

RESEARCH ARTICLE

DECISION SUPPORT SYSTEM OF THE RECRUITMENT OF CONTRACT EMPLOYEE WITH SIMPLE MULTI ATTRIBUTE RATING TECHNIQUE METHOD

*¹Dalle, J., ²Fahleffi, R. and ³Hastuti, D.

^{1,2}Department of Information Technology, Universitas Lambung Mangkurat, Banjarmasin, Indonesia

³Department of Electrical Engineering, Universitas PGRI Adi Buana, Surabaya, Indonesia

ARTICLE INFO

Article History:

Received 07th May, 2020
Received in revised form
19th June, 2020
Accepted 14th July, 2020
Published online 30th August, 2020

Key words:

Decision Support System, SMART
Method, Contract Employee Selection
System.

ABSTRACT

The selection of contract employees was a routine by the Public Order Enforcers Office and Fire Department of Tanah Laut Regency. In reality, the contract employee Recruitment was not objective and did not satisfy the required standard. Thus, the main duty, such as shift duty, writing report, physical endurance, and discipline, were hindered that the work of the public order enforcers and fire department, became ineffective. This research aims to develop a decision support system of the contract employee Recruitment with the Simple Multi Attribute Rating Technique (SMART). This system was developed by following the waterfall development method. The collection of the data was conducted by noticing and observing the system as well as through experimenting with this decision support system. The result of this research shown that the SMART method could be applied as support toward the result of the selection of the contract employee in Public Order Enforcers and Fire Department. The classification process was conducted through the Smart method. The work of this method was by ranking the data of each candidate.

Citation: Dalle, J., Fahleffi, R. and Hastuti, D. 2020. "Decision support system of the recruitment of contract employee with simple multi attribute rating technique method", *Asian Journal of Science and Technology*, 11, (08), 11080-11084.

Copyright © 2020, Dalle et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

The enactment of the regional autonomy based on Undang-Undang Nomor 22 1999 provides direction for state governance changes. One of them is in terms of governance, where it is possible for the regional government to recruit the contract employee (Prasetya, 2017). Bahrin (2016) states that the selection of the contract employee is a process of selecting several people with a specific preference. Selecting the contract employee is common in the regional, even worldwide, as a potential instrument to shorten citizen unemployment and increase income (Sheikh, Naveed, & Iqbal, 2011). As is a contract, the work has a certain period of time and can be classified as a temporary employee (Sethi & Kataria, 2016). Schoukens & Barrio (2017) add that the contract employee also has a work standard as well as a certain amount of work time by agreement with the employer. The contract employee's selection is a common activity by the office of Public Order Enforcers and Fire Department of Tanah Laut Regency. In reality, the recruitment of the contract employee is not objective. It does not satisfy the predetermined standard, thus hinder the practice of the main duty such as shift duty, report writing, physical endurance and discipline that the work of the

office of public order enforcers and fire department become ineffective. In the future, in the selection of contract staff the office will provide a series of tests to determine the abilities and personalities of the participants. Data on the results of the test participants will later be used as material for decision making. Tests as a basis for decision making have been carried out in various institutions to select potential workers for several years (Carrigan, 2007). According to Harackiewicz & Hulleman (2010), The test also serves to determine how much interest the prospective worker has to contribute to an institution. Besides, the quality of prospective workers can be seen from the assembling of the test (Campion, Campion, & Campion, 2019). An assessment must be made using predetermined criteria (Ekwoaba, Ikeje, & Ufoma, 2015). There are six criteria to select an employee: physical, health, knowledge, personality, religion, and education. Apart from the test scores, other criteria needed in the contracting system are the experiences and results of the relevant psychological test. So from the results of the assessment, the office can decide on an evaluation material to receive the Contractor who registers at the Office of the Public Order Enforcers Unit and the Fire Department of Tanah Laut Regency. These six criteria become standard criteria in the recruitment of workers. Aslan (2017) states that adequate physical condition is the main support in doing work. Besides, health factors both physically and mentally affect the productivity endurance at work and the safety of other workers from the possibility of contracting

*Corresponding author: Dalle, J.,

Department of Information Technology, Universitas Lambung Mangkurat, Banjarmasin, Indonesia.

