International Journal of Engineering Applied Sciences and Technology, 2020
Vol. 5, Issue 6, ISSN No. 2455-2143, Pages 64-71
Published Online October 2020 in IJEAST (http://www.ijeast.com)

THE APPLICATION OF ANALYTIC HIERARCHY PROCESS TO SUPPORT BUSINESS SELECTION FOR LAZ SIDOGIRI

Achmad Fitro
Computer Technology
NSC Polytechnic, Surabaya, East Java, Indonesia

Heru Prasetyo
Computer Technology
NSC Polytechnic, Surabaya, East Java, Indonesia

***Abstract*— In essence, zakat must be distributed among eight predetermined groups, namely: indigent, poor, amil, ghorim, slave, ibn sabil, fisabilillah and converts. LAZ sidogiri is an Amil Zakat Institution located in Sidogiri Village which has the hope of changing zakat recipients (mustahik) into zakat givers (Muzakki) by providing community assistance in the form of capital for entrepreneurship. The provision of assistance by LAZ Sidogiri has been carried out for several periods. However, the assistance that has been carried out is still far from expectations because many recipients are still blind to knowledge of the types of businesses. The wealth of knowledge about types of business is considered to be the main factor, by having this knowledge the recipient can anticipate mistakes in determining the type of business such as the inaccuracy of the business towards the location, intense competition with the same business actors and unfair price competition. The Analytic hierrarchy process method is a very popular method of making decisions by giving priority values to each variable. That way, the decision support system using the AHP method can help recipients of assistance to meet the expectations given by LAZ Sidogiri**

Keywords— **Decision support, Analytic Hierarchy Process, Zakat, Enterpreuner, UMKM**

I. INTRODUCTION

In essence, zakat is distributed or distributed to 8 (eight) predetermined groups, namely: needy, poor, amil, ghorim, slave, ibn sabil, fisabilillah and converts [1]. Zakat is one of the pillars of Islam and must be carried out by some individuals who have a lot of assets (according to the nisab) as a process of cleaning and purifying for them [2], often zakat is given to mustahik to fulfill all consumptive life needs such as: daily shopping, loans and education [3]. However, the giving of zakat which is consumptive in nature cannot fully guarantee the welfare of the mustahik so that zakat is prioritized on a productive nature such as the provision of capital and employment [4]. that way the management of zakat must really be managed properly in accordance with Islamic law so as not to be misdirected like LAZ Sidogiri.

LAZ Sidogiri is an Amil Zakat Institution that has distributed productive zakat in the form of training, business capital [5] and has hopes of changing Mustahik (recipient) to Muzakki (giver) [6]. The hope of zakat distribution that has been carried out by LAZ Sidogiri is still far from ideal. Many zakat recipients who have been selected are still confused in determining what line of business to run, so that many Mustahik run an inaccurate business sector which can cause the business to stop such as: selection of business by location, intense competition in the same field, range of promotion and product manufacture. LAZ Sidogiri hopes to be able to assist in making decisions regarding business sector selection by taking into account several criteria.

The multi-criteria decision-making method is very fast developing among researchers in supporting policies in a company such as the AHP method to create an idea related to corporate social responsibility (CSR) related to quality, strategy, sustainability and image of an airline company [7], TOPSIS selection of building materials [8], FAHP to determine mineral water development points [9] and AHP Fuzzy and VIKOR in development in the investment sector [10]. That way, the use of the multi-criteria method can solve the problems faced by LAZ Sidogiri, one of which is the AHP method.

