

Quantification of Missed Chances in Cricket

¹Bireswar Bhattacharjee and ²Dr.Dibyojyoti Bhattacharjee

¹Research Scholar, Department of Statistics, Assam University, Silchar, Cachar, Assam, India

²Professor, Department of Statistics, Assam University, Silchar, Cachar, Assam, India

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Abstract

Cricket is one of the most popular sports in the world. Starting from England it has spread over almost all the countries in the world. The game has three aspects namely batting, bowling and fielding. Team having good batsman and bowlers has an advantage over their opponent but in recent times with the development of Twenty-20 cricket the aspect of good fielding has increased. In many occasions it is seen that the team won matches very closely, thus saving two or three runs in field or taking a good catch can turn the whole match towards the fielding team. On the other hand dropping catches, run-out or any other fielding mistakes in the field may cause the game. Thus, in recent past the importance of fielding has increased. On this backdrop the present study tries to quantify the value of missed chances in a game of cricket. Since all the batsman doesn't have the same level of efficiency thus dropping a catch of top order batsman is different from dropping a catch of lower order batsman. Thus, in this study taking all those factors which is going to effect in the quantification of missed chances a metric is developed for finding the value of missed chances. This metric is then used in ICC Men's Twenty-20 World Cup-2021 for the computation of value of missed chances. From this we find that D.Mitchell of New Zealand missed opportunity in semifinal of this tournament has highest value of missed chances which has also cost the match for the fielding team. Also the team which has lowest value of missed chances overall in the tournament is South Africa. Thus, it is concluded that South Africa is the best team in the tournament compared to other teams with regard to fielding.

1.0 Introduction

Cricket is one of the most popular sports in the world. Having started in England, the game spread over the world as a whole. Presently more than a hundred countries play the game of cricket. The International Cricket Council governing body divided countries among heads, viz. full members and associate members. ICC has 12 countries full member countries, whereas 96 countries are associate members. ICC is also responsible for conducting different tournaments such as World Cups, and it's also responsible for updating the game rules and regulations from time to time. ICC also publishes the ranking of the teams and players. The popularity of this game has grown immensely due to its simplicity of the game.

We can easily divide the game into three aspects such as batting, bowling and fielding. Batting in cricket is an act or skill of hitting the ball with a bat and scoring runs. While batting, the

batter must be aware that they need to prevent the loss of one's wicket. Batting is also a mixture of quick reflexes, excellent decision making and good strategies. Batters need to adapt to different weather conditions and pitches when playing the game to become good batters. Like batting, bowling is also a skill or action of propelling the ball toward the wicket the batsman faces. Bowling the ball is distinguished from throwing the ball by the strictly specified definitions issued by ICC. The governing of the purposes laid by ICC is monitored by two umpires and a match referee designated by ICC during the match. If, while bowling, the ball is bowled illegally, then the umpire will rule it a no-ball. Bowling in a cricket match can be divided into two broad categories, namely fast bowling and spin bowling. Fast and spin bowling can also be sub-divided into different forms. Fielding in cricket is the action of the fielders in collecting the ball when the batsman strikes the ball. Limiting the number of runs the striker scores or getting the batter out by catching or running out fielding plays an important role. A fielder may field the ball with any body parts if the ball is in the play; otherwise, the ball becomes dead¹. Fielding is also a crucial aspect of the game, like batting and bowling. But, it is not given as importance as a player offers to batting and bowling; it consistently ranks after batting and bowling when in order of preference on most players' schedules. The same is noticed during the practice session of the players as they pay little attention to fielding compared to bowling and batting. But fielding can create a big difference between losing a game and winning. Most of the time, we hear that any team's winning or losing margin is relatively narrow. With the introduction of Twenty-20 cricket these days, the winning margin on average revolves around five-ten runs, a few balls or a couple of wickets. Missed fielding attempts, dropped catches, missed run-outs, and overthrows can be a decisive factor in the overall result of the match². A good fielding team has more chance of winning the game compared to a poor or average fielding side. Some fielding positions commonly referred to are slips, mid-on, mid-off, gully, square leg, deep mid-wicket etc. Thus, fielding is often treated as a mantra of success these days. It's an aspect that makes a crucial difference on occasions, separating the winner from the loser³. Therefore a crucial aspect of fielding these days is reducing errors in the field, which may be one of these, viz. missed catch, run-out, mis fielding etc. Fielding errors in a broad heading called Missed Chances in cricket. The potential reason for a missed chance in cricket is one or more than one of the following reasons. The first is lacking interest, one of the key fundamental to fielding being aware of what is happening. Fielding is no different to batting or bowling when it comes to concentration. A fielder with good mindfulness is going to commit fewer mistakes while fielding. Next is the poor positioning of the fielder. It is pretty hard to field with utmost efficiency if the positioning of the fielder is not up to the mark. A little bit of wrong positioning of the fielder may cause a missed catch or missed run-out. The third reason for missed chances on a cricket field is due to a lack of composure of the fielder. If a ball is hit towards a particular fielder, and the fielder becomes panicked, there is a high chance that the fielder may commit some error while fielding. The fourth reason may be a lack of good fielding techniques. A good fielding technique can be developed with practice. Using incorrect techniques when it comes to catching, stopping or throwing the ball may cause fielding errors, resulting in losing the game. Thus, using the correct fielding technique and practising it may help immensely to the fielding team. The last but not the slightest reason for poor fielding performance of any fielder is lack of effort. Laziness, not putting enough effort, don't care