(Jonathan & Mbogo, 2016). For example, a worker has a higher likelihood of making a wrong decision when in an unhealthy state. Furthermore, persona or personality criteria are considered important because they determine effectiveness in work management, such as high or low turnover rates (Kaluginaa & Shvydun, 2014). Besides, Nuckcheddy (2018) proves that a friendly personality in the world of work is also proven to increase the motivation of other coworkers. Finally, work experience is no less important, given that experience is a more guaranteed assurance of one's talents (Iapina & Sceulovs, 2014). Therefore, following the problems explained above, it is important to design a system that can help the office make decisions about the selection of Contract Workers by implementing the Simple Multi-Attribute Rating Technique (Smart) method. This Simple Multi-Attribute Rating Technique (Smart) method was chosen because it can maximize the number of criteria involved in making decisions on contracting. Each decision-maker must choose an alternative under the objectives that have been formulated. Each alternative consists of a set of attributes, and each attribute has a prospective contractor candidate value. This value is averaged by the scale set by the agency. With more criteria used, the decision-making results obtained will be more accurate. Based on the problems above, this study aims to create a decision support system that aims to build a decision support system for the recruitment of Contract Personnel at the Public Order Enforcers Office and the Fire Department in Tanah Laut Regency using the Simple Multi-Attribute Rating Technique (SMART) method.

LITERATURE REVIEW

Definition of Decision Making Support System: The decision support system has become a general term for employers to assist in making strategic decisions (Dulcic, Pavlic, & Silic, 2012). Although initially only intended to help decision-making about structured problems, but as the development, DSS is also able to help policymakers to decide unstructured problems (Suduc, Bîzoi, Cioca, & Filip, 2010). Noteworthy then is the arrangement of algorithms for analytical prediction and the formulation of decision possibilities (Song, Liu, Wu, & Mao, 2018). According to Aboelmagd (2018), the possibilities formulation will be calculated on a priority scale as well as an alternative scale.

Purpose of the Decision Support System: Another DSS pioneer Peter G. W. Keen (Saliman, 2016), in collaboration with Scott Morton, defines three goals that DSS must achieve. These goals relate to three basic principles of the DSS concept - problem structure, decision support, and decision effectiveness. They believe that DSS must:

- Help managers make decisions to solve semi-structured problems.
- Supports the manager's judgment rather than trying to replace it.
- Improve the effectiveness of manager decision making rather than efficiency.

Khodashahri and Sarabi (2013) explain that DSS helps us to make sure the accuracy of the decision and the provision of various alternative decisions.

SMART: SMART (Simple Multi Attribute Rating Technique) is a multi-attribute decision-making method developed by Edward in 1977. This multi-attribute decision-making technique is used to support decision-makers in gathering information about all related data in the form of criteria (Siregar, Arisand, Usman, Irwan, & Rahim, 2017). Each decision-maker must choose an alternative under the objectives that have been formulated. Each alternative consists of a set of attributes, and each attribute has values (Risawandi & Rahim, 2016). This value is then averaged on a certain scale. Each attribute has a weight that illustrates how important it is compared to other attributes (Edwards, 1977). This weighting and ranking are used to assess each alternative to obtain the best alternative. Weighting on Simple Multi-Attribute Rating Technique (smart) uses a scale between 0 to 1, making it easier to calculate and compare values for each alternative. The model used in the Simple Multi-Attribute Rating Technique (smart):

$$u(a_i) = \sum_{j=1}^m w_j u_j(a_i)$$

Information:

- w_j = the weighting value of the j th and k criteria
 - $u(a_i)$ = value of the i th criteria utility for the i th criteria
- Decision making is identifying which of the n alternatives has the greatest functional value.