II. PROPOSED ALGORITHM

A. Analytic Hierarrchy Process (AHP

AHP has a strong potential in structuring decision problems in the form of a hierarchical structure. In general, the form of a hierarchical structure takes the form of a tree where the roots represent the overall goal and the nodes descending from the goals represent the criteria. The complexity of the decision problem controls the number of levels of the main criterion and alternative criteria, the last level of the structure is stored for the selection set [11]. AHP uses pairwise comparisons at each node of the structure and allows consistency for cross-checking between different paired comparisons using a ratio scale [12]. Pairwise comparisons are a mainstay in reducing the impact of subjective viewpoints associated with direct weighting [13]. The AHP method makes it possible to evaluate the quantitative and qualitative criteria

International Journal of Engineering Applied Sciences and Technology, 2020
Vol. 5, Issue 6, ISSN No. 2455-2143, Pages 64-71
Published Online October 2020 in IJEAST (http://www.ijeast.com)

of alternatives on the same preference scale at each level where verbal comparisons must be converted into numerical values [14]. Derivation of priority in the ahp method requires calculating the maximum Eigenvalues, Consistency Index (CI), Consistency ratio, and normal values for each criterion / alternative and obtaining satisfactory results, otherwise the procedure will be repeated until these values are well within the desired range. Therefore, researchers can conclude the AHP method has the following steps:

1. Determination of Criteria and Alternative Elements

In applying the AHP method, we must first define the hierarchical structure obtained from the criteria and alternative elements as shown in Fig 1:

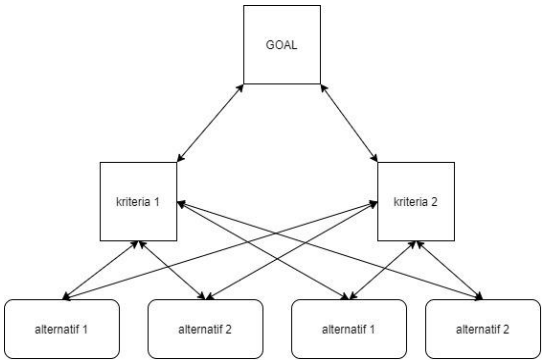

Fig 1. Hierarchical structure

2. Create pairwise matrix

After each element forms a hierarchical structure, the next step is to build a paired matrix against each criterion as many as the number of criteria that have been determined. The paired matrix can be explained in Table 1

Table - 1 Paired Matrix

	Criteria 1	**Criteria 2**	**…….**	**Criteria n**
Criteria 1				
Criteria 2				
…..				
Criteria n				

3. Weighted Elements

Each level of the hierarchy must be assigned a value / weight according to the provisions in Table 2:

Table - 2 Wieghting Scale [15]

1	Just as important
2	The same is a little more important
3	A little bit more important
4	A little more until it is clearly more important
5	Obviously more important
6	Clear to very clear is more important
7	Very clearly more important
8	So clear that it is absolutely more important
9	Absolutes are more important

4. Calcating Consistency Priority Value

The consistency priority value will be replaced by an X symbol in the paired matrix in Table 1 with the provision of contributions based on the weighted value of the elements in Table 2 which will be explained in Table 3.

Table – 3 Calculation of consistency priority value

	Criteria 1	**Criteria 2**	**. .**	**Criteria n**
Criteria 1	1	X_2		X_n
Criteria 2	$1/X_1$	1		
:			1	
Criteria n	$1/X_n$			1
Jumlah	$\sum Criteria_1$	$\sum Criteria_2$	$\sum Criteria_3$	$\sum Criteria_n$

After obtaining the number per column, the contents of the matrix are changed into the Criteria Value matrix by dividing from the results of the sum of each Criteria in Table 3

5. Calculating the Eigen Vector

After getting the total value per line, we can calculate the Eigen Vector as shown in Table 4.

