

Vice Presidential Election Prediction Period 2019-2024 using Simple Additive Weighting

Aviv Yuniar Rahman
Department of Informatics Engineering
Universitas Widayagama
Malang, Indonesia
aviv@widyagama.ac.id

Mamba'us Sa'adah
Departement of Electrical Engineering
Institut Teknologi Sepuluh Nopember
Surabaya, Indonesia
mambaus.ms@gmail.com

Feddy Wanditya Setiawan
Department of Automotive Mechanical Engineering
Politeknik Hasnur
Barito Kuala, Indonesia
feddy@polihasnur.ac.id

Eko Supriyanto
Faculty of Engineering
Universiti Teknologi Malaysia
Skudai Johor, Malaysia
eko@utm.my

Abstract—Simple Additive Weighting (SAW) method is a method that can be applied in the process of selecting candidates for vice presidential candidates for the period 2019-2024. Determining the criteria, weight, and the alternative of each person is different - this makes the decision very difficult to do, requires a lot of choice, time and cost. The purpose of the research conducted is to provide a choice of solutions or considerations in selecting a vice presidential candidate in determining the best deputy leader in accordance with the needs and desires of the community. Accuracy in the provisions of the criteria for selecting a vice presidential candidate is necessary because some of the candidates who run for vice president are not well known to the public, and some do not meet the requirements of the criteria to become a vice presidential candidate. For the registration of presidential candidates in the KPU, it is still on 4-10 August 2018, but it is estimated that the strongest candidates are Joko Widodo and Prabowo Subianto, therefore here we will predict who can be the vice presidential candidate from Joko Widodo and Prabowo Subianto camp by using the SAW method, it is useful to know the weight of each criterion as the parameters of the vice presidential candidate.

Keywords-*decision support system; simple additive weighting; vice presidential candidates.*

I. INTRODUCTION

The concept of a computer-based decision support system is currently growing very rapidly. Many methods are used to assist in the decision making process. Decision making is carried out with a systematic approach to the problem through the process of collecting data into information and coupled with factors that need to be considered in decision making.

The political system is a principle and mechanism that forms an interconnected unity to regulate government and maintain power by regulating the relationship between individuals or groups with state relations [1]. Besides that

politics can also be interpreted as an effort taken by citizens to realize the common good.

Decision Support System is one part of an information system that is useful to improve the effectiveness of decision making [2]. Decision support systems can be used as a consideration in certain decisions or policies, a flexible model that allows individuals or groups to form ideas and limit problems by making their own assumptions and producing desired solutions. But there are still those who use decision support systems manually so that they are not effective and unable to anticipate assessment subjectivity [3].

The SAW method (Simple Additive Weighting) is one method that can be used in the completion of DSS because the basic concept of the SAW system is to find the weighted sum of the performance ratings in each alternative of all attributes [4]. In making a decision when choosing a suitable candidate to become a vice presidential candidate, this requires a level of accuracy or high accuracy. Because in the process of drawing conclusions when the election of a vice presidential candidate will bring the fate of many people. So that with this system the level of accuracy in the analysis process of each vice presidential candidate can be done carefully.

The SAW method was chosen because this method determines the weight value for each attribute, then proceed with the ranking process that will select the best alternative from a number of alternatives, in this case, the alternative in question is the registered vice presidential candidates [5]. With the ranking method, it is expected that the assessment will be more appropriate because it is based on the criteria and weight values that have been determined so that it will get more accurate results so that the weight of each criterion of the vice-presidential candidates will determine the final result or output of this system.

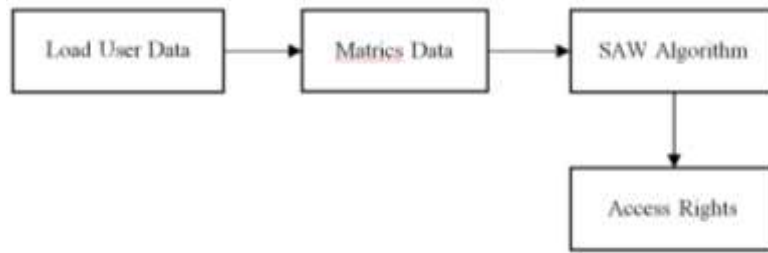


Figure 1. Flow of Prediction Process for Vice President Candidates.