¹<https://bit.ly/3z2PQVU>

²<https://bit.ly/3zs8FIN>

³<https://bit.ly/3RUe3X0>

enough about fielding or simply just giving up is some of the vital reason why a fielding team may suffer⁴. Thus a crucial aspect of fielding is minimising missed chances in cricket because a missed opportunity may cause a game for a particular team. The impact of missed chances on the outcome of the match can be seen in different international competitions; among them, one is the quarter-final match of the 2015 Cricket World Cup, where New Zealand is taking on the West Indies. The West Indies allrounder Marlon Samuels dropped the catch of New Zealand opener Martin Guptill when his score was 4. Later, Martin added 233 more runs to his score and ended up scoring 237, not out and giving his team a place in the semi-finals. Another example of missed chance that caused the match is India versus Sri Lanka playing in Kolkata. The highest individual score as on 1st August 2022 in a One Day International game is also due to missed chance in fielding. Rohit Sharma, who is dropped on the score of 4 by Thisara Perera, takes full advantage of his luck, scores a record-breaking score of 264 and helps India win the game. Another instance of missed chance which caused the game is during the 1999 World Cup where during the South Africa and Australia game Herschelle Gibbs dropped the catch of Australian captain Steve Waugh which eventually scored an unbeaten 120 to help his side to win the match which ultimately knocked out the South African team from the contention of a place in Semi-Final in 1999 Cricket World Cup. Recently in IPL 2022, the game between Lucknow Super Giant and Royal Challenger Bangalore, an Eliminator, saw similar results where the missed chance caused by the fielding team eventually caused them the match. Lucknow Super Giant started the game well by dismissing Virat Kohli, Faf Du Plessis and Glenn Maxwell Cheaply. But, youngster Rajat Patidar scored a magnificent hundred and helped his team to qualify for Qualifier 2. The innings played by the Rajat Patidar is immensely contributed by the Lucknow Super Giant fielding, where they dropped Patidar two times, one at 72 and one at 99 by Deepak Hooda and Manan Vohra, respectively. Rajat Patidar scored 112 unbeaten to help his team to cross the 200 mark and post a big total.

Their captain admits the game lost due to chances missed by Lucknow Super Giant in the post-match interview by saying, "It's quite obvious why we didn't win the game. We let ourselves down in the field. The difference between the teams was Patidar's knock. When the player from the top ends up playing a good knock, the team wins"- K L Rahul. Thus, from these examples, we got an idea that it is essential to field well because errors while fielding may cause the game for the team. Therefore, good fielding is necessary for a team to be successful in cricket in the long run. Against this backdrop, this chapter stressed quantifying the value of the missed chances that have been made during the match. The matter of the missed opportunity eventually tells us the severity of the opportunity missed by the fielder in the match's outcome. Dropping a catch at the beginning of the competition has greater weight than dropping a catch at the game's later stages. Thus, the value of the missed chance will tell us the exact extent of opportunity missed by the fielder. The value of missed chances will also be helpful for the team's support staff while assessing the team's overall fielding performance. Based on this, team and individual perspectives can also take corrective measures. Thus, in this chapter, we shall try to find the Value of a Missed Chance (VMC) concerning different chances missed during a cricket match.

⁴<https://bit.ly/3owv1qs>

2.0 Review of Literature

Shah(2016) in his study tries to quantify the performance of the fielder. Different factors important in fielding are selected, and scores are assigned. The ball-by-ball information of each cricketer is monitored, and combining the total fielding points (TFP) of a cricketer; his fielding performance is computed. Lastly, average fielding points (AFP) are obtained by dividing total fielding points (TFP) by the number of matches played. *Perera et. al. (2018)* in his study assess the impact of fielding in Twenty-20 cricket. They have taken a metric called expected runs saved due to fielding. Based on the match commentaries, the metric is assigned to individual players and uses a machine learning algorithm random forest to assess the impact of fielding in cricket. Based on this study, an average fielder save on average 1.2 runs per match. *Gerber et.al.(2006)* attempts to quantify the fielding performance in cricket using a fielding performance index based on the number of specialist fielders in the team with dismissal rate and a sum of the dismissal rate of the fielders. *Bhattacharjee et. al. (2012)* his study tries to quantify fielding performance measures using two performance metrics: Preparatory Fielding Performance Measure (PFPM) and Fairer Fielding Performance Measure (FFPM). The ball-by-ball commentary of the matches is used to compute both the measures. To compare players' performance and rank them as per their performance, they have used Fairer Fielding Performance Measure (FFPM). Later since collecting ball-by-ball information became a tedious job *Bhattacharjee et. al. (2017)*, his study proposed an extension to their previous study by modifying the measure of FFPM using the Bayesian approach. The modified FFPM measure is computed in two parts, one using ball-by-ball information and the other from the scorecard of any particular match. This measure is also applied in IPL, where the best fielder of the tournament is selected. Selected.

3.0 Research Gap

After reviewing all the research papers related to fielding performance measurement, it is found that none of the articles gives importance to missed chances in cricket. But, missed chance in quantifying fielding performance is essential as a missed chance that a particular fielder commits may cost the game for a team. Thus, giving importance to missed opportunities is necessary to understand the overall fielding performance better. Therefore, in this chapter, an attempt is made to identify the critical factor to quantify the value of the missed chances and then try to develop an index which measures the extent of the missed opportunities. The matter of the missed chance tells us how costlier the missed chance is. It also helps us find the good or bad teams at fielding, allowing them to improve. Thus, in this chapter, an attempt is made to find the Value of a Missed Chance (VMC).