Table – 4 Eigen vector calculation

	Total	**Priority**	**Solution (Total + Priority)**
Criteria$_1$	$\sum Criteria_1$	$\sum Criteria_1/n$	$\sum Criteria_1+\sum Criteria_1/n$
Criteria$_2$	$\sum Criteria_2$	$\sum Criteria_2/n$	$\sum Criteria_2+\sum Criteria_2/n$
:	:	:	:
Criteria$_n$	$\sum Criteria_n$	$\sum Criteria_n/n$	$\sum Criteria_n+\sum Criteria_n/n$
		Total	$\sum$Solusi

Information :

Eigen Maksimum (λmak) = $\sum$Solusi / n (1)

Consistency Indexs (CI) = (λmak – n) / (n-1) (2)

Where n is the sum of the Criteria matrix

6. Random Index (RI)

Random Index (RI) is a constant value used for Consistency Random calculations, the following values will be described in Table 5.

Table – 5 Random Index (RI)

n	RI
1	0,0

International Journal of Engineering Applied Sciences and Technology, 2020
Vol. 5, Issue 6, ISSN No. 2455-2143, Pages 64-71
Published Online October 2020 in IJEAST (http://www.ijeast.com)

2	0,0
3	0,58
4	0,9
5	1,12
6	1,24
7	1,32
8	1,41
9	1,45
10	1,49
11	1,51
12	1,48
13	1,56
14	1,57
15	1,59

7. Ratio Consistency

Consistency Ratio (CR) is the consistency of opinion on decisions taken. The formula for getting CR is in equation 3.

$$CR = CI/RI \quad (3)$$

If the CR result is less than 10%, then the decision can be tolerated or accepted.

III. Experiment and Result

The system created will be divided into two parts (source code), namely the web-based admin role and the android mobile application (apk) based user. The implementation of the AHP method in this system has been determined in a hierarchical structure which will be described in Fig 2 according to the problems faced with basic aspects of business planning [16-17].

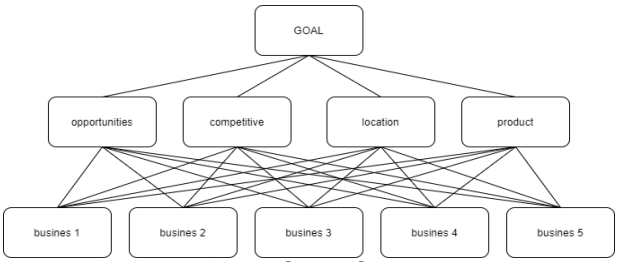

Fig 2. System hierarchy structure

A. Role administrator

The admin on this system will get a login page before entering the system as shown in Fig 3 below.

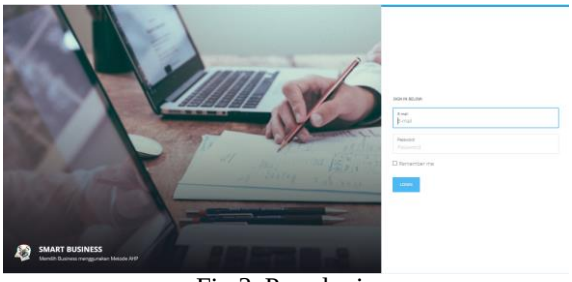

Fig 3. Page login

After successfully entering the system, the admin will get menus in managing the system such as the ahp module, entrepreneurial module, settings, and tools which will be explained in Fig 4.

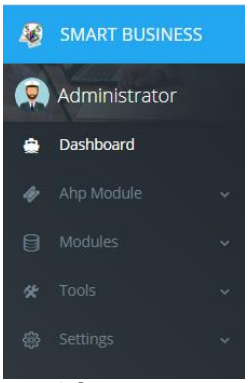

Fig 4. Administrator menu

On the Ahp module menu, the administrator must fill in a weighting scale, random index (RI), Criteria and perform pairwise comparison calculations so that it will produce a value matrix for each Criteria as explained in Fig 5 which will affect the results of user analysis.

in this application, the administrator is tasked with calculating the matrix between one alternative and another. The administrator is trusted to fill in because the administrator is a representative part of the site surveyor. The following is the pairwise comparison calculation for the alternatives which will be explained in the table 6-13.

