



How to Rank T-20 Player: A Measurement Index for Decision Makers

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Abstract: Cricket is the sports of the day. Almost all age groups have their association with cricket. Nowadays time is a constraint and people have thrust to earn more money in less time. To attract more people, ICC decided in 2005 to reduce number of overs and time with new exciting rules for cricket matches. To model players' performance with multidimensional factors statistical techniques are found to be so useful and predictable. Present study aims to quantify the worth of bowler, batter and fielder in T-20. Study develops a performance index for performance measurement. The tuned index will help the team selectors to compare performance of players. The technique will help in identifying the best performance and player's induction for coming events. From seven cricket squads a sample of 12 players satisfying the set criteria, is taken from Bangladesh premier league (BPL) 2013-16 and T-20 world cup (WC) 2014-16. Data regarding selected variables are obtained from entertainment and sports programming network (ESPN), the single sport world's leading cricket website. For measurement, each player was observed for a certain skill and the level of skill it has, derived index is ranged from zero to one. High index score reveals a high performance. Shakib Ul Hasan comes up with highest index and is declared as the best player with highest score for both BPL T-20 and WC T-20.

Keywords: Cricket, T-20, Player, Measurement Index, BPL, WC

1. Introduction

Cricket is a crazy entertainment source in all cricket playing countries and for every age group. It is a ball, bat and wicket (stump and bails) game that is played on a field with a center of tough, dry and smooth rectangle of 20-meter length [1]. It is played between two fighting teams with eleven players with different skills; batting, balling, fielding and wicket keeping [2]. It is internationally governed by a council, international cricket council (ICC), and each cricket playing country have its own national cricket board [3]. Cricket is the sports of the day with so much craze in almost all age groups right from playing to enjoy. Statistics feature heavily in the sport of cricket [4]. Statistical summaries like highest score in first class cricket, cumulative totals for a span of time, average run rate during T-20 and a batting average in international county cricket in 2012 are in fashion [5]. Health and physical researchers have keen interest for developing statistical models, measurement indices and inferential analyses of different aspects of cricket players.

The Twenty20 (T-20) format of cricket is probably the most significant development of the game in the twenty first century [2]. In 2003, faced with five straight years of falling attendances of spectators in the domestic cricket league, the English cricket authorities decided in favour of a shorter version of cricket [7]. Stuart

Robertson, the formerly marketing manager of the England and Wales Cricket board (ECB) proposed this twenty over-a-side cricket tournament.

England Premier League (EPL), Indian Premier League (IPL), Pakistan Premier League (PPL), Bangladesh Premier League (BPL) are franchise-oriented T-20 cricket competitions. Like IPL was launched by board of cricket control in India (BCCI) on 13th September, 2007 in New Delhi with a grandiloquent celebration in April, 2008. This master plan, the layout, the reward money, the contract revenue system and team composition rules were a brain child of Lalit Modi, the then BCCI vice-president who expounded it. The format of IPL is like that of the English Premier League (EPL) of England and the National Basketball League (NBA) in the USA [8].

Player's performance evaluations in all three formats of cricket have been a topic of great concern for sports analysts and research experts. [3] proposed a comprehensive performance estimation tool that incorporates all the essential inputs–outputs and evaluates a cricketer's overall performance. This research introduced three different estimation indices for player efficiency in all three formats of cricket for batting, bowling, and fielding. [6] report performance evaluation of teams and players as vital for cricket development in the earning and game enhancement perspectives. The performance of any player is gauged through batting averages, as well as the 100s and 50s he scored. In the bowling department, the wickets a bowler took or his bowling average throughout his career gauges his performance. In the fielding department, the more catches, stumps, and run-outs he takes will summarize his performance. [3] develop input–output selection criterion in DEA efficiency evaluation. They argue that efficiency is a great concern because it impacts the final efficiency scores of each DMU, which could create bias in the estimation process.

[9] develop a model of practice for cricket player and [10] develop a microtechnology for evaluation of T-20 bowlers. They argue that it is very important to be implemented according to the cultural perspective and the needs of the players. The mentioned techniques represent player's needs both in development and physically to well perform in the field.

2. Literature Review

Cricket as a game has three formats. Australia and England played in the first official Test match in March 1877. Australia reportedly hosted the first 50-over One Day International (ODI) against England in 1971. T-20, on the other hand, is become in fashion in June of 2003, not long after the millennium change. Rediff reports that T-20s represent 92% of the global fans' interest, while 88% of fans follow ODIs. Conversely, only 70% of spectators were interested in watching a test match.