Nofriansyah, et al (2017) explained the technical steps of the SMART Method as follows:

- Step 1: determine the number of criteria
 - Step 2: the system by default gives a scale of 0-100 based on normalized priorities.
- Normalization = 1

Information:

- w_j : the weight of a criterion
- Step 3: provide criteria values for each alternative.
- Step 4: calculate the utility value for each criterion.

$$u_i(a_j) = 100 \frac{C_{max} - C_{out i}}{C_{max} - C_{min}} \%$$

Information:

- $u_i(a_j)$: value of the i th criteria utility for the i th criteria
- C_{max} : maximum criterion value
- C_{min} : minimum criterion value
- $C_{out i}$: i th criterion value

- Step 5: calculate the final value of each.

RESEARCH METHODOLOGY

In this research, the software development method used is the approach to the waterfall model. The waterfall is a method of software development where between one phase to another is done sequentially or linearly. So, if step one is not complete, it cannot continue steps 2, 3, and so on. In other words, a stage of waterfall is an input for the next stage.

The use of this development method in this research is because the requirements must be defined in depth before the next process and allow for changes as the project progresses. The software development method with the waterfall model approach has stages shown in Figure 1 below.

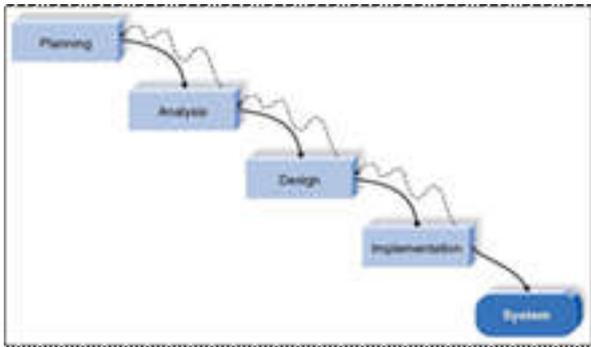


Figure 1 Waterfall

RESULT AND DISCUSSION

The database is analyzing the data needed in this research case study. The data needed for this study are Family Card Registration Number, Citizenship Number of the Head of Family, Full Name, Gender, Place and Date of Birth, Religion, Address, No. Phone, Email, and the final scores from the entire set of tests. Smart Method Manual Calculation steps.

- Determine the number of criteria
- The system by defaults to a scale of 0-100 based on the priorities that have been entered then normalize. The formula used for the simulation process is as shown below.
- Information:

$$\frac{w_j}{\sum w}$$

3. Provide criteria values for each alternative specified.
4. Calculate utility value of each criterion.

$$u_i(a_i) = 100 \frac{C_{max} - C_{out i}}{C_{max} - C_{min}} \%$$

Information:

ui(ai): utility value of 1th criterion for ith criterion
 Cmax: maximum value of criteria
 Cmin: minimum value of criteria
 Cout i: the value of the I criteria {16}

Calculate the final value of each.

For the example of the Manual Calculation of the Smart Method is as follows:

Criteria used: Here is the Criteria Table that goes along with Calculating Weight Normalization (Wj).

Table 1 Criteria Data

Criteria	Weight (wj)
Physical	85
Health	75
Knowledge	70
Personality	63
Religion	50
Education	40
TOTAL	383

Determining Normalization: Table 2 Determine the normalization of wj weights based on the normalization formula, the wj weight values for each criterion value will be divided by the total number of criteria weights.

Table 2. Determining Normalization

Criteria	Normalization
Physical	85/383=0,22
Health	75/383=0,19
Knowledge	70/383=0,18
Personality	63/383=0,16
Religion	50/383=0,13
Education	40/383=0,10

Parameter

Table 3. Parameter

Criteria	Parameter
Physical	Quantitative
Health	Quantitative
Knowledge	Quantitative
Personality	Quantitative
Religion	Quantitative
Education	Quantitative

Utility Value: Calculates the Utility Value of each criterion in the Smart Method manual calculation.

Table 4. Utility Value

	K1	K2	K3	K4	K5	K6
A1	0,4	0,42	1	0,33	0,5	0,0
A2	0,48	0,57	0,7	0,33	1	0,5

Final Calculation: Here will calculate the utility value of each criterion in the Smart Method manual calculation

$$\begin{aligned}
 A1 &= (0,22.0,4) + (0,19.0,42) + (0,18.1) + (0,16.0,33) + (0,13.0,5) + (0,10.0,0) \\
 &= 0,088 + 0,079 + 0,18 + 0,52 + 0,065 + 0 \\
 &= 0,932
 \end{aligned}$$

$$\begin{aligned}
 A2 &= (0,22.0,48) + (0,19.0,57) + (0,18.0,7) + (0,16.0,33) + (0,13.1) + (0,10.0,5) \\
 &= 0,105 + 0,108 + 0,126 + 0,052 + 0,13 + 0,05 \\
 &= 0,569
 \end{aligned}$$

If the data is implemented in the system, it will be seen as follows.