4.0 Objective

Fielding is an essential aspect of cricket. A good or lousy fielding can change the course of the game. In the past, it has been observed that errors while fielding eventually cost the game for the team. Thus the importance of minimizing mistakes in fielding is of utmost importance. But, fielding consists of several factors, one of which is missed chances. Reducing the frequency of missed opportunities on the field gives the team an added advantage. Thus, in this backdrop, the present study tries to quantify the value of missed chances during a match.

- *To quantify the Value of a Missed Chance in the game of Cricket.*

5.0 Methodology

5.1 Value of a Missed Chance: A Simplified Formula

Since we know the significance of missed chances in a game of cricket, we, as a viewer of the game, has always had an interest in finding the exact value of a particular missed opportunity. Since no such study is done in literature to quantify the value of a missed chance thus, here, we start by finding a simplified formula that can quantify the value of a missed opportunity. Since the missed opportunity occurs to a particular batter thus, here in this chapter, we compute the value of a missed chance corresponding to an individual batter. Therefore, to measure the value, we can calculate the difference between the runs scored by a particular batsman when he gets out and gets dropped. Therefore,

$$VMC_1 = RS_F - RS_D \dots (1)$$

Where,

VMC = Value of a missed chance.

RS_F = Individual score of the player when the player finishes the inning.

RS_D = Individual score of the player when his chance is missed.

Computation of VMC using (1) can be done in case when the concerned player whose chance is missed gets out or remain not out. This formula explains how much damage a player does to his opponent when given an opportunity. This formula is straightforward to calculate but has some deficiencies. One of the significant problems with this formula is that it only represents the number of runs scored by an individual after a chance is missed by the fielding team, which is generally not a good measure of a missed opportunity. The value we get using (1) is not comparable because the total number of runs scored by the team is not the same for all the matches due to the condition, pitches, weather etc. Thus, for a low-scoring game, a small VMC may be of more importance than a higher VMC in a high-scoring game. To overcome this difficulty, we modify our initial formula as follows,

$$VMC_2 = \frac{(RS_F - RS_D)}{FS} \dots (2)$$

Where,

RS_F = Individual score of the player when the player finishes the inning.

RS_D = Individual score of the player when his chance is missed.

FS = Final score of the team.

Using (2) to compute the value of a missed chance gives us a better picture of the extent of damage that the individual has made after his opportunity is missed. It is a better metric than (1) because it gives us a relative figure concerning the final team total. But, the formula for VMC discussed in (2) is not perfect because a few of the aspects that may influence the VMC are not considered in (2).

Below we shall try to incorporate some other factors so that the formula to compute VMC becomes reliable.

5.2 Value of a Missed Chance: Introducing Wicket Weight

Each member of a Cricket team doesn't have the same quality of hitting the bowl when it comes to batting. A Cricket team consists of eleven players. Among them, generally, six to seven of them are batters and the rest the bowlers. The bowlers of any group don't usually expect to score runs and are not compared with batters only because of the difference between skillset and practice when it comes to batting. Firstly, *Lemmer (2012)* in his work uses the same weight for all the batters when he computed an index for a bowler. Later he modified his earlier formula for the computation of bowling index and introduced batting position-specific weight in *Lemmer (2005)*. Thus, from his study, it is ascertained that all the batsman doesn't carry the same weight or efficiency. This concept is crucial while computing the value of a missed chance as all the batting players do not have the same skill set or expertise. Dropping the catch of a top or middle-order batsman is more critical than a lower-order batter as a lower-order batsman does have the same level of efficiency. Thus, to counter this problem, batting position-specific weight is used. The batting position-specific weight for Test and One Day International matches is given by *Lemmer (2005)*. The same batting position-specific importance in the case of Twenty-20 Cricket is developed in Objective No. 4 of this chapter. Thus, the position-specific weight for a batsman in different formats of games is summarized in Table 1.

Table1: Batting Position Specific Weight for Batsman in Different Forms of Cricket

Batting Position	Test*	ODI*	Tewnty-20**
1	1.20	1.30	1.78
2	1.31	1.35	1.74
3	1.42	1.40	1.62
4	1.53	1.45	1.44
5	1.47	1.38	1.22
6	1.25	1.18	0.99
7	1.02	0.98	0.76
8	0.79	0.79	0.56
9	0.56	0.59	0.40
10	0.34	0.39	0.27
11	0.11	0.19	0.17

* Developed by Lemmer(2005)

** Developed in the current Ph.D. Thesis (2022)

To get a correct value of the missed chances during a game, we need to incorporate the weight of the wicket whose chance is missed. Thus, we modify the formula given in (2) and define the modified one below,

$$VMC_3 = \frac{(RS_F - RS_D)W_w}{FS} \dots (3)$$

Where,

W_w = Batting Position Specific Wicket Weight for Batsman

The incorporation of wicket weight gives us a most efficient value of missed chances that took place during a game. Since it is essential to give more weightage to batters who generally come to bat at the top order, we modified the formula used (3) to compute VMC. But having said that, this is not the exhaustive list of factors that influences the value of a missed chance. Other factors include pressure on the team, an individual whose opportunity is missed contributing to the outcome of the match, relative importance of the game in which chance is dropped etc. Factors which are illustrated above are very much crucial for the efficient working of our VMC. Thus, an attempt to include all these factors in our model has been made below.

