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Analysis of Public Service Satisfaction using Artificial Intelligence K-Means Cluster

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ABSTRACT

Public service refers to the provision of goods, services, and support by the government to meet the community's desires and needs. In order to assess the efficacy of this service, a metric for gauging service quality, referred to as the Community Satisfaction Index, has been devised. This data offers insights into the level of satisfaction within the community regarding a particular service. This study utilizes the K-Means Cluster algorithm, a form of unsupervised machine learning, to categorize data based on similarities and dissimilarities into distinct clusters.

The objective of this study is to gain insight and conduct an analysis of the level of satisfaction within the community regarding the information services offered by the Communication and Information Department of West Java Province. Furthermore, the objective of this study is to ascertain the categorization of the public satisfaction index by using the K-Means Cluster technique, employing an artificial intelligence methodology. This approach will enable the identification of the public satisfaction index as well as the identification of specific indicators that necessitate enhancement.

The initial step in examining the public satisfaction index through the utilization of Artificial Intelligence involves the application of the K-Means Cluster algorithm, which will generate multiple clusters based on their shared characteristics. The values utilized by each group consist of the integers 1, 2, 3, and 4. Subsequently, an assessment is conducted on each formed group in order to ascertain the most favorable outcomes. The study yielded clusters that were deemed optimal, with smaller values indicating areas in which the services could be enhanced.

The present study aims to investigate the impact of Artificial Intelligence (AI) on public service quality, as measured by the Community Satisfaction Index (CSI). Specifically, we employ the K-Means clustering algorithm to analyze the data collected from a representative sample of community members. By utilizing AI techniques, we seek to gain insights into.

Keywords: public services, IKM, Artificial Intelligence, K-Means

INTRODUCTION

Essentially, the necessity for services is universal, indicating that providing services is an inherent component of societal and national existence. Public service can be conceptualized as the provision of services to individuals affiliated with governmental establishments, thereby addressing the desires or requirements of the communities about the services rendered by said establishments. The Community Satisfaction Index (CSI) is a tool that offers insights into public satisfaction with services. (de Oña, 2022; Nor et al., 2022; Prokop & Tepe, 2022; Song et al., 2021) It achieves this by utilizing both qualitative and quantitative methods to measure public opinion regarding the services provided by various public organizations. This information is then compared to the expectations and needs of the community.(Reis et al., 2019; Sousa et al., 2019; Wang et al., 2021)

Two distinct measurement models are predicated upon the nature of the service provider: customer satisfaction measurement within the private sector and public satisfaction measurement. Within private organizations, the conventional approach to assessing customer satisfaction commonly entails utilizing market or marketing research. Conversely, public organizations tend to employ community satisfaction surveys (CSS) as their preferred method, conveying the outcomes through Community Satisfaction Reports (ICM). Similarly, implementing digital reforms within the bureaucracy of the West Java Communication and Information Service is imperative to promote effective governance and ensure transparency in government operations. From 2004 to 2021, the West Java Communication and Information Department has undertaken bureaucracy reform programs. The existence of bureaucracy validates prior reforms in bureaucratic systems, and the ongoing execution of these reforms is crucial in establishing a proficient and autonomous institution that aligns with the public's anticipated standards. The bureaucracy reform roadmap aims to address public demands by implementing fundamental technical tasks and policies in communication, information technology, and public relations. In order to attain an effective and economically viable performance-oriented bureaucracy, the adoption of electronic performance management systems is being pursued. The purpose of these measures is to guarantee the measurable implementation of essential tasks and functions.

The K-Means Clustering algorithm is an instance of a non-hierarchical technique for data clustering. Its objective is partitioning the given data into distinct clusters (Ikotun et al., 2023; Ran et al., 2021; Sinaga & Yang, 2020; Yuan & Yang, 2019). This algorithm divides the data into smaller clusters based on common characteristics and subsequently processes input data without explicit class labels. Clustering refers to the

systematic procedure of categorizing data elements according to their shared characteristics, such that elements within a given cluster exhibit high similarity. In contrast, the similarity between clusters minimizes. Clustering is a technique used for the segmentation of data into distinct categories. The K-Means algorithm is an illustrative instance of an unsupervised learning algorithm utilized for data grouping within the classification domain. The algorithm accepts input in the form of data without class identifiers. The initial step in the K-Means algorithm involves accepting unclassified data points and aggregating them. The collected input consists of data about the anticipated number of groups, which is three.

