Scientific Journal of Impact Factor (SJIF): 3.134
e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 3, Issue 1, January -2016

Effect on Selection of Number of Attributes While Making a Decision - Using Simple Additive Weighting Approach

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ABSTRACT:*Multiple attribute decision making (MADM) is oldest popular approach which is usedto select one from the available options. Initially, a decision maker (DM) selects number of attributes according to the availability and suitability of the problem defined. In this process, selection of number of attributes will play crucial role while making a decision. Simple additive weighting approach (SAW) is one of the popular and simple among all the methods available in Multi-Attribute Decision Making (MADM). Effect on selection of attributes while making a decision has been tested here in this research paper by considering different cases for making the same decision in a case study. During this case study, cases are considered with different number of attributes i.e., 2, 3, 4, 5, 6, 7 and 8. It is also attempted to conclude with the best option from all cases considered with two different approaches.*

KEY WORDS and ABBREVIATIONS:*MADM- Multiple attribute decision making , MCDM- Multi-Criteria Decision Making, DM-Decision Maker, SAW-Simple Additive Weighting approach, MAT-Number of matches played, HIGH SCORE-Individual highest score, AVERAGE-Individual batting average, 100's-Number of centuries, 50's-Number of Half-Centuries, 0's-Number of duck-outs, NOTOUT-Number of Not outs, RUNS- Total runs, CPS-Composite Performance Score*

I. INTRODUCTION

Multi-Criteria Decision Making (MCDM) is the popular approach that allows one to make decisions in the presence of multiple conflicting criteria. This can be divided into two categories i.e., Multi-Attribute Decision Making (MADM), and Multi-Objective Decision Making (MODM). Earlier one involves the selection of the "best" alternative from pre-specified alternatives described in terms of multiple attributes; later one involves the design of alternatives which optimize the multiple objectives of Decision Maker (DM). Although MCDM as a discipline only has a relatively short history of about 40 years, over 70 MCDM techniques have been developed for facilitating the decision making process.
Among these developed MCDM methods, different methods have different underlying assumptions, information requirements, analysis models, and decision rules that are designed for solving a certain class of decision making problems. This implies that it is critical to select the most appropriate method to solve the problem under consideration since the use of unsuitable method always leads to misleading design decisions. Consequently, bad design decisions will result in big loss to the society, such as property damage or personal injury. However, it can be seen that the selection of MCDM methods itself is a complicated MCDM problem [Hwang, 1981] and needs to be prudently performed.

II. LITERATURE REVIEW

ValentinasPodvezko (2011) described saw method in 'The Comparative Analysis of MCDA Methods SAW and COPRAS' and concluded thatThe methods SAW and COPRAS are widely used for multicriteria evaluation. Though they may seem to bedifferent, both methods have a number of common features and properties. more accurately evaluate and validate the calculation results, are defined and proved mathematically. The cases, when COPRAS may be unstable due to datavariation, and the results obtained may differ from the data, yielded by other multicriteria evaluation methods, aredescribed. Common properties of the methods SAW and COPRAS allow them to be used for comparison and evaluation of criteria describing hierarchically structured complex magnitudes, which are of the same hierarchical level.

AlirezaAfshari, MajidMojahed and RosnahMohdYusuff (2010) are described SAW method in 'Simple Additive Weighting approach to Personnel Selection problem' and concluded as they have presented a MCDM methodology for Personnel selection. The method was applied using data from a real case in the Telecommunication sector of Iran. To increase the efficiency and ease-of-use of the proposed model, simple software such as MS Excel can be used. Evaluation of the candidates on the basis of the criteria only will be sufficient for the future applications of the model and implementation of this evaluation via simple software will speed up the process. The limitation of this article is that SAW ignores the fuzziness of executives" judgment during the decision-making process. Besides, some criteria could have a qualitative structure or have an uncertain structure which cannot be measured precisely. In such cases, fuzzy numbers can be used to obtain the evaluation matrix and the proposed model can be enlarged by using fuzzy numbers.

Xiaoqian Sun and Yongchang Li are described SAW method in 'An Intelligent Multi-Criteria Decision Support System for Systems Design' and concluded as a systematic MCDM selection process is developed and applied to solve a given decision making problem. The selection of the most appropriate MCDM methods is formulated as a complicated MCDM problem and a hybrid framework is proposed to deal with this problem. 24 candidate MCDM methods and their characteristics are stored in a method library, and the method evaluation criteria for selecting the most appropriate method are defined. Relative weights are assigned to each evaluation criterion to describe the DM's preference information. The Simple Additive Weighting (SAW) method is used to choose the most suitable method from the method library. This MCDM methods selection process is implemented in MATLAB and an intelligent knowledge- based system is created, which consists of a MCDM base storing the typically widely used decision making methods and a knowledge base providing the information required in the method selection process. A fighter aircraft selection problem is implemented to demonstrate the capabilities of the intelligent MCDM decision support system. Study shows that the proposed decision support system can effectively help DM with selecting the most appropriate method and guide the DM to get the final decision for the given decision problem. It is worth noting that there is no absolute "best" MCDM method since the MCDM method selection is problem specified. The selection of the most suitable MCDM method depends on the problem under consideration. In addition, new methods may emerge during the process of MCDM methods selection as we get more insights on the characteristics of the methods. For example, by combining the characteristics of two or more decision making methods, DM may get one hybrid method which is more effective for solving the given problem.