International Journal of Engineering Applied Sciences and Technology, 2020
Vol. 5, Issue 6, ISSN No. 2455-2143, Pages 64-71
Published Online October 2020 in IJEAST (http://www.ijeast.com)

Table – 6 Matrix pairwise opportunities

Criteria	Usaha Risoles / Sosis Solo	Jamu Kunyit Asam	Ekspedisi lionparcel	Ekspedisi Wahana	Pakaian Anak
Usaha Risoles / Sosis Solo	1	0.5	5	4	0.5
Jamu Kunyit Asam	2	1	6	5	1
Ekspedisi lionparcel	0.2	0.16667	1	0.5	0.16667
Ekspedisi Wahana	0.25	0.2	2	1	0.2
Pakaian Anak	2	1	6	5	1
SUM	5.45	2.86667	20	15.5	2.86667

Table – 7 Eigen vector calculation opportunities

Kriteria	Usaha Risoles / Sosis Solo	Jamu Kunyit Asam	Ekspedisi lionparcel	Ekspedisi Wahana	Pakaian Anak	Jumlah	Priority Vector
Usaha Risoles / Sosis Solo	0.18349	0.17442	0.25	0.25806	0.17442	1.04039	0.20808
Jamu Kunyit Asam	0.36697	0.34884	0.3	0.32258	0.34884	1.68723	0.33745
Ekspedisi lionparcel	0.0367	0.05814	0.05	0.03226	0.05814	0.23523	0.04705
Ekspedisi Wahana	0.04587	0.06977	0.1	0.06452	0.06977	0.34992	0.06998
Pakaian Anak	0.36697	0.34884	0.3	0.32258	0.34884	1.68723	0.33745
Principe Eigen Vector (λ maks)							5.09441
Consistency Index							0.0236
Consistency Ratio							2.11%

Table – 8 Matrix pairwise competitive

Criteria	Usaha Risoles / Sosis Solo	Jamu Kunyit Asam	Ekspedisi lionparcel	Ekspedisi Wahana	Pakaian Anak
Usaha Risoles / Sosis Solo	1	0.5	3	5	5
Jamu Kunyit Asam	2	1	4	6	6
Ekspedisi lionparcel	0.33333	0.25	1	3	3
Ekspedisi Wahana	0.2	0.16667	0.33333	1	1
Pakaian Anak	0.2	0.16667	0.33333	1	1
Jumlah	3.73333	2.08333	8.66667	16	16

Table – 9 Eigen vector calculation competitve

Criteria	Usaha Risoles / Sosis Solo	Jamu Kunyit Asam	Ekspedisi lionparcel	Ekspedisi Wahana	Pakaian Anak	Jumlah	Priority Vector
Usaha Risoles / Sosis Solo	0.26786	0.24	0.34615	0.3125	0.3125	1.47901	0.2958
Jamu Kunyit Asam	0.53571	0.48	0.46154	0.375	0.375	2.22725	0.44545
Ekspedisi lionparcel	0.08929	0.12	0.11538	0.1875	0.1875	0.69967	0.13993
Ekspedisi Wahana	0.05357	0.08	0.03846	0.0625	0.0625	0.29703	0.05941
Pakaian Anak	0.05357	0.08	0.03846	0.0625	0.0625	0.29703	0.05941
Principe Eigen Vector (λ maks)							5.14612
Consistency Index							0.03653
Consistency Ratio							3.26%

International Journal of Engineering Applied Sciences and Technology, 2020
Vol. 5, Issue 6, ISSN No. 2455-2143, Pages 64-71
Published Online October 2020 in IJEAST (http://www.ijeast.com)

