
Data Mining Implementation in Admission of New Students Using Zone Systems**Hikmat Nurhidayat¹, Hariyanto², Chirstina Juliane³**Hikmat.nurhidayat@gmail.com, hariyanto87@guru.smk.belajar.id, christina.juliane@likmi.ac.id¹²³ School of Business and Information Technology, STMIK LIKMI

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Abstract

Every aspect of education that is now in place has to be continuously improved by the government. The Admissions Process for New Students (PPDB) in schools that have a zoning system in place is examined in this study. The primary goal of the study is to use the clustering approach to calculate the distance between students and schools. Analyzing, gathering, processing, and evaluating data are all steps in the research methodology. The study's findings demonstrate how the zoning system has a big impact on school enrollment trends. These results highlight how crucial it is to keep the PPDB's zoning system under constant review in order to provide equitable access to education for all pupils without sacrificing educational quality. The investigation ultimately discovered clustering in the distance, classified as the closest and farthest radius, between the student's home and the school. as well as the significance of a more comprehensive study.

A. Introduction

Because the environment may affect any system, including the educational system, which depends on the environment to manage educational resources effectively and efficiently, the education system must adapt to the environment [1]. Actors' collaboration is motivated, energized, inspired, and guided by the admirable principles they support. The components of an education system are made up of both organic and inorganic components, such as resources, buildings, and other teaching aids. The components and values of the education system are interdependent and must work together [2].

The government mandates that the PPDB be made in a way that allows regions to modify the regulations in accordance with their unique requirements and features. To make it simpler for areas to maintain and/or raise the percentage of the accomplishment route as needed, the zoning and affirmation route expressly mentions the minimal proportion. Following the determination of the zoning route quota, the affirmation route quota, and so forth, regions are required to elucidate to the community, particularly stakeholders, the terms of each PPDB [3]. Additionally, in order to be accountable to the public and maintain openness, the regional government must be in a position to explain to them the rationale behind choosing the proportions of each route.

Previous <u>Permendikbud</u> PPDB (<u>Permendikbud</u> No. 51 of 2018 jo <u>Permendikbud</u> No. 20 of 2019)	Latest PPDB Minister of Education and Culture Regulation (<u>Permendikbud</u> No. 44 of 2019)
Minimum 80% zoning line Maximum achievement path 15% Maximum transfer path for parents/ <u>guardinas</u> 5%	Minimum 50% zoning line Minimum 15% affirmation pathway Maximum transfer path for parents/guardians 5% If there is remaining quota, an achievement route can be opened, which can be based on the National. Examination or other <u>acamdemic</u> and non- academic <u>acvievemnt</u> . This path, thus, is a maximum of 30%

Figure 1. PPDB Rules

The process of enrolling or registering new students into a school, university, or other educational establishment is referred to as admission of new students. Publicizing registration, completing the registration form, taking the entrance exam (if required), and publicizing the results of the selection and acceptance of new students are only a few of the steps in this procedure. The goal is to choose applicants who satisfy the requirements established by the school so that, in contrast to the study, which did not result in appreciable increases in quality, the quality of education improves [4].

The government uses the zoning system in the New Student Admissions (PPDB) system to control how new students are admitted based on certain zones or areas. The goal of this strategy is to more equally close the gap between preferred schools and schools in less desired places [5]. Therefore, it may be

argued that every human being has the right to self-development through high-quality education in order to improve their quality of life, regardless of their status or class [6].

Each region implements this zoning system differently, and it may begin at a different time. The zoning system in the PPDB is often implemented in accordance with national legislation from the appropriate ministries or local government directives. Certain academic years may see the start of zoning system implementation, which is then updated or changed in later years to accommodate new circumstances and regulations. As a result, in order to give its citizens the best possible education, the Indonesian government prioritizes education [7].

