International Journal of Research in Engineering and Modern Technology (IJREMTE)
Volume 1, No 1, October 2024, Pages 19 - 27
ISSN: xxxx-xxxx

Implementation of Fuzzy Analytical Hierarcy Process Method for Selection of Coffee Producing Cities in East Java

Diana Puspitasari [1*], Adhitya Ichlasul Fadillah [2], and Nia Saurina [3]

[1] Universitas Wijaya Kusuma Surabaya/TIP, City, Country; Email: diana.puspitasari@uwks.ac.id
[2] ,Universitas Wijaya Kusuma Surabaya/Informatics, City, Country; Email: dhitteroboxx@gmail.com
[3] ,Universitas Wijaya Kusuma Surabaya/Informatics, City, Country; Email: niasaurina@gmail.com
*Correspondence: diana.puspitasari@uwks.ac.id

Abstract*— The quick development of the coffee industry requires expanded effectiveness within the determination of districts to meet expanding shopper request. In this setting, the application of the web-based Fluffy Explanatory Hierarcy Prepare (F-AHP) strategy is imperative as an assessment device to select the ideal elective for selecting coffee-producing cities in East Java. F-AHP allows coffee industry partners to assess and organize different aspects. The utilize of this strategy points to supply arrangements to the challenges of selecting coffee-producing cities in East Java, progress effectiveness, maintainability and item quality, and back more precise and quantifiable decision-making. This research contributes to the down to earth understanding of the application of F-AHP within the setting of positioning coffee-producing cities, giving a establishment for moving forward the execution of the coffee industry as a entire.

Keywords— Coffee, Fuzzy Analytical Hierarcy Process, Website, East Java.

I. INTRODUCTION

Decision Support System (DSS) could be a framework that can give issue fathoming and communication capabilities for issues in semi-structured and unstructured conditions. This framework is utilized to bolster choice making in semi-structured and unstructured circumstances where no one knows precisely how the choice will be made. One approach that can be utilized to make strides proficiency in selecting coffee creating cities is the Fuzzy Analytical Hierarcy Process (F-AHP) strategy.

F-AHP could be a strategy that can overcome this vulnerability by presenting an component of fluffiness or instability in choice making. Through the integration of F-AHP, choices related to the determination of coffee-producing cities in East Java can be made more carefully. The application of F-AHP within the determination of coffee creating cities comes about in moving forward operational effectiveness, diminishing hazard. By considering different components such as the wholeness of coffee beans, coffee assortments, and development of coffee beans from each locale, F-AHP can help coffee companies in upgrading the choice of coffee creating cities for dispersion to their companies.

Based on this foundation, the issue detailing for the execution of the F-AHP strategy in coffee abdicate suggestions can be defined as takes after:

- How can the F-AHP strategy perform calculations from elective information and criteria to rank the cities?What are the gaps or missing links that need to be addressed?
- How to plan and construct a positioning framework that can perform F-AHP calculations with the accessible information?

This investigate points to survey the degree to which the F-AHP strategy can progress the adequacy of choice making within the setting of selecting coffee creating cities, as well as assessing the capacity of the F-AHP strategy to improve the choice of the finest coffee creating cities in East Java. Based on the comes about of the investigation, it gives concrete and commonsense suggestions for commerce individuals in progressing the administration of coffee dispersion through the application of the F-AHP strategy.

II. LITERATURE REVIEW

Coffee is one of the most commodities of the rural industry in Indonesia. The role of coffee items within the Indonesian economy is exceptionally vital, both as a source of pay for coffee ranchers, as a source of remote trade, as a maker of mechanical crude materials and as a supplier and trade and import-export activities. Coffee could be a developed item that gives advertise openings both locally and globally. Since 1984, Indonesia's share of coffee sends out within the worldwide coffee showcase is the third most noteworthy after Brazil and Colombia, indeed for Robusta coffee, Indonesia's trades rank to begin with within the world. Indonesia's coffee sends out are generally Robusta coffee (94%), the rest is Arabica coffee. In any case, since 1997, Indonesia's position has been supplanted by Vietnam.

A choice bolster framework is an data framework utilized to bolster decision-making in an association or trade. DSS is outlined to back complex decision-making forms by giving organized and important data.