5.3 Value of a Missed Chance: Introducing the Concept of Pressure Index

In sports like football, hockey, basketball, tennis etc., one thing common is that the player playing the game continuously comes under pressure during the match. The impact of stress on players' overall performance is studied by Hill *et. al.* (2013), Fleming *et. al.* (2009) and concluded that pressure significantly drops players' performance. Similar to other sports, Cricket players need to deal with stress. In Cricket, we can divide the pressure into two parts one is for individual players, and another is for the team as a whole. The pressure on teams to win the game is of two types. In the case of the first innings, the batting team is constantly under pressure to score a competitive total such that the opposition fails to score the required number of runs. In the second innings, the batting team is again under the pressure of achieving the required number of runs before losing all the wickets or completing a specified number of overs. Thus, measuring pressure on teams while batting is of great importance. Shah *e. al.* (2014) in his work tried to measure the pressure on the chasing team by developing a pressure index. The pressure index considers factors such as initial run rate, required run rate, wicket weight, target, runs scored, total balls faced etc. The formula for the same is given in (4).

$$PI = \left(\frac{RRR}{IRR}\right) 100 + \left(\frac{WW}{180}\right) T \cdot \left(\frac{TB-BF}{TB}\right) \cdot \left(\frac{T-RS}{T}\right) \dots (4)$$

Where,

RRR = Required run rate.

IRR = Initial run rate.

WW = Wicket weightage.

T = Target.

TB = Total balls.

BF = Ball Faced.

RS = Runs scored.

For an evenly poised game, the value of missed chance will be precisely 100, whereas the value of PI starts from 0 and goes some high value above 100. For PI to be 0, the required run rate needs to become zero, i.e. the batting team already won the game. If the value of PI is much higher than 100, then it indicates that the required run rate of the chasing team is too high. But this formula has a considerable number of deficiencies, such as not considering the resources left in the batting team. Another one is that it only applies to the second innings, whereas, in cricket, the team who is batting first is constantly under pressure to score a winning total. Thus, pressure exists on the team who is

batting first. Also, the formula for computing WW is not provided in the article. All these things make this formula a doubtful one. Thus, *Bhattacharjee et. al. (2016)* their work provided a much more simple and efficient index for computing pressure in cricket. They have considered the current run rate, initial run rate, resources available, and a standard wicket weight of the batsman provided by *Lemmer(2005)*.

5.3.1 Computation of Pressure Index: Second Innings

In a limited over cricket match, the team who is batting second tries to score the required number of runs before losing all of their wickets and completing all the overs. In *Bhattacharjee et. a. (2015)*, they have combined the progress of the team and the way the batting team lost their wickets. Combining these two factor the, they given their first pressure index formula as,

$$PI_1 = \frac{CRRR}{IRRR} \cdot e^{\sum w_i / 11} \dots (5)$$

Where,

CRRR = Cureent run rate.

IRRR = Initial required run rate.

w_i = Batting position specific wicket weight

Further, *Bhattacharjee et. al. (2016)* constructed another measure that again utilises the team's progress and the batting team's resources. The formula for the same is provided below,

$$PI_2 = \frac{CRRR}{IRRR} \cdot e^{\frac{\sum RU}{100}} \dots (6)$$

Where,

RU = Resource availabe of the team upto a certain point.

PI₁ is sensitive to falling wickets, depending on the resources used. Thus dependencies on the wicket losing and resources remaining in both becomes prominent; therefore, to overcome this point *Bhattacharjee et. al. (2016)* again modified their formula and provided a better alternative for computing pressure index in (7).

$$PI = \frac{CRRR}{IRRR} \cdot \frac{1}{2} \left[e^{\sum w_i / 11} + e^{\frac{\sum RU}{100}} \right] \dots (7)$$

5.3.2 Computation of Pressure Index:First Innings

The main difficulty in computing the pressure index for the first innings is that there is no target score for the team who is batting first. Since the formula for calculating the pressure index defined in (7) heavily depends on the initial required run rate (IRRR) thus, finding the value of PI in the target score is necessary. But, defining the target score in the first innings is problematic because it depends on factors such as pitch condition, weather, the strength of the opposition, match condition

etc. The difficulty of setting a competitive total in the first innings is a problematic task accepted by the different captains of the team while in toss or post-match press conference. The problem is addressed by *Bhattacharjee et. al. (2019)* in his study by finding an initial target of the team for the first innings by

$$T_0 = \mu + \sigma \dots (8)$$

Where,

μ = Mean number of runs scored at a particular venue.

σ = Standard deviation of runs scored at a particular venue.

Since falling off a wicket potentially decreases the run-scoring of the team for a while thus, after each wicket fall, the team need to revise their target score. Therefore, *Bhattacharjee et. al. (2019)* also provided the formula for rescheduled target score after falling a wicket as,

$$T_t = R_{t-1} + (100 - RU_{t-1}). \text{Max} \left(\frac{T_0}{B}, \frac{R_{t-1}}{B_{t-1}} \right) \dots (9)$$

Where,

R_{t-1} = Total runs scored.

RU_{t-1} = Resources utilized.

B_{t-1} = Balls bowled after the end of the partnership.

Using the formula given in (8) and (9), we shall compute the target score of the team after any wicket is lost. This target score is then used for finding the group's initial run rate (IRRR), which is eventually used for finding the value of the pressure index for the first innings using (7).