The Twenty20 format of cricket is probably the most significant development of the game in the twenty first century [2]. In 2003, faced with five straight years of falling attendances of spectators in the domestic cricket league, the English cricket authorities decided in favour of a shorter version of cricket [7]. Stuart Robertson, the formerly marketing manager of the England and Wales Cricket board (ECB) proposed this twenty over-a-side cricket tournament. This new tournament is named as the T-20 cup. In the tournament, each side would bat for twenty overs and, in effect, the game had been transformed into one that could be finished in three hours.

Lourens [8] says that for cricket, analysis of sports data is an interesting thing. This paper investigates the efficiency of eight participating teams in the Indian Premier League 2019. We have used Data Envelopment Analysis (DEA), a Linear Programming (LP) based technique and Structural Equation Modeling (SEM) to evaluate the efficiency of the Decision Making Units (DMU) on the basis of DEA Scores. A real dataset of IPL 2019 is used for efficiency estimation. [9] analysed batting in cricket statistically. This study was expended by [11] suggesting a method to compare and select batsmen in cricket. [12] projected a simulation procedure for optimal batting order in One Day Cricket. This work expanded modeling and simulation for one-day cricket. [13] derived the hedonic price equations to estimate a bid price for all the cricketers in the Indian IPL auction. He proposed a price models using the data from the 2008 season and fruitfully tested next to the data from the 2009 season. The variables in the equations were the regular playing factors such as runs scored, wickets taken and age. [14] proposed a graphical technique for comparison of cricketers' bowling and batting performances. [15] made an effort for measuring the performance of teams in the IPL using DEA. He took both playing and non-playing factors to analyze the efficiencies of the teams in 2009 season. [16] used various playing and non-playing factors of the athletes of cricket sport that determine their bidding value in the auction of IPL. [17] applied Factor Analysis approach in performance measurement of T-20 cricket. [18-19] applied DEA and SEM for evaluating the performance and cricket team selection

[10] use microtechnology to evaluate the between and within-match variability of professional T-20 cricket fast bowlers. [8] provides the direction for the new coaches to set their skills according to the needs of the players

criterion of standards. Sports researcher and critiques used the traditional statistics like batting average, strike rate, etc. for quantifying performance of cricketers, while others tried to combine such traditional measures to a refined statistic. [10] measure training load during two consecutive T-20 cricket seasons in professional fast bowlers. Global positioning system (GPS) and accelerometer data (Player-Load) were collected from eight fast bowlers in 17 matches of domestic Twenty20 competition. Using GPS-accelerometry systems, the variables selected for analysis were as follows: total distance, low speed running distance (<14.4 km.h-1), high-speed running distance (>14.4 km.h-1), total sprint distance (>18 km.h-1), number of sprint efforts (n), peak speed(km.h-1) and Player-Load™ (arbitrary units; AU).

Cricket analysts and the ICC often compile and maintain a list of top performers at each player's career end [19]. It is based on absolute performance measurements like the number of runs scored by batters, the number of wickets taken by bowlers, and run outs and catches taken by a fielder. Therefore, our study employed multiple input-output indexes to evaluate the actual Efficiency of Players [13].

Davis, (2020) introduces a new metric for player evaluation in Twenty20 cricket. The proposed metric of expected run differential. The measures the proposed additional runs that a player contributes to his team when compared to a standard player. Of course, the definition of a standard player depends on their role and therefore the metric is useful for comparing players that belong to the same positional cohort.

Desai et al. [19] evidence weighted relative runs per over (EWR-RPO) to measure how many runs more or less a batsman scores in one over relative to the average batsman coming in the same position and evidence weighted cumulative survival probability (EWSF) to measure it is for an average batsman coming in the same position, in the same competition, on a similar ground and facing deliveries in the same environment.

3. Material and Methods

For the measurement of overall performance of a player in T-20 BPL for the years 2013 and 2015 and respective T-20 world cups 2014 and 2016 we select 12 players and factors considered for evaluating performance are wicket keeping, batting, bowling. The data for all variables in question were obtained from the official website ESPN. In Table-1 and Table-2, we have given the descriptive absolute summaries for players.

3.1 Batting Performance

Batting is one of the most important factors for a player performance. A batsman being judge by various factors such as the number of innings in which the player actually batted, strike rate, batting average, percentage contribution to the team total and number of matches played. Different characteristics are discussing below and their formula.

