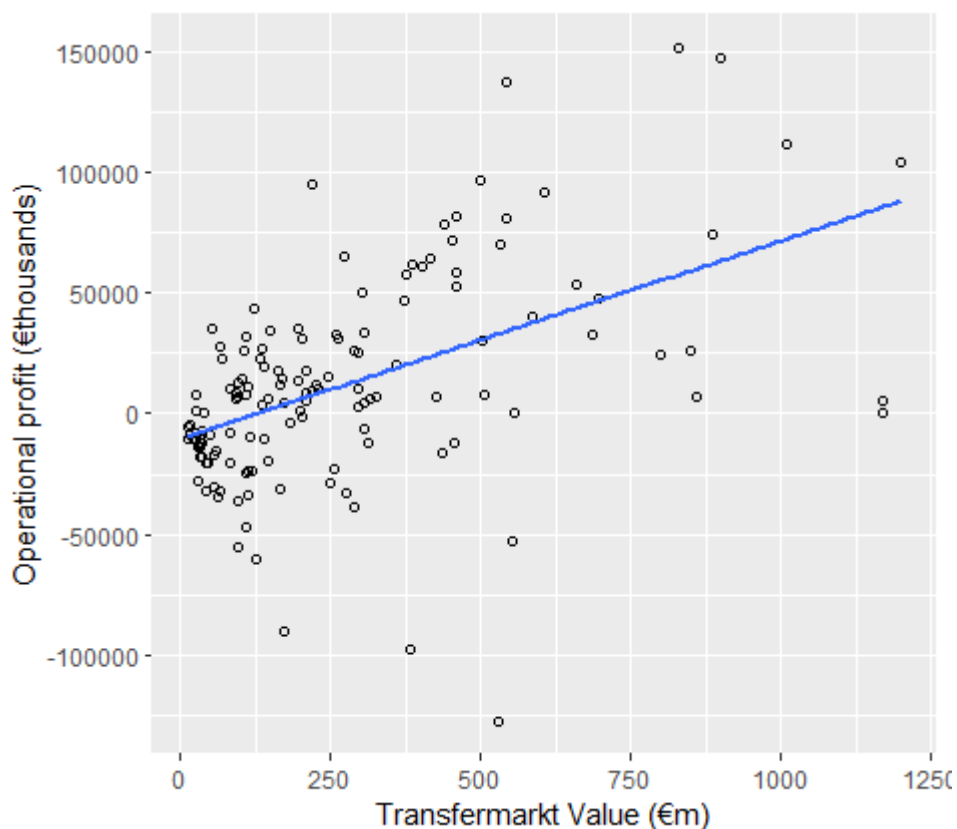


Figure 19: Regression for Transfermarkt v. Operational Profit

Other analyses, like Transfermarkt values to predict Total Profits or Book Values to predict Operational Profits show very little promise. Total Profits are greatly volatile season to season due to off-pitch results, investments and player trading, therefore getting a good significance but little explanatory value. As expected by the nature of Book Values, it does a poorer job than Transfermarkt to predict future Operating Profits, with a good significance but a lower $R = 0.16$.

F.C. Barcelona supporters' opinion on accounting practices, transparency and governance

The questions asked to every socio interviewed (17) were the same. In the following lines I'll write down the questions asked, the general feeling of the answers (if there is a majoritarian opinion) and transcriptions (translated from Catalan to English) of the most relevant answers.

Current Events

Do you think that the current sporting situation is a direct consequence of the club's financial situation?

The vast majority of the interviewees strongly agreed. Only a few pointed out that the current financial situation might partially be due to bad investments both on and off the pitch. In general, the feeling was that the previous board held a very risky position and

that with covid it all crumbled down, even though it probably would have happened anyway sooner or later.

Why do you think this is the case? (Covid not included)

Here there was a diversity of opinions, generally divided between a) Neymar's transfer money not being properly spent and b) an out-of-market salary structure. A socio said *'I think that Bartomeu wanted to make sure that after Neymar's snatch by PSG he wouldn't lose the main column of Barça players. He renewed old players like Piqué, Busquets, Messi, and Jordi Alba for outrageous salaries just to be able to increase their release clause'*. Another pointed out that *'while it is true that the replacements for Neymar were a flop, nobody expected that. It was the continuous spending without sporting project that led to this situation, not losing the €222 million of Neymar'*. The overall sense was that the club was already in bad shape due to bad economical decisions and those translated into bad signings, turning into a vicious cycle.