5.3.3 Value of a Missed Chance Integrating Pressure Factor

The falling of a wicket generally reduces the scoring rate of the batting team, which eventually increases the pressure on the batting side. Since the number of wickets and specialist batters in a game of cricket is limited thus, losing a wicket encourages the team to play slowly and build a partnership. The importance of losing a wicket is very high in cricket; therefore, when a chance is created of getting a wicket on the field, it is essential to take the opportunity and not commit any error. The error in the area in different forms, such as missed catch, run-out etc., may cause a lower level of pressure on the batting side, making them easily score their target score and eventually more. Against this backdrop, we need to capture the increased pressure on the bowling team due to fielding errors. This can be done using a simple formula,

$$\text{Pressure Factor (PF)} = PI_{nm} - PI_m \dots (10)$$

Where,

PI_m = Pressure Index on batting team if the chance is missed by the fielding team.

PI_{nm} = Pressure Index on batting team if the chance is not missed by the fielding team.

The value of the pressure index, when not missed and missed, is computed using the formula given in (7). The pressure factor indicates how much pressure on the batting team decreases with a missed chance; in other words, we can say that how much pressure on the bowling team increases with an opportunity is cut on the field. Since team pressure during a match is an essential factor in cricket, thus the inclusion of the pressure factor in our value of the missed chance index is critical.

5.4 Value of a Missed Chance Having Win-Loss Stabiliser

In any sport, the individual or team always go for a win, which is also applicable in cricket. Thus, it is essential for players always to help the team to win the game instead of playing for their benefit. In missed chance, also the chance that the player got due to a fielding error needs to take with both hands and try to win the game for his team. Thus, in this scenario, the player who got the chance and successfully beat the game for this team needs to be credited with some extra points, rather than the player who got the opportunity and his team lost the match. To tackle this type of situation Cronin *et. al.* (2016) in his work, while improving the ranking of the teams in the English Premier League used the win-draw-loss indicator as

$$S = \begin{cases} 1; & \text{for a missed chance resulting a win} \\ 0.5; & \text{for a missed chance resulting a draw...} \\ 0; & \text{for a missed chance resulting a loss} \end{cases} \quad (11)$$

But the difficulty of using (11) is that for losing a game, it takes S as zero, which is impossible in our case since the value of missed chance is never going to be zero even if his team loses the match. Under this, we have modified (11) and used an exponentially decreasing value of S for our study. Thus, the value of S for our research is,

$$S^* = \begin{cases} 0.80; & \text{for a missed chnace resulting a win} \\ 0.80^2; & \text{for a missed chance resulting a draw...} \\ 0.80^3; & \text{for a missed chance resulting a loss} \end{cases} \quad (12)$$

Thus the final win-loss stabiliser, which is going to be used in our process of computing the value of a missed chance, is given in (13) as,

$$S^* = \begin{cases} 0.80; & \text{for a missed chnace resulting a win} \\ 0.64; & \text{for a missed chance resulting a draw...} \\ 0.51; & \text{for a missed chance resulting a loss} \end{cases} \quad (13)$$

5.5 Value of a Missed Chance: Incorporating Importance of Knock Out Matches

It is vital for any team not to commit any error in the field. The mistake in fielding or missed chances while fielding may cost a game for any team. Thus, any team must pay attention to fielding. Against this, it is crucial not to make any type of fielding error in knockout games. Since knockout rounds are such that the losing team doesn't have a second chance of winning the tournament because the loser of the match went home. For example, the recent semi-final match between Pakistan and Australia was in the 2021 Twenty-20 Cricket World Cup. The missed opportunity of Mathew Wade in the 18th over of the competition by a Pakistani fielder cost them as Mathew Wade

hit three consecutive sixes to win the match for his team, knocking Pakistan out of the tournament. Thus, missed chance in such a game has significance if the player whose opportunity is missed contributes to his team winning the match. Since it is essential to capture the amount of loss that has occurred due to the team who missed the chance in a knockout game, we modified it as,

$$S^{**} = \begin{cases} 1; & \text{for a missed chance resulting a win in knockout game.} \\ 0.64; & \text{for a missed chance resulting a draw in a knockout.} \\ 0.51; & \text{for a missed chance resulting a loss in a knockout game.} \end{cases} \dots(14)$$

5.6 Value of a Missed: Final Model

The entire model for computing value of a missed chance is going to be discussed in this section. The main formula used to compute the value of missed chance is,

$$VMC_4 = \begin{cases} c_1 m_f + c_2 \cdot p_f; & m_f \neq 0 \\ 0; & m_f = 0 \end{cases} \dots(15)$$

Where,

$$m_f = \frac{(RS_F - RS_D)W_w}{FS}$$

$$p_f = PI_{nm} - PI_m$$

The quantity c_1 & c_2 are constants and chosen in such a way that our objective function maximises i.e.

Max,

$$Z = c_1 m_f + c_2 \cdot p_f$$

Subject to the condition

$$\sum_{i=1}^2 c_i = 1$$

Next using solver in excel we computed the value of c_1 & c_2 .

Now, for the incorporation of win-loss stabiliser and impact of knockout matches in the value of missed chance we are going to incorporate S^* and S^{**} in (15) in the following manner.

Case I: Chance is Missed and the Team Won the Match

$$VMC = S^*(c_1 m_f + c_2 \cdot p_f) \dots(16)$$

Case II: Chance is Missed in a Knock-Out Game and the Team Won the Match

$$VMC = S^{**}(c_1 m_f + c_2 \cdot p_f) \dots(17)$$

6.0 Application of Value of Missed Chances

In this section, we have tried to apply our missed chance model for measuring the value of missed chances in different Twenty-20 matches. To know the practical application of missed opportunities, we have selected the matches played between the top twelve teams qualified for the Men's Twenty-20 World Cup played in UAE, hosted by India. The data is collected from cricbuzz.com on indicators used to compute missed chances.

