The Making of: "Overall Business Values of NBA Players" Visualization

Jacob McConnell
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Final Viz: https://public.tableau.com/profile/jacob.mcconnell -!/vizhome/OverallBusinessValuesofNBAPlayers/Dashboard1

Github:
https://github.com/jmcconnell831/NBA_Project

Documentation

If you follow the National Basketball Association (NBA) you realize that basketball is more than just a game. The NBA's 30 teams and 481 players act as athletes, entertainers, and role-models whose work is enjoyed around the world. Around the time the 2016-2017 NBA regular season ended and the playoffs began, I was tasked with creating a Data Visualization for a graduate course at Santa Clara University. As a self proclaimed "NBA Super Fan", it was only natural I explore how to apply my newly developed Data Visualization skills towards visually solving an NBA related debate. Ultimately, the process of creating a successful visualization can be broken into four categories: developing a *Problem Statement*, *Data Wrangling*, *Data Visualization*, and *Refinement.*

Problem Statement

Developing an insightful Problem Statement was by far the most challenging aspect of my NBA project. It is easy to make a claim and imagine how you could visually represent the problem, but a useful problem statement consists of two crucial aspects: *objective dimensions* and *subjective dimensions.* Objective dimensions are facts and data, and subjective dimensions are style and audience. I knew I wanted to explore player values and began thinking of highly debated NBA topics like: "who should be the MVP?", "who is the best player?", and "what is the most important player characteristic?". As I researched however, two common problems arose: there was either not enough data to support a claim, or there was no clear audience and therefore I could not produce a useful problem statement.

After many attempts of hypothesizing a claim and failing to wrangle supportive data, I realized my problem- I was missing the most important aspect of the subjective dimension: *truthfulness.* Statements that are subject to viewer opinion do not produce truthful results. So how can I produce a truthful, functional, and enlightening data visualization about NBA player

values without being subject to opinion? The answer lay in the root of what the NBA is: a multibillion dollar business. The two main sources of data I could find that were not subject to debate were **player box-score statistics** and **player salaries**. I realized there was a large *audience* consisting of team owners, investors, scouts, and even fantasy basketball players who would be interested in analyzing "***Business Values of NBA players"*** and thus had developed my problem statement.

Data Wrangling

Mentioned above, data wrangling directly tied into developing my problem statement. To produce *qualifying* data, I needed to find sources that could *warrant* and *back* my claim without falling victim to *rebuttals.* On http://www.basketball-reference.com/, I found the majority of data I needed to research my problem statement. Due to availability of data, I decided to focus my search on only the most recent 2016-2017 regular season numbers. My final data sources consisted of the following:

Box-Score Totals

Player Totals

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Rk	Player	Pos	Age	Tm	G	GS	MP	FG	FGA	FG%	3P	3PA	3P%	2P	2PA	2P%	eFG%	FT	FTA	FT%	ORB	DRB	TRB	AST	STL	BLK	TOV	PF	PTS
1	Alex Abrines	SG	23	OKC	68	6	1055	134	341	.393	94	247	.381	40	94	.426	.531	44	49	.898	18	68	86	40	37	8	33	114	406
2	Quincy Acy	PF	26	TOT	38	1	558	70	170	.412	37	90	.411	33	80	.413	.521	45	60	.750	20	95	115	18	14	15	21	67	222
2	Quincy Acy	PF	26	DAL	6	0	48	5	17	.294	1	7	.143	4	10	.400	.324	2	3	.667	2	6	8	0	0	0	2	9	13
2	Quincy Acy	PF	26	BRK	32	1	510	65	153	.425	36	83	.434	29	70	.414	.542	43	57	.754	18	89	107	18	14	15	19	58	209
3	Steven Adams	C	23	OKC	80	80	2389	374	655	.571	0	1	.000	374	654	.572	.571	157	257	.611	282	333	615	86	88	78	146	195	905
4	Arron Afflalo	SG	31	SAC	61	45	1580	185	420	.440	62	151	.411	123	269	.457	.514	83	93	.892	9	116	125	78	21	7	42	104	515
5	Alexis Ajinca	C	28	NOP	39	15	584	89	178	.500	0	4	.000	89	174	.511	.500	29	40	.725	46	131	177	12	20	22	31	77	207
6	Cole Aldrich	C	28	MIN	62	0	531	45	86	.523	0	0		45	86	.523	.523	15	22	.682	51	107	158	25	25	23	17	85	105