Open the Admin Login Page



Figure 2. Login Admin Page

Open Participant Data Page



Figure 3 Participant Data Page

Select Participant Value Data Page



Figure 4 Participant Value Data Page

Select Value Calculation Page



Figure 5 Value Calculation Page

Select Results Page

ID	NAMA PESERTA	TAHUN	NILAI KRITERIA FISIK	NILAI KRITERIA KESEHATAN	NILAI KRITERIA PENGETAHUAN	NILAI KRITERIA KEMAMPUAN	NILAI KRITERIA AKSI	NILAI KRITERIA PENSIKSIAN	SKOR
14	Yuli Gunawan	2019	75	75	80	80	70	75	69.50
15	Choir Saputra	2019	75	85	80	85	70	65	81.25
16	Muhammad Rizki	2019	72	85	60	62	70	45	66.35
17	Choir Erlambang	2019	65	68	50	65	55	60	61.25
18	Abdul Gani	2019	72	85	52	64	55	45	65.90
19	Choir Saputra	2019	75	85	80	85	70	65	81.25
20	Abdul Gani	2019	72	85	52	64	55	45	65.90
21	Choir Erlambang	2019	65	68	50	65	55	60	61.25
22	Abdul Gani	2019	72	85	52	64	55	45	65.90
23	Choir Saputra	2019	75	85	80	85	70	65	81.25
24	Yuli Gunawan	2019	75	75	80	80	70	75	69.50
25	Muhammad Rizki	2019	72	85	60	62	70	45	66.35
26	Choir Saputra	2019	75	85	80	85	70	65	81.25
27	Abdul Gani	2019	72	85	52	64	55	45	65.90
28	Choir Erlambang	2019	65	68	50	65	55	60	61.25
29	Abdul Gani	2019	72	85	52	64	55	45	65.90
30	Choir Saputra	2019	75	85	80	85	70	65	81.25
31	Abdul Gani	2019	72	85	52	64	55	45	65.90
32	Choir Erlambang	2019	65	68	50	65	55	60	61.25
33	Abdul Gani	2019	72	85	52	64	55	45	65.90
34	Choir Saputra	2019	75	85	80	85	70	65	81.25
35	Abdul Gani	2019	72	85	52	64	55	45	65.90
36	Choir Erlambang	2019	65	68	50	65	55	60	61.25
37	Abdul Gani	2019	72	85	52	64	55	45	65.90
38	Choir Saputra	2019	75	85	80	85	70	65	81.25
39	Abdul Gani	2019	72	85	52	64	55	45	65.90
40	Choir Erlambang	2019	65	68	50	65	55	60	61.25
41	Abdul Gani	2019	72	85	52	64	55	45	65.90
42	Choir Saputra	2019	75	85	80	85	70	65	81.25
43	Abdul Gani	2019	72	85	52	64	55	45	65.90
44	Choir Erlambang	2019	65	68	50	65	55	60	61.25
45	Abdul Gani	2019	72	85	52	64	55	45	65.90
46	Choir Saputra	2019	75	85	80	85	70	65	81.25
47	Abdul Gani	2019	72	85	52	64	55	45	65.90
48	Choir Erlambang	2019	65	68	50	65	55	60	61.25
49	Abdul Gani	2019	72	85	52	64	55	45	65.90
50	Choir Saputra	2019	75	85	80	85	70	65	81.25

