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## **CRICKET ANALYTICS: Enhancing Team Performance, Strategy Development and Player Selection**

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### **ABSTRACT:**

Cricket Analytics integrated by big data and advanced technologies helps teams prepare, make strategies and evaluate performance of each player in an easy way. This paper guides about the methodologies of data collection including the match statistics, player performance data and the type of data used like historic data and real time data for a longer vision. Analytical tools such as python, R and power bi for visualizing the idea or information into insights which helps team and the players in better understanding and planning the game according to the specific opponent or for a specific player by finding their weakness and strengthening the base to be covered before the game with the help of coach and staff members. Strategic Development and player selection according to the pitch conditions and specific opponent with the factors considering home or away game, the type of pitch to be played and the kind of wicket the team to be played, the overcast conditions and players fitness to be considered in today's modern game of cricket. As technology evolve the game also evolves according to the technology making for the coach and players to make a decision instantaneously considering the match situation and the game play.

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### **Introduction:**

Cricket is not just a game it is an emotion of many people. In Australia the game cricket was known due to SIR DON BRADMAN the person who scored tons of runs in his career in the olden days. Then SIR VIVIN RICHARDS made it popular in some of the areas due to his stylish and fearless way of batting. The world came to know about cricket by a little man or the little master called SACHIN RAMESH TENDULKAR who made the entire globe look back to a sport called cricket where football was the only highlight sport in those time. As the era changes the technology in the cricket also developed. Technologies like ball tracking and Decision review system(DRS) was introduced to challenge the decision of the umpire and cricket also developed analytically as teams started to prepare plans for the opponents to win a game according to specific conditions, player performance and match tactics.

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### **Methodologies in Cricket Analytics:**

#### **Data Collection**

#### **Source of Data:**

##### **1)Match Statistics:**

The match statistics like Runs, Wickets, Extras, Overs, Strike rate, Economy, Balls Faced, Six, Four, etc.. are collected for a particular team or for a particular player to analyze. It can be also ball by ball Statistics which is a detailed record of every delivery bowled in a match that gives a much clearer understanding of the team or player for which delivery what type of shot is played the ball is left behind or the ball is beaten and the wicket delivery etc. The next is the historical data which is the past match records of a team or a particular player. The below FIG 1 is the example for the match data between India vs Australia in Test matches where it consist of the top scorers combined from both teams during a span of time.

Player	Span	Mat	Inns	NO	Runs	HS	Ave	BF	SR	100	50	0	4s	6s
SR Tendulkar (IND)	1991-2013	39	74	8	3630	241*	55	6110	59.41	11	16	4	434	25
RT Ponting (AUS)	1996-2012	29	51	4	2555	257	54.36	4428	57.7	8	12	4	278	4
VVS Laxman (IND)	1998-2012	29	54	5	2434	281	49.67	4480	54.33	6	12	3	338	0
SPD Smith (AUS)	2013-2024	23	44	6	2319	192	61.02	4394	52.77	11	5	3	253	13
V Kohli (IND)	2011-2024	29	51	2	2209	186	45.08	4211	52.45	9	5	3	241	7
R Dravid (IND)	1996-2012	32	60	6	2143	233	39.68	5432	39.45	2	13	3	266	4
CA Pujara (IND)	2010-2023	25	45	3	2074	204	49.38	4903	42.3	5	11	4	228	4
MI Clarke (AUS)	2004-2014	22	40	2	2049	329*	53.92	3622	56.57	7	6	2	227	14

FIG 1:Match statistics

2)Player Performance Data:

This includes Batting and Bowling metrics like Average, Strike Rate, Economy, and Partnerships between the players also collected from previous matches or historical data. Then the fielding statistics because there is the phrase by the commentators "Catches Win Matches" and fielding is the most important part of the game of cricket because if you can able to save a four or a six and covert it into one or two it may be helpful in any phase of the game, the best example of fielding is the great Jonty Rhodes who redefined the definition of the word fielding to the cricketing world. Then the player's fitness and condition are also important things in cricket because they not only play in their home conditions but also play in away conditions so their body should be able to adapt to those conditions. The below is the Virat kohli performance data in host Countries across all formats and the player analysis dashboard across all the formats