Widayanti-Deni, Oka-Sudana and Arya-Sasmita (2013) described SAW method in ' Analysis and Implementation Fuzzy Multi-AttributeDecision Making SAW Method for Selection of HighAchieving Students in Faculty Level' and concluded as Based on the research that has been done, it can beconcluded that the FMADM SAW method can be used inthe selection process of high achieving students. Theselection results obtained in the form of ranking the finalvalue of the participant. Although using a simple weighting calculation, FMADM SAW method canprovide the best decision in the decision process.

Abbas ToloieEshlaghy, NasimRastkhizPaydar, KhadijehJoda and NedaRastkhizPaydar (2009) described SAW method in 'Sensitivity analysis for criteria values in decisionmaking matrix of SAW method' and concluded as In SAW method, alternativesranks regards to criteria. This method is one of the individual, multiple criteria decisionmaking methods but simply can be used for group decision making. Also, criteria weightscan be finding with various methods. After obtaining alternatives rank, managers need to find the sensitivity of values and also, the domain of deviations in decision making matrix.This paper shows that by sensitivity analysis, decision makers can find extra informationas decision supports, without any changes in alternatives ranking.In this article, a new method for sensitivity analysis of numerical values in decision makingmatrix is presented, and also a case study done for model verification.

AzizollahMemariani, Abbas Amini, AlirezaAlinezhad (2009) described in their paper entitled ' Sensitivity Analysis of Simple Additive Weighting Method (SAW):The Results of Change in the Weight of One Attribute on the FinalRanking of Alternatives' and concluded as In classic techniques of MADM, often, it is assumed that all used data (such as weight of attributes, efficiencyof alternatives against attributes,…) are deterministicthen final score or utility of alternatives are obtained bysolving MADM, whereas in reality, data of decisionmaking problem are changing. So that, after solvingdecision making problems, usually a sensitivity analysismust be done for them.

Simple Additive Weighting (SAW) Method

This is also called the weighted sum method (Fishburn, 1967) and is the simplestand still the widest used MADM method. Here, each attribute is given a weight,and the sum of all weights must be 1. Each alternative is assessed with regard toevery attribute. The overall or composite performance score of an alternative isgiven by Equation given below

$$Pi = \sum_{j=1}^{M} wjmij$$

Previously, it was argued that SAW should be used only when the decisionattributes can be expressed in identical units of measure (*e.g.*, only dollars, onlypounds, only seconds, *etc.)*. However, if all the elements of the decision table arenormalized, then SAW can be used for any type and any number of attributes. Inthat case, Equation above mentioned will take the following form:

$$Pi = \sum_{j=1}^{M} wj(mij)normal$$

where (mij)normal represents the normalized value of mij, and Pi is the overall orcomposite score of the alternative Ai. The alternative with the highest value of Pi isconsidered as the best alternative.

The attributes can be beneficial or non-beneficial. When objective values ofthe attribute are available, normalized values are calculated by (mij)K/(mij)L, where(mij)K is the measure of the attribute for the K-th alternative, and (mij)L is themeasure of the attribute for the L-th alternative that has the highest measure of theattribute out of all alternatives

considered. This ratio is valid for beneficialattributes only. A beneficial attribute (*e.g.*, profit) means its higher measures aremore desirable for the given decision-making problem. By contrast, non-beneficialattribute (*e.g.*, cost) is that for which the lower measures are desirable, and thenormalized values are calculated by (mij)L/(mij)K.
If the restriction that the sum of all weights is to be equal to 1 is relaxed, thenEquation mentioned below can be used and this method is called simple multiple attribute ratingtechnique (SMART).

$$P_i = \left[\sum_{j=1}^{M} w_j (m_{ij})_{normal} \right] / \sum_{j=1}^{M} w_j$$

Edwards *et al.* (1982) proposed a simple method to assess weights for eachattribute to reflect its relative importance to the decision. For a start, the attributesare ranked in order of importance and 10 points are assigned to the least importantattribute. Then, the next-least important attribute is chosen, more points areassigned to it, and so on, to reflect their relative importance. The final weights areobtained by normalizing the sum of the points to one.

Standard Deviation Method

The standard deviation (SD) method calculates objective weights of the attributes by Equation mentioned below.

$$w_j = \sigma_j / \sum_{k=1}^{M} \sigma_k$$

Where σj is the standard deviation of the normalized vector Rj = (R1j, R2j, R3j, ….. ,RNj) in the above Equation. Both the entropy method and standard deviation method calculate the objective weights of the attributes without giving any consideration to the preferences of the decision maker.

III. CASE STUDY

Test cricket is the popular sports world- wide. Countries like INDIA will treat cricket as religion. Many cricketers i.e., cricket legends have played wonderful knocks during their tenure. Evaluation of best performance in the world test cricket is very interesting task always. Here in this case study, evaluation of best performance is attempted with the consideration of different attributes in number in different case, through which the change of best option depending on the attributes considered to select the bestusing Simple Additive Weighting Method. To limit number of cricketers for this case study, the constraintkept here is, top 12 top scorers (run getters) up to 12 April 2015.
(NOTE: statistics considered here are as on 12th April 2015)

CASE1: when TWO attributes are considered

In the initial case only TWO attributes are considered i.e., individual batting average (Ave) and Number of duck outs(0). The following table gives the actual data of individual player, normalized data and CPS respectively. Weights are calculated using SD method and they may be w1=0.415031553& w2=0.584968447