Do you think that some of the transfers and subsequent contracts have been priced 'off the market'? Which?

An older socio said *'It is tough for us to know. Salaries here are rarely disclosed, same as in other clubs, so we have to believe what the board tells us. The previous one said that everything was great, and this one denounced an overpricing of almost 80% compared to other clubs in the due diligence. But still the contracts aren't public'*. Some others pointed out loads of players signed by the club since 2015, not just for the first team. Douglas, Paulinho, Matheus or Malcom were very repeated names. When asked about Coutinho and Dembele, the general answer was that at the moment they did not think they were overpriced.

Socio Awareness of Financial Statements

What did you think of the club's finances when the signings of Dembelé, Coutinho, Griezmann, De Jong were carried out... Did you think that the Club could afford them back then?

Every respondent said 'Yes'. There was no doubt that the club was in a decent enough financial position to attempt these signings. While Coutinho and Dembelé were incredibly expensive (record breaking for Barcelona), the crowd felt the transfer fees were within reason. *'After all Coutinho, Dembelé and Frenkie were key players in their teams with ongoing contracts'*.

Did you know the financial situation of the club and did you show an active interest in it?

'No. I never thought I'd have to get interested in that. I vote for a president who chooses a board that should be competent enough to handle these things. I have my share of blame for putting such a bad president and board in place, but my job is not to look at financial statements'. In general, nobody looked at the financial statements when things

were going well, and now some have briefly glanced at them but found them boring. *'I have seen them. Numbers here, numbers there, but I do not have a financial education and cannot tell which numbers are good and which are dangerous, and that's quite disheartening'*.

Do you know where to find annual club accounts if you would like to consult them?

All but one knew they can be downloaded from the club's website, showing the socio credentials.

Do you think that under Bartomeu's tenure, an opaque financing and signing system was created and covered up by saying that everything was going well, or that the club's financial model was sustainable and the pandemic 'unbalanced' it?

The answer was unanimous: Yes. Two of the interviewees mentioned how in August right after Barcelona's loss 8-2 against Bayern Munich, Bartomeu said that the accounts were perfectly fine. One year later, the club would not be able to renovate Messi's contract. *'[...] there even was the scandal about the board hiring opinion companies to attack influential people critic with them on social networks. Piqué, Messi, Guardiola... And this was just the top of the iceberg, then was the contract partition to escape governance controls inside the club, the financial engineering with transfers [...]. Maybe the financials of the club where unbalanced due to covid, but they were definitely not sustainable before it'*.

Is it important for you that the Club has transparent finances, or do you think that privacy in this aspect is more important in order not to lose competitiveness with other clubs?

In general, nobody had a strong opinion in this question. Most of them felt that there has to be a balance, but they couldn't agree where it was. An interesting answer was *'I think that we must stop not disclosing the sale value of players and the transfer fees paid. While I understand that the club doesn't want to give out information to competitors, all of these could be disclosed at the end of the transfer window so that it doesn't affect any of the ongoing deals'*. Two of them got in a discussion on whether players would reject coming to Barcelona if they had to agree to have their salaries made public in the financial statements. In my opinion, the club base is very divided on this issue.

Player valuation and current regulations

Note - Here I presented them with the following introduction: *Barça (and other clubs) have a serious problem valuing their intangibles (players). In 2021, the club valued the team at € 313 million, while Transfermarkt valued the team at € 813m). With this valuation, the club would not have had a negative capital of € 451m, but a positive one of about € 50m.*

Do you think that a change in the current regulations is necessary (amortization over the years of contract)?

After a short explanation, all of them agreed that it makes no sense to value football players in that way. Moreover, they did not know this was how it was done.

Alternatively, do you think the club should value its players internally based on other metrics? If so, which ones?

While the general opinion agreed that the valuation should be done differently, nobody proposed a specific method. Goals and goals saved (for goalkeepers) was mentioned in every single interview, in 8 of them people mentioned expected events like xG or xA, others talked about passing % etcetera. In a bit of discussion 3 socios mentioned the shirt sales and I explained the CGU problem in football (that even shirt sales cannot be attributed to a single player). Then one of them proposed that if the CGU is the whole team why is the club so interested in valuing individual players instead of the whole team. They ended up agreeing that it would be fine to report intangible assets but not for internal performance analyses.