	Span	Mat	Inns	NO	Runs	HS	Avg	BF	SR	100s	50s	0s	4s	6s
in Australia	2011-2020	13	25	0	1352	169	54.1	2544	53.1	6	4	2	151	3
in Bangladesh	2015-2022	3	5	1	59	24	14.8	151	39.1	0	0	0	5	0
in England	2014-2023	17	33	0	1096	149	33.2	2111	51.9	2	5	4	129	1
in India	2011-2024	54	85	9	4331	254*	56.9	7138	59.4	14	13	7	473	16
in New Zealand	2014-2020	4	8	1	252	105*	36	438	57.5	1	1	0	38	1
in South Africa	2013-2024	9	18	0	891	153	49.5	1649	54	2	4	0	117	3
in Sri Lanka	2015-2017	6	10	1	394	103*	43.8	707	55.7	2	1	0	34	2
in West Indies	2011-2023	11	15	0	660	200	44	1301	50.7	2	3	2	64	2

FIG 2:Performance Data in host countries

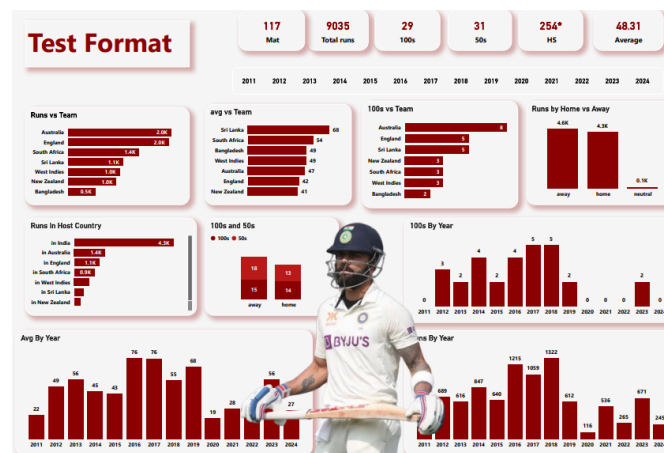


FIG 3:Dashboard of Kohli in Test format

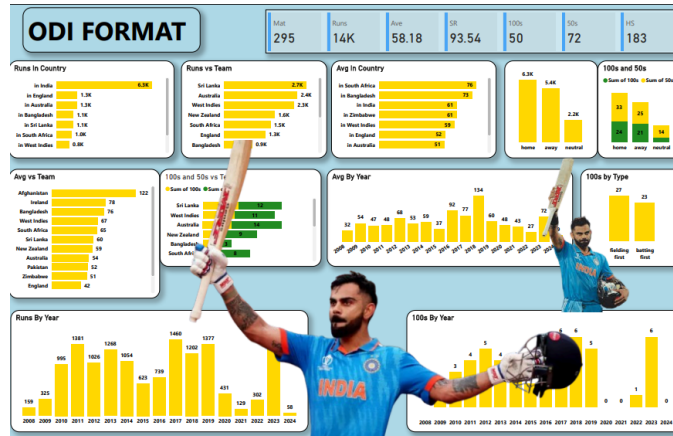


FIG 4:Dashboard of ODI Format

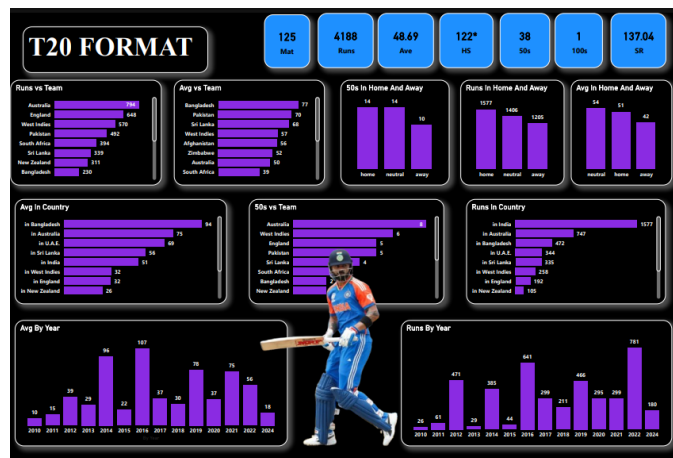


FIG 5:Dashboard of T20 format

3)Environmental Data:

This plays a major role For Example if You go to England if the condition is a overcast then it is the best time for fast bowlers to ball as they get enough swing to make the batsmen trouble. The weather condition even decides the fate of the match also and the next is the pitch conditions if the pitch is red soil then the spin will play a major role in the match India has red soil pitches and then green pitch which will benefit the fast bowlers like New Zealand and England have green pitches. The below is the data of the Test Matches in Adelaide Oval.