Figure 6 Result Page

From the explanation above, the development of a decision support

system for recruitment of contract staff with the Simple Multi-Attribute Rating Technique (SMART) method has been successfully carried out. The system is capable of calculating values and ranking automatically. With the availability of the decision support system, contract employee selection will be carried out more objectively. An online and digital system will help the effectiveness and efficiency of a work (Dalle & Ariffin, 2018). As stated by Cabrerizo, Morente-Molinera, Pérez, López-Gijón, & Herrera-Viedma (2015), quantitative data are the source of the DSS accuracy, thus, it can reduce subjectivity. The result of this study also shows that the system developed has met the criteria of a decision support system. As stated by Alyoubi (2015) decision support system is an information system to help decision-makers take solutions from the consideration that the objectives can be achieved. In this study, the developed system is used to assess and rank prospective workers and has been proven capable of asking. Coherent with this, Chan, Song, Sarker, dan Plumlee (2017) also said that the Decision Support System (DSS) has features to measure existing problems, measure a person's motivation level, and measure the level of performance. As seen in the system implementation drawings, it can be said that the system developed already has the required features. So, it can be said that the system developed has been proven to be able to meet the main purpose of DSS, which is to help users to be able to make the most appropriate decisions in a short time (Dalle, Windaryah, & Ridho, 2018)

Conclusion and Recommendation: From the research that has been done by looking at and completing the system and through the testing stages of the decision support system, the conclusions can be drawn as follows:

- The Smart Method can be applied as a support decision in recruitment for contract employees at the Public Order Enforcers Office and Fire Department.
- The classification process is done using the Smart method. This method works by ranking each prospective Participant's data.

As for the suggestions of the authors for further research are:

- Similar systems can be developed with other methods to produce a greater and better level of conformity.
- This decision-making support system can also be developed to classify other studies.

All authors read and approved the paper.

REFERENCES

Aboelmagd, Y. M. 2018. Decision support system for selecting optimal construction bid price. *Alexandria Engineering Journal*, 57(4), 4189-4205. doi:https://doi.org/10.1016/j.aej.2018.11.007

Alyoubi, B. A. 2015. Decision support system and knowledge-based strategic management. *Procedia Computer Science*, 65, 278-284. doi:https://doi.org/10.1016/j.procs.2015.09.079

Aslan, I. 2017. Measuring job satisfaction, performance criteria and job life quality: bingol city banking case. *Journal of Business and Management*, 5(4), 167-187. doi:DOI: 10.25255/jbm.2017.5.4.167.187

Bahrin. 2016. The decision support system for the selection of contract staff recruitment is using the simple additive weighting (saw) method at the PP Satpol Pohuwato office. *Jurnal Ilmiah ILKOM*, 8(2), 82-88.