The previous study conducted by Dwitri et al. (2020) demonstrates the efficacy of utilizing the K-Means algorithm for monitoring the Covid-19 pandemic within the Indonesian context—the K-Means algorithm employed to discern the extent of Covid-19 transmission across various regions within Indonesia. The present study employs the K-Means algorithm to directly evaluate observation-based assessments alongside the requisite methodologies for generating objective data. The current grouping utilizes data from thirty-seven indicators and processes the results of each endpoint as outcomes. The utilization of the K-Means algorithm is favored due to its efficient computational performance and flexibility in application.

METHOD

The structured Systems Development Life Cycle (SDLC) model, commonly known as the linear structure model or the classical method model, was employed in this research. A structured and sequential process characterizes the waterfall software lifecycle model. It begins with the analysis phase, which identifies and assesses needs and conditions. Subsequently, the system design, coding, and system testing phases are undertaken. (Pinciroli et al., 2022; Restrepo et al., 2021; Yankson, 2023)

The present study encompasses a comprehensive review of the existing literature, focusing on acquiring knowledge about assessment, monitoring, evaluation, and clustering systems. This study was conducted based on a comprehensive review of relevant scholarly papers, articles, books, and other literature about the selected algorithm and research goals.

The primary objective of data collection is to acquire information from structured forms from reviewers. This data will subsequently be utilized as test data for the system.

System design is a process that seeks to ascertain the essential requirements for the development of an application. The design process involves the selection of a programming language model and the outcome, which is a crucial step in streamlining the application process.

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Code writing aims to transform natural language into a programming language.

The purpose of testing is to assess the application's operational capabilities, identify system disruptions, and detect any software defects present in the developed application.

K-Means Clusters

This K-means algorithm aims to divide some data into several prearranged groups. The following are the steps for calculating the distance:

Euclidean distance

The formula for the distance between two points in one, two, and three dimensions, respectively, is shown in formulas 1, 2, and 3 below:

$$\sqrt{x - y)2} = |x - y| \quad (1)$$

$$d(p, q) = \sqrt{(p1 - q1)2 + (p2 - q2)2} \quad (2)$$

$$d(p - q) = \sqrt{(p1 - q1)2 + (p2 - q2)2 + (p3 - q3)2} \quad (3)$$

The Manhattan distance, also known as the taxicab distance, is a metric used to measure the distance between two points in a grid-like $Dcheb(p, q) = \max(|pii - q1|)$

The stages of the K-Means Clustering algorithm can be seen in the image below:

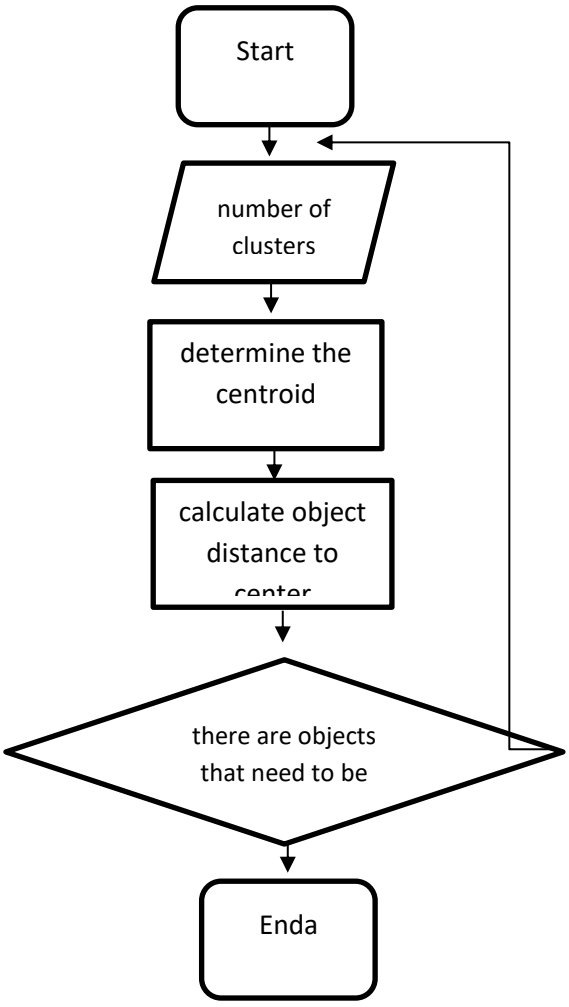

Figure 1. Stages of K-Means Cluster

RESULT AND DISCUSSION

Data Record/Dataset In the realm of data analysis, a data record or dataset refers to a structured collection of information that.