International Journal of Research in Engineering and Modern Technology (IJREMTE)
Volume 1, No 1, October 2024, pages 19-27
ISSN: xxxx-xxxx

In DSS, information and data are prepared utilizing numerical or measurable strategies to deliver proposals or choice choices that can back choice making. DSS can be utilized for different sorts of choices, extending from vital choices to operational choices, and can be connected in different divisions such as industry, commerce, healthcare, and other divisions. It can moreover offer assistance decision-makers unravel complex and unstructured issues by giving organized and well-organised data.

F-AHP could be a combination of AHP strategy and fluffy rationale. In spite of the fact that F-AHP incorporates existing shortcomings, to be specific predisposition caused by subjectivity and mistake of decision-making, this investigation can be made strides with fluffy set hypothesis presented by Zadeh in 1965. Fluffy rationale makes a difference characterise and clarify the deficiencies of conventional speculations. Twofold rationale moreover permits us to characterize different marvels that cannot be communicated by other investigations. The participation work show in fluffy rationale makes a difference analyse uncertainty and equivocalness in a way that's comparable to human dialect.

III. Materials and Methods

In arrange to decide the leading coffee-producing cities in East Java, we have created an investigation utilizing a few significant criteria. The investigation includes 10 elective cities considered based on five fundamental criteria. The pecking order graph over gives a visual representation of the relationship between the criteria and the choices considered.

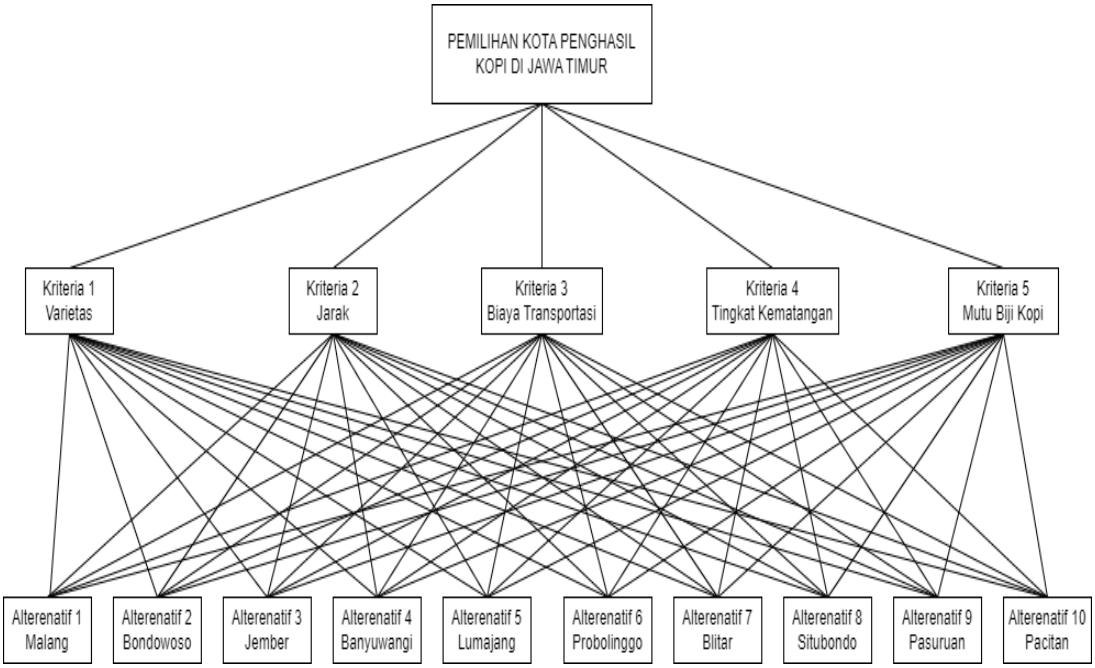


Figure 1. Hierarcy Structure

Utilitarian necessities are a shape of necessity that has focuses almost a handle that's at that point carried out by the framework. This require has focuses around the data that exists and is produced by the framework. The taking after are the different useful necessities of this inquire about:

(1) Client (Admin) Needs
- Admin can login and logout on the site.
- Admins can decide criteria and elective information.
- Admin can decide the weight of each model.
- Admin can see the calculation comes about.
- Admin can oversee client information on the framework

(2) Client (End-user) Needs
- End-users can login and logout on the site.
- End-users can decide the weight of each measure.
- End-users can decide criteria and elective information.
- End-user can see the calculation comes about.