S.No.	Name of the player	Actual data		Normalized data		CPS
		Ave	0	Mat	Ave	
1	SR Tendulkar	53.78	14	0.91680873	0.571429	0.714772234
2	RT Ponting	51.85	17	0.88390726	0.470588	0.642128673
3	JH Kallis	55.37	16	0.94391408	0.5	0.684238351
4	R Dravid	52.31	8	0.89174906	1	0.955072445
5	KC Sangakkara	58.66	10	1	0.8	0.883006311
6	BC Lara	52.88	17	0.90146608	0.470588	0.649416135
7	DPMD Jayawardene	49.84	15	0.849642	0.533333	0.664611413
8	S Chanderpaul	52.33	14	0.89209001	0.571429	0.704513187
9	AR Border	50.56	11	0.86191613	0.727273	0.783153987
10	SR Waugh	51.06	22	0.87043982	0.363636	0.573975791
11	SM Gavaskar	51.12	12	0.87146267	0.666667	0.751663468
12	GC Smith	48.25	11	0.82253665	0.727273	0.766810262

Then the sequence of best performance with the rank may be

Rank	Name of the Player
1	R Dravid

2	KC Sangakkara
3	AR Border
4	GC Smith
5	SM Gavaskar
6	SR Tendulkar
7	S Chanderpaul
8	JH Kallis
9	DPMD Jayawardene
10	BC Lara
11	RT Ponting
12	SR Waugh

CASE2: when THREE attributes are considered

In this case THREE attributes are considered i.e., Individual batting average (Ave), Number of centuries (100's) and Number of duck outs(0). The following table gives the actual data of individual player, normalized data and CPS respectively. Weights are calculated using SD method and they may be w1=0.198437482, w2=0.521873747 and w3=0.279688771 ;

S.No	Name of the player	Actual data			Normalized data			CPS
		Ave	100	0	Ave	100	0	
1	SR Tendulkar	53.78	51	14	0.91680873	1	0.571429	0.863625117
2	RT Ponting	51.85	41	17	0.88390726	0.803922	0.470588	0.726564138
3	JH Kallis	55.37	45	16	0.94391408	0.882353	0.5	0.787629154
4	R Dravid	52.31	36	8	0.89174906	0.705882	1	0.825026678
5	KC Sangakkara	58.66	38	10	1	0.745098	0.8	0.811035604
6	BC Lara	52.88	34	17	0.90146608	0.666667	0.470588	0.658418734
7	DPMD Jayawardene	49.84	34	15	0.849642	0.666667	0.533333	0.665683996
8	S Chanderpaul	52.33	30	14	0.89209001	0.588235	0.571429	0.643830807
9	AR Border	50.56	27	11	0.86191613	0.529412	0.727273	0.650732582
10	SR Waugh	51.06	32	22	0.87043982	0.627451	0.363636	0.601883088
11	SM Gavaskar	51.12	34	12	0.87146267	0.666667	0.666667	0.707305869
12	GC Smith	48.25	27	11	0.82253665	0.529412	0.727273	0.642918219

Then the sequence of best performance may be

Rank	Name of the Player
1	SR Tendulkar
2	R Dravid
3	KC Sangakkara
4	JH Kallis
5	RT Ponting
6	SM Gavaskar
7	DPMD Jayawardene
8	BC Lara
9	AR Border
10	S Chanderpaul
11	GC Smith
12	SR Waugh

CASE3: when FOUR attributes are considered

In this case FOUR attributes are considered i.e., Individual batting average (Ave), Number of centuries (100's), Number of Half Centuries (50s) and Number of duck outs(0). The following table gives the actual data of individual player, normalized data and CPS respectively. Weights are calculated using SD method and they may be w1=0.1174115, w2=0.308782282, w3=0.408319955 and w4=0.165486265,

S.No.	Name of the player	Actual data				Normalized data				CPS
		Ave	**100**	**50**	**0**	**Ave**	**100**	**50**	**0**	
1	SR Tendulkar	53.78	51	68	14	0.91680873	1	1	0.571429	0.919309703
2	RT Ponting	51.85	41	62	17	0.88390726	0.803922	0.911765	0.470588	0.802185225
3	JH Kallis	55.37	45	58	16	0.94391408	0.882353	0.852941	0.5	0.814297356
4	R Dravid	52.31	36	63	8	0.89174906	0.705882	0.926471	1	0.866448251
5	KC Sangakkara	58.66	38	51	10	1	0.745098	0.75	0.8	0.786113549
6	BC Lara	52.88	34	48	17	0.90146608	0.666667	0.705882	0.470588	0.677799077
7	DPMD	49.84	34	50	15	0.849642	0.666667	0.735294	0.533333	0.694107198
8	S Chanderpaul	52.33	30	66	14	0.89209001	0.588235	0.970588	0.571429	0.777252386
9	AR Border	50.56	27	63	11	0.86191613	0.529412	0.926471	0.727273	0.763321913
10	SR Waugh	51.06	32	50	22	0.87043982	0.627451	0.735294	0.363636	0.656357474
11	SM Gavaskar	51.12	34	45	12	0.87146267	0.666667	0.661765	0.666667	0.688710503
12	GC Smith	48.25	27	38	11	0.82253665	0.529412	0.558824	0.727273	0.608580679

Then the sequence of best performance may be

Rank	Name of the Player
1	SR Tendulkar
2	R Dravid
3	JH Kallis
4	RT Ponting
5	KC Sangakkara
6	S Chanderpaul
7	AR Border
8	DPMD Jayawardene
9	SM Gavaskar
10	BC Lara
11	SR Waugh
12	GC Smith

CASE4: when FIVE attributes are considered

In this case FIVE attributes are considered i.e., Individual batting average (Ave), Number of centuries (100's), Number of Half Centuries (50s), Number of duck outs(0) and Number of Not outs (NO). The following table gives the actual data of individual player, normalized data and CPS respectively. Weights are calculated using SD method and they may be w1=0.071933373, w2=0.189178669, w3=0.250161458, w4=0.101386877 and w5=0.387339623