3.1.1 Batting Strike Rate

Strike rate of the batsman SR_i is the number of runs scored per hundred balls by him.

$$SR_i = \frac{\text{Total no of runs scored by ith player}}{\text{Total no of ball faced by ith player}} \times 100 \quad i = 1, 2, \dots, 12$$

3.1.2 Batting Average

The batting average is calculated as follows:

$$BA_i = \frac{\text{Total no of runs scored by ith player}}{\text{Total no of completinnings}}$$

3.2 Number of Innings Played

Only those innings are enumerated, where the cricketer goes to the pitch twentytwo yards long with his bat, as his performance.

3.3 Average Percentage of Contribution to the Team Total

Average of contribution to the team total APC_i is define as the total number of runs scored by ith cricketer divided by the team's total score in a given innings.

$$APC_i = \text{Average} \left(\frac{\text{Run scored by ith player in jthinnings}}{\text{Team total scored by jthinnings}} \times 100 \right)$$

3.4 Bowling performance

The bowling performance for a player will be judged through his four factors like bowling average, economy rate, strike rate and number of innings played.

3.4.1 Bowler Average

Bowling average (BWA_i) defines as follows:

$$BWA_i = \frac{\text{Totalnoofrunsconceded}}{\text{Totalnowicketstaken}}$$

3.4.2 Economy Rate

Economy rate (ER_i) define the number of runs conceded per over or six balls.

$$ER_i = \frac{\text{Totalnoofrunsconcededbyithbowler}}{\text{Totalnoofballsbowledbyithbowler}} \times 6$$

3.4.3 Normalization

Now, positive dimension factor the following normalization formula can be used

$$Y_{ijk} = \frac{X_{ijk} - \min(X_{ijk})}{\max(X_{ijk}) - \min(X_{ijk})}$$

$$Y_{ijk} = \frac{\max(X_{ijk}) - X_{ijk}}{\max(X_{ijk}) - \min(X_{ijk})}$$

Where $\text{playersnamedontedby } i = 1, 2, \dots, 12$ factor of player denoted by $j = 1, 2, 3, 4$, skill of player denoted by $k = 1, 2, 3$

3.4.4 Weighted Index

For performance measurement a weighted index

$$S_{jk} = \sum_{j=1}^4 W_{jk} Y_{ijk}$$

Where Y_{ijk} is the normalize value of X_{ijk} , where X_{ijk} shows the score of i^{th} player of j^{th} factor and k^{th} skill

$$W_{jk} = \frac{C_k}{\sqrt{\text{var}(Y_{ijk})}} \quad j=1, 2, 3, 4, \quad k=1, 2, 3$$

$$\text{Where} \quad \sum_{j=1}^4 W_{jk} = 1$$

C_k Normalizing constant as follows

$$C_k = \left[\sum_{j=1}^4 \frac{1}{\sqrt{\text{var}(Y_{ij})}} \right]^{-1}$$

The batting performance score S_{i1} for the i^{th} player is

$$S_{i1} = \sum_{j=1}^4 W_{1j} Y_{ij1} \quad j=1, 2, 3, 4$$

Where w_{1j} is batting weight and y_{ij1} is the normalize value for i^{th} batsman with j^{th} factor

The bowling performance score S_{i2} for the i^{th} player is

$$S_{i2} = \sum_{j=1}^4 W_{j2} Y_{ij2} \quad j=1, 2, 3, 4$$

Where w_{j2} is bowling weights and y_{ij2} is the normalize value for i^{th} bowler with j^{th} factor The wicket keeping performance score S_{i3} for the i^{th} player is

$$S_{i3} = \sum_{j=1}^4 W_{j3} Y_{ij3} \quad j=1, 2, 3, 4$$

Where w_{j3} is wicket keeper weights and y_{ij3} is the normalize value for i^{th} wicketkeeper with j^{th} factor. The value is $S_{i1} S_{i2}$ and S_{i3} performance score of S_i of the i^{th} player.

3.5 Performance Index (P.I)

The performance index checks out the individual performance in each cricketer is evaluate by using the performance measure of total players changed to the performance index (P. I_i)

$$PI_i = \frac{S_i}{\max(S_i)} \quad (0 < P. I_i < 1)$$

The range for each player is between zero and one. The value close to one means that a player's

4. Results and Discussion

Performance is better, while the value tending towards zero means the performance is getting poor.