(3) Framework Necessities
- The framework can login with a enrolled account.
- The framework can spare the criteria and elective information that has been entered.
- The framework can show criteria and options
- The framework can enter the weights entered by the client.

- The framework can show the calculation comes about.
- Overseeing accounts can as it were be done by admin.
- Creating an account can as it were be done by admin.

In planning this framework plan, the creator employments DFD with the point of portraying the stream of the coffee-producing city determination framework. When utilizing DFD framework plan, an diagram of the arranged coffee-producing city choice framework is shown. Figure 2 appears the coffee-producing city choice framework from admin to client there are 2 substances, to be specific admin and client. This framework incorporates a stream that to begin with the client can log in at that point enter different criteria and elective information and can decide the weight of the criteria. Besides, the framework forms different information that has been entered and can show calculation reports to clients and can see calculation comes about.

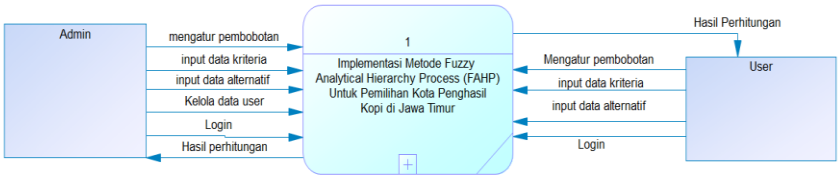


Figure 2. DFD Context Level

For database plan, there are two stages of plan, to be specific the conceptual information show which is the concept of making substances within the database and their connections which are at that point changed to the physical information show for the table frame. The CDM plan includes a concept related to client perception of information put away within the database. The taking after CDM on the positioning data framework can be seen in figure 3 Clarification of the admin substance, the admin is portion of the client but the admin can oversee client information so that the admin substance itself is made with a one to numerous relationship to the client substance.

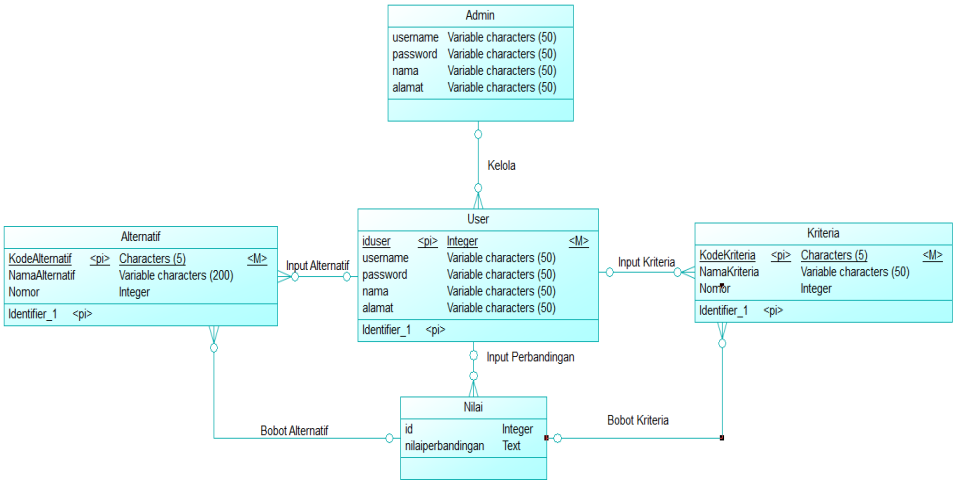


Figure 3. Conceptual Data Model

IV. Result and Discussion

A well-presented results section and a convincing discussion will prove the novelty and importance of your research. It should provide a concise and precise description of the experimental results, their interpretation, and the empirical conclusions that can be drawn.

A. Database Result Implementation

Database execution may be a organize containing a database plan containing tables utilized to make a client interface/web show so that it can store information from the calculation system.

- Alternative Data Table
  The elective information table is valuable for storing alternatives within the shape of city names that have been entered within the framework. There are Elective Code and Elective Title properties within the table.

	KodeAlternatif	NamaAlternatif
Edit Copy Delete	A7	Blitar
Edit Copy Delete	A6	Probolinggo
Edit Copy Delete	A5	Lumajang
Edit Copy Delete	A4	Banyuwangi
Edit Copy Delete	A3	Jember
Edit Copy Delete	A2	Bondowoso
Edit Copy Delete	A1	Malang
Edit Copy Delete	A10	Pacitan
Edit Copy Delete	A8	Situbondo
Edit Copy Delete	A9	Pasuruan

Figure 4. Alternative Data Table

- Criteria Data Table
  The criteria information table is useful for putting away criteria that are utilized for the appraisal figure of options that will be positioned. There are attributes CodeCriteria and NameCriteria within the table.