S.No.	Name of the player	ACTUAL DATA					NORMALIZED DATA					CPS
		Ave	100	50	0	NO	Ave	100	50	0	NO	
1	SR Tendulkar	53.78	51	68	14	33	0.91680873	1	1	0.571429	0.673469	0.824086008
2	RT Ponting	51.85	41	62	17	29	0.88390726	0.803922	0.911765	0.470588	0.591837	0.72070892
3	JH Kallis	55.37	45	58	16	40	0.94391408	0.882353	0.852941	0.5	0.816327	0.815083336
4	R Dravid	52.31	36	63	8	32	0.89174906	0.705882	0.926471	1	0.653061	0.783795001
5	KC Sangakkara	58.66	38	51	10	17	1	0.745098	0.75	0.8	0.346939	0.616003758
6	BC Lara	52.88	34	48	17	6	0.90146608	0.666667	0.705882	0.470588	0.122449	0.46268998
7	DJayawardene	49.84	34	50	15	15	0.849642	0.666667	0.735294	0.533333	0.306122	0.543825331
8	S Chanderpaul	52.33	30	66	14	49	0.89209001	0.588235	0.970588	0.571429	1	0.863531363

9	AR Border	50.56	27	63	11	44	0.86191613	0.529412	0.926471	0.727273	0.897959	0.815472262
10	SR Waugh	51.06	32	50	22	46	0.87043982	0.627451	0.735294	0.363636	0.938776	0.76574917
11	SM Gavaskar	51.12	34	45	12	16	0.87146267	0.666667	0.661765	0.666667	0.326531	0.548423881
12	GC Smith	48.25	27	38	11	13	0.82253665	0.529412	0.558824	0.727273	0.265306	0.475616842

Then the sequence of best performance may be

Rank	Name of the Player
1	S Chanderpaul
2	SR Tendulkar
3	AR Border
4	JH Kallis
5	R Dravid
6	SR Waugh
7	RT Ponting
8	KC Sangakkara
9	SM Gavaskar
10	DPMD Jayawardene
11	GC Smith
12	BC Lara

CASE5: when SIX attributes are considered

In this case SIX attributes are considered i.e., number of matches played (Mat), individual batting average (Ave), Number of centuries (100's), Number of Half Centuries (50s), Number of duck outs(0) and Number of Not outs (NO). The following table gives the actual data of individual player, normalized data and CPS respectively. Weights are calculated using SD method and they may be w1=0.384922763, w2=0.04424458, w3=0.116359493, w4=0.153868618, w5=0.06236076 and w6=0.238243785

S.No.	Player name	ACTUAL DATA						NORMALIZED DATA						CPS
		Mat	**Ave**	**10**	**5**	**0**	**N**	**Mat**	**Ave**	**100**	**50**	**0**	**NO**	
1	SR Tendulkar	**200**	53.78	51	6	1	33	0.585	0.916808	1	1	0.5714	0.6734	0.7320563
2	RT Ponting	**168**	51.85	41	6	1	29	0.6964	0.883907	0.8039	0.9117	0.4705	0.5918	0.7113628
3	JH Kallis	**166**	55.37	45	5	1	40	0.7048	0.943914	0.8823	0.8529	0.5	0.8163	0.7726401
4	R Dravid	**164**	52.31	36	6	8	32	0.7134	0.891749	0.7058	0.9264	1	0.6530	0.7567039
5	KC Sangakkara	**130**	58.66	38	5	1	17	0.9	1	0.7450	0.75	0.8	0.3469	0.6810757
6	BC Lara	**131**	52.88	34	4	1	6	0.8931	0.901466	0.6666	0.7058	0.4705	0.1224	0.6283760
7	DPMD	**149**	49.84	34	5	1	15	0.7852	0.849642	0.6666	0.7352	0.5333	0.3061	0.6367493
8	S Chanderpaul	**161**	52.33	30	6	1	49	0.7267	0.892090	0.5882	*0.9705*	0.5714	1	0.8108649
9	AR Border	**156**	50.56	27	6	1	44	0.75	0.861916	0.5294	0.9264	0.7272	0.8979	0.7902704
10	SR Waugh	**168**	51.06	32	5	2	46	0.6964	0.870439	0.6274	0.7352	0.3636	0.9387	0.7390660
11	SM Gavaskar	**125**	51.12	34	4	1	16	0.936	0.871462	0.6666	0.6617	0.6666	0.3265	0.6976107
12	GC Smith	**117**	48.25	27	3	1	13	1	0.822536	0.5294	0.5588	0.7272	0.2653	0.6774638

Then the sequence of best performance may be

Rank	Name of the Player
1	S Chanderpaul
2	AR Border
3	JH Kallis
4	R Dravid
5	SR Waugh
6	SR Tendulkar
7	RT Ponting
8	SM Gavaskar
9	KC Sangakkara
10	GC Smith

11	DPMD Jayawardene
12	BC Lara

CASE6: when SEVEN attributes are considered

In this case SEVEN attributes are considered i.e., number of matches played (Mat), Individual highest score (HS), individual batting average (Ave), Number of centuries (100's), Number of Half Centuries (50s), Number of duck outs(0) and Number of Not outs (NO). The following table gives the actual data of individual player, normalized data and CPSrespectively. Weights are calculated using SD method and they may be w1=0.185680286, w2=0.517616769, w3=0.021342843, w4=0.056129868, w5=0.074223641, w6=0.030081785 and w7=0.114924807