Team	Span	Mat	Won	Lost	Draw	Tied	Tie+W	Tie+L	NR	W/L	%W	%L	%D	%
Australia	1884-2024	83	46	18	19	0	0	0	0	2.555	55.42	21.68	22.89	71.87
England	1884-2021	33	9	19	5	0	0	0	0	0.473	27.27	57.57	15.15	32.14
India	1948-2024	14	2	9	3	0	0	0	0	0.222	14.28	64.28	21.42	18.18
New Zealand	1974-2015	5	0	4	1	0	0	0	0	-	0	80	20	0
Pakistan	1972-2019	5	0	2	3	0	0	0	0	-	0	40	60	0
South Africa	1911-2016	9	2	4	3	0	0	0	0	0.5	22.22	44.44	33.33	33.33
Sri Lanka	1996-1996	1	0	1	0	0	0	0	0	-	0	100	0	0
West Indies	1930-2024	16	5	7	4	0	0	0	0	0.714	31.25	43.75	25	41.66

FIG 6:Enviromental Data

Types of data:

1)Quantitative Data:

It consists of numerical data like scores, averages, wickets, economy, four, six, strike rate, etc. The match data will be found here

2)Qualitative Data:

The data like player form that is whether the player is consistent in his previous matches or not and the psychological assessment data is also a part of qualitative data

### 3)Real-time Data:

The in-match data which will help make spot decisions that will benefit the team or the player is the real-time data

### 4)Historical Data

The past performance of a team or a player will help in predicting the match results like which player will score high against the team and which player will take the most wickets when these two teams meet each other. The below is the analysis of India vs Pakistan match analysis inT20 World cup.

Analytical Tools And Techniques:

#### **Software:**

##### 1)Python:

It is widely used for Statistical analysis with the help of certain in-built library functions such as Pandas, Matplotlib, NumPy, and Seaborn. By using these libraries we can able to make data analysis of the player or a team performance.

##### 2)R:

It is used for advanced Statistical Computing and graphics with the help of libraries like ggplot2, dplyr and caret

##### 3)SQL:

It is mainly used for quering from the large dataset from the cricket statistics. It is one of the easiest way for querying the data comparing to other software.

Visualization Techniques:

#### **Tools:**

Most used tolls for visualizing the data are

##### 1)Power bi

It is one of the most commonly used tools not only by cricket analyst but also by data analyst also. It is helpful in building creative and interactive dashboards which is useful in the field of business intelligence and analytics.

##### 2)Tableau:

It is also one the commonly used tools along with Power Bi for creating interactive and shareable dashboards.

#### **Visualization Methods:**

##### 1)Heat Maps:

It is a visual representation of data where values are depicted by color and is useful to check the bowlers pitching the ball on the pitch like at which line and length they prefer the to bowl the most.

##### 2)Wagon Wheel:

It shows the areas where batsmen hit most of their runs in the ground , by using this the team can able to place the field for the batsmen. A real time example is Surya Kumar Yadav always like to score runs on fine leg and third man region and so there will be always a fielder for him in that two positions to make him cut his majority of scoring area.