	KodeKriteria	NamaKriteria
Edit Copy Delete	C5	Mutu Biji Kopi
Edit Copy Delete	C1	Varietas
Edit Copy Delete	C2	Jarak
Edit Copy Delete	C3	Biaya Transportasi
Edit Copy Delete	C4	Tingkat Kematangan

Figure 5. Criteria Data Table

- Score Data Table
  The Esteem information table is useful for putting away the weighting that has been entered within the framework. Whether it's criteria weighting or elective weighting against criteria. There are id and comparison esteem traits within the table.

id	nilaiperbandingan
1	C1__1X3X5X7X9XXXXC2__0X1X3X3X5XXXXC3__0X0X1X1X3XXX...
2	A1__1.00X1.00X0.75X0.25X1.00XXXXA2__1.00X0.5X0.5X0...

Figure 6. Score Data Table

- User Data Table
  The elective information table is valuable for putting away client accounts enrolled with the framework. There are username, secret word, title, and address traits within the table.

id	username	password	nama	alamat
7	admin	21232f297a57a5a743894a0e4a801fc3	admin 1	jl. buah pepaya
11	user	ee11cbb19052e40b07aac0ca060c23ee	user 1	Jl buah mangga
12	user2	7e58d63b60197ceb55a1c487989a3720	Ridwan	jl. buah nangka
15	user3	92877af70a45fd6a2ed7fe81e1236b78	Ira	Jl. buah apel

Figure 7. User Data Table

B. System Result Implementation

Within the usage of this interface plan utilizing php programming code and employing a css or bootstrap system. At this organize the site has been completed and can be utilized by clients for wants of existing issues. The usage contains a few substance counting. Login page, criteria, options, to positioning comes about.

- Alternative data page
  The elective information page contains different city information utilized for choices within the positioning framework.

Figure 8. Alternative data page

- Criteria data page
  The criteria information page contains different criteria information or those utilized for alternative selection.

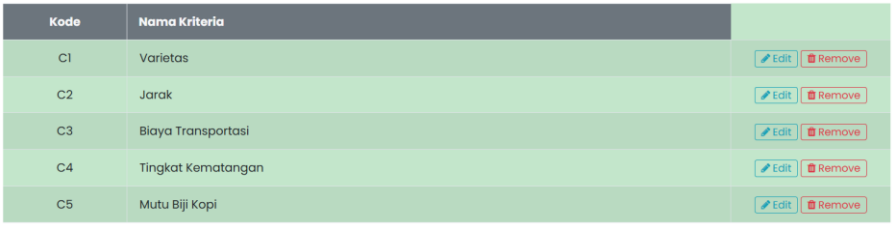
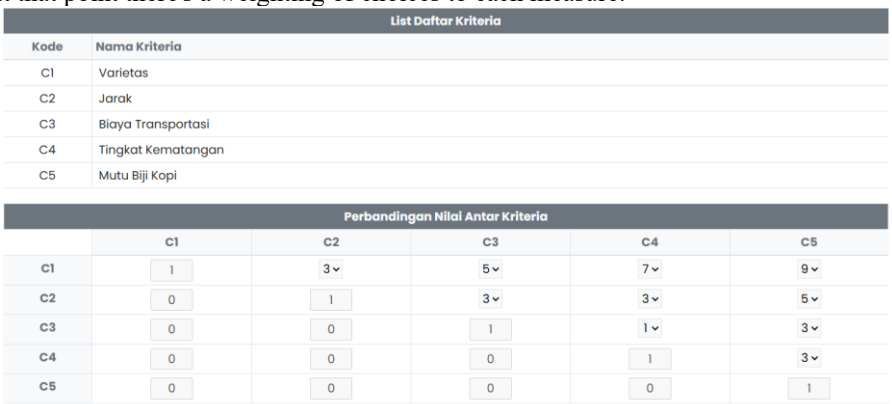


Figure 9. Criteria data page

- Weighting and Comparison page
  The comparison page contains the assurance of the significance esteem for the calculation of criteria comparison, at that point there's a weighting of choices to each measure.