Salaries

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			Salary							
Rk	Player	Tm	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	Signed Using	Guaranteed
1	LeBron James	CLE	$30,963,450	$33,285,709	$35,607,968				Early Bird	$64,249,159
2	Mike Conley	MEM	$26,540,100	$28,530,608	$30,521,115	$32,511,623	$34,504,132		Cap Space	$140,529,829
3	DeMar DeRozan	TOR	$26,540,100	$27,739,975	$27,739,975	$27,739,975	$27,739,975		Cap Space	$109,760,025
4	James Harden	HOU	$26,540,100	$28,299,339	$30,431,854	$32,703,493			Bird Rights	$85,271,293
5	Al Horford	BOS	$26,540,100	$27,734,405	$28,928,710	$30,123,015			Cap Space	$83,203,215
6	Russell Westbrook	OKC	$26,540,100	$28,530,608	$30,670,404				Bird Rights	$55,070,708
7	Kevin Durant	GSW	$26,540,100	$27,734,406					Cap Space	$26,540,100
8	Dirk Nowitzki	DAL	$25,000,000	$25,000,000					Bird Rights	$25,000,000
9	Carmelo Anthony	NYK	$24,559,380	$26,243,760	$27,928,140				Bird Rights	$50,803,140
10	Damian Lillard	POR	$24,328,425	$26,153,057	$27,977,689	$29,802,321	$31,626,953		1st Round Pick	$139,888,445
11	Chris Bosh	MIA	$23,741,060	$25,289,390	$26,837,720				Bird Rights	$75,868,170

Team records

2016-17 NBA CONFERENCE STANDINGS

Conference | Division 2016-2017 Regular Season

EASTERN CONFERENCE	W	L	PCT	GB	HOME	ROAD	CONF	DIV	STREAK	L10
1 z-Boston	53	29	0.646	-	30-11	23-18	36-16	11-5	W3	7-3
2 y-Cleveland	51	31	0.622	2	31-10	20-21	35-17	8-8	L4	4-6
3 x-Toronto	51	31	0.622	2	28-13	23-18	34-18	14-2	W4	8-2
4 y-Washington	49	33	0.598	4	30-11	19-22	32-20	8-8	L1	5-5
5 x-Atlanta	43	39	0.524	10	23-18	20-21	30-22	6-10	L1	6-4
6 x-Milwaukee	42	40	0.512	11	23-18	19-22	27-25	10-6	L1	5-5
7 x-Indiana	42	40	0.512	11	29-12	13-28	26-26	8-8	W5	6-4