Table 1: Average Frequency of the chances missed by the teams in the ICC Twenty-20 World Cup-2021

TEAM	1ST INNINGS	2ND INNINGS	AVERAGE MISSES IN BOTH INNINGS
AFGHANISTAN	0.2	0.6	0.4
AUSTRALIA	1.0	0.1	0.6
BANGLADESH	0.6	0.6	0.6
ENGLAND	0.5	0.5	0.5
INDIA	0.2	0.4	0.3
NAMIBIA	0.6	0.2	0.4
NEW ZEALAND	0.8	0.7	0.8
PAKISTAN	0.2	0.2	0.2
SCOTLAND	0.4	0.2	0.3
SOUTH AFRICA	0.2	0.8	0.5
SRILANKA	0.0	0.6	0.3
WEST INDIES	0.7	0.0	0.4

First, we have tried to compute the average frequency of the chances missed by the teams in the ICC Twenty-20 World Cup-2021. The result of the same is presented in Table 1. From this, we can say that, on average, Pakistan has the lowest missed chances in the first innings and overall tournament, followed by India, Scotland and Sri Lanka. It signifies that these teams have relatively better fielding units compared to other groups as far as the ICC Twenty-20 World Cup-2021 is concerned. In the first innings, New Zealand has the highest no. of missed chances, followed by Bangladesh and Namibia. In the Second Innings, South Africa has the highest number of missed opportunities, followed by New Zealand; Australia has the lowest missed in their second innings.

Next, we computed the value of missed chances for all the matches of the Twenty-20 World Cup 2021. From this, we listed out the tournament's top five misses in both the tournament's second and first innings. This analysis gives us an idea of the player's impact on the outcome of the match whose chance is missed in the tournament. It is also helpful for field teams to overcome the errors they committed on the field to boost their chances of winning the game.

Table 2: Top Five Missed Chances of the Tournament in First Innings

MATCH NO.	INNINGS	BATTING TEAM	FIELDING TEAM	PLAYER	VMC	RESULT
27	1ST	AFG	NAM	M SHAHZAD	0.097577	Won
41	1ST	PAK	SCO	B AZAM	0.097033	Won
23	1ST	WI	BAN	R CHASE	0.093111	Won
33	1ST	IND	AFG	H PANDYA	0.089799	Won
29	1ST	ENG	SL	BUTTLER	0.083632	Won

Table 3: Top Five Missed Chances of the Tournament in Second Innings

MATCH NO.	INNINGS	BATTING TEAM	FIELDING TEAM	PLAYER	VMC	RESULT
SF1	2ND	NZ	ENG	D MITCHELL	0.1118	Won
42	2ND	IND	NAM	ROHIT	0.11	Won
22	2ND	AUS	SL	WARNER	0.0996	Won
34	2ND	AUS	BAN	FINCH	0.0996	Won
SF1	2ND	NZ	ENG	CONWAY	0.0956	Won

In the top five missed chances of the first innings, from Table 2, M Shahzad's missed opportunity committed by Namibia has the highest value, who eventually goes on to win the match for his team. Next, the biggest miss of the tournament is Babar Azam, who plays for Pakistan and is Captain of his team. Thus, the missing chance given by Babar Azam to Scotland proved to be costly, and the fielding team eventually lost the match. The tournament's third most costlier miss is Roston Chase of West Indies, who also won the game for his team.

Table 3 explains the top five missed chances of the second innings, Daryll Mitchell missed chance committed by England in the Semi-Final match has the highest value; he eventually goes on to win the game for his team, and by this, England was knocked out of the tournament. Next, the biggest miss of the tournament is of Rohit Sharma with a value of missed chance of 0.1100, which also resulted in winning the match for India. The third most costlier miss of the tournament in the second innings is of David Warner of Australia in the 22nd match of the game with a value of 0.0996 of the missed chance

We are now going to analyse the happening of missed chances according to Venue. i.e. average value of missed opportunities in three stadiums used for the tournament. Dubai International Cricket Stadium, Sheikh Zayed Stadium: Abu Dhabi and Sharjah Cricket Stadium. This type of analysis helps us to understand whether any particular ground is much prone to missed chances or not, i.e. happening of missed opportunities in any the specific ground is more compared to other stadiums.