The data that has already been recorded originates from the year 2000 and encompasses multiple cities and districts evaluated in the West Java region. Within this particular context, the indicators function as variables, whereas the predicates fulfill the role of labels.

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Table 1. Service Component Labels

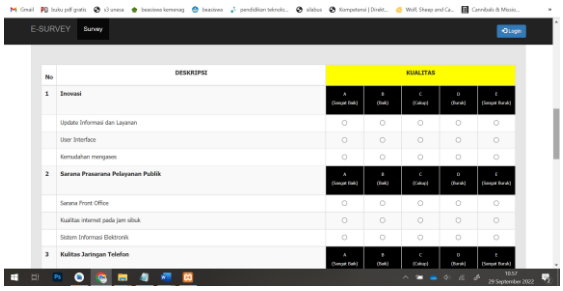
No.	Label
1.	Service Rules
2.	Human Resource Competency
3.	Service Infrastructure
4.	Service Technology
5.	Complaints & follow up
6.	Service Update

Tabel 1. Cluster Setiap Label

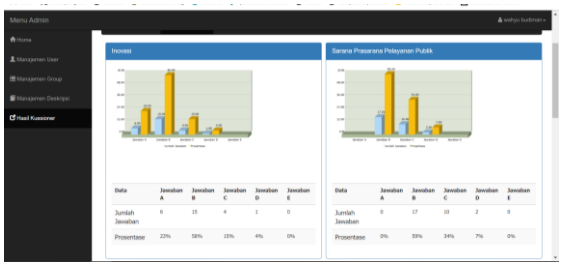
Label	No.	Cluster	Number of Indicators
1	1.	Service SOPs	8
1	2.	Disclaimer Board	1
1	3.	SKM	4
2	1.	Professionality	1
2	2.	Responsive	2
2	3.	Code of Ethics	1
2	4.	Rule Enforcement	2
2	5.	Culture	1
3	1.	Parking and Waiting Room	3
3	2.	Infrastructure for ABK	1
3	3.	Supporting infrastructure	1
3	4.	Public Service Facilities	2
4	1.	Service Technology	4
4	2.	Renewable technology	1
5	1.	Complaint follow-up	2
5	2.	complaints	2
6	0.	Service Update	1

Figure 2. User Interface of the West Java IKM Diskokinfo Survey Application

The following user interface displays information about the main page of the public service survey application.



The survey page interface contains questions regarding what points must be filled in by the public regarding services at Diskominfo.



The graph shows the survey results in the form of image visualization and survey data.

Clustering Result Data

Clustering results from public assessment data using the K-Means method in table 3, where you can see each number of cluster members.

From the data from the following survey entries, it is calculated using the K-Menas Cluster and the results are as follows.

Table 3. Grouping results

No.	Label	clustter
1.	Asep Andi	Clustter-1
2.	Asep Fahmi	Clustter-1
3.	Dadang N.	Clustter-1
4.	Muh. Muin	Clustter-4
5.	Kemal Aditya	Clustter-4
6.	Sridewi	Clustter-4
7.	Siti Aisyah	Clustter-4
8.	Qiky	Clustter-4
9.	Zully	Clustter-4
10.	Yusuf Amin	Clustter-2

Table 4. Grouping results

Cluster	Kurang		Cukup		Baik		Total
	N	%	N	%	N	%	
cluster_0	3	30	7	70	0	0	10
cluster_1	0	0	14	100	0	0	14
cluster_2	0	0	7	100	0	0	7
cluster_3	0	0	1	11	8	89	9
cluster_4	12	40	18	60	0	0	30

The summary of the group results is presented in Table 3. Cluster 0 exclusively comprises data points with a predicate value falling below the threshold of sufficiency, specifically at the 30th and 70th percentiles. Group one consists exclusively of survey results that have been deemed adequate. Group two primarily comprises an ample amount of data that encompasses predicates. Within group three, a single dataset is classified as sufficient, while eight datasets are classified as good. The group consists of 12 data points that possess a smaller predicate, while 18 data points possess a predicate that is considered sufficient.