Bobot Nilai Kriteria	
Bobot	Keterangan Bobot Nilai
1.00	Sangat Baik
0.75	Baik
0.5	Cukup
0.25	Kurang
0.00	Sangat Kurang

Input Bobot Nilai Kriteria Untuk Masing Masing Alternatif					
	Varietas	Jarak	Biaya Transportasi	Tingkat Kematangan	Mutu Biji Kopi
Malang	Sangat Baik	Sangat Baik	Baik	Kurang	Sangat Baik
Bondowoso	Sangat Baik	Cukup	Cukup	Baik	Cukup
Jember	Sangat Baik	Cukup	Cukup	Kurang	Baik
Banyuwangi	Cukup	Sangat Kurang	Kurang	Baik	Baik
Lumajang	Baik	Baik	Baik	Kurang	Cukup
Probolinggo	Kurang	Sangat Baik	Sangat Baik	Cukup	Cukup
Blitar	Cukup	Cukup	Cukup	Sangat Kurang	Kurang
Situbondo	Kurang	Cukup	Cukup	Sangat Baik	Kurang
Pasuruan	Cukup	Sangat Baik	Sangat Baik	Sangat Kurang	Kurang
Pacitan	Cukup	Sangat Kurang	Kurang	Sangat Kurang	Sangat Kurang

Figure 10. Weighting and Comparison Page

- F-AHP Ranking Result
  On the comes about page there are weights and comparisons already entered for survey, at that point there's a calculation prepare table and at the conclusion there's elective information that has been positioned.

	INPUTAN NILAI PERBANDINGAN ANTAR KRITERIA				
	C1	C2	C3	C4	C5
C1	1	3	5	7	9
C2	0	1	3	3	5
C3	0	0	1	1	3
C4	0	0	0	1	3
C5	0	0	0	0	1

	KONVERSI NILAI PERBANDINGAN ANTAR KRITERIA KE MATRIKS BERPASANGAN FUZZY														
	C1			C2			C3			C4			C5		
	l	m	u	l	m	u	l	m	u	l	m	u	l	m	u
C1	1	1	1	1	1.5	2	2	2.5	3	3	3.5	4	4	4.5	4.5
C2	0.5	0.667	1	1	1	1	1	1.5	2	1	1.5	2	2	2.5	3
C3	0.333	0.4	0.5	0.5	0.667	1	1	1	1	1	1	1	1	1.5	2
C4	0.25	0.286	0.333	0.5	0.667	1	1	1	1	1	1	1	1	1.5	2
C5	0.222	0.222	0.25	0.333	0.4	0.5	0.5	0.667	1	0.5	0.667	1	1	1	1

	FUZZY TRINGULAR NUMBER			SINTESIS FUZZY			BOBOT VECTOR	NORMALISASI	
	l	m	u	l	m	u	Nilai	Min	Nilai
C1	11	13	14.5	0.289	0.404	0.544	1,1,1,1	1	0.824
C2	5.5	7.167	9	0.144	0.223	0.338	0.213,1,1,1	0.213	0.176
C3	3.833	4.567	5.5	0.101	0.142	0.206	0,0.434,1,1	0	0
C4	3.75	4.453	5.333	0.098	0.139	0.2	0,0,0.971,1	0	0
C5	2.555	2.956	3.75	0.067	0.092	0.141	0,0,0,0.478	0	0
Total	26.638	32.143	38.083						

	INPUTAN NILAI BOBOT KRITERIA DARI MASING-MASING ALTERNATIF				
	C1	C2	C3	C4	C5
A1	Sangat Baik	Sangat Baik	Baik	Kurang	Sangat Baik
A2	Sangat Baik	Cukup	Cukup	Baik	Cukup
A3	Sangat Baik	Cukup	Cukup	Kurang	Baik
A4	Cukup	Sangat Kurang	Kurang	Baik	Baik
A5	Baik	Baik	Baik	Kurang	Cukup
A6	Kurang	Sangat Baik	Sangat Baik	Cukup	Cukup
A7	Cukup	Cukup	Cukup	Sangat Kurang	Kurang
A8	Kurang	Cukup	Cukup	Sangat Baik	Kurang
A9	Cukup	Sangat Baik	Sangat Baik	Sangat Kurang	Kurang
A10	Cukup	Sangat Kurang	Kurang	Sangat Kurang	Sangat Kurang