S.No.	Name of the player	ACTUAL DATA							NORMALIZED DATA							CPS
		Ma	H	Ave	10	5	0	N	Mat	HS	Ave	100	50	0	NO	
1	SR Tendulkar	**200**	24	53.7	51	6	1	33	0.585	0.62	0.916808	1	1	0.5714	0.6734	0.6740541
2	RT Ponting	**168**	25	51.8	41	6	1	29	0.6964	0.642	0.883907	0.8039	0.9117	0.4705	0.5918	0.6757182
3	JH Kallis	**166**	22	55.3	45	5	1	40	0.7048	0.56	0.943914	0.8823	0.8529	0.5	0.8163	0.6625740
4	R Dravid	**164**	27	52.3	36	6	8	32	0.7134	0.675	0.891749	0.7058	0.9264	1	0.6530	0.7144126
5	KC	**130**	31	58.6	38	5	1	17	0.9	0.797	1	0.7450	0.75	0.8	0.3469	0.7626817
6	BC Lara	**131**	40	52.8	34	4	1	6	0.8931	1	0.901466	0.6666	0.7058	0.4705	0.1224	0.8207348
7	DPMD	**149**	37	49.8	34	5	1	15	0.7852	0.935	0.849642	0.6666	0.7352	0.5333	0.3061	0.7911288
8	S	**161**	20	52.3	30	6	1	49	0.7267	0.507	0.892090	0.5882	0.9705	0.5714	1	0.6538381
9	AR Border	**156**	20	50.5	27	6	1	44	0.75	0.512	0.861916	0.5294	0.9264	0.7272	0.8979	0.6464918
10	SR Waugh	**168**	20	51.0	32	5	2	46	0.6964	0.5	0.870439	0.6274	0.7352	0.3636	0.9387	0.6153214
11	SM Gavaskar	**125**	23	51.1	34	4	1	16	0.936	0.59	0.871462	0.6666	0.6617	0.6666	0.3265	0.6419096
12	GC Smith	**117**	27	48.2	27	3	1	13	1	0.692	0.822536	0.5294	0.5588	0.7272	0.2653	0.6852468

Then the sequence of best performance may be

Rank	Name of the Player
1	BC Lara
2	DPMD Jayawardene
3	KC Sangakkara
4	R Dravid
5	GC Smith
6	RT Ponting
7	SR Tendulkar
8	JH Kallis
9	S Chanderpaul
10	AR Border
11	SM Gavaskar
12	SR Waugh

CASE7: when EIGHT attributes are considered

In this case EIGHT attributes are considered i.e., number of matches played (Mat), Individual highest score (HS), individual batting average (Ave), Number of centuries (100's), Number of Half Centuries (50s), Number of duck outs(0), Number of Not outs (NO) and their total runs (Runs). The following table gives the actual data of individual player, normalized data and CPS respectively. Weights are calculated using SD method and they may be w1=0.012616454, w2=0.932052807, w3=0.035170607, w4=0.001450186, w5=0.003813867, w6=0.005043288, w7=0.002043973 and w8=0.007808818

S.No.	Name of the player	ACTUAL DATA								NORMALIZED DATA								CPS
		Ma	Run	H	Ave	10	5	0	N	Mat	Runs	HS	Ave	100	50	0	NO	
1	SR Tendulkar	**20**	1592	24	53.7	51	6	1	33	0.585	1	0.62	0.916808	1	1	0.5714	0.6734	0.9778528
2	RT Ponting	**16**	1337	25	51.8	41	6	1	29	0.6964	0.8402	0.64	0.883907	0.8039	0.9117	0.4705	0.5918	0.8290927
3	JH Kallis	**16**	1328	22	55.3	45	5	1	40	0.7048	0.8346	0.56	0.943914	0.8823	0.8529	0.5	0.8163	0.8229893
4	R Dravid	**16**	1328	27	52.3	36	6	8	32	0.7134	0.8346	0.67	0.891749	0.7058	0.9264	1	0.6530	0.8264531
5	KC Sangakkara	**13**	1220	31	58.6	38	5	1	17	0.9	0.7664	0.79	1	0.7450	0.75	0.8	0.3469	0.7662144
6	BC Lara	**13**	1195	40	52.8	34	4	1	6	0.8931	0.7507	1	0.901466	0.6666	0.7058	0.4705	0.1224	0.7555233
7	DPMD	**14**	1181	37	49.8	34	5	1	15	0.7852	0.7420	0.93	0.849642	0.6666	0.7352	0.5333	0.3061	0.7453743
8	S Chanderpaul	**16**	1177	20	52.3	30	6	1	49	0.7267	0.7395	0.50	0.892090	0.5882	0.9705	0.5714	1	0.7337626
9	AR Border	**15**	1117	20	50.5	27	6	1	44	0.75	0.7018	0.51	0.861916	0.5294	0.9264	0.7272	0.8979	0.6980795
10	SR Waugh	**16**	1092	20	51.0	32	5	2	46	0.6964	0.6863	0.5	0.870439	0.6274	0.7352	0.3636	0.9387	0.6815016
11	SM Gavaskar	**12**	1012	23	51.1	34	4	1	16	0.936	0.6357	0.59	0.871462	0.6666	0.6617	0.6666	0.3265	0.6361816
12	GC Smith	**11**	9265	27	48.2	27	3	1	13	1	0.5819	0.69	0.822536	0.5294	0.5588	0.7272	0.2653	0.5889555