II. LITERATURE REVIEW

The SAW method is widely used for selecting individuals from a group. Therefore, the selection of qualified individuals is a key success factor for solving a problem [6]. Some of them are applied to the selection of SMEs [7], the selection of candidates for division heads [8], the selection of outstanding teachers [9], the governor election [10], the selection of scholarship recipients [11], the singer selection process [12], or the project manager [13].

The SAW method can also be applied to determine the health level of urban forests [14]. The SAW method can automatically determine the weight coefficient and produce an objective evaluation [15]. The study was also carried out by exploring heavy adaptations with weights for each conflict rather than for each constraint or variable [16].

III. METHODOLOGY

In this study, we developed a vice presidential candidates selection by using Simple Additive Weighting. The first process carried out is data collection, data from what criteria are needed to be able to become a vice presidential candidate. The data search process is carried out by surveying several places to make it more valid. Then the data that has been obtained is processed into table matrix data. The matrix table which contains the value of the criteria each determines the value of benefits and costs which will be used to determine the value of the normalization table. This normalization value will be processed with the SAW algorithm.

The Simple Additive Weight (SAW) method is often also known as the weighted addition method. The basic concept of the SAW method is to find the weighted sum of performance ratings on each alternative on all attributes. Simple Additive Weight method requires the decision matrix normalization process (X) to a scale that can be compared with all available alternative ratings. The formula for normalization is as follows:

$$r_{ij} = \left\{ \begin{array}{l} \frac{x_{ij}}{\max x_{ij}} \\ \frac{\min x_{ij}}{x_{ij}} \end{array} \right. \quad (1)$$

where: r_{ij} = Normalized performance rating

$\max_{x_{ij}}$ = Maximum value of each row and column

$\min_{x_{ij}}$ = Minimum value of each row and column

x_{ij} = Rows and columns of the matrix

with r_{ij} is the normalized performance rating of the A_i alternative to the C_j attribute; $i = 1, 2, \dots, m$ and $j = 1, 2, \dots, n$.

Preference values for each alternative (V_i) are given as:

$$V_i = \sum_{j=1}^n w_j r_{ij} \quad (2)$$

where: V_i = The final value of the alternative

w_j = Weight

r_{ij} = Normalization of the matrix

A greater value of v_i indicates that the alternative A_i is more selected. To be able to solve this problem, the criteria for decision making are determined.

The criteria used are as follows:

C1 = High Nationalism

C2 = Religious person

C3 = High Capability

C4 = High Integrity

C5 = Good Interpersonal Ability

The process of searching data from the criteria needed to determine the vice presidential candidate is done by creating an online questionnaire form using Google docs media. The questionnaire form was distributed through WhatsApp applications so that it was expected that many parties could fill out the questionnaire and could also be known to the anime or public interest in determining the vice presidential candidate for the 2019-2024 period. From the questionnaires that have been conducted, there are 8 respondents who have filled out the questionnaire. The results of the questionnaire from each candidate for vice president namely Joko Widodo can be seen in Fig. 2 and Prabowo Subianto can be seen in Fig. 3.

TABLE I. THE WEIGHT OF EACH CRITERION

Criteria	Weight
C1	5
C2	4
C3	3
C4	3
C5	2

TABLE II. BENEFIT AND COST

Benefit Criteria	Cost Criteria
C1	C5
C2	
C3	
C4	

TABLE III. MATCH RATING

Suitability Rating of Joko Widodo's Vice President Candidate					
Vice President	Criteria				
	C1	C1	C3	C4	C5
Romahurmuzyi	8	4	3	6	4
Muhaimin Iskandar	4	8	3	7	5
Muhammad Zainul Majdi	8	5	8	3	5
Airlangga Hartarto	4	8	3	4	6
Mahfud MD	8	4	5	5	5

To begin the calculation of Joko Widodo's Vice Presidential Candidate with the SAW method, the first step that must be taken is to determine the criteria and weight of each. The suitability rating of each alternative in each criterion is assessed by 2 to 5 in Table III, namely:

- 5 = Have High Nationalism
- 4 = Religious person
- 3 = High Capability
- 3 = High Integrity
- 2 = Good Interpersonal Ability

TABLE IV. MATRIX TABLE

Matrix Table					
	1	2	3	4	5
1	8	4	3	6	4
2	4	8	3	7	5
3	8	5	8	3	5
4	4	8	3	4	6
5	8	4	5	5	5