Fan casted All-Star votes

2017 EASTERN CONFERENCE ALL-STAR STARTER FINAL PLAYER VOTING RESULTS
(324 players participated in the voting process)

Player Name	Conference	Position	Total Votes	Rank
James, LeBron -- CLE	Eastern	Frontcourt	198	1
Antetokounmpo, Giannis -- MIL	Eastern	Frontcourt	162	2
Butler, Jimmy -- CHI	Eastern	Frontcourt	68	3
George, Paul -- IND	Eastern	Frontcourt	64	4
Porzingis, Kristaps -- NYK	Eastern	Frontcourt	51	5
Anthony, Carmelo -- NYK	Eastern	Frontcourt	50	6
Love, Kevin -- CLE	Eastern	Frontcourt	47	7
Embiid, Joel -- PHI	Eastern	Frontcourt	43	8
Drummond, Andre -- DET	Eastern	Frontcourt	30	9
Parker, Jabari -- MIL	Eastern	Frontcourt	22	10
Turner, Myles -- IND	Eastern	Frontcourt	14	11
Lopez, Brook -- BKN	Eastern	Frontcourt	13	12 (tie)
Millsap, Paul -- ATL	Eastern	Frontcourt	13	12 (tie)
Whiteside, Hassan -- MIA	Eastern	Frontcourt	11	14
Thompson, Tristan -- CLE	Eastern	Frontcourt	9	15
Horford, Al -- BOS	Eastern	Frontcourt	8	16
Booker, Trevor -- BKN	Eastern	Frontcourt	7	17 (tie)
Young, Thaddeus -- IND	Eastern	Frontcourt	7	17 (tie)
Beasley, Michael -- MIL	Eastern	Frontcourt	6	19 (tie)
Gibson, Taj -- CHI	Eastern	Frontcourt	6	19 (tie)
Gortat, Marcin -- WAS	Eastern	Frontcourt	6	19 (tie)
Howard, Dwight -- ATL	Eastern	Frontcourt	6	19 (tie)
Monroe, Greg -- MIL	Eastern	Frontcourt	6	19 (tie)
Morris, Markieff -- WAS	Eastern	Frontcourt	6	19 (tie)

Player Name	Conference	Position	Total Votes	Rank
Irving, Kyrie -- CLE	Eastern	Guard	130	1
Thomas, Isaiah -- BOS	Eastern	Guard	92	2
DeRozan, DeMar -- TOR	Eastern	Guard	91	3
Wall, John -- WAS	Eastern	Guard	49	4
Lowry, Kyle -- TOR	Eastern	Guard	40	5
Wade, Dwyane -- CHI	Eastern	Guard	33	6
Walker, Kemba -- CHA	Eastern	Guard	31	7
Beal, Bradley -- WAS	Eastern	Guard	16	8
Rose, Derrick -- NYK	Eastern	Guard	14	9 (tie)
Teague, Jeff -- IND	Eastern	Guard	14	9 (tie)
Batum, Nicolas -- CHA	Eastern	Guard	10	11
Bradley, Avery -- BOS	Eastern	Guard	8	12 (tie)
Rodriguez, Sergio -- PHI	Eastern	Guard	8	12 (tie)
Brogdon, Malcolm -- MIL	Eastern	Guard	7	14
Dellavedova, Matthew -- MIL	Eastern	Guard	6	15 (tie)
Dragic, Goran -- MIA	Eastern	Guard	6	15 (tie)
Jackson, Reggie -- DET	Eastern	Guard	6	15 (tie)
Lee, Courtney -- NYK	Eastern	Guard	6	15 (tie)
Bogdanovic, Bojan -- BKN	Eastern	Guard	5	19
Augustin, D.J. -- ORL	Eastern	Guard	4	20 (tie)
Carter-Williams, Michael -- CHI	Eastern	Guard	4	20 (tie)
Ellis, Monta -- IND	Eastern	Guard	4	20 (tie)
Foye, Randy -- BKN	Eastern	Guard	4	20 (tie)
McConnell, T.J. -- PHI	Eastern	Guard	4	20 (tie)