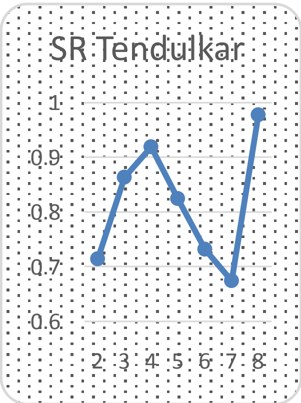
Then the sequence of best performance may be

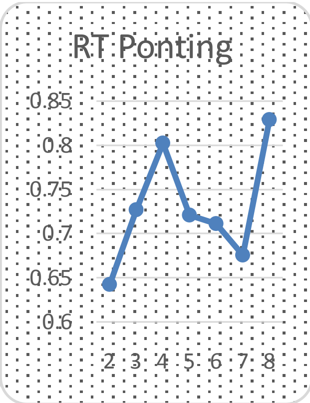
Rank	Name of the Player
1	SR Tendulkar
2	RT Ponting
3	R Dravid
4	JH Kallis
5	KC Sangakkara
6	BC Lara
7	DPMD Jayawardene
8	S Chanderpaul
9	AR Border
10	SR Waugh
11	SM Gavaskar
12	GC Smith

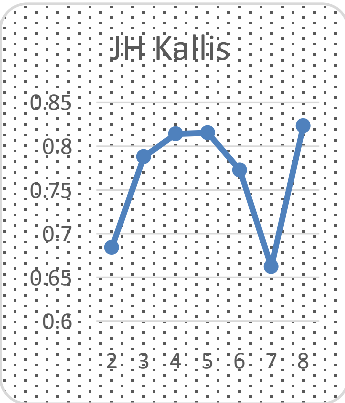
IV. ANALYSIS

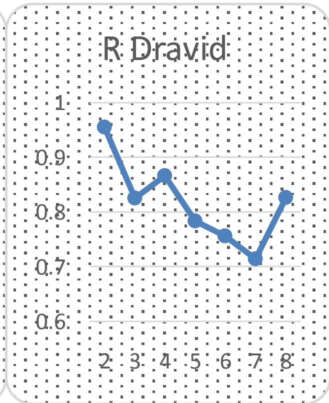
The following table gives the complete data of the above cases i.e., player wise weightages with number of attributes. Below shown graphs are player-wise CPS by considering the range of CPS on Y-axis and number of attributes on X-axis

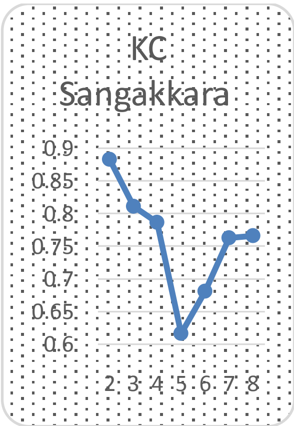
Attribu	NAME OF THE PLAYER											
	SR Tendulkar	RT Ponting	JH Kallis	R Dravid	KC Sangakkara	BC Lara	Jayawardene	S Chanderpaul	AR Border	SR Waugh	Gavaskar	GC Smith
2	0.714772	0.642129	0.684238	0.955072	0.883006	0.649416	0.664611	0.704513	0.783154	0.573976	0.751663	0.76681
3	0.863625	0.726564	0.787629	0.825027	0.811036	0.658419	0.665684	0.643831	0.650733	0.601883	0.707306	0.642918
4	0.91931	0.802185	0.814297	0.866448	0.786114	0.677799	0.694107	0.777252	0.763322	0.656357	0.688711	0.608581
5	0.824086	0.720709	0.815083	0.783795	0.616004	0.46269	0.543825	0.863531	0.815472	0.765749	0.548424	0.475617
6	0.732056	0.711363	0.77264	0.756704	0.681076	0.628376	0.636749	0.810865	0.79027	0.739066	0.697611	0.677464
7	0.674054	0.675718	0.662574	0.714413	0.762682	0.820735	0.791129	0.653838	0.646492	0.615321	0.64191	0.685247
8	0.977853	0.829093	0.822989	0.826453	0.766214	0.755523	0.745374	0.733763	0.69808	0.681502	0.636182	0.588956

