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

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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 hierarchy 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, Entrepreneur, 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.

II. PROPOSED ALGORITHM

A. Analytic Hierarrrch 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.
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:

![Hierarchical structure diagram](image)

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:

| Criteria 1 | Criteria 2 | ...... | Criteria n |
|------------|------------|-------|------------|
| Criteria 1 |            |       |            |
| Criteria 2 |            |       |            |
| ......      |            |       |            |
| Criteria n |            |       |            |

Table 1 Paired Matrix

3. Weighted Elements

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

| Weighting 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 |

4. Calculating 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:

| Criteria 1 | Criteria 2 | ...... | Criteria n |
|------------|------------|-------|------------|
| Criteria 1 |            |       |            |
| Criteria 2 |            |       |            |
| ......      |            |       |            |
| Criteria n |            |       |            |

Table – 3 Calculation of consistency priority value

5. Calculating the Eigen Vector

After getting 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

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:

| n | RI |
|---|----|
| 1 | 0.0 |

Table – 5 Random Index (RI)
7. Ratio Consistency

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

\[ CR = \frac{CI}{RI} \]  

(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].

|   |   |
|---|---|
| 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 |

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.

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.

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.
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         |

Principle Eigen Vector ($\lambda$ 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                | 5            |
| Ekspedisi lionparcel      | 0.33333                    | 0.25              | 1                     | 3                | 3            |
| Ekspedisi Wahana          | 0.2                        | 0.16667           | 0.33333               | 1                | 3            |
| Pakaian Anak              | 0.2                        | 0.16667           | 0.33333               | 1                | 1            |
| Jumlah                    | 3.73333                    | 2.08333           | 8.66667               | 16               | 16           |

Table – 9 Eigen vector calculation competitive

| Kriteria                  | 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           | 1.47901      | 0.2958 |
| Jamu Kunyit Asam          | 0.53571                    | 0.48              | 0.46154               | 0.375            | 2.22725      | 0.44545|
| Ekspedisi lionparcel      | 0.08929                    | 0.12              | 0.11538               | 0.1875           | 0.69967      | 0.13993|
| Ekspedisi Wahana          | 0.05357                    | 0.08              | 0.03846               | 0.0625           | 0.29703      | 0.05941|
| Pakaian Anak              | 0.05357                    | 0.08              | 0.03846               | 0.0625           | 0.29703      | 0.05941|

Principle Eigen Vector ($\lambda$ maks): 5.14612
Consistency Index: 0.03653
Consistency Ratio: 3.26%
### 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 lion parcel | 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 lion parcel | Ekspedisi Wahana | Pakaian Anak | Jumlah | Priority Vector |
|---------------|----------------------------|------------------|----------------------|------------------|--------------|--------|-----------------|
| Usaha Risoles / Sosis Solo | 0.27273 | 0.27273 | 0.27273 | 0.27273 | 1.36364 | 0.27273 |
| Jamu Kunyit Asam | 0.27273 | 0.27273 | 0.27273 | 0.27273 | 1.36364 | 0.27273 |
| Ekspedisi lion parcel | 0.09091 | 0.09091 | 0.09091 | 0.09091 | 0.45455 | 0.09091 |
| Ekspedisi Wahana | 0.09091 | 0.09091 | 0.09091 | 0.09091 | 0.45455 | 0.09091 |
| Pakaian Anak | 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 lion parcel | 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 lion parcel | 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 lion parcel | 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 lion parcel | 0.27273 | 0.25 | 0.23529 | 0.21127 | 0.27273 | 1.24202 | 0.2484 |
| Ekspedisi Wahana | 0.4909 | 0.3125 | 0.47059 | 0.42254 | 0.4909 | 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%
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.

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               |       | Opportunities | √ | 2 |
| Location              |       | Competitive | √ | 5 |
| Location              |       | Opportunities | √ | 4 |
| Competitive           | √     | Opportunities | 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      | 0.55333       | 1.88344 | 0.47086        |
| Opportunities | 0.31579 | 0.30769  | 0.2459      | 0.26667       | 1.13605 | 0.28401        |
| SUM         | 6.33333 | 13       | 2.03333     | 3.75          |      |                 |
| 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 | Janu Kunya | 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 eigenvector, 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 recommended

| 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.

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