The following conclusions may be drawn from the findings of the interviews conducted with SMK Negeri 1 Kedawung students who successfully completed this zoning system:

1. Equitable Distribution: To lessen disparity between favored and less well-liked schools, make sure that students are distributed equally throughout schools in different locations.
2. Local Representation: Boost the number of kids from the neighborhood and fortify the bonds that bind students, teachers, and communities.
3. Equitable Education Quality: Has the ability to raise educational standards across the board with more equitable backing from the public and private sectors.
4. Social Justice: Advance social justice by giving students from all socioeconomic backgrounds equitable access to high-quality education.
5. Establishes stability and predictability in the student body, which supports long-term planning for the capacity of schools and the distribution of resources.
6. Enhanced Community Connectivity: Fosters stronger ties between educational institutions, learners, and the local community, hence promoting parental involvement in their kids' education.

Within the relevant educational regulatory framework, laws and regulations that have been agreed upon often serve as the basis for the application of the zoning system in PPDB. This system may be modified in line with updates to education-related rules or guidelines published by the national or local government. This is one tactic to spread high-quality education more quickly [8]. Depending on the state or region in which the zoning system is used, there may be different legal justifications for its use in the New Student Admissions (PPDB) system. Students that are situated near each other might balance certain issues, such as maintaining capacity and commute time closeness, in addition to other local proximity. Additionally, because of zoning variables, learning may be monitored [9].

Furthermore, according to [10], it is inferred in his journal that schools may obtain students without needing to be the preferred school by using the school zoning system to implement innovative programs. All schools, nevertheless, are capable of producing excellent pupils for the next generation of learners. This may promote equitable access to high-quality education inside schools. All schools within the zoning will receive an equal distribution of high-quality students when

each school has the number of students specified by the zoning. This encourages schools to produce a high-caliber generation, and in line with this generation's needs, the school management system must also be improved.

The zoning system's implementation of justice for all Indonesians is based on two key points: (1) the government's zoning policy equalizes the quality of education; and (2) it gives citizens the opportunity to pursue higher education. (3) Zoning policies, which follow from the application of the fifth principle, require all schools to offer high-quality educational services to all students without regard to race [11].

Every aspect of education that is now in place has to be continuously improved by the government. The development of an approach to address issues pertaining to Indonesia's educational challenges is required in order to meet the country's education goals. Solving problems is an ongoing process that begins at the beginning and ends with a precise definition. Human resources and economic growth will undoubtedly benefit from the success of raising educational standards [12]. An educational institution's decision to admit students is crucial since doing so will benefit the school in the registration process for future students who will be handled properly. In addition to altering the dynamics of how people in the area perceive their access to educational possibilities [13].

When implementing data mining, K-Means is a clustering technique that is frequently used to cluster or group data into many data groups [14]. With this approach, a lot of data is grouped according to its center point (Centroid). The nearest items that are comparable to one another will be grouped together by data clustering, and the data to be clustered is chosen at random. Clustering features are present in grouped data [15]. It is envisaged that by applying data mining with the K-Means Clustering method, it would be possible to group student houses with their target school's location at a specific distance. In order to generate meaningful information, data clustering technology is a technique that highlights the similarities in features within a group [16].

B. Research Method

The partitional clustering approach, which divides data into many clusters without establishing a hierarchical structure between them [15]. The objective of this partitional clustering approach is to minimize the distance between the center of each cluster and all of the data. Each cluster in this method has a cluster center point, or centroid. The phases of this study consist of :

1. Design of Research

This design begins with a search for or identification of current issues. The next stage is then approved or rejected after a review of the literature or an analysis of the available data. If it is determined that the problem is comprehensive and manageable, data collection, system design, data processing, testing, and, if approved, outcomes are executed. A report is created by analyzing the outcomes.

