

## **Compute Attributes Contribution for Player Pricing in Indian Premier League**

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**Abstract.** For last 5 years Indian Premier League (IPL) twenty-20 cricket tournament is the most fashionable and entrainment sports in India. The international players of India and other countries and the upcoming talent of India took participate in IPL and their salary decided by auction among several franchise owner. Compute several attributes contribution is very much essential for franchise owner to bid a player with actual price so that they shall increase their profit. Different attributes have different importance level to judge a player. Analytical Hierarchy Process (AHP), a pair-wise comparison method is used to measure the significance of several attributes. In this paper three main criteria and several sub-criteria are considered for pair-wise comparison method according expert's view. Finally, this article produced the credence of the attributes of the player for player valuation.

**Keywords:** AHP, IPL, Player Pricing, MCDM and Player Attribute.

### **1. Introduction**

People of India are fascinated with the game of cricket among all the games played in India. In April 2008, BCCI initiated Indian Premier League (IPL) [8, 9, 10, 11, 12], a Twenty-Twenty cricket tournament to be played among eight domestic teams or franchisee constructed according the name of 8 big metropolitan city of India. The players were selected through competitive bidding from a pool of available players of Indian National player, uncapped player and overseas players mainly from Australia, South Africa, Srilanka, West-Indies, England, New-Zealand. Due to its tremendous popularity media gives more preferences to this game in India. The use of analytical methods is very useful in cricket.

The Analytical Hierarchy Process (AHP), a powerful tool of multi-criteria decision analysis for pair-wise comparison was first introduced by T.L.Saaty in 1980 [1, 2]. AHP

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is an approach for decision making that involves structuring multiple choice criteria into a hierarchy, assessing the relative importance of these criteria, comparing alternatives for each criterion and determining an overall ranking of the alternatives.

In this paper, modified AHP is used to measure the relative importance of the criteria and their sub-criteria according expert opinion. This relative importance of the criteria of players plays vital role to decide the player price.

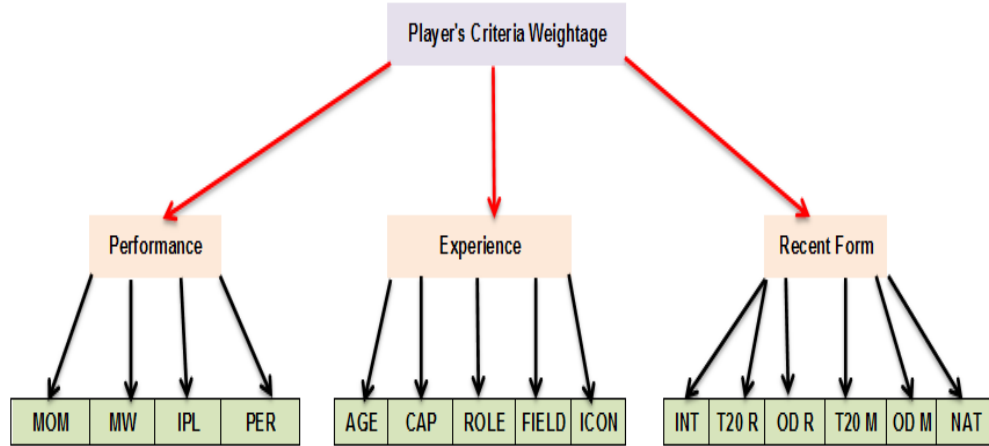
Application of Analytic Hierarchy Process (AHP) in materials and human resource management under group decision making environment was introduced by C. Muralidharan, in 2000 [3]. Player valuations in the IPL by their previous performance, experience and other characteristics of individual players were done by David Parker and et al. [4]. A.G. Kamble and et.al. presents a cricket team players selection procedure from a set six level players in complex situations using AHP [5]. The strategies of franchisee teams during the auction of the players in IPL and economical, behavioral factors with cricketing attributes that involve to make the decision was presented in Sonali Bhattacharya paper [6]. David Parker and et. al.[7] found that player valuations depended on measurable performance and experience factors.

The paper is organized as follows: Indian Premier League player's criteria for player pricing have been discussed in Section 2. Section 3 focuses on the basic concepts of AHP and Results. Finally, section 4 concludes the paper.

### 2. Player's Criteria in IPL

In IPL main three attributes involve in the decision making which are as follows –

- Player's Performance Appraisal ( $C_1$ )
  - Previous IPL performance of player (**IPL**)
  - Previous IPL performance analysis (**PER**)
  - Match Winner (**MW**)
  - Man of Match (**MOM**)
  
- Player's Experience Contribution ( $C_2$ )
  - Age (**AGE**)
  - Captaincy (**CAP**)
  - Extra Role in the team (**ROLE**)
  - Fielding Capability (**FIELD**)
  - Iconic Player (**ICON**)
  
- Player's Recent Form ( $C_3$ )
  - International Player (**INT**)
  - Recent T20I team member (**T20M**)
  - Recent ODI team member (**ODM**)
  - Recent T20I rating (**T20R**)
  - Recent ODI rating (**ODR**)
  - Nation (**NAT**)



**Figure 1:** Hierarchy of the criteria and sub- criteria

### 3. AHP & Experiment Result

AHP helps to capture both subjective and objective evaluation measures, providing a useful mechanism for checking the consistency of the evaluation measures and alternatives suggested by the team thus reducing bias in decision making.