- Cabrerizo, F. J., Morente-Molinera, J. A., Pérez, I. J., López-Gijón, J., & Herrera-Viedma, E. 2015. A decision support system to develop a quality management in academic digital libraries. *Information Sciences*, 323, 48-58. doi:http://dx.doi.org/10.1016/j.ins.2015.06.022
- Campion, M. C., Campion, E. D., & Campion, M. A. 2019. Using practice employment tests to improve recruitment and personnel selection outcomes for organizations and job seekers. *Journal of Applied Psychology*, 104(9), 1089-1102. doi:https://doi.org/10.1037/apl0000401
- Carrigan, M. 2007. Pre-employment testing – prediction of employee success and legal issues: a revisit of griggs v. duke power. *Journal of Business & Economics Research*, 5(8), 35-44.
- Chan, S. H., Song, Q., Sarker, S., & Plumlee, R. D. (2017). Decision support system (DSS) use and decision performance: DSS motivation and its antecedents. *Information & Management*, 54(7), 934-947. doi:https://doi.org/10.1016/j.im.2017.01.006
- Dalle, J., & Ariffin, A. M. 2018. The Impact of Technologies in Teaching Interaction Design. *Journal of Advanced Research in Dynamical and Control System*, 04(special issue), 1779-1783.
- Dalle, J., Windarsyah, & Ridho, R. 2018. Decision support system for selecting banjar restaurant in Banjarmasin City using simple additive weighting method. *Journal of K6, Education and Management*, 1(4), 35-43.
- Dulcic, Z., Pavlic, D., & Silic, I. 2012. Evaluating the intended use of decision support system (dss) by applying technology acceptance model (tam) in business organizations in croatia. *Procedia- Social and Behavioral Sciences*, 58(12), 1565-1575. doi:https://doi.org/10.1016/j.sbspro.2012.09.1143
- Edwards, W. 1977. How to use multiattribute utility measurement for social decision making. *IEEE Transactions on Systems, Man, and Cybernetics*, 7(5), 326-340.
- Ekwoaba, J. O., Ikeje, U. ..., & Ufoma, N. 2015. The impact of recruitment and selection criteria on organizational performance. *Global Journal of Human Resource Management*, 3(2), 22-33.
- Harackiewicz, J. M., & Hulleman, C. S. 2010. The Importance of Interest: The Role of Achievement Goals and Task Values in Promoting the Development of Interest. *Social and Personality Psychology Compass*, 4(1), 42-52. doi:10.1111/j.1751-9004.2009.00207.x
- Jonathan, G. K., & Mbogo, R. W. 2016. Maintaining health and safety at workplace: employee and employer's role in ensuring a safe working environment. *Journal of Education and Practice*, 7(29), 1-7. doi:https://doi.org/10.7176/JEP
- Kaluginaa, E., & Shvydun, S. 2014. An effective personnel selection model. *Procedia Computer Science*, 31, 1102-1106. doi:doi: 10.1016/j.procs.2014.05.365
- Khodashahri, N. G., & Sarabi, M. M. 2013. Decision support system (DSS). *Singaporean Journal of Business Economics, and Management Studies*, 1(6), 95-102.
- lapina, I., & Sceulovs, D. (2014). Employability and skills anticipation: competences and market demands. *Procedia Social and Behavioral Sciences*, 156, 404-408. doi:doi: 10.1016/j.sbspro.2014.11.211
- Nofriansyah, D., Ganefri, Defit, S., Ridwan, Azanuddin, & Kuncoro, H. S. 2017. Application to determination of scholarship worthiness using simple multi attribute rating technique and merkle hellman method. *International Journal of Artificial Intelligence Research*, 1(2), 40-49. doi:DOI: https://doi.org/10.29099/ijair.v1i2.22
- Nuckcheddy, A. 2018. The Effect of Personality on Motivation and organisational behavior. *Psychology and Behavioral Science*, 9(2), 1-5. doi:DOI: 10.19080/ PBSIJ. 2018. 09.555760
- Prasetya, B. 2017. The effectiveness of the performance of regional contract labor in the forestry department in West Kutai District. *Journal administrative Reform*, 5(4), 190-199.
- Risawandi, & Rahim, R. 2016. Study of the simple multi-attribute rating technique for decision support. *IJSRT*, 2(6), 491-494.
- Saliman. 2016. Knowing decision support system (DSS). *Journal e-prints UNY*, 5-7.
- Schoukens, P., & Barrio, A. 2017. The changing concept of work: When does typical work become atypical. *European Labour Law Journal*, 8(4), 306-332. doi:https://doi.org/10.1177/2031952517743871
- Sethi, S., & Kataria, N. 2016. The realistic view of contract labour (regulation & abolition) act, 1970. *International Journal of Advance Research*, 4(12), 105-113. doi:DOI: 10.21474/IJAR01
- Sheikh, M. A., Naveed, F., & Iqbal, M. J. 2011. A study of contract employment as a suitable alternative to permanent employment. *Asian Journal of Scientific Research*, 1(3), 102-111.
- Siregar, D., Arisand, D., Usman, A., Irwan, D., & Rahim, R. 2017. Research of simple multi-attribute rating technique for decision support. *Journal of Physics: Conference Series*, 930, 1-6. doi:doi :10.1088/1742-6596/930/1/012015
- Song, X., Liu, J., Wu, J., & Mao, Y. 2018. Study on health management decision support system. *Journal of Interdisciplinary Mathematics*, 21(6), 1463-1470. doi:DOI: 10.1080/09720502.2018.1512202
- Suduc, A.-M., Bizoi, M., Cioca, M., & Filip, F. G. 2010. Evolution of Decision Support Systems Research Field in Numbers. *Informatica Economica*, 14(4), 78-86.