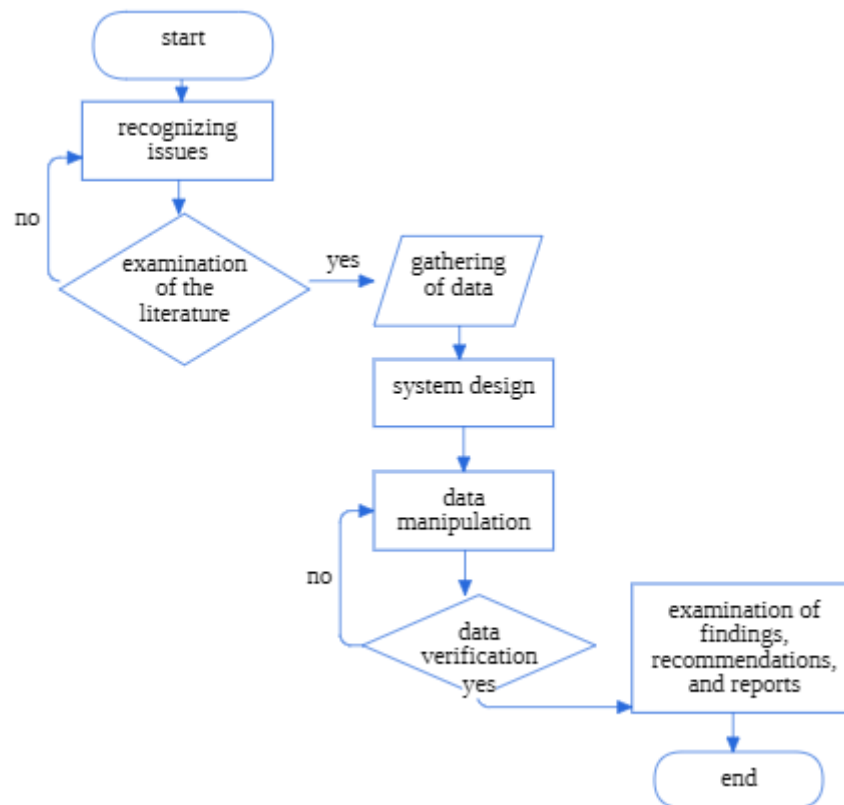


Figure 2. Design of Research

2. Data Gathering

In this instance, the author gathers information from SMK Negeri 1 Kedawaung Cirebon, where 847 students were enrolled for 2023 at the time the Admissions Process for New Students was conducted. then a study at the library to look up some material online and in relevant journals.

3. Steps of Processing and Testing

The used the K-Means technique in the data processing and testing phase, and Rapid Miner was used to test the data set.

4. Analysis on finding recommendations, and documents

The research is finished at this point and can be utilized as a helpful journal report.

C. Result and Discussion

A dataset is a group of data that is organized into information so that data mining techniques may be used. The data might be historical or from other sources. Rapid Miner software is used in data processing to apply the K-Means Clustering technique. The Rapid Miner program was used to create this study model.

The following operators were a few of the ones utilized to construct this model: Excel files containing previously preprocessed datasets may be read using Retrieve Clustering.

1. An operator called multiply makes a duplicate of a RapidMiner object. A RapidMiner object is taken from the input port by this operator, and a copy is sent to the output port
2. K-Means is the clustering algorithm operator used in data processing.
3. The K-means clustering algorithm's data processing performance is assessed and shown using the Performance Operator.