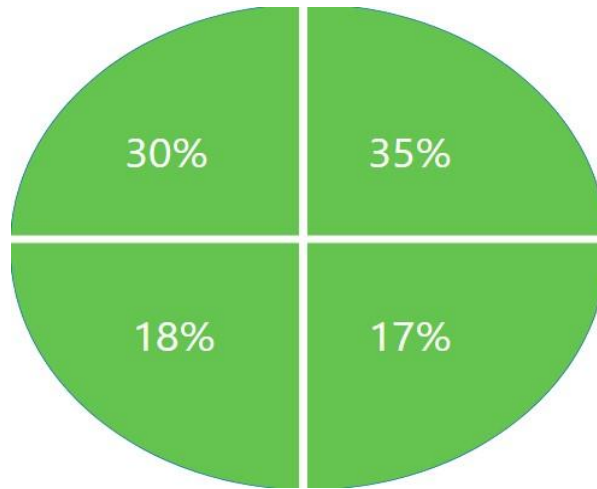


FIG 7:Wagon Wheel of Surya Kumar Yadhav

3)Hawk-Eye Technology:

It provides the ball tracking of the delivery which is used when there is decision to be made for Leg Before Wicket(LBW) appeal comes. It shows whether the ball has pitched in line or not and the impact of the ball is inside or outside and whether the balls is hitting or not hitting the wickets and also for the umpire’s call.

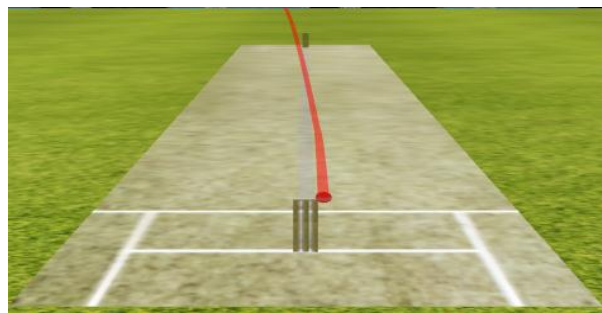


FIG 8:Hawk wye

4)Bar and Line Graphs:

It is used for showing trends over the time like the runs between the two teams in the same over and also for analyzing players performance over the years. The below is the performance of Virat kohli in test matches over the years represented in bar and line charts.

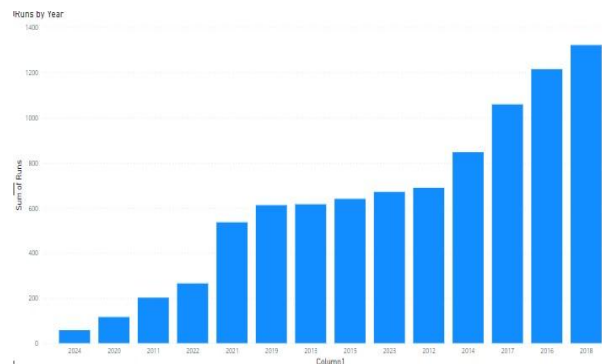


FIG 9: Runs in form of Bar graph

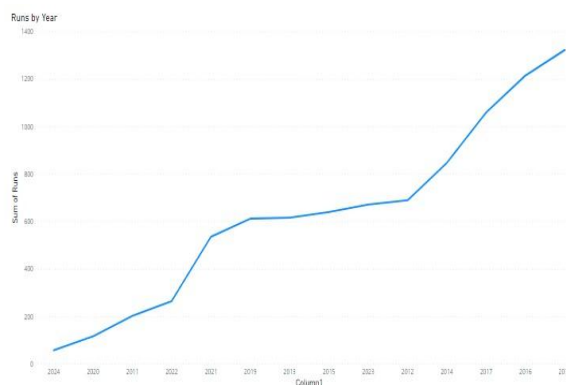


FIG 10:Runs in form of Line graph

## Applications In Enhancing Team Performance:

### Match Preparation

#### Use of Historical Data:

##### 1)Player Performance Analysis:

Analyzing the individual player performance or statistics over the previous matches data to identify strength and weakness of an individual player in a team. Every player has their own weakness to any delivery so they try to figure out with the help of the previous match data or the use of historical data. This also includes studying the players performance in the home and away conditions that is some player might be good in home conditions and some players may be good in away conditions, so it can also be analyzed. For example here is the player analysis of Sanju Samson against South Africa where he scored 107 but due to minor mistake he scored duck in back to back matches where he struggled in the body and stump line deliveries during his first match and the opponent capitalized his weakness and got his wicket in back to back matches.

##### 2)Team Performance Trends:

One of the most important thing in planning a game is understanding an opponent at its very best even a toss can decide a fate of a match like some team may be good in setting the target due to their good bowling line up and some team may be good in chasing due to their good batting lineup so we to understand the opponent's pattern of winning the game.