TABLE V. NORMALIZATION MAXIMUM VALUE

Normalization Value					
		Max Value	Result		
R11	8	5	1,6	R21	4
R12	4	5	0,8	R22	8
R13	8	5	1,6	R23	5
R14	4	5	0,8	R24	8
R15	8	5	1,6	R25	4
		Max Value	Result		
R31	3	5	0,6	R41	6
R32	3	5	0,6	R42	7
R33	8	5	1,6	R43	3
R34	3	5	0,6	R44	4
R35	5	5	1	R45	5

TABLE VI. NORMALIZATION MINIMUM VALUE

Normalization Value			
		Min Value	Result
R51	4	2	2
R52	5	2	2,5
R53	5	2	2,5
R54	6	2	3
R55	5	2	2,5

The weight value is the value of each criterion. Determination of the value of weight depends on the conditions that have been determined to register as a vice presidential candidate. Of all the existing criteria, which criteria must be determined as part of the benefits, as well as the costs. Criteria 1 to criterion 4 is assumed to be a criterion of benefits, and criterion 5 is assumed as a criterion of costs.

Then the process of entering each value and criterion into a table is obtained so that the matrix table is found in Table IV. The process of finding a normalized matrix is done by normalizing the matrix X based on equation (1). Then the values of normalization of benefits become:

$$r_{1,1} = 8 / \max\{5;5;5;5\} = 8 / 5 = 1.6$$

$$r_{1,2} = 4 / \max\{5;5;5;5\} = 4 / 5 = 0.8$$

$$r_{1,3} = 8 / \max\{5;5;5;5\} = 8 / 5 = 1.6$$

$$r_{1,4} = 4 / \max\{5;5;5;5\} = 8 / 5 = 0.8$$

$$r_{1,5} = 8 / \max\{5;5;5;5\} = 4 / 5 = 1.6$$

The process of calculating normalization of values is applied to all criteria, whether the criteria of benefit (profit) or cost (cost). The difference is from the minimum value and maximum value. The divider value from the maximum value is 5 because the highest weight is 5. While the divider for the minimum value is 2. So, the normalized factor matrix is :

$$R_{ij} = \begin{bmatrix} 1,6 & 0,8 & 0,6 & 1,2 & 2 \\ 0,8 & 1,6 & 0,6 & 1,4 & 2,5 \\ 1,6 & 1 & 1,6 & 0,6 & 2,5 \\ 0,8 & 1,6 & 0,6 & 0,8 & 3 \\ 1,6 & 0,8 & 1 & 1 & 2,5 \end{bmatrix}$$

TABLE VII. MINIMUM AND MAXIMUM VALUE MATRIX

Normalization Factor of The Value that has been Obtained				
1,6	0,8	0,6	1,2	2
0,8	1,6	0,6	1,4	2,5
1,6	1	1,6	0,6	2,5
0,8	1,6	0,6	0,8	3
1,6	0,8	1	1	2,5

The value that has been obtained from the normalization process is entered into the table so that it can be easier for the next process. At this stage is the final stage where all normalization values are obtained by the weighting of each criterion.

TABLE VIII. FINAL SCORE

Final score	
V1	20,6
V2	21,4
V3	23,6
V4	20,6
V5	22,2

The output of the Simple Additive Weight method is an alternative decision ranking. For ranking values, equation (2) is used.

$$v1 = (1,6*5) + (0,8*4) + (0,6*3) + (1,2*3) + (2*2) = 20,6$$

$$v2 = (0,8*5) + (1,6*4) + (0,6*3) + (1,4*3) + (2,5*2) = 21,4$$

$$v3 = (1,6*5) + (1*4) + (1,6*3) + (0,6*3) + (2,5*2) = 23,6$$

$$v4 = (0,8*5) + (1,6*4) + (0,6*3) + (0,8*3) + (3*2) = 20,6$$

$$v5 = (1,6*5) + (0,8*4) + (1*3) + (1*3) + (2,5*2) = 22,2$$

So that the biggest value is V3, Muhammad Zainul Majdi gets the most polls to become Candidate for Vice President Joko Widodo.

Whereas to begin the calculation of candidate Prabowo Subianto with the SAW method, the first step that must be taken is to determine the criteria and each of weight.