I introduced them to goals added and the concept was generally understood, but the majority doubted that F.C.Barcelona was at that stage of R&D development. A few pointed out that the conversion from goals added to a monetary value might not be as straightforward as one might expect.

If so, do you think these player valuations should be public?

The opinion was a bit more concentrated in this one, with most agreeing that these individual player valuations should remain private just for the management team to work with. A socio said *'As much as I'd like to know how much our players are worth according to us, I understand that it can have implications in transfer negotiations and even for the players' morale in case that these numbers are public'*. One socio advocated for the regulator being the one who independently values and publishes the players' worth seasonally for every club in Europe.

Did you know that players trained at the Masia or signed 'for free' do not count as club assets before LaLiga or the law?

None of the interviewees knew, and the vast reaction was of astonishment. Several of them traced back to the previous question where they had been asked about the current regulation and made bolder statements. *'If the best player in history is not an asset for the club, then the system is not just wrong, it's stupid. Is there really no one fixing this at UEFA?'* This same socio then added *'[...] this means that Mbappé would have not been an asset in case of signing for Real Madrid, no? That is crazy man, crazy'*.

Do you think this has affected the club's financial performance (less active) compared to others with a more aggressive signing policy?

This question was a bit difficult to understand for some of the interviewees. I had to explain them the benefits of having a larger asset base. Afterwards, the majority of them said that they didn't know, though they mentioned that if Messi was not an asset then we were probably behind other clubs in that regard.

Financial Engineering & Club Governance

At the time of market moves like the signing of Douglas, Neto, Pjanic or Paulinho, do you think the club moved for purely sporting interests?

All of the interviewees agreed that these signings were done with a financial intent more than a sporting interest. One socio said *'Yes, Paulinho scored several goals and Neto is a decent sub for a goalkeeper, but that is besides the point. You could bring up players from the B team for that or bring other younger promises with potential for the future. Paulinho went back to China in the following season and Neto is just too much of a salary budget liability for what he is... And let's not talk about Douglas or the Arthur-Paulinho swap. If a transfer is announced around end of June, I already frown at it'*.

Did you know that the Italian prosecution is investigating the signing of Arthur by Juventus?

Five of the interviewees knew, though they weren't worried about it. The rest asked whether Barcelona could be fined but weren't much bothered.

Regardless of previous financial transactions, do you believe that purely financial moves are in line with the club's ethics and values?

'Definitely not. It's not even a matter of ethics and values, it's about financial sustainability. In a football club, if your investments have money in mind instead of sporting success, you're doing something very wrong'. This was a widespread opinion amongst the socios. *'I think that the transfer of players for financial reasons is the consequence of betraying the Masia model. You have made bad investments in the past to bring players with outrageously large transfer fees instead of potentiating the youth teams, and now you're paying the price'*. Another socio added *'let's not pretend that Barça is a small club. It's massive, and it is due that some signings go wrong, and that's okay. The problem is that when Barça did that in the past, it managed to keep filling spots with youth players, something that from 2010 to 2020 was forgotten about. Just to name one, we signed Hleb from Arsenal and when he did not work, we didn't sign another expensive winger, we brought up Pedro. In 2008, Barça decided to finally add a sponsor to the shirt: UNICEF! And then the board changed, massive transfers came in and it had to be changed for Qatar Airways and Qatar Foundation. I don't think that a change of model is either worth it or right'*.

Do you believe that there is an effective system of governance and compliance?

'I think that now there is good compliance, even if it's slightly enforced by La Liga [the regulator]'. Most of the interviewees could recall that the previous compliance officer resigned after feeling that the Bartomeu's board was ignoring her alerts about the business that was being done. 'It shows the state of the club when the compliance officer resigns, starts giving out interviews to newspapers and yet nothing happens. This has to change, but I don't think we've had any news regarding that'. In terms of governance, all the socios agreed that they are proud to be owners of the club and that it is not property of any investment company. 'It is a bit romantic in my case. I like to feel we are still part of the club and that nobody will make the decisions for us. That is obviously not true, there is a board deciding on all the major things, but we still have the capacity to kick people out and put new ones if we feel like it, and that's something most fans cannot say'. Another said 'Maybe it is a question of identity. F.C.Barcelona has a special history very tied to this city and Catalonia, and many people do not know that. "Més Que Un Club" isn't just a fancy slogan, it is a reality, and part of that is due to the fact that us, the fans, still have a saying in what we do and what we do not do. When the Super League was announced, we still had to ratify it, and I think that shows that the socio base here is incredibly important. Maybe we are not as efficiently run as other clubs, but we run our club, not just go to a stadium wearing the jersey of a team owned by a millionaire that happened to like football'.