Table – 10 Matrix pairwise location

Criteria	Usaha Risoles / Sosis Solo	Jamu Kunyit Asam	Ekspedisi lionparcel	Ekspedisi Wahana	Pakaian Anak
Usaha Risoles / Sosis Solo	1	1	3	3	1
Jamu Kunyit Asam	1	1	3	3	1
Ekspedisi lionparcel	0.33333	0.33333	1	1	0.33333
Ekspedisi Wahana	0.33333	0.33333	1	1	0.33333
Pakaian Anak	1	1	3	3	1
SUM	3.66667	3.66667	11	11	3.66667

Table – 11 Eigen vector calculation location

Criteria	Usaha Risoles / Sosis Solo	Jamu Kunyit Asam	Ekspedisi lionparcel	Ekspedisi Wahana	Pakaian Anak	Jumlah	Priority Vector
Usaha Risoles / Sosis Solo	0.27273	0.27273	0.27273	0.27273	0.27273	1.36364	0.27273
Jamu Kunyit Asam	0.27273	0.27273	0.27273	0.27273	0.27273	1.36364	0.27273
Ekspedisi lionparcel	0.09091	0.09091	0.09091	0.09091	0.09091	0.45455	0.09091
Ekspedisi Wahana	0.09091	0.09091	0.09091	0.09091	0.09091	0.45455	0.09091
Pakaian Anak	0.27273	0.27273	0.27273	0.27273	0.27273	1.36364	0.27273
Principe Eigen Vector (λ maks)							5
Consistency Index							0
Consistency Ratio							0%

Table – 12 Matrix pairwise product

Criteria	Usaha Risoles / Sosis Solo	Jamu Kunyit Asam	Ekspedisi lionparcel	Ekspedisi Wahana	Pakaian Anak
Usaha Risoles / Sosis Solo	1	3	0.5	0.33333	1
Jamu Kunyit Asam	0.33333	1	0.25	0.2	0.33333
Ekspedisi lionparcel	2	4	1	0.5	2
Ekspedisi Wahana	3	5	2	1	3
Pakaian Anak	1	3	0.5	0.33333	1
SUM	7.33333	16	4.25	2.36667	7.33333

Table – 13 Eigen vector calculation product

Criteria	Usaha Risoles / Sosis Solo	Jamu Kunyit Asam	Ekspedisi lionparcel	Ekspedisi Wahana	Pakaian Anak	Jumlah	Priority Vector
Usaha Risoles / Sosis Solo	0.13636	0.1875	0.11765	0.14085	0.13636	0.71872	0.14374
Jamu Kunyit Asam	0.04545	0.0625	0.05882	0.08451	0.04545	0.29674	0.05935
Ekspedisi lionparcel	0.27273	0.25	0.23529	0.21127	0.27273	1.24202	0.2484
Ekspedisi Wahana	0.40909	0.3125	0.47059	0.42254	0.40909	2.02381	0.40476
Pakaian Anak	0.13636	0.1875	0.11765	0.14085	0.13636	0.71872	0.14374
Principe Eigen Vector (λ maks)							5.07146
Consistency Index							0.01786
Consistency Ratio							1.60%

International Journal of Engineering Applied Sciences and Technology, 2020
Vol. 5, Issue 6, ISSN No. 2455-2143, Pages 64-71
Published Online October 2020 in IJEAST (http://www.ijeast.com)

B. Role user

The role user in this system is expected to be able to help mustahik who will run entrepreneurship. Before using the application, the user must first download the Playstore available on an Android phone, the name of the application on the Playstore will be shown in Fig. 5.