Player casted All-star votes

2017 EASTERN CONFERENCE FRONTCOURT
ALL-STAR STARTER FINAL FAN VOTING RESULTS

Player Name	Conference	Position	Total Votes	Rank
James, LeBron	Eastern	Frontcourt	1,893,751	1
Antetokounmpo, Giannis	Eastern	Frontcourt	1,604,463	2
Embiid, Joel	Eastern	Frontcourt	922,174	3
Love, Kevin	Eastern	Frontcourt	909,488	4
Butler, Jimmy	Eastern	Frontcourt	691,072	5
Anthony, Carmelo	Eastern	Frontcourt	544,133	6
Porzingis, Kristaps	Eastern	Frontcourt	486,527	7
George, Paul	Eastern	Frontcourt	426,325	8
Thompson, Tristan	Eastern	Frontcourt	245,822	9
Parker, Jabari	Eastern	Frontcourt	198,574	10
Whiteside, Hassan	Eastern	Frontcourt	169,746	11
Ilyasova, Ersan	Eastern	Frontcourt	162,185	12
Howard, Dwight	Eastern	Frontcourt	151,155	13
Horford, Al	Eastern	Frontcourt	122,190	14
Drummond, Andre	Eastern	Frontcourt	100,797	15
Gortat, Marcin	Eastern	Frontcourt	66,667	16
Valanciunas, Jonas	Eastern	Frontcourt	57,857	17
Jefferson, Richard	Eastern	Frontcourt	53,771	18
Frye, Channing	Eastern	Frontcourt	46,384	19
Millsap, Paul	Eastern	Frontcourt	39,551	20
Ross, Terrence	Eastern	Frontcourt	38,516	21
Crowder, Jae	Eastern	Frontcourt	31,413	22
Ibaka, Serge	Eastern	Frontcourt	29,123	23

I customized a Python script to cut, sort, and merge these data sources. Furthermore, I developed two more data files: Box-score Totals divided by Games Played and Box-score Totals divided by Salaries. The sources further helped me analyze the player business value KPI I developed.

After all my data sources were consolidated, I ranked each column as to find the value of each player for every point of data. I averaged these ranks as the following (table snapshot seen below): Pure State Rank, Stats adjusted to GP, Stats Adjusted for Salary, Team Rank, Popularity (vote) rank, MVP candidate (Stats, popularity, and Team Rank), and averaged all these to find the "Overall Business Value".