Table 1: Performance of the players

Wicket keeping	BPL-2013				BPL-2015 Record			
	Played Match	No of Catches	No of Stumpings	No of Bye runs conceded	Played Match	Number of Catches	No of Stumpings	No of Bye runs conceded
Mushfiqur Rahim	12	13	4	45	10	11	0	41
BRM Tayalor	11	8	2	33	4	4	0	18
Bowler	Strike Rate	No of Matches	Average	Economy	Strike Rate	No of Matches	Average	Economy
Mashrafe Mortaza	26.2	11	33.5	7.65	36.4	9	37.4	6.16
Shakib UI Hasan	18.6	12	19.33	6.21	13.6	11	14.55	6.39
Mahmudullah	29	11	34	7.03	17.8	7	18.4	6.2
Mohammad Nabi	15.6	14	19.27	7.38	17.4	7	20.28	6.98
Taskin Ahmad	11.2	4	14.25	7.6	37.5	7	53.25	8.52
Batsman	No Matches	Strike Rate	Average	Average % contribution to the total	No Matches	Strike Rate	Average	Average % contribution to the total
CH Gale	1	223.52	114	57.87	4	163.52	46.33	27.41
TM Dilshan	7	114.07	25.66	15.93	10	133.33	28.88	19.034
Tamim Iqbal	9	122	27.11	17.69	9	118.72	37.25	22.28
Mushfiqur Rahim	13	132.93	40	21.23	9	110.56	26.16	12.89
BRM Tayalor	11	126.59	39.66	21.44	4	68.42	3.25	2.79
Shakib UI Hasan	12	164.5	32.9	16.79	11	103.81	17	11.45
Mahmudullah	12	113.1	21.18	14.29	13	100.35	27.9	17.82
Sabbir Rahman	11	145.18	24.1	14.2	13	103.84	18.9	12.83
Nasir Hossain	12	136.52	31.4	17.63	11	102.65	19.3	12.9
Mohammad Nabi	10	102.11	16.11	11.81	4	106.9	7.75	7.75
Mashrafe Mortaza	6	114.71	6.5	3.99	7	129.11	20.4	11.43

In Table-1 the data has been divided into three sections. The first section data is relevant to the

performance of wicket keeper the second is bowler and third one is batsmen. The first section the factors of wicket keeper for BPLs (2013-2015) seasons. The wicket keeper performance is judged through number of matches, number of catches caught, number of successful stumps and number of by-runs. The two wicket keeper are satisfied the below mentioned criteria 3.7 such that Mushfiqur Rahim and Brendan Ross Murray Taylor. The second sections of table describe the four factors of a bowler such as number of matches played, strike rate, average and economy rate. There are only five bowlers satisfying the above criteria. These payers are Mashrafe Mortaza, Shakib Ul Hasan, Mahmudullah, Taskin Ahmad and Mohammad Nabi. The four players are local and one player is foreign. The maximum number of matches played Shakib Ul Hasan and minimum economy rats. The third portion of the table is to evaluate batting performance according to four factors that are number of matches, strike rates, average and percentage contribution to the total runs. There are eleven players selected who fulfill the above criteria out of these seven cricketers were local and four players were foreign. The maximum number of matches are played by Mahmudullah and the maximum strike rate is of Chris Gale.

Table 2: World cup performance

Wicket keeping	WC-2014				WC-2016			
	Played Match	No of Catches	No of Stumps	No of By runs conceded	Played Match	Number of Catches	No of Stumps	No of By runs conceded
Mushfiqur Rahim	7	2	4	29	7	2	2	27
BRM Taylor	3	1	0	18	3	1	3	19
Bowler	Strike Rate	No of Matches	Average	Economy	Strike Rate	No of Matches	Average	Economy
Mashrafe Mortaza	36	5	47.33	7.89	34	6	39	6.88
Shakib Ul Hasan	18.8	7	17.87	5.68	13.8	6	16.6	7.21
Mahmudullah	18	5	15.8	5.26	0	3	0	10.2
Mohammad Nabi	22	3	21	5.72	13.5	7	13.66	6.07
Taskin Ahmad	24	1	24	6	20	3	20.33	6.1
Batsman	No Matches	Strike Rate	Average	Average % contribution to the total	No Matches	Strike Rate	Average	Average % contribution to the total
CH Gale	5	107.51	28.6	18.16	4	194.82	37.66	15.73
TM dilshan	6	105.6	26.4	17.27	4	123.14	44.33	23.66
Tamim Iqbal	7	85.56	11.85	10.54	6	142.51	73.75	34.39
Mushfiqur Rahim	5	116.83	23.6	18.76	5	104.76	8.8	5.91
BRM Taylor	3	133.69	41	27.49	3	90.63	9.67	6.94
Shakib Ul Hasan	7	129.16	37.2	21.82	7	126.47	32.25	12.31