The suitability rating of each alternative in each criterion is assessed by 2 to 5, namely:

- 5 = Have High Nationalism
- 4 = Religious person
- 3 = High Capability
- 3 = High Integrity

2 = Good Interpersonal Ability

Then, determine the suitability rating. The weight value is the value of each criterion. Determination of the value of weight depends on the conditions that have been determined to register as a vice presidential candidate. Of all the existing criteria, which criteria must be determined as part of the benefits, as well as the costs. Criteria 1 to criterion 4 is assumed to be a criterion of benefits, and criterion 5 is assumed as a criterion of costs.

TABLE IX. MATCH RATING

Suitability Rating of Prabowo Subianto's Vice President Candidate					
Vice President Candidate	Criteria				
	C1	C2	C3	C4	C5
Zulkifli hasan	8	5	6	4	5
Ahmad Heryawan	4	8	5	7	5
Salim Segaf Al Jufri	8	5	5	5	6
Agus Hari Murti Yudhoyono	4	8	3	4	6
Anies Rasyid Baswedan	4	7	6	6	5

TABLE X. MATRIX TABLE

Matrix Table					
	1	2	3	4	5
1	8	5	6	4	5
2	4	8	5	7	5
3	8	5	5	5	6
4	4	8	3	4	6
5	4	7	6	6	5

TABLE XI. NORMALIZATION MAXIMUM VALUE

Normalization Value							
	Max Value	Result		Max Value	Result		
R11	8	5	1,6	R21	5	5	1
R12	4	5	0,8	R22	8	5	1,6
R13	8	5	1,6	R23	5	5	1
R14	4	5	0,8	R24	8	5	1,6
R15	4	5	0,8	R25	7	5	1,4
	Max Value	Result		Max Value	Result		
R31	6	5	1,2	R41	4	5	0,8
R32	5	5	1	R42	7	5	1,4
R33	5	5	1	R43	5	5	1
R34	3	5	0,6	R44	4	5	0,8
R35	6	5	1,2	R45	6	5	1,2

TABLE XII. NORMALIZATION MINIMUM VALUE

Normalization Value			
		Min Value	Result
R51	5	2	2,5
R52	5	2	2,5
R53	2	2	3
R54	2	2	3
R55	1	2	2,5

TABLE XIII. MINIMUM AND MAXIMUM VALUE MATRIX

Normalization Factor of The Value that has been Obtained				
1,6	1	1,2	0,8	2,5
0,8	1,6	1	1,4	2,5
1,6	1	1	1	3
0,8	1,6	0,6	0,8	3
0,8	1,4	1,2	1,2	2,5

The value of normalization of benefits is:

$$r_{1,1} = 8 / \max\{5;5;5;5;5\} = 8 / 5 = 1.6$$

$$r_{1,2} = 4 / \max\{5;5;5;5;5\} = 4 / 5 = 0.8$$

$$r_{1,3} = 8 / \max\{5;5;5;5;5\} = 8 / 5 = 1.6$$

$$r_{1,4} = 4 / \max\{5;5;5;5;5\} = 4 / 5 = 0.8$$

$$r_{1,5} = 4 / \max\{5;5;5;5;5\} = 4 / 5 = 0.8$$

Normalized factor matrix:

$$r_{ij} = \begin{bmatrix} 1.6 & 1 & 1.2 & 0.8 & 2.5 \\ 0.8 & 1.6 & 1 & 1.4 & 2.5 \\ 1.6 & 1 & 1 & 1 & 3 \\ 0.8 & 1.6 & 0.6 & 0.8 & 3 \\ 0.8 & 1.4 & 1.2 & 1.2 & 2.5 \end{bmatrix}$$

TABLE XIV. FINAL SCORE

Final score	
V1	23
V2	22,6
V3	24
V4	20,6
V5	21,8

For ranking values, equation 2 is used, so the results are obtained.

$$v_1 = (1,6*5) + (1*4) + (1,2*3) + (0,8*3) + (2,5*2) = 23$$

$$v_2 = (0,8*5) + (1,6*4) + (1*3) + (1,4*3) + (2,5*2) = 22,6$$

$$v_3 = (1,6*5) + (1*4) + (1*3) + (1*3) + (3*2) = 24$$

$$v_4 = (0,8*5) + (1,6*4) + (0,6*3) + (0,8*3) + (3*2) = 20,6$$

$$v_5 = (0,8*5) + (1,4*4) + (1,2*3) + (1,2*3) + (2,5*2) = 21,8$$

So that the biggest value is V3, Salim Segaf Al Jufri gets the most polls to become Candidate for Vice President Prabowo Subianto.