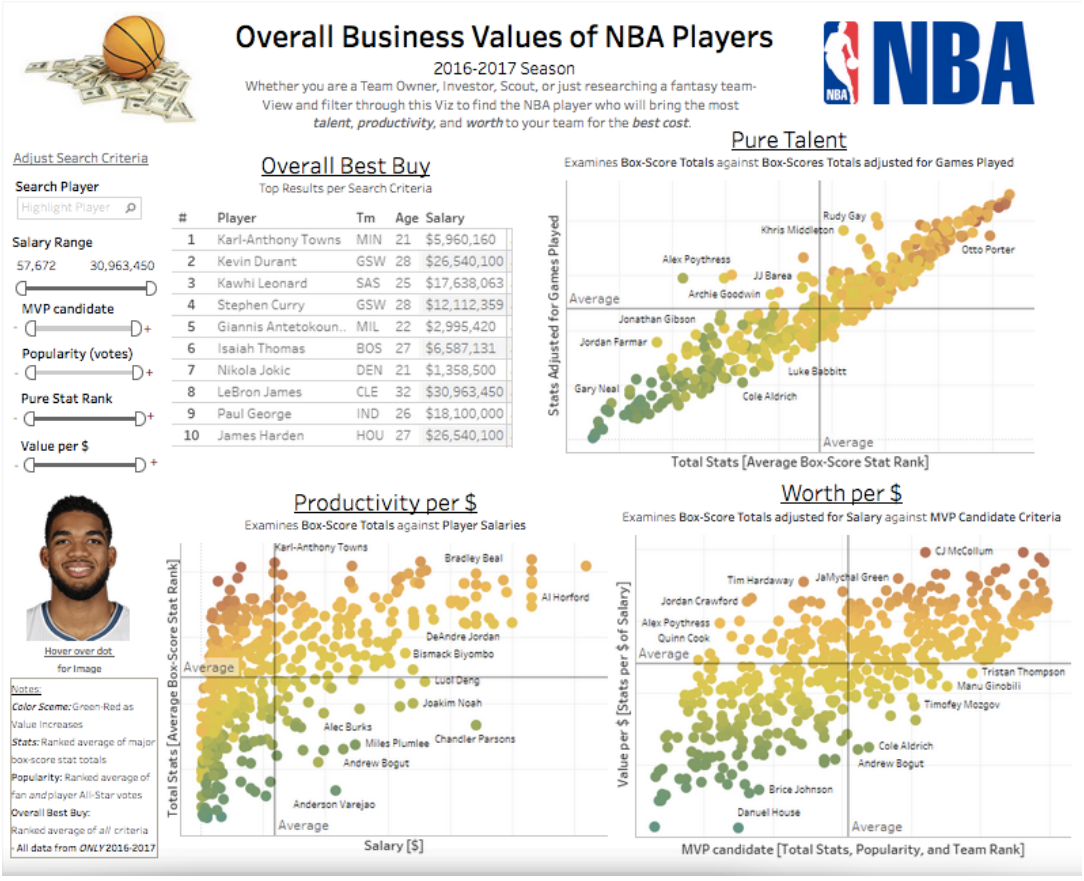
A	B	C	D	E	F	G	H	I	J	K	L
Player	Age	Tm	Salary	Pure Stat Ra	Stats adjusted to (	Adjusted for sal	Team Ra	Popularity (vot	MVP candidate	Best Value $	Overall A(	age
Karl-Anthony Towns	21	MIN	$5,960,160	412.3684211	429.2	304.2857143	24	452	296.122807	381.9513784	379.910652	
Kevin Durant	28	GSW	$26,540,100	417.1578947	447.05	112.7619048	1	479	299.0526316	325.6565998	372.229282	
Kawhi Leonard	25	SAS	$17,638,063	413.3684211	436.55	174.047619	2	474	296.4561404	341.3220134	371.924144	
Stephen Curry	28	GSW	$12,112,359	407.6842105	427.1	221.3333333	1	474	294.2280702	352.0391813	370.262865	
Giannis Antetokounmpo	22	MIL	$2,995,420	389.8947368	409.45	361.1428571	13	477	293.2982456	386.829198	369.868045	
Isaiah Thomas	27	BOS	$6,587,131	393.7368421	415.15	284.1428571	4	468.5	288.745614	364.3432331	365.493922	
Nikola Jokic	21	DEN	$1,358,500	384.8421053	399.05	402.7142857	18	442	281.6140351	395.5354637	365.260401	
LeBron James	32	CLE	$30,963,450	408.3684211	431.5	112.3809524	5	481	298.122807	317.4164578	363.851921	
Paul George	26	IND	$18,100,000	400.8421053	428.9	162.2380952	13	462.5	292.1140351	330.6600668	363.129052	
James Harden	27	HOU	$26,540,100	400.7368421	427.55	143.047619	3	478	293.9122807	323.7781537	361.494319	
Kyrie Irving	24	CLE	$17,638,063	397.2105263	425.2	161.952381	5	476.5	292.9035088	328.1209691	360.858751	
CJ McCollum	25	POR	$3,219,579	406.6842105	424.15	354.8095238	15	209	210.2280702	395.2145781	359.069215	
DeMarcus Cousins	26	TOT	$15,756,438	385.5789474	416.95	195.1428571	0	467.5	284.3596491	332.5572682	354.861466	
Kyle Lowry	30	TOR	$12,000,000	383.0526316	418.3	189.8095238	5	460	282.6842105	330.3873851	353.606057	
Klay Thompson	26	GSW	$16,663,575	395.5789474	407	160	1	455.5	284.0263158	320.8596491	351.866228	
Kemba Walker	26	CHO	$12,000,000	384.1578947	403.5	215.6190476	20	446.5	283.5526316	334.4256475	351.409043	
Gordon Hayward	26	UTA	$16,073,140	390.4210526	411.3	166.2857143	5	443.5	279.6403509	322.6689223	351.007581	
Damian Lillard	26	POR	$24,328,425	386.8947368	416.1	133.2857143	15	456	285.9649123	312.0934837	350.263283	
Russell Westbrook	28	OKC	$26,540,100	380.9473684	413.95	152.1904762	10	477	289.3157895	315.6959482	349.977277	
Jimmy Butler	27	CHI	$17,552,209	380.6842105	410	173.952381	15	466.5	287.3947368	321.5455305	349.906119	
Bradley Beal	23	WAS	$22,116,750	396.5789474	413.1	131.5714286	9	421.5	275.6929825	313.7501253	349.780514	
Anthony Davis	23	NOP	$22,116,750	379.4736842	403.15	156.8095238	21	472	290.8245614	313.1444027	346.648162	
Marc Gasol	32	MEM	$21,165,675	380.6842105	408.25	135.3809524	11	457.5	283.0614035	308.1050543	345.025167	
Devin Booker	20	PHO	$2,148,360	355.1052632	382.6	376.952381	29	419	267.7017544	371.552548	344.239891	
Kristaps Porzingis	21	NYK	$4,317,720	358.4736842	384.3	308.5238095	24	463	281.8245614	350.4324979	343.757686	
Myles Turner	20	IND	$2,380,440	371.5263158	371.15	362.1428571	13	401	261.8421053	368.2730576	343.19787	
Otto Porter	23	WAS	$5,893,981	398.3157895	371.75	276.952381	9	337	248.1052632	349.0060568	341.794277	
Mike Conley	29	MEM	$26,540,100	384.2631579	408.35	99.47619048	11	430	275.0877193	297.3631161	341.265998	
John Wall	26	WAS	$15,756,438	368.4736842	398.65	184.7142857	9	457.5	278.3245614	317.2793233	340.681892	
Chris Paul	31	LAC	$22,868,827	377.0526316	409.95	99.61904762	5	458	280.0175439	295.5405597	340.640184	
Brook Lopez	28	BRK	$21,165,675	381.1052632	400.45	131.4761905	30	409.5	273.5350877	304.3438179	339.858542	
Jabari Parker	21	MIL	$5,374,320	348.8421053	394.7	264.1904762	13	445.5	269.1140351	335.9108605	337.14175	
Andrew Wiggins	21	MIN	$6,006,600	360.3684211	379.6	290.7142857	24	410	264.7894737	343.5609023	337.079699	