Mahmudullah	5	115.69	11.8	8.568	5	117.8	21.5	12.05
Sabbir Rahman	3	88.89	8	6.26	7	123.52	24.5	15.42
Nasir Hossain	3	100	14.67	11.23	1	42.85	3	1.96
Mohammad Nabi	3	62.5	3.33	2.94	7	131.25	15	10.98
Mashrafe Mortaza	3	150	14	11.96	4	129.17	7.75	5.82

In above Table-2 the data has been divided into three sections, the first section data is relevant to the performance of wicket keeper, the second is bowler data third one is batsmen. The first section the factors of the wicket keeper have been discussed for World Cups (2014-2016) seasons. The wicket keeper performance is judged through total number of matches, number of catches, number of successful stumps and number of by-runs scored. The two wicket keepers are satisfied the below mentioned criteria such that Mushfiqur Rahim and Brendan Ross Murray Taylor.

The second section of table describes the performance of the bowler according to four factors such as number of matches that actually played, strike rate, average and economy rate.

The third portion of the table is to evaluate batting performance according to four factors such as number of matches, strike rates, batting average and percentage contribution to the total runs. There are eleven players selected who fulfill the criteria out of them seven cricketers found local while four players are foreign.

Table 3: Comparison of WC and BPL

S.NO	players name	Player of BPL-1	Player of WC-1	Player of BPL-2	Player of WC-2
1	CH Gale	0.746898	0.33964	0.575818	0.556518
2	TM diawwwlshan	0.167431	0.350494	0.463394	0.507925
3	Tamim Iqbal	0.208666	0.241208	0.476601	0.768427
4	Mushfiqur Rahim	0.917292	0.747707	0.8151	0.728064
5	BRM Tayalor	0.483038	0.575663	0.237231	0.424482
6	Shakib Ul Hasan	1	1	1	0.984887
7	Mahmudullah	0.441792	0.72255	0.909861	0.931239
8	Sabbir Rahman	0.243798	0.090062	0.355282	0.492615
9	Nasir Hossain	0.267538	0.16921	0.324725	0
10	Mohammad Nabi	0.708783	0.372251	0.558471	1
11	Mashrafe Mortaza	0.264133	0.360778	0.673488	0.48737
12	Taskin Ahmad	0.418538	0.283705	0	0.275897
Average		0.488992	0.4377723	0.532497	0.596452

The New Performance indices Shakib-Ul-Hassan has the highest performance index of exactly 1 (one) mean that good performance where the other player performances are compared with Shakib-ul-Hasan than the rest of the other twelve players. The second is Mushfiqur Rahim, and third is Mahmudullah, all first three players are local player. The local players Nasir Husain, Taskin Ahmad were poor preformed in all four tournaments. While “0” performance means the poorest performance of the player.

Table 4: Player Performance

Tournament	players	performance		Active Margin
		poor	Good	
BPL -2	Local	6	2	8

	Foreign	2	2	4
	Total	8	4	12
	Local	5	3	8
WC -5	Foreign	3	1	4
	Total	8	4	12
	Local	4	4	8
BPL-3	Foreign	2	2	4
	Total	6	6	12
	Local	3	5	8
WC-6	Foreign	3	1	4
	Total	6	6	12

Table-4 shows the Poor and Good performance of the players in all four tournaments and also shown the comparison between the local and non-local players. In BPL-2 25% of the foreign and 50% of the local player performances were above the average (good performance). As the result of BPL-3 the 50% of foreign and 50% of the local player performance were better.

5. Conclusion

It was found that Shakib Ul Hasan is the best player both in BPL and World Cup for the mentioned seasons. Rest of the players who performed moderately well is also mentioned in given study. Furthermore, Nasir Husain and Sabir Ur Rehman poor performance in both BPLs and world cups of the consider study. Inspire of that the non-local player Dilshan had a poor performance both the BPLs and world cups. The poor and good performance for each individual player for BPLs and World cups were found for each and every player. A correlation also finds between BPL-2 and World Cup-5 as well as that of the BPL-3 and World Cup-6. The performance indices were found separately both for the local and non-local players. In the last we apply weighted index for each twelve players. It is also suggested for the team management for possible improvement in Twenty-20 as well as in BPL.

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