##### 3)Opponent Analysis:

We need to be well prepared in a game that we should never let the opponent settle for runs. Every batsmen will have their own weakness so the analyst need to break down that weakness and ask their bowlers to bowl in that line and length to get the batsmen out and some batsmen's may got out to a single bowler the most times or a bowler may troubled the batsmen the most in the past so they may to useful when the batsmen come into bat. A real time example is Rohit Sharma has a weakness of playing against left arm bowlers so when he comes to bat most of the bowlers use their left arm bowlers to bowl to him.

##### 4)Condition-Specific Preparation:

Preparing team based on the conditions of the pitch or weather is like setting the tone for winning the match. A real time example is in home conditions India always use 3 spinner formulae to win the game that most of the teams do not have like that every team is strong in their home conditions as they have their own winning formulae. Similarly when you see Australia, England and South Africa they use 4 fast or medium pace bowlers with 1 or no spinner in their lineup as there is no assistance for spinners in those conditions.

#### Tools Used:

The tools used in this preparation are video analysis software for reviewing previous matches or based on particular player so that they can able to make the match preparation for that team or specific batsmen. Next is the statistical data and software like CricViz, ESPNcricinfo or their own team databases are also used here.

#### In-Game Strategies:

##### Real-Time Data Usage:

##### 1)Live match Data:

Accessing real time data and ball-by-ball data to watch the match progression and player performance during the game . By that they can able to understand the batsmen's scoring areas and the low scoring areas and the variations in speed of the ball.

#### 2)Dynamic Strategy Adjustments:

Making tactical adjustments during the match like field placements and bowling changes. Nowadays during the IPL and international matches they give a 2.30 minutes break for every team to make their own strategy to get back into the game or get into the game.

#### 3)Communication Systems:

Nowadays the bowling coaches of most of the teams stand in the boundary line and give tips to the players or the captains next to them and those players run into the bowlers and give the instructions to them during the course of the match to make real time adjustments in the field and bowling variations to get into the game.

## Strategy Development

### Game Plans:

#### 1)Opponent Player Analysis:

##### Strength and Weakness:

Analyzing opponent player strength and weakness is one the key factor in the game plan. It can found from the previous match data or historical data because in a team there will be some 2 or 3 main players or game changers whose wicket are most important to take. So the analyst or the coach and captain plan for those batsmen's to bowl the kind of line and length that is difficult for them to pick. Studying opponent batsmen's go through short and the short the batsmen struggle to play so they keep eye on the player and make that bowling and fielding changes according to the batsmen. For Example Indian player Virat Kohli getting out on the 4<sup>th</sup> stump line and outside off stump line during a period of time every bowler used this tactics against him and then he recovered from that weakness.

#### 2)Tactical Game Plans:

In Power play overs the batting team's aim to score the most of the runs as there will be only 2 fielders inside the 30 yard circle by loosing maximum of 1or 2 wickets because thee valuable runs can help the batsmen coming at no 3 or 4 a time to get settle and the make runs. This implementation was successful for Indian team in 2023 ODI World Cup as Rohit Sharma scored the maximum number of runs in the power play to make Virat Kohli take his own time to get the score to a winning total and in this process Rohit Sharma scored 597 runs and Virat Kohli scored over 700 runs.

In Bowling team's point of view they always try to take the maximum number of wickets in the power play itself because if they give some 70 odd runs and if they take some 3 or 4 wickets then there is a lot of chance of restricting the batting team to a score of under 230 or even 200 and also the bowling team like to keep the overs tight in the middle overs by letting the spinners and their medium pace bowlers to take charge of the game and coming to the death overs they use their best bowler to restrict their score to the maximum like Australia team using Starc and Hazelwood and India team using Jasprit Bumrah.

#### 3)Tactical Adjustments:

Changing the batting order based on the match situation or an unexpected tactical adjustments that the opponent team cannot able to predict it. A real time example is in the famous World Cup win of India in 2011 finals where MS Dhoni came ahead of Yuvraj Singh who was supposed to come to bat . He came as a tactical change as he faced Muralidharan the most times in Chennai Super Kings(CSK) net session during the time of 2008-2010 IPL seasons , and so it was one of the most successful tactical change as he went on to score 91 runs which helped India win the finals.