Data Visualization

With all 481 NBA players ranked and averaged across a large amount of categories, the second most difficult part of the project was linking the three aspects of a visualization: *domain*, *data*, and *task.* Understanding the domain (needs) of the visualization was found through trial and error. Being an avid NBA fan was beneficial as I looked for ways to visualize the data. Deciding what factors to graph against each other was difficult but I applied my basketball knowledge (with audience in mind) to create my final product. Ultimately, I took my data and imagined three key charts I wanted to visualize: “talent”, “productivity”, and “worth”, in order to accomplish my task of finding the “business value of players”.

Refinement

After *validating* my *claim* was confirmed in my *visualization,* I was tasked with adjusting the *aesthetics.* I wanted my dashboard to be as interactive as possible as to apply to a larger array of audiences. I implemented tableau filters of custom KPI’s relative to “Business Value” into my visualization and added another data source- player images. In my final dashboard, I allow users to filter upon salary, MVP Candidacy, Popularity, Pure Stat Ranks, and Value per dollar spent in order to find the perfect player for their exact needs which is displayed in a results table. In addition, users can search player names to be highlighted and running the cursor over a player on any graph shows all relative statistics for that player.



Conclusion

Finding the "Business Values of NBA players" was a three-part process: *Data Wrangling*, *Data Visualizing*, and *Documenting*. Upon completion of the three, I feel as if my final product directly relates to the relative *audience* by making an *insightful claim* and produces *enlightening results*. I followed *"Toulmin's Structure of Arguments"* model to *Visually Explore*, *Visually Confirm*, *KPI* develop, and produce a final *dashboard* as described in the above documentation process.

Though the top 10 results of my dashboard are common NBA names, the overall business value of each player is interesting, particularly the range of salaries. The top business valued player is Karl-Anthony Towns, a second year player, who earns only $5 million (16% of the highest salary). You would expect the top 10 results to consist of similarly low salaries, but surprisingly, Kevin Durant, the second highest paid player in the league, produced the second most valuable season in the NBA. Depending on budget and what my dashboard user is searching for: they can filter through and explore their options and *ultimately find the best player at the best price.*