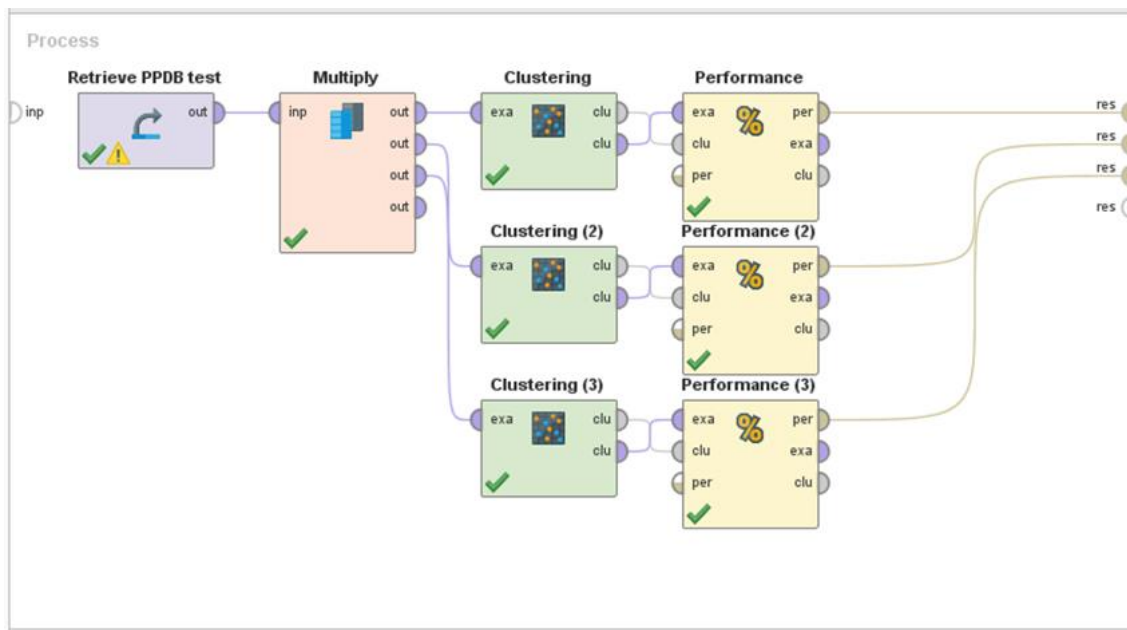


Figure 3. Research Model on Rapid Miner

4. The next figure provides more insight for parameters with clustering $k = 4$ with a maximum run of 10 times for repetition, utilizing the measure type MixedMeasures.

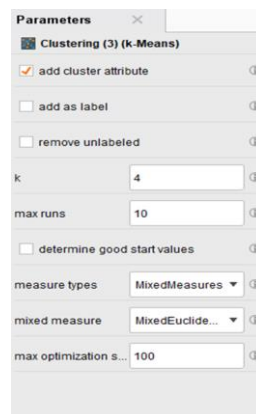


Figure 4. Parameters $k = 4$ on Rapid Miner

Assessment of the Outcomes

Determining the k value is a crucial step in applying the K-means clustering method. The anticipated number of clusters is k. The user determines the k value at the start of the data analysis procedure. Using the Devies-Bouldin Index (DBI) value from many trials, the k value in this study was calculated. The DBI values from multiple trials are shown in the table below :

Table 1. DBI Score

Test	K Value	BDI Value
1	2	1.103
2	3	0.725
3	4	0.718

The cluster outcomes achieved in the K-means clustering technique are determined by the DBI value. The better the cluster, the lower the DBI rating. Since the DBI value in this study is the lowest at 0.718, k = 4 is the value that was selected. Three clusters were generated in this study based on the DBI results. And with k = 3, here are the specifics of performance vector 3 with Davie Bouldin 0.718 :

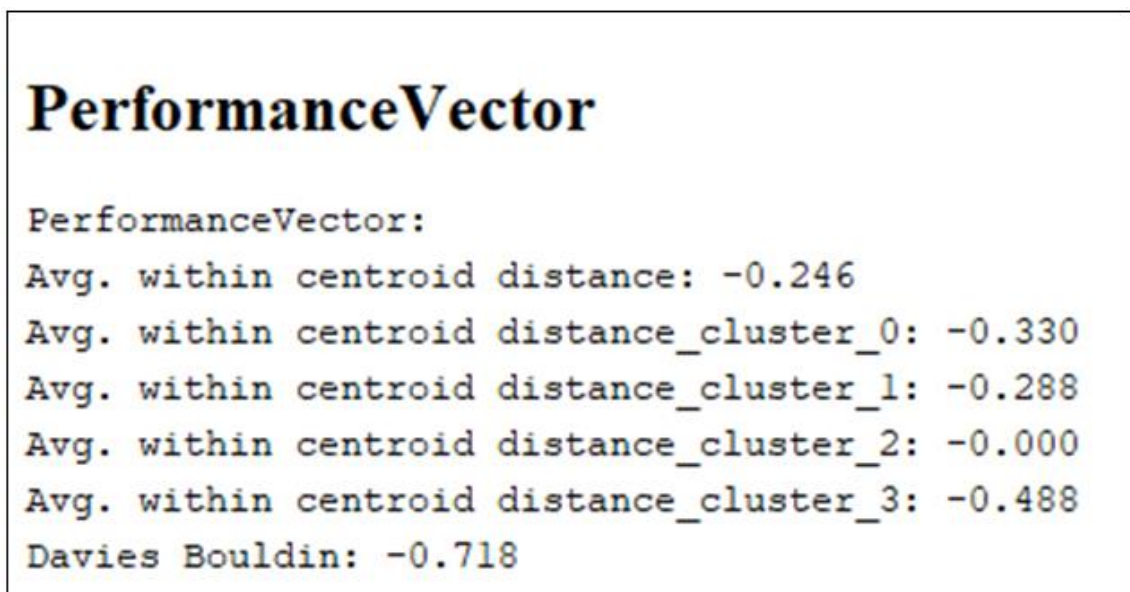


Figure 5. Performance Vector on Rapid Miner

There were 847 objects in all, and 4 clusters with the following definition were created :