KONVERSI NILAI BOBOT KRITERIA DARI MASING-MASING ALTERNATIF

	C1	C2	C3	C4	C5
A1	1.00	1.00	0.75	0.25	1.00
A2	1.00	0.5	0.5	0.75	0.5
A3	1.00	0.5	0.5	0.25	0.75
A4	0.5	0.00	0.25	0.75	0.75
A5	0.75	0.75	0.75	0.25	0.5
A6	0.25	1.00	1.00	0.5	0.5
A7	0.5	0.5	0.5	0.00	0.25
A8	0.25	0.5	0.5	1.00	0.25
A9	0.5	1.00	1.00	0.00	0.25
A10	0.5	0.00	0.25	0.00	0.00

PERHITUNGAN BOBOT NILAI KRITERIA DARI MASING-MASING ALTERNATIF

	C1	C2	C3	C4	C5	Nilai
A1	0.824	0.176	0	0	0	1
A2	0.824	0.088	0	0	0	0.912
A3	0.824	0.088	0	0	0	0.912
A4	0.412	0	0	0	0	0.412
A5	0.618	0.132	0	0	0	0.75
A6	0.206	0.176	0	0	0	0.382
A7	0.412	0.088	0	0	0	0.5
A8	0.206	0.088	0	0	0	0.294
A9	0.412	0.176	0	0	0	0.588
A10	0.412	0	0	0	0	0.412

URUTAN RANKING ALTERNATIF

Rangking	Alternatif	Nilai
1	Malang	1
2	Bondowoso	0.912
3	Jember	0.912
4	Lumajang	0.75
5	Pasuruan	0.588
6	Blitar	0.5
7	Banyuwangi	0.412
8	Pacitan	0.412
9	Probolinggo	0.382
10	Situbondo	0.294

Figure 11. F-AHP Ranking Result

C. *System Testing*

- Criteria page testing

In testing the criteria page, users must be able to add, edit and delete criteria. Test scenarios are carried out and the results obtained then ascertained whether the system runs as it should.

Table 1. Criteria page testing

No	Test scenario	Result obtained	Conclusion
1	If adding new criteria data	Then the system displays the new criteria that have been added	*Valid*
2	If editing existing criteria	Then the system can display the criteria that have been edited	*Valid*
3	If delete existing criteria	Then the system can delete the deleted criteria	*Valid*

- Alternative page testing

On testing alternative pages, users must be able to add, edit and delete criteria. Test scenarios are carried out and the results obtained are then confirmed whether the system runs as it should.

Table 2. Alternative page testing

No	Test scenario	Result obtained	Conclusion
1	If adding new alternative data	Then the system displays the new alternative that has been added	*Valid*
2	If editing an existing alternative	Then the system can display alternatives that have been edited	*Valid*
3	If deleting an existing alternative	Then the system can delete the deleted alternative	*Valid*

- Comparison page testing

In testing the Criteria and Alternative Comparison page, users must be able to enter comparison data. Test scenarios are carried out and the results obtained then ascertained whether the system runs as it should.

Table 3. Criteria page testing

No	Test scenario	Result obtained	Conclusion
1	If entering the weights of the criteria with each other	Then the system displays the weighting that has been filled in	*Valid*

Table 4. Alternative page testing

No	Test scenario	Hasil Yang Didapat	Conclusion
1	If you include alternative weights on the criteria	Then the system displays the weight that has been filled in	*Valid*

- Ranking page testing

On the ranking page test, admins and users must be able to see the ranking calculations from the system. Test scenarios are carried out and the results obtained then ascertained whether the system runs as it should.

Table 5. Ranking page testing

No	Test scenario	Result obtained	Conclusion
1	If pressing the ranking process button	Then the system displays the calculation and ranking results	*Valid*

V. CONCLUSION

The F-AHP strategy may be a combination of the AHP strategy and Fluffy rationale concepts. It empowers way better decision-making in situations including instability and subjectivity. Within the setting of positioning cities based on certain criteria, the F-AHP strategy can be utilized to recognize criteria and choices, the primary step is to distinguish

pertinent criteria such as coffee assortment, city remove, coffee quality level, transportation taken a toll, and coffee development level. Together with the cities that have been decided.

Distinguishing client prerequisites and framework determinations, counting criteria to be utilized, information input strategies, and anticipated yields. At that point plan the framework design that incorporates modules for information input, F-AHP calculation, and positioning result yield. Key components may incorporate the client interface, database, and F-AHP calculations. Create the framework employing a programming dialect and Microsoft Visual Studio Code as program to construct the framework. At that point testing the framework to guarantee the ease of use of the interface.