If not, what would you change?

In general, there weren't any ideas about what could be improved in the compliance department. Some socios agreed that maybe the compliance team should be independent of the Board and that an external auditor should be in it.

Do you think the guarantors affect (positively or negatively) the management of the club?

Generally, it's viewed as a negative aspect of the management of the club. While it is an obligation set by the regulator, the socios feel like it acts as a 'hanging sword' on the board's neck. *'Every board starts to become conservative by the end of their term and looks for their own good ahead of the club. Having their own patrimony at stake is just tough. There must be better ways to do this'*. Another socio said *'The guarantee that the entering board must provide is 15% of the budget of the club for one year. We're talking about around €150 million, it's mad. It does two things: prevent capable but poor people from joining the board, or having these capable people controlled by the people who put the money in. Some say this is the reason why Messi's contract wasn't renovated'*.

Did you know that a participatory process is currently underway for members to make proposals for new club statutes?

The answer was divided. The majority of younger socios knew it due to the email communications, some of the eldest didn't.

Will you make a proposal? If so, which?

Just two socios mentioned they were thinking of proposing a few changes regarding ticketing and socio involvement in club decisions. When told that they were the only ones who might make a proposal, one said *'Well, not every socio is equally invested. Not sure if it's a shame or a blessing [laughs]. In any case, the fact that there is this process open means that the club has its ears open and knows it needs a change. That's a start'*

CONCLUSIONS

General

The literature review leaves no doubt that the current state of the football regulations regarding player valuation is flawed: Not counting free transfers or youth players as assets can negatively affect clubs with a strong youth development strategy in contrast with heavily purchasing clubs with large capitalizations of intangible assets and can inflate profits due to an undervaluation of the cost of goods sold. It can also impact the transfer values of players creating capital gains fraud, and it can potentially undermine the purpose of the Financial Fair Play regulations.

There are alternatives which have already been proposed and can be easily implemented short-term, even without changing the current regulation. Moreover, the appearance of the goals added metric and the subsequent algorithms to measure it creates a hopeful future for player valuation based solely on their individual (and collective) performance instead of their transfer values, which are not necessarily related a player's value.

The necessity for a player valuation based on goals added is furthermore proved by the existing research showing how other alternatives are biased or incomplete. Transfermarkt values are biased and wrongly used by clubs as proxies for transfer negotiations, EA Sports attributes are inconsistent, and event data metrics -while an improvement- are incomplete.

Implementing goals added (or any other related "goal difference" metric) to the analysis of the game will not only solve the player valuation problem in sporting terms, but as soon as a monetary conversion is fixed (i.e. €2m/added goal) it will also solve the financial statements' inconsistency with the real player values, not just for the market, but for a single team.

Event data to predict individual player value

The results showed that a 59% of the variance in value for the whole group of players could be explained by factors that a priori seem logical: Age being a negative value driver and non-penalty expected Goals, percentage of passes completed and expected assists driving the value upwards, amongst others. Further analyses showed that it made sense to distinguish players by position since their abilities are different and are related to different metrics. Forwards showed an $R = 0.83$, showing interesting and a priori un-

expected results like dribbling and non-penalty expected goals not being significant. The difference between non-penalty expected goals and actual goals is what was significant, which proved that players who score more than they should are highly valued. Age obviously was a factor driving the value down as it grew.

Midfielders ($R = 0.71$) showed the unintuitive result that age was not a significant variable, but as explained before, it could be both due to a smaller sample size or the fact that nowadays there are many technical players that elongate their football years when they don't have to rely on their physicality. Again, overachievers were systematically valued higher in case of the number of assists compared to the number of expected assists (even though $p\text{-value} > 0.05$, it is close enough to stay relevant in such a position). Fouls drawn leading to a shot is also an interesting explanatory value that the model rewarded.