Changing in bowling plans during the course of the match is also the tactical changes most of the teams use if the finisher of the opponent team is weak against spin bowling then the captain keep their main spinner for that batsmen until he comes to bat. Introducing new bowler is also a tactical change but it might not work all the time sometimes it may become the head ache for the bowler or captain himself.

## Player Selection and Management:

#### 1)Performance Metrics:

Selection of a player is purely based on the talent he is showcasing in the high standards like every country have their own league standards like Australia has Big Bash League(BBL), Sheffield Shield and England has T20 blast, County cricket and India has Indian Primer League(IPL) and Syed Mustaq Ali Trophy(SMAT), Ranji Trophy and the local T20 conducted in every state. The player should perform in these leagues consistently for more than 2 years in their respective leagues of their country to get a place in the national team. IPL is one of the best place to showcase the hidden talent of the players to get selected in the team. Most of the current national players in every country has come through this process and every teams Talent scout also play a key role in finding a new raw talent by directly going and watching the players play in the tournament.

**2)Data Sources:**

Gathering data from the domestic leagues, local tournaments, youth cricket and club level cricket to understand the potential of the player and also collecting the video analysis of a player to analyze his batting or bowling style and to provide insights and area to improve also. Talent Scout play a major role in finding the new player for a team. They also call them for net sessions to see the potential of the players to play the ball or to bowl the ball to a specific batsmen. There are many real time examples where a player who played consistent both in domestic circuit and in the IPL also and one of the name is Surya Kumar Yadav who is the current No 1 T20 batsmen in the world . He consistently performed for over 2-3 years to secure a spot in national team.

**Team Composition:****1)Player Roles and Match-up Analysis:**

Selecting players based on the specific roles like power hitter, swing bowler, defensive batsmen etc. and also picking the players based on the condition. A real time example is England team always select James Anderson for test matches in home conditions till his age of 40 because they know how dangerous he is to the opponent bowlers in the overcast conditions and his incoming and outswing deliveries he bowl with the new ball and the reverse swing deliveries he bowl in old ball. He can make any batsmen dance to this his song of swing in those bowling conditions.

**2)Balanced Team Structure and Bench Strength:**

Every team ensure a balanced mix of bowling and batting in their lineup. They need both the batsmen and bowlers to win a match so the team should be balanced and so they should also have the bench strength to make sure if any player faces an injury there should be a player to replace him. The top teams like Australia always have minimum of 7 bowlers and 8 batsmen in their playing 11 and India have minimum of 7 batsmen and 6 bowler in playing 11.

**Case Studies:****Successful Implementations:****Sherays Iyer Short Ball Implementation:**

Indian Cricketer Sherays Iyer was exposed to short ball tactics by England coach Brendon Macclum during a test match in England. At that time he was the head coach of Kolkata Knight Riders(KKR) team and Iyer was the captain of that team. Macclum asked his bowlers to bowl bouncers at the body level to him with a field of midwicket and square leg at the edge of 30 yard circle and then deep square and deep back square leg at the boundary line. He struggled a lot in that innings with the bowlers bowling him continuous bouncers and he started to get beat ball by his body and finally he got out on the same bouncer ball going into the hands of midwicket. After that every match when he comes to bat every team used the short ball bouncer tactics with the same field setup to get him out for more number of times and during the ODI world cup 2023 he made some adjustments in the batting to avoid the short ball tactics and he also got succeed in hitting or defending the ball without getting out.

**Conclusion:**

As Technology advances in every field in the industry cricket has also developed with the advancement of technologies. Big data and Analytics has helped team plan their strategy and select team players according to the pitch condition and environment. It has also so many local talents with the help of domestic league matches and the Indian Premier league(IPL) where new talents are born as they are noted by their playing style and pickup. Visualization help teams bring the data intot he insight which help in planning and coordination and the field setup for the teams to outplay the opponent sometimes it work or sometimes it may go in the opposite way also because the opponents also come prepared with their strategy. Now cricket has evolved apart from skill where thinking on spot for a player or a team plays a important role too. As technology evolves the cricket Analytics also evolves in the same speed making this sport to worth watching.

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