REFERENCES

[1] U. Fauziah dan A. Ihwana, "Analisa Nilai Distribusi Kopi di Kabupaten Garut," Junal Kalibrasi, vol. 1, no. 13, p. 1, 2015.
[2] O. Veza dan N. Y. Arifin, "Sistem Pendukung Keputusan Calon Mahasiswa Non Aktif dengan Metode Simple Additive Weighting," Jurnal Industri Kreatif, vol. 3, no. 2, p. 72, 2019.
[3] D. Chandra, R. H. Ismono dan E. Kasymir, "PROSPEK PERDAGANGAN KOPI ROBUSTA INDONESIA DI PASAR INTERNASIONAL," p. 10, 2013.
[4] A. K. E. Sinarwastu, "Kolaborasi Kontraktor Utama Dengan Pelaku Rantai Pasok Lainnya Dalam Pengadaan Proyek Konstruksi," p. 6, 2019.
[5] V. A. Hartono, "Optimasi Sistem Distribusi Pada Distributor Sepeda di PD. Trijaya Semarang," pp. 4-5, 2015.
[6] D. Fatmawati dan T. K. Miranti, "Perancangan Alat Pengukuran Tingkat Kapabilitas Proses BAI06 Dan BAI07 Pada TNDE Provinsi Jawa Timur Menggunakan Cobit 5," Universitas Pembangunan Nasional "Veteran" Jawa Timur, Surabaya, 2021.
[7] D. Sarwandi, Sistem Pendukung Keputusan, Deli Serdang: Graha Mitra Edukasi, 2023.
[8] S. Wibowo, "Penerapan Logika Fuzzy Dalam Penjadwalan Waktu Kuliah," Jurnal Informatika UPGRIS, vol. 1, p. 62, 2015.
[9] S. Pebakirang, A. Sutrisno dan J. Neyland, "PENERAPAN METODE AHP (ANALYTICAL HIERARCHY PROCESS) UNTUK PEMILIHAN SUPPLIER SUKU CADANG DI PLTD BITUNG," Jurnal Online Poros Teknik Mesin, vol. 6, no. 1, p. 34.
[10] Y. W. Mandaya, "Sistem Pemilihan Personel dengan Fuzzy Analytic Hierarcy Process (FAHP)," pp. 6-8, 2019.
[11] K. Ardi dan I. Al Amin, "Sistem Pendukung Keputusan Prioritas Persediaan Tools Menggunakan Metode Fuzzy AHP," Jurnal Ilmiah Ekonomi Dan Bisnis, vol. 13, no. 1, pp. 47 - 48, 2020.
[12] R. S. O. Setijabudi, "APLIKASI E-BOOKING PADA STUDIO VIBESROOM," Skripsi, pp. 7-8, 2022.
[13] I. Yani, "RANCANGAN BANGUN CUSTOMER RELATIONSHIP MANAGEMENT PADA SISTEM INFORMASI WEDDING ORGANIZER," Undergraduate Thesis, pp. 11-12, 2019.
[14] Z. Tuzzahra dan R. K. P.W., "Pembangunan Web Profil Pada UMKM Diva DIgital," Surabaya, 2021.
[15] R. P. Hastanti, B. E. Purnama dan I. U. Wardati, "Sistem Penjualan Berbasis Web (E-Commerce) Pada Tata Distro Kabupaten Pacitan," jurnal Bianglala Informatika Vol 3 No 2, p. 4, 2015.
[16] A. Makhi dan A. C. Fauzan, "Sistem Informasi Manajemen Administrasi Pada Lembaga Sertifikasi Profesi P1 Universitas Nahdlatul Ulama Blitar Menggunakan MOdel Rapid Application Development," Jurnal Aplikasi Teknologi Informasi dan Manajemen (JATIM), Vol 3 No 1, p. 24, 2022.
[17] D. Darmawan, "Perancangan Sistem Informasi Akuntansi Pada Sentra Roti Babakan Rahayu," p. 61, 2020.
[18] R. C. S. Indonesiawan, B. R. Prasetyo dan S. A. Cahyono, "Rancang Bangun 3D Model Dan Pengaduan Masyarakat Berbasis Website Pada BNNK Sidoarjo," pp. 5-6, 2022.