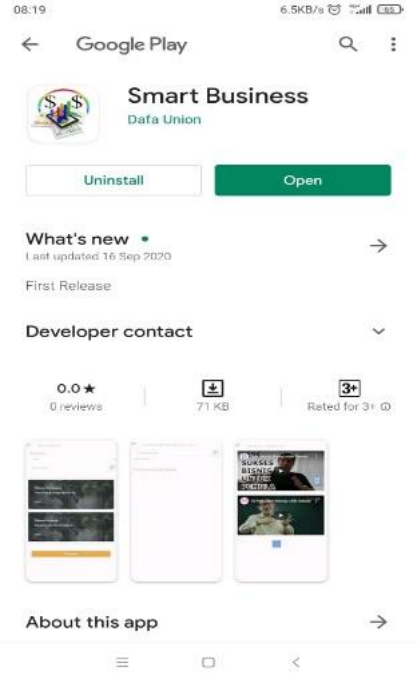

Fig 5. Smart business on the playstore

After downloading the application, the user will gain knowledge of the types of business fields, business news, video tutorials, marketplaces that sell business needs and business analysis if you are still confused about choosing a decision. Analysis using AHP for weight filling will be described in Table 14. However, before weighting the user will be asked to enter the nominal capital as a sorting business.

Table – 14 Weighting scale

Choice				Nilai
Product	√	Location		3
Product		Competitive	√	3
Product		Opportunites	√	2
Location		Competititve	√	5
Location		Opportunites	√	4
Competitive	√	Opportunites		2

After filling in the comparison scale, the user will get the results of the pairwise comparison matrix such as Table 15 and the Criteria Value Matrix which will be explained in Table 16.

Table – 15 Matrix pairwise criteria

Kriteria	Product	Location	Competitive	Opportunities
Product	1	3	0.33333	0.5
Location	0.33333	1	0.2	0.25
Competitive	3	5	1	2
Opportunities	2	4	0.5	1
Jumlah	6.33333	13	2.03333	3.75

Table – 16 Eigen vector criteria

Kriteria	Product	Location	Competitive	Opportunities	SUM	Priority Vector
Product	0.15789	0.23077	0.16393	0.13333	0.68593	0.17148
Location	0.05263	0.07692	0.09836	0.06667	0.29458	0.07365
Competitive	0.47368	0.38462	0.4918	0.53333	1.88344	0.47086
Opportunities	0.31579	0.30769	0.2459	0.26667	1.13605	0.28401
Principe Eigen Vector (λ maks)						4.06591
Consistency Index						0.02197
Consistency Ratio						2.44%

After getting a Consistency Ratio below 10%, namely 2.44%, the user results can continue to get the calculation results as shown in Table 17.

Table – 17 Eigen vector criteria and alternative

Overall Composite Height	Priority Vector (rata-rata)	Usaha Risoles / Sosis Solo	Jamu Kunyit Asam	Ekspedisi lionparcel	Ekspedisi Wahana	Pakaian Anak
Product	0.17148	0.14374	0.05935	0.2484	0.40476	0.14374
Location	0.07365	0.27273	0.27273	0.09091	0.09091	0.27273
Competitive	0.47086	0.32865	0.4308	0.13516	0.0527	0.0527
Opportunities	0.28401	0.20808	0.33745	0.04705	0.06998	0.33745
Total		0.25858	0.32895	0.12629	0.1208	0.16539

After calculating the eighen vector, the user will be able to see what type of business is most recommended by the system such as Table 18 with the tamarind herbal medicine business which has the first rank and the least recommended wahana expedition.

Table – 18 Ranking business recomended

Rank	Alternatif	Nilai
1	Jamu Kunyit Asam	0.328945
2	Usaha Risoles / Sosis Solo	0.258578
3	Pakaian Anak	0.165388
4	Ekspedisi lionparcel	0.126294
5	Ekspedisi Wahana	0.120795

IV. CONCLUSION

From the results of the discussion, the authors can conclude several points, including: Mustahik will have a wealth of knowledge on the types of fields in entrepreneurship, Get tips and tricks in entrepreneurship, develop business innovation and can support a decision in determining the field of business using the method AHP on application.

V. REFERENCE

[1] Firdaningsih., Wahyudi, M.S., & Hakim, R. (2019). Delapan Golongan Penerima Zakat Analisis Teks dan Konteks. Jurnal Ekonomi Syariah, 7(2), 316-342. https://doi.org/10.21043/equilibrium.v7i2.5843

[2] Hasanah, U. (2020). Optimalisasi Pengelolaan Zakat Produktif Sebagai Realisasi Revolusi Mental. Ijtimaiyya: Jurnal Pengembangan Masyarakat Islam, 13(1), 75-88.