**Step 1:** Perform Pair-wise Comparison (Saaty nine-point preference scale is adopted for constructing the pair-wise comparison matrix).

Scale	Compare factor of i and j
1	Equally Important
3	Weakly Important
5	Strongly Important
7	Very Strongly Important
9	Extremely Important
2,4,6,8	Intermediate value between adjacent

**Table 1:** Saaty's nine-point preference scale

Let A represents  $n \times n$  pair-wise comparison matrix:

$$A = \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ a_{21} & 1 & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & 1 \end{bmatrix} \quad (1)$$

**Step 2:** Normalize the raw score by Arithmetic Mean as given below:

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$$r_{ij} = \frac{x_{ij}}{\sum_{i=1}^m x_{ij}}, \quad j = 1, 2, \dots, n \quad (2)$$

**Step 3:** Perform Consistency check.

**Step 3a:** Let C denotes a n-dimensional column vector describing the sum of the weighted values for the importance degrees of the attributes, then

$$C = [c_i]_{n \times 1} = AW^T, \quad i = 1, 2, \dots, n \quad (3)$$

where

$$AW^T = \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ a_{21} & 1 & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & 1 \end{bmatrix} [w_1, w_2, \dots, w_n] = \begin{bmatrix} c_1 \\ c_2 \\ \dots \\ c_n \end{bmatrix} \quad (4)$$

**Step 3b:** To avoid inconsistency in the pair-wise comparison matrix, Saaty [1] suggested the use of the maximum Eigen value  $\lambda_{\max}$  to calculate the effectiveness of judgment. The maximum Eigen value  $\lambda_{\max}$  can be determined as follows:

$$\lambda_{\max} = \frac{\sum_{i=1}^n c_i \cdot v_i}{n}, \quad i = 1, 2, \dots, n \quad (5)$$

**Step 3c:** With  $\lambda_{\max}$  value, a consistency index (CI) can then be estimated by

$$CI = \frac{\lambda_{\max} - n}{n - 1} \quad (6)$$

**Step 3d:** Consistency ratio (CR) can be used as a guide to check the consistency

$$CR = \frac{CI}{RI} \quad (7)$$

where RI denotes the average random index with the value obtained by different orders of the pair-wise comparison matrices are shown in table 2. The value of  $CR \leq 0.10$  is the consistent criteria.

Initially weight of the main criteria calculated by AHP and then for each criterion measures the relative importance of several sub-criterion is calculated with the help of AHP pair-wise comparison and calculation weights of sub-criteria for criteria-1 is shown in the table-3 and also satisfies the consistency checking of pair-wise comparison matrix.

Matrix	1,2	3	4	5	6	7	8
R.I.	0	0.52	0.89	1.12	1.26	1.36	1.41
Matrix	9	10	11	12	13	14	
R.I.	1.46	1.49	1.52	1.54	1.56	1.58	

**Table 2:** Table of random Index

Criteria	MOM	MW	IPL	PER	W	Vecto r	Lamd a	max	CI	CR
MOM	1.000	0.500	0.100	0.143	0.0488	0.1954	4.0021	4.0107	0.0036	0.0040
MW	2.000	1.000	0.167	0.333	0.0964	0.3868	4.0134			
IPL	10.000	6.000	1.000	2.000	0.5532	2.2229	4.0182			
PER	7.000	3.000	0.500	1.000	0.3016	1.2091	4.0090			
Sum->	20.000 0	10.500 0	1.766 7	3.476 2	1.0000	4.0142				
Criteria	MOM	MW	IPL	PER	Sum	W				
MOM	0.0500	0.0476	0.056 6	0.041 1	0.1953	0.0488				
MW	0.1000	0.0952	0.094 3	0.095 9	0.3855	0.0964				
IPL	0.5000	0.5714	0.566 0	0.575 3	2.2128	0.5532				
PER	0.3500	0.2857	0.283 0	0.287 7	1.2064	0.3016				

**Table 3:** Relative Importance of Sub-criterion of criteria-1

The weights of the main criteria are as follows-

**C1 = 0.62631, C2 = 0.30125, C3 = 0.072439** and the weights of the sub-criteria are shown in the table- 4.

MOM	MW	IPL	PER	AGE	CAP	ER	FIELD	ICON
0.031	0.06	0.346	0.189	0.073	0.098	0.033	0.033	0.063
INT.	T20R	ODR	T20M	ODM	NAT			
0.009	0.018	0.009	0.024	0.009	0.003			

**Table 4:** Relative Importance of Sub-criterion

#### 4. Conclusion

Different category of players take participated in IPL like Indian uncapped player that is Indian young talented players who does not start their international carrier, current international player who presently played international cricket in their respective nation, players who already goodbye from their international playing carrier or some iconic player whose presence give the franchisee owner a big profit, etc. Cricket is an outdoor physically game so age is a factor. Players experience also helps the team and the young

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player motivated from the experienced iconic player. So, the salary of each player does not depend on two or three attributes but it depend on the attributes mentioned in this paper and the relative closeness of the criteria measured by AHP according expert opinion gives a complete idea how the franchisee owner set the salary structure of IPL cricketer. For each criterion several values is there for several players and according this the several players price will be generated. The last three IPL performance of any player get the highest priority followed by players performance analysis followed by captaincy and so on. This research work provides a well established mathematical tool based on pair-wise comparison method for calculating the weights of the attributes of player which are responsible for calculating the player salary.

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