CONCLUSION

According to a study conducted at the Communication and Informatics Department of West Java, utilizing the K-Means Cluster artificial intelligence technique revealed the existence of certain service clusters that continue to elicit public complaints and are perceived as insufficient. Cluster one reveals instances of inadequate internet services and incomplete information services. The data obtained from Cluster-1 and Cluster-2 exhibit significant label indicators, whereas Cluster-4 contains the highest number of clusters. The K-Means algorithm is a valuable tool for effectively categorizing the outcomes of public service surveys.

REFERENCES

de Oña, J. (2022). Service quality, satisfaction and behavioral intentions towards public transport from the point of view of private vehicle users. *Transportation*, *49*(1), 237–269. https://doi.org/10.1007/s11116-021-10175-7

Dwitri, N., Tampubolon, J., Prayoga, S., Zer, F. I. R., & Hartama, D. (2020). Penerapan algoritma K-Means dalam menentukan tingkat penyebaran pandemi COVID-19 di Indonesia. *(JurTI) Jurnal Teknologi Informasi*, *4*(1), 128–132.

Ikotun, A. M., Ezugwu, A. E., Abualigah, L., Abuhaija, B., & Heming, J. (2023). K-means clustering algorithms: A comprehensive review, variants analysis, and advances in the era of big data. *Information Sciences*, *622*, 178–210. https://doi.org/10.1016/j.ins.2022.11.139

Nor, R., Gani, A. J. A., Saleh, C., & Amin, F. (2022). Organizational commitment and professionalism to determine public satisfaction through good governance, public service quality, and public empowerment. *International Review on Public and Nonprofit Marketing*, *19*(1), 191–217. https://doi.org/10.1007/s12208-021-00297-0

Pinciroli, F., Barros Justo, J. L., & Forradellas, R. (2022). Systematic mapping study: On the

coverage of aspect-oriented methodologies for the early phases of the software development life cycle. *Journal of King Saud University - Computer and Information Sciences*, *34*(6), 2883–2896. https://doi.org/10.1016/j.jksuci.2020.10.029

Prokop, C., & Tepe, M. (2022). Talk or type? The effect of digital interfaces on citizens' satisfaction with standardized public services. *Public Administration*, *100*(2), 427–443. https://doi.org/10.1111/padm.12739

Ran, X., Zhou, X., Lei, M., Tepsan, W., & Deng, W. (2021). A Novel K-Means Clustering Algorithm with a Noise Algorithm for Capturing Urban Hotspots. *Applied Sciences*, *11*(23), 11202. https://doi.org/10.3390/app112311202

Reis, J., Santo, P. E., & Melao, N. (2019). Impacts of Artificial Intelligence on Public Administration: A Systematic Literature Review. *2019 14th Iberian Conference on Information Systems and Technologies (CISTI)*, 1–7. https://doi.org/10.23919/CISTI.2019.8760893

Restrepo, L., Aguilar, J., Toro, M., & Suescún, E. (2021). A sustainable-development approach for self-adaptive cyber–physical system's life cycle: A systematic mapping study. *Journal of Systems and Software*, *180*, 111010. https://doi.org/10.1016/j.jss.2021.111010

Sinaga, K. P., & Yang, M.-S. (2020). Unsupervised K-Means Clustering Algorithm. *IEEE Access*, *8*, 80716–80727. https://doi.org/10.1109/ACCESS.2020.2988796

Song, M., An, S.-H., & Meier, K. J. (2021). Quality standards, implementation autonomy, and citizen satisfaction with public services: cross-national evidence. *Public Management Review*, *23*(6), 906–928. https://doi.org/10.1080/14719037.2020.1730939

Sousa, W. G. de, Melo, E. R. P. de, Bermejo, P. H. D. S., Farias, R. A. S., & Gomes, A. O. (2019). How and where is artificial intelligence in the public sector going? A literature review and research agenda. *Government Information Quarterly*, *36*(4), 101392. https://doi.org/10.1016/j.giq.2019.07.004

Wang, C., Teo, T. S. H., & Janssen, M. (2021). Public and private value creation using artificial intelligence: An empirical study of AI voice robot users in Chinese public sector. *International Journal of Information Management*, *61*, 102401. https://doi.org/10.1016/j.ijinfomgt.2021.102401

Yankson, B. (2023). Small scale IoT device privacy evaluation using Petri net modeling. *Internet of Things*, *22*, 100725. https://doi.org/10.1016/j.iot.2023.100725

Yuan, C., & Yang, H. (2019). Research on K-Value Selection Method of K-Means Clustering Algorithm. *J*, *2*(2), 226–235. https://doi.org/10.3390/j2020016