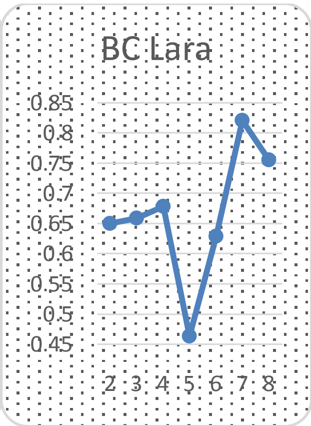


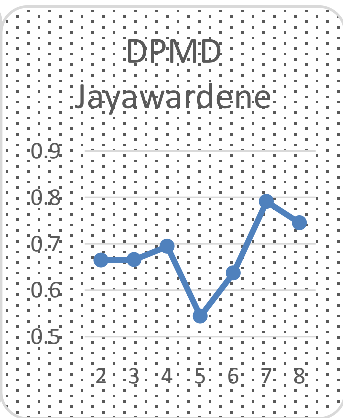


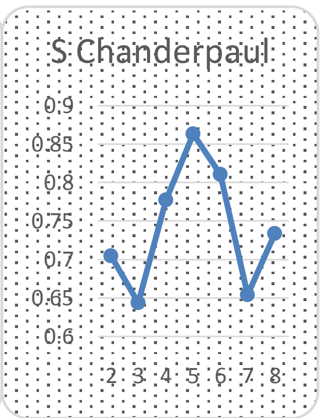


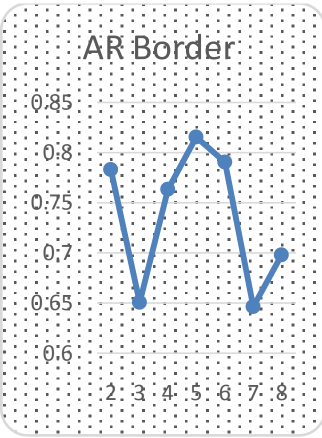


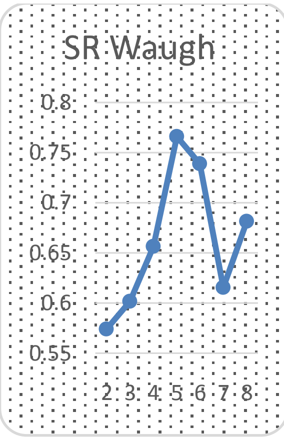


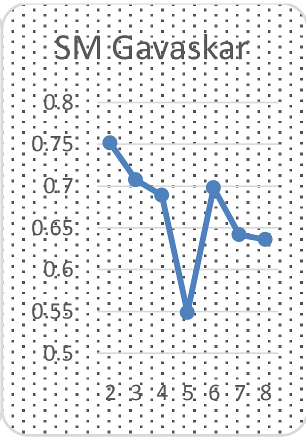


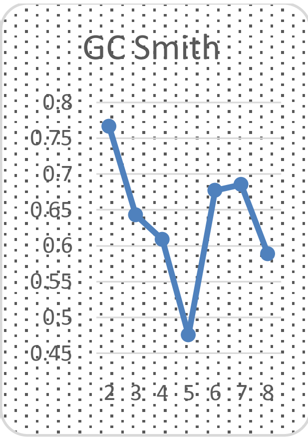


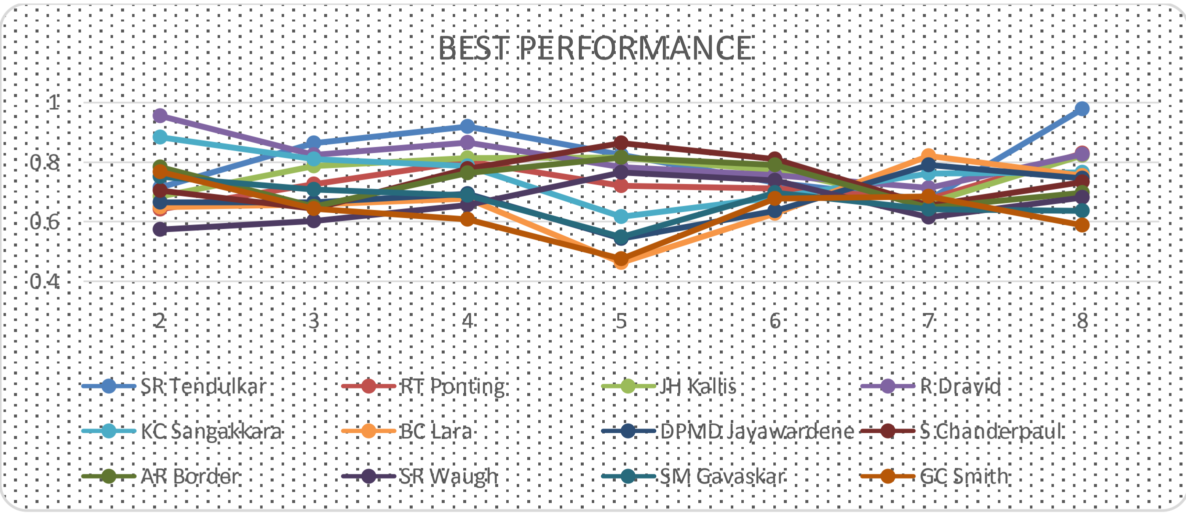












Out of the seven sequences obtained above, it is always interesting to obtain the best sequence with in or out of the above. For that, the same final values of CPS are considered for SIMPLE ADDITIVE WEIGHING APPROACH again. To find out the optimized sequence and number of attributes, two tables are being considered, out of which first one is used to find out optimized sequence players and second one is used to determine optimized sequence of number of parameters by applying Simple Additive Weighing Approach as above. For that, the final values of CPSin two ways are tabulated below,To determine the optimized sequence in players

	2P	3P	4P	5P	6P	7P	8P
SR Tendulkar	0.714772234	0.863625117	0.919309703	0.824086008	0.732056361	0.67405411	0.977852892
RT Ponting	0.642128673	0.726564138	0.802185225	0.72070892	0.711362861	0.67571829	0.829092764
JH Kallis	0.684238351	0.787629154	0.814297356	0.815083336	0.77264019	0.662574062	0.822989381
R Dravid	0.955072445	0.825026678	0.866448251	0.783795001	0.756703995	0.714412637	0.826453124
KC Sangakkara	0.883006311	0.811035604	0.786113549	0.616003758	0.681075796	0.76268176	0.766214422
BC Lara	0.649416135	0.658418734	0.677799077	0.46268998	0.628376054	0.82073484	0.755523378
DPMD	0.664611413	0.665683996	0.694107198	0.543825331	0.636749369	0.791128897	0.74537435
S Chanderpaul	0.704513187	0.643830807	0.777252386	0.863531363	0.810864964	0.653838172	0.733762679
AR Border	0.783153987	0.650732582	0.763321913	0.815472262	0.790270498	0.64649183	0.698079561
SR Waugh	0.573975791	0.601883088	0.656357474	0.76574917	0.739066093	0.615321475	0.681501662
SM Gavaskar	0.751663468	0.707305869	0.688710503	0.548423881	0.697610752	0.641909622	0.636181657