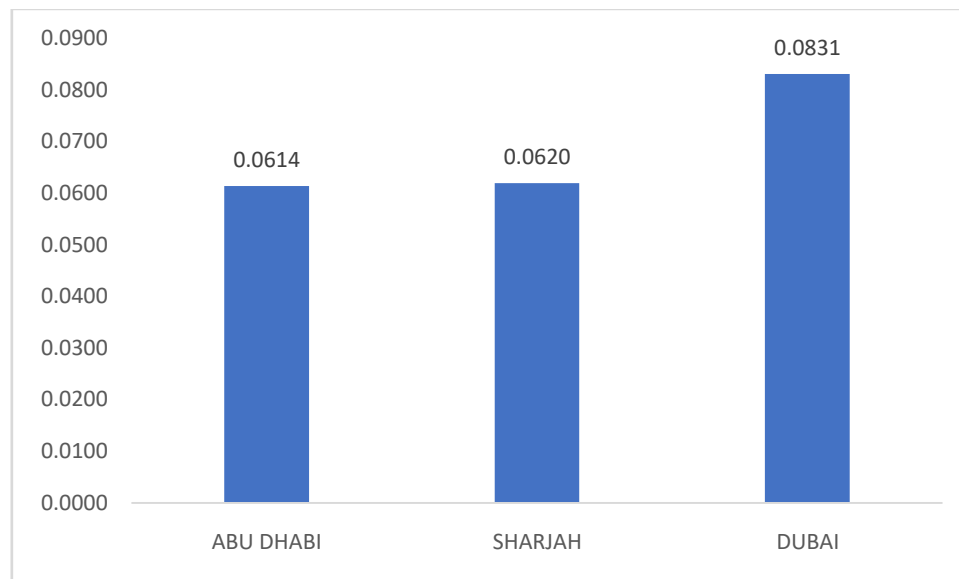
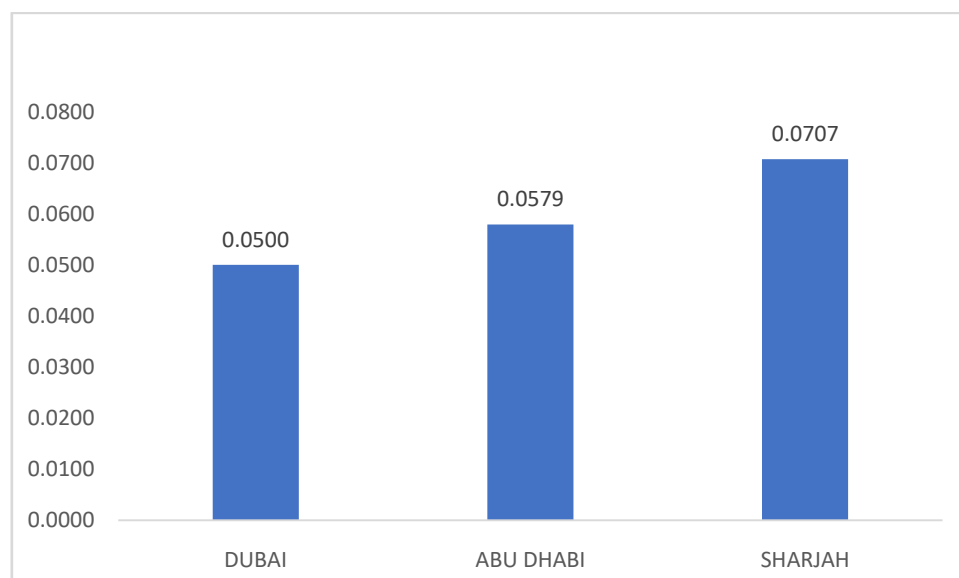
Figure 1: Average Value of Missed Chance in Second Innings By Ground

Figure 1 shows that Abu Dhabi has the lowest missed chance average, followed by Sharjah. On the other hand, Dubai has the highest average value of missed chances. The analysis indicates that the occurrence of missed opportunities in Abu Dhabi is comparatively lesser than in Sharjah and Dubai in the case of second Innings.

Figure 2: Average Value of Missed Chance in First Innings By Ground

On the other hand, in the first innings, Figure 2 shows that Dubai has the lowest average of missed chances, followed by Abu Dhabi and Sharjah. The analysis indicates that the happening of missed

opportunities in Sharjah has comparatively more than two venues which led to the conclusion that fielding in Sharjah is difficult for the fielder.

It is also essential for teams to be good fielding teams for continuously performing in the tournament. The quality of cricket and competitiveness between the teams has gone to another level in the last decade. Due to this, the winner is, in most cases, decided in by a few runs, a few balls remaining, or a few wickets. The number of runs saved and chances taken by the team in fielding helped them to win the match. Thus, monitoring the fielding performance of teams is a significantly important aspect of modern cricket. In our subsequent analysis, we tried to analyze the teams with a minimum value of missed chances.

Table 4 explains the team's ranking based on the value of missed chances computed in Cronin et. al. (2016) for the first innings of the Twenty-20 World Cup 2021. According to this, in the first inning, West Indies committed the slightest error in the field in the tournament, followed by India and Pakistan. Teams like Sri Lanka, Scotland and Afghanistan ranked in the bottom half of the table.

Table 4: Team Wise Ranking of the Team Based On Average Value of Missed Chances in First Innings

TEAM	RANK	AVERAGE-VMC
WEST INDIES	1	0.0000
INDIA	2	0.0195
PAKISTAN	3	0.0291
SOUTH AFRICA	4	0.0434
ENGLAND	5	0.0460
NEWZEALAND	6	0.0494
AUSTRALIA	7	0.0516
NAMIBIA	8	0.0647
BANGLADESH	9	0.0771
SRILANKA	10	0.0836
SCOTLAND	11	0.0895
AFGHANISTAN	12	0.0898

Table 5: Team Wise Ranking of the Team Based On Average Value of Missed Chance in Second Innings