Defenders ($R=0.63$) showed once more that event data is not a great tool to measure defending performances. While the analysis shows a decent R value, the variables driving it aren't very defensive. While age keeps being a decent metric in terms of significance, Goal Creating Actions and pass percentage completion are important variables, which is surprising given the a priori offensiveness of them. As mentioned before, this can be a result of the capacity of players to not lose the ball when risking a forward pass, compared to the usual "easy" passes between defenders. GCA sees a similar effect, being possible that defenders who have both a defensive and offensive capacity see their value boosted, like Alexander-Arnold, Van Dijk or Ruben Dias.

Finally, goalkeepers didn't have enough data or variables to show a meaningful relationship between event data and Transfermarkt value.

In summary, event data is at most a decent proxy for understanding player valuation, specially when compared to Transfermarkt values. The combination of the lack of tracking data and the biased Transfermarkt values, makes a model based solely on event data not recommendable, since it would be missing important aspects of the game. In the same way that Event Data related metrics like expected goals are an improvement to simply looking at number of goals, Tracking Data is the improvement needed to Event Data. Only when tracking data becomes publicly available and/or widely used by football clubs, our understanding of football and player's value in the pitch will be truly complete.

Transfermarkt versus Profits, Operational Profits & Book Values

The analysis of the linear regressions shows that the financial data published by the clubs, whether it is Profits, Operational Profits or Book Values, doesn't precisely reflect the team valuations over the period studied, proving that a) Transfermarkt values are biased, since an unbiased valuation would highly explain the variations in Operational Profit, and it has an $R = 0.25$ with $p\text{-value} < 0.05$ and b) Book Values are a worse proxy than Transfermarkt values when it comes to predicting Operational Profits ($R=0.16$). Book Values are highly correlated with

Transfermarkt, as expected, since the Book Values derive from transfer fees, and these are highly influenced by Transfermarkt.

Socios Interviews

The socios interviews showed a clear lack of interest in the financial statements during the period before the club's crises, followed by an intention to get more informed but with a discouraging result coming from boredom and a lack of financial knowledge combined with little benchmarks and low transparency. All of them thought that the signings of players like Dembelé, Coutinho and De Jong were logical and sensible moves, and while it is true that many of them raised an eyebrow to all the swaps and shady deals like Malcom, Paulinho, etcetera, none of them felt in power to do anything in hopes that the board knew what they were doing.

In terms of the players' valuation in the financial statements, the generalized reaction was of astonishment, and while no socio could clearly formulate a specific way of valuating them, they all agreed that a new model should be used, both in terms of the valuation of transferred players and home-grown ones. As one socio put it *'If the best player in history is not an asset for the club, then the system is not just wrong, it's stupid. Is there really no one fixing this at UEFA?'*. This same socio then added *'[...] this means that Mbappé would have not been an asset in case of signing for Real Madrid, no? That is crazy man, crazy'*.

The transparency of these players' individual valuations was agreed that it should remain private because of the potential impacts on transfer and contract negotiations, and the players' morale. Team valuations was something that the socios found easier to disclose without risking giving too much information.

When mentioned the Goals Added methodology, they agreed that on paper it seemed alright, but they doubted that the club had this kind of data analytics capability to implement it in the short-term.

On the question of whether the socio governance model is still the adequate to manage a leading club like F.C. Barcelona, my opinion and that of the majority of the socios is that it still is. Disregarding the romanticism of having the fans own the club instead of a group of investors, the current role of the socios' effect on the management of the club is only slightly relevant. If we look into the votings that socios usually participate in, we have distinguished two: Choosing a president and voting on major sponsor deals/infrastructure investments.

The first one consists of two rounds: a) The candidates must present a certain amount of socio endorsements in the form of signatures and b) those who manage to achieve the minimum number start a campaign to win the election. That said, the guarantees that are currently in place mean that only 3 types of candidates can run for the presidency: 1. Individuals which inherited a large amount of wealth, 2. Successful

businessmen/women who managed to mass large sums of money and 3. People with sponsors who will pay the guarantees for them.

Historically, of these 3 profiles only the latter 2 have stood a chance. During the campaign, one of the usual main points of discussion is the capacity of running a multimillionaire business, and it quickly rules out the “rich kids” with no real experience. Out of the remaining two, one has already proven the capacity of generating profits and maintaining a company, and the other proves their leading abilities by having convinced companies/individuals to sponsor their guarantees.