[3] Abubakar, A.Y. (2014). Senif Penerima Zakat: Sebuah Upaya Untuk Reinterpretasi. Media Syariah, 16(1)

[4] Riyaldi, M.H. (2017). Kedudukan dan Prinsip Pembagian Zakat dalam Mengatasi Permasalah Kemiskinan (Analisis Pandangan Yusuf Qardhawi). Jurnal Perspektif Ekonomi Darussalam, 3(1).

[5] Hakim, A. (2015). Pengelolaan Zakat Pertanian Di Lazis Nu Kabupaten Kendal. Wahana Akademika, 2 (2)

[6] Ridwan, M., Andalsari, M., Setiani, R.I., & Merliana, R. (2020). Pengelolaan Zakat Produktif Melalui Program Senyum Mandiri Dalam Pemberdayaan Ekonomi Mustahiq Di Rumah Zakat Cabang Cirebon. Jurnal Perbankan Syariah, Jurnal EcoBankers, 1(2),44 – 52.

[7] Karaman, A.S., & Akman, E. (2017). Taking-off corporate social responsibility programs: An AHP application in airline industry. , Journal of Air Transport Management, 68, 187-197. http://dx.doi.org/10.1016/j.jairtraman.2017.06.012

[8] Singh, A.K., Avikal, S., Kumar, N.K.C., Kumar, M., & Thakura, P. (2020). A fuzzy-AHP and M- TOPSIS based approach for selection of composite materials used in structural applications. Materials Today: Proceedings, 26(2), 3119-3123. https://doi.org/10.1016/j.matpr.2020.02.644

[9] Khasesi-Siuki, A., Keshavarz, A., & Sharifan, H. (2020). Comparison of AHP and FAHP methods in determining suitable areas for drinking water harvesting in Birjand aquifer. Iran. Groundwater for Sustainable Development, 10 (100328). https://doi.org/10.1016/j.gsd.2019.100328

[10] Ozdemir, S., & Sahin, G. (2018). Multi-criteria decision-making in the Location Selection for a Solar PV Power Plant using AHP. Measurement, 129, 218-226. https://doi.org/10.1016/j.measurement.2018.07.020

[11] Del Vasto-Terrientes, L., Valls, A., Slowinski, R., & Zielniewicz, P. (2015). ELECTRE-III-H: An outranking-based decision aiding method for hierarchically structured criteria. Expert Systems with Applications, 42(11), 4910-4926.

[12] Kainulainen, T., Leskinen, P., Korhonen, P., Haara, A., & Hujala, T. (2009). A statistical approach to assessing interval scale preferences in discrete choice problems. Journal of the Operational Research Society, 60(2), 252-258

[13] Dede, G., Kamalakis, T., & Sphicopoulos, T. (2016). Theoretical estimation of the probability of weight rank reversal in pairwise comparisons. European Journal of Operational Research, 252(2), 587-600.

[14] Ishizaka, A., & Labib, A. (2011). Review of the main developments in the analytic hierarchy process. Expert Systems with Applications, 38(11), 14336-14345.

[15] Saaty, T.L., & Kirti, P. (2008). Group Decision Making: Drawing out and Reconciling Differences. RWS Publications: Pittsburgh Pennsylvania

[16] Tamjis, A.K., & Fitro, A. 2018. Design of Web-Based Legislative Candidate Application. Journal of Information Systems and Applied Computer Science. 1 (1). 1-6

[17] Supriyanto. (2009). BUSINESS PLAN SEBAGAI LANGKAH AWAL MEMULAI USAHA. Jurnal Ekonomi & Pendidikan, 6(1)