GC Smith	0.766810262	0.642918219	0.608580679	0.475616842	0.677463856	0.685246816	0.588955501

Weights are calculated using SD method and they may be w1=0.162123556, w2=0.131329075, w3=0.139299124, w4=0.224758551, w5=0.08843021, w6=0.097656602 and w7=0.156402882. Best sequence may be

S.No.	Name of the player	CPS
1	SR Tendulkar	0.922894593
2	R Dravid	0.9225937
3	JH Kallis	0.866189978
4	S Chanderpaul	0.843619149
5	KC Sangakkara	0.840248415
6	AR Border	0.834570964
7	RT Ponting	0.819214448
8	SR Waugh	0.750540242
9	DPMD Jayawardene	0.743562317
10	SM Gavaskar	0.73646526
11	BC Lara	0.72052207
12	GC Smith	0.693559147

1. To determine the optimized sequence in number of parameters

	SR	RT Ponting	JH Kallis	R Dravid	KC	BC Lara	DPMD	S	AR Border	SR Waugh	SM	GC Smith
2P	0.714772234	0.642128673	0.684238351	0.955072445	0.883006311	0.649416135	0.664611413	0.704513187	0.783153987	0.573975791	0.751663468	0.766810262
3P	0.863625117	0.726564138	0.787629154	0.825026678	0.811035604	0.658418734	0.665683996	0.643830807	0.650732582	0.601883088	0.707305869	0.642918219
4P	0.919309703	0.802185225	0.814297356	0.866448251	0.786113549	0.677799077	0.694107198	0.777252386	0.763321913	0.656357474	0.688710503	0.608580679
5P	0.824086008	0.72070892	0.815083336	0.783795001	0.616003758	0.46268998	0.543825331	0.863531363	0.815472262	0.76574917	0.548423881	0.475616842
6P	0.732056361	0.711362861	0.77264019	0.756703995	0.681075796	0.628376054	0.636749369	0.810864964	0.790270498	0.739066093	0.697610752	0.677463856
7P	0.67405411	0.67571829	0.662574062	0.714412637	0.76268176	0.82073484	0.791128897	0.653838172	0.64649183	0.615321475	0.641909622	0.685246816
8P	0.977852892	0.829092764	0.822989381	0.826453124	0.766214422	0.755523378	0.74537435	0.733762679	0.698079561	0.681501662	0.636181657	0.588955501

Weights are calculated using SD method and they may be w1=0.115282625, w2=0.067330678, w3=0.066994718, w4=0.080007877 , w5=0.088728399, w6=0.11417047, w7=0.080779495, w8=0.082901103, w9=0.070851712, w=100.072911885, w11=0.066938816 and w12= 0.093102221 .Best sequence may be,

NUMBER OF PARAMETERS	CPS
8	0.90118854
4	0.895207407
2	0.869422135
6	0.852484406
3	0.851813829
7	0.83760581
5	0.802735968

From the above table it is clear that optimized values are obtained when attributes are eight. And in the best sequence above 8attributes are better when the attributes are eight.

V. CONCLUSION

Selections of number of attributes are very important while making a decision. In the case study mentioned above, the top performer varies 4 times out of 7 times in seven cases. Depending upon the number of cases considered that may vary even. At the end, all the composite performance scores (CPS) are considered to find the optimized sequence in player and optimized sequence in number of parameters from the above result and it was done innovatively.

REFERENCES

1. R. VenkataRao (2007), 'Decision Making in the Manufacturing Environment Using Graph Theory and Fuzzy Multiple Attribute Decision Making Methods', Springer-Verlag London Limited , ISBN 978-1-84628-818-0 e-ISBN 978-1-84628-819-7
2. ValentinasPodvezko (2011), "The Comparative Analysis of MCDA Methods SAW and COPRA"S, InzinerineEkonomika-Engineering Economics, 22(2), 134-146
3. AlirezaAfshari, MajidMojahed and RosnahMohdYusuff (2010), "Simple Additive Weighting approach to Personnel Selection problem", International Journal of Innovation, Management and Technology, Vol. 1, No. 5,ISSN: 2010-0248
4. Xiaoqian Sun and Yongchang Li, "An Intelligent Multi-Criteria Decision Support System for Systems Design", American Institute of Aeronautics and Astronautics
5. Widayanti-Deni1, Oka-Sudana2 and Arya-Sasmita (2013), 'Analysis and Implementation Fuzzy Multi-AttributeDecision Making SAW Method for Selection of HighAchieving Students in Faculty Level", IJCSI International Journal of Computer Science Issues, Vol. 10, Issue 1, No 2, January 2013, ISSN (Print): 1694-0784 | ISSN (Online): 1694-0814
6. Abbas ToloieEshlaghy,NasimRastkhizPaydar, KhadijehJodaand NedaRastkhizPaydar (2009), ' Sensitivity analysis for criteria values in decisionmaking matrix of SAW method', Int. J. Industrial Mathematics Vol. 1, No. 1 (2009) 69-75
7. AzizollahMemariani, Abbas Amini and AlirezaAlinezhad (2009), 'Sensitivity Analysis of Simple Additive Weighting Method (SAW):The Results of Change in the Weight of One Attribute on the FinalRanking of Alternatives', *Journal of Industrial Engineering 4 (2009) 13- 18*