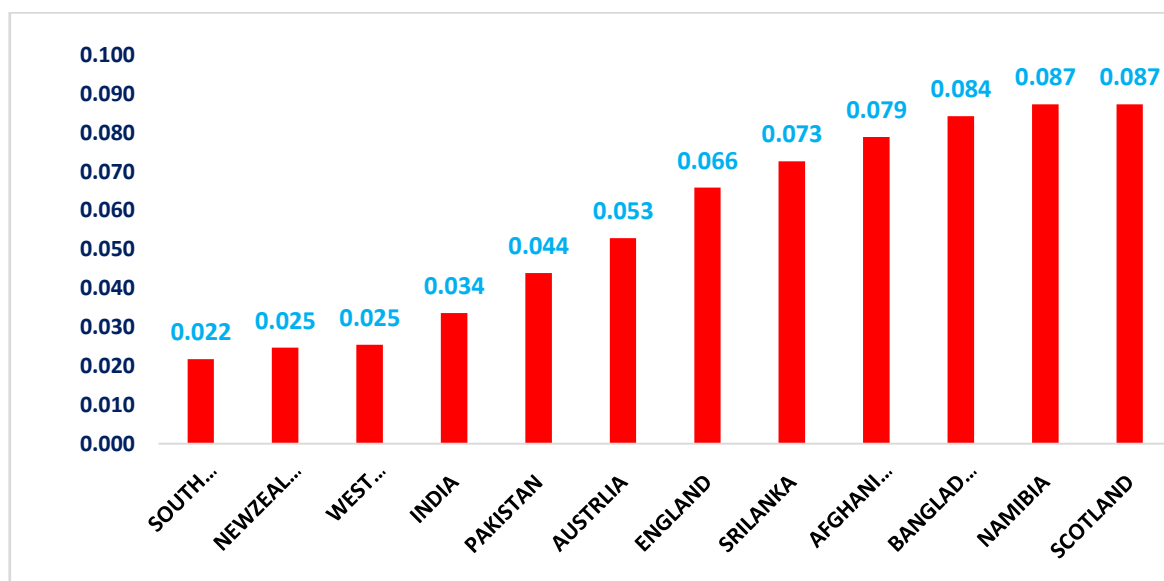
TEAM	INNINGS	AVERAGE-VMC
NEWZEALAND	1	0.0000
SOUTH AFRICA	2	0.0000
INDIA	3	0.0478
WEST INDIES	4	0.0510
AUSTRALIA	5	0.0542
PAKISTAN	6	0.0586
SRILANKA	7	0.0617
AFGHANISTAN	8	0.0680

SCOTLAND	9	0.0852
ENGLAND	10	0.0858
BANGLADESH	11	0.0914
NAMIBIA	12	0.1100

On the other hand, in the second innings, from Table 5 the best fielding team in New Zealand and South Africa has not committed any mistakes on the field. India's third rank in the table is captured by a score of 0.0478. In the bottom half of the table, teams like England, Bangladesh and Namibia are there. From this study, we can relate that the higher teams in the Team ranking released by ICC performed well in fielding.

In Figure 3 overall ranking of the teams in the tournament is provided in the aspect of fielding using the value of missed chances. The team which has the lowest VMC performed well compared to their opponent. From this figure, we can conclude that South Africa is the team which has the most negligible value of missed chances, with an average VMC of 0.022. New Zealand and West Indies occupy the second and third positions. In comparison, the teams like India, Pakistan, and England are in the middle half of the table. Bangladesh, Namibia, and Scotland have the highest VMC putting them in the last half of the table. The ranking is also justifiable because the team in New Zealand reaches the Final and becomes runner-up in the tournament.

Figure 3: Team Wise Average Value of Missed Chances



7.0 Conclusion

Thus, this study attempts to quantify the value of missed chances that the teams commit during a cricket match while fielding. Since fielding is an essential aspect of cricket, excellent or lousy fielding may change the game's result in favor of any team. In recent times the competitiveness among teams has increased significantly, where the result of the match in most cases is decided in the last ball. Thus, to compete at a higher level along with batting and bowling, teams also need to

work on their fielding aspect. Therefore, to provide an idea about the missed chances that the teams are committing in the field, this chapter proposes quantifying the value of missed opportunities. The quantification metric includes different factors such as player contribution to the final score of the team and the relative strength of the player whose chance is missed, incorporated using the wicket weight of the player whose opportunity is missed. The essential factor is how much pressure has been increased in the bowling team due to the error on the field. The values of missed chances are computed for both the first and second innings. In the top missed opportunities of the first innings, M Shahzad's missed chance was committed by Namibia, who eventually went on to win the match for his team. Next, the biggest miss of the tournament is Babar Azam, who plays for Pakistan and is Captain of his team. Thus, the missing chance given by Babar Azam to Scotland proved to be costly, and the fielding team eventually lost the match. The tournament's third most costlier miss is Roston Chase of West Indies, who also won the game for his team. In the top missed chances of the second innings, Daryll Mitchell missed chance committed by England in the Semi-Final match has the highest value, which eventually goes on to win the game for his team. Under this, England was knocked out of the tournament. Next, we have tried to compute the average frequency of the chances missed by the teams in the ICC Twenty-20 World Cup-2021. On a reasonable basis, Pakistan has the lowest missed opportunities in the first innings and overall tournament, followed by India, Scotland and Sri Lanka.

In contrast, New Zealand has the highest number of missed chances. South Africa has the highest number of missed opportunities in the Second Innings, followed by New Zealand. On the other hand, Australia has the lowest missed chances in their second innings. To understand whether any particular ground is much more prone to missed opportunities or not, i.e. happening of missed events in any specific ground is more compared to other stadiums, we have also undertaken this analysis. Abu Dhabi has the lowest average of missed chances, followed by Sharjah. On the other hand, Dubai has the highest average value of missed opportunities in the second innings. In contrast, the missed chances in Sharjah in the second innings has comparatively more than two venues which led to the conclusion that fielding in Sharjah is difficult for the fielder.

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