Regarding the second action that socios take (voting on certain projects), the current model is clearly improvable: Projects are presented by the board -who makes a recommendation to the socio to vote in favour-, usually with incomplete and simplified data due to confidentiality agreements (like the recent Spotify sponsorship deal) and then voted by a mass of socios that can't weight it against alternatives (due to the lack of data and lack of alternatives presented) and who are heavily influenced by the interest of the media.

So, how can the socios' influence in the club be improved? Educating the socios in management and finance is a utopy. Most Barcelona socios are socios just because it allows them to have discounts and to have access to a season ticket to Camp Nou. Many of them have an interest in choosing decent presidents because they want to see results in the pitch, assuming that this president will keep track of the books. After all a socio is not a shareholder that can make a profit, and this is why many of them do not pay too much mind to the Financial Statements. Therefore, educating socios in 'how to vote' would be as efficient as trying to educate the population of a country in how to vote a president: It would be incredibly painful and constantly attacked by claims of bias.

One alternative roughly suggested by candidate Victor Font was to have a socio model that allowed them to vote on certain aspects if their CV proved a certain career trajectory and abilities, following a technocratic approach. For example, when choosing new sponsors, only those socios with experience in marketing and sponsor valuation deals who voluntarily register to be in this socio panel would have a say. This way, the board would negotiate and filter a number of alternatives and give a recommendation to be assessed by a panel of socio 'experts'.

In conclusion, the governance model should be improved, but the socios grasp on the club can be sustainable. Only if the guarantees are lifted the election process should find a new way of filtering out unfit candidates. Moreover, cases like the Bartomeu presidency are unlikely to be repeated for several reasons: Firstly, because the socio has seen that when not kept in check these things do happen. With new compliance measures and a closer group of the panel of socios it will be easier to blow the whistle and have motions of no confidence sooner. Secondly, because his presidency was a perfect storm, after he inherited the vice-presidency and the presidency after several

resignations and won the election in 2015 against all odds (he was forced to call for early elections in January 2015 due to bad team results, an open war between Messi and coach Luis Enrique, and the Neymar signing case) only because F.C. Barcelona surprisingly made a comeback in all the competitions, won the treble, and the socio was blind sighted by the sudden success. It is unlikely that such a character comes to be a president in these strange situations.

FUTURE RESEARCH

Proposal of a 'goals added to euros' model: This would be the ultimate goal of the goals added usage to improve the player valuations. A model capable of precisely attributing a monetary value to goals added would solve the problem of biased transfer fees and could be of use both for the teams, agents, and regulators, who could talk in the same terms when discussing signings, player salaries and fair play regulations.

Correlation between Transfermarkt and FM: As mentioned in previous sections, Football Manager is a deeply complicated and data-rich game that surpasses the precision of games like FIFA from EA Sports. It would be interesting to see if there's any correlation between Transfermarkt and FM, and the capacity of FM to build a pricing model based on their data.

The effect of disclosing fair values in transfer and contract negotiations: A study of this phenomenon would be specially interesting to solve the current trend in football to hide players' salaries, agent bonuses and transfer fees. If it can be proven that this public information does not necessarily affect negotiations more than the effect of Transfermarkt -by looking at similar industries or any other means-, it could be of interest to make football more transparent.

Correct Goals Added for division and competition: The Goals Added model is not just interesting for internal valuation purposes, but also for sporting analyses. That said, players moving between countries or divisions usually see their performance altered. This analysis has briefly hinted at by looking at xG differences during the first year after a transfer and through Possession Value models, but it would be interesting to see it compare with Goals Added as the main metric.

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APPENDIX

FRef Metrics Used

Age

Ninties: Total number of minutes played divided by 90.

Goals: Total goals scored during the season

Shots: Total shots taken during the season

Shots on Target

Percentage of Shots on Target

Distance: Average distance from which the shots were taken

Non-penalty expected Goals

Non-penalty goals minus Non-penalty expected Goals

Completed passes

Percentage of passes completed

Total pass distance

Progressive Distance: Distance that the ball moved towards the opposite goal in a pass

Assists

Expected Assists

Assists minus Expected Assists

Shot Creating Actions per 90 minutes

Total number of Dribbles

Fouls drawn that lead to a shot attempt

Defensive actions that lead to a shot attempt

Goal Creating Actions per 90 minutes (GCA)

Total Tackles

Percentage of tackles won

Total Pressing actions

Successful pressing actions

Total Blocks

Pass blocks

Interceptions

Clearances

Errors leading to shot

Team Graphs Complete Teams