TABLE XV. CALCULATION OF THE DETERMINATION OF JOKO WIDODO'S VICE PRESIDENTIAL CANDIDATE 2019-2024 PERIOD

Calculation of The Determination of Joko Widodo's Vice Presidential Candidate 2019-2024 Period						
Cost Benefit	Cost	Benefit	Benefit	Benefit	Benefit	Total
Importance	2	3	3	4	5	17
Alternative/Criteria	Interpersonal Skills	High Integrity	High Capability	A Religious Person	High Nationalism	
Romahurmuzyi	4	6	3	4	8	
Muhaimin Iskandar	5	7	3	8	4	
Muhammad Zainul Majdi	5	3	8	5	8	
Airlangga Hartarto	6	4	3	8	4	
Mahfud MD	5	5	5	4	8	
Divider	6	7	8	8	8	
Normalization	0.666666667	0.857142857	0.375	0.5	8	
	0.833333333	1	0.375	1	1	
	0.833333333	0.428571429	1	0.625	0.5	
	1	0.571428571	0.375	1	1	
	0.833333333	0.714285714	0.625	0.5	0.5	

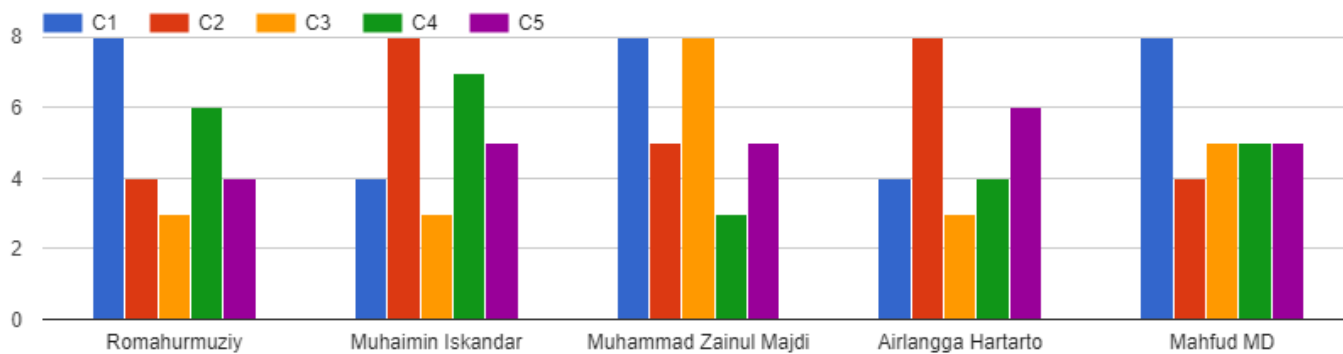


Figure 2. Joko Widodo Response Graph.

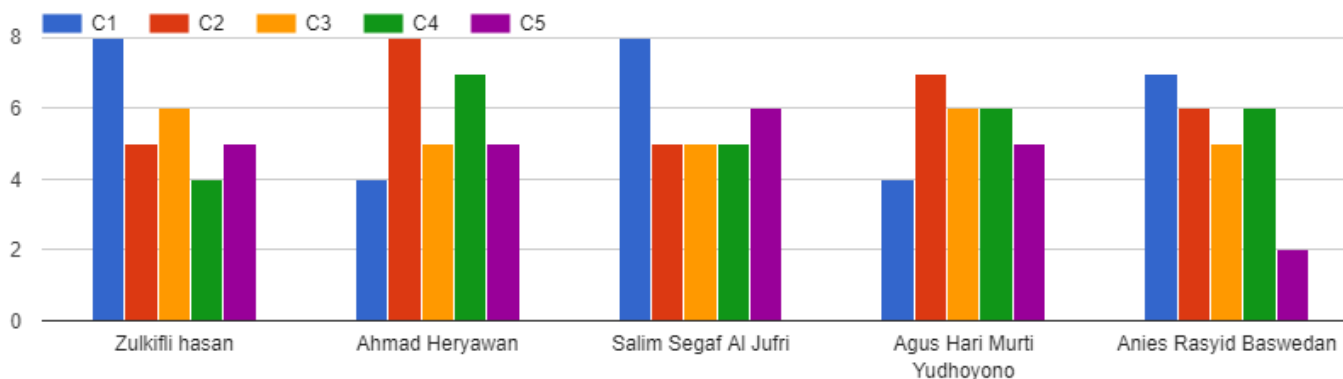


Figure 3. Prabowo Subianto Response Graph.

TABLE XVI. CALCULATION OF THE DETERMINATION OF PRABOWO SUBIANTO'S VICE PRESIDENTIAL CANDIDATE 2019-2024 PERIOD

Calculation of The Determination of Prabowo Subianto's Vice Presidential Candidate 2019-2024 Period						
Cost Benefit	Cost	Benefit	Benefit	Benefit	Benefit	Total
Importance	2	3	3	4	5	17
Alternative/Criteria	Interpersonal Skills	High Integrity	High Capability	A Religious Person	High Nationalism	
Zulkifli Hasan	5	4	6	5	8	
Ahmad Heryawan	5	7	5	8	4	
Salim Segaf Al Jufri	6	5	5	5	8	
Agus Hari Murti Yudhoyono	6	4	3	8	4	
Anies Rasyid Baswedan	5	6	6	7	4	
Divider	5	7	6	8	8	
Normalization	0.833333333	0.571428571	1	0.625	1	
	0.833333333	1	0.833333333	1	0.5	
	1	0.714285714	0.833333333	0.625	1	
	1	0.571428571	0.5	1	0.5	
	0.833333333	0.857142857	1	0.875	0.5	

IV. RESULT AND DISCUSSION

The results of this study are a decision support system using Microsoft Excel which can help simplify the process of predicting the selection of vice presidential candidates. Besides this decision support system uses the SAW method which is used to provide an alternative ranking of the results of the vice presidential election results from the process of calculating the value of several vice presidential candidate selection criteria, including high nationalism, religious personalities, high capability, high integrity, and interpersonal skills. The experiments using Microsoft Excel is used to test the criteria that are made. In this test, the correctness of the tested calculations is seen from the output given for the existing criteria. For testing accuracy, the results of the ranking of the decision support system with the SAW method are compared with the results of the ranking obtained from calculations using Microsoft Excel shown in Table XV and Table XVI.

V. CONCLUSION

Decision support system built with the Simple Additive Weight method is successfully implemented in the system to find out who the vice presidential candidate can accompany Joko Widodo and Prabowo Subianto. As well as to be able to know the anime or public enthusiasm towards the Presidential Election process for 2019-2024 Period. From the results of the tests conducted based on the results of a questionnaire with eight respondents. Vice presidential candidate Joko Widodo found that Muhammad Zainul Majdi with the highest percentage of 23.6%. While for vice-presidential candidate Prabowo Subianto namely Salim Segaf Al Jufri with a percentage of 24%. The test results are carried out by manual calculation, the level of accuracy of the system is 100%. Thus the system can produce the right decision.

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AUTHORS PROFILE

Aviv Yuniar Rahman received the S.T. degree from Institut Teknologi Sepuluh Nopember Surabaya in 2013 and the M.T. degree in 2017 from Institut Teknologi Sepuluh Nopember Surabaya with LPDP scholarship in 2015. He is a lecturer in the Department of Informatics Engineering, Universitas Widyagama, Malang.
Mamba'us Sa'adah received the S.ST. degree from Politeknik Elektronika Negeri Surabaya in 2015. She currently studying the Master's Degree program in Multimedia Intelligent Network at Institut Teknologi Sepuluh Nopember Surabaya.
Feddy Wanditya Setiawan received the S.T. degree from Universitas Widyagama in 2004 and the M.T. degree in 2011 from Universitas Brawijaya. He is a lecturer in automotive engineering study program and also as a director of Politeknik Hasnur, Banjarmasin.
Eko Supriyanto is the Director of IJN-UTM Cardiovascular Engineering Centre, Universiti Teknologi Malaysia. He obtained his Ph.D., in electronics engineering from the University of Federal Armed Forces Germany, Hamburg. He worked as an academic staff at this university and a product development manager in a private company in Duesseldorf, Germany, before moved to Malaysia. He is a visiting professor at Ilmenau University of Technology, Germany and guest professor at Department of Radiology, Universitas Padjajaran, Indonesia. His involvement in the computer application in medicine has been started since 1996 for the dialysis machine safety monitoring system. He has 15 patents in the area of biomedical and computer-based products. He also obtained more than 24 awards for his achievement from international institutions. He has more than 120 publications in international journals and proceeding and author of a few international books. He has been also active in WSEAS conferences since 2009 as an invited speaker, speaker for more than 36 papers and session chairman.