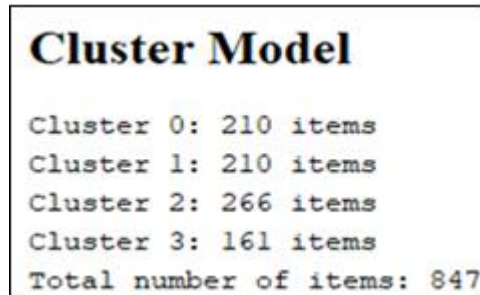


Figure 6. Cluster Model on Rapid Miner

The least number of clusters from choices school 1 and choice 2, specifically with $k = 4$, consisting of 161 individuals, and the highest number from choices school 1 and 2, specifically with $k = 3$, consisting of 266 individuals, are shown in detail in Figure 6 above. The school can notify the pupils who fall into one of the following categories based on this amount: within reach, distant reach, not in range, or not able to be in range due to the excessive distance between the school and their home.

The following table provides an explanation of the centroid or center point values found for each cluster :

Table 2. Centroid's Value

Atribut	Cluster_0	Cluster_1	Cluster_2	Cluster_3
Optional Distance 1	1	2.281	1	2.230
Optional Distance 2	2.314	1	1	2.248

The following graphic displays the colorful outcomes of the data processing: blue Cluster 1, green Cluster 2, yellow Cluster 3, and red Cluster 4 :

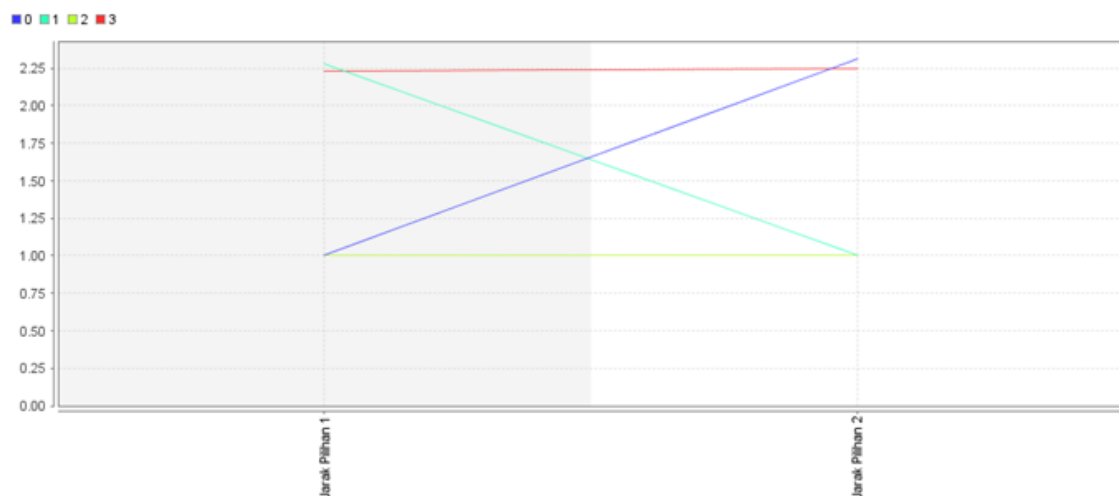


Figure 7. Result of Data Processing on Rapid Miner

Following processing of the data, Clusters _0, _1, _2, and _3 emerge with two special and two regular qualities, as shown in the following table:

ExampleSet (847 examples, 1 special attribute, 2 regular attributes)

Row No.	Nama	Jarak_Pilihan1	Jarak_Pilihan2
1	students anonymous 1	1	3
2	students anonymous 2	2	2
3	students anonymous 3	2	1
4	students anonymous 4	1	2
5	students anonymous 5	2	2
6	students anonymous 6	2	1
7	students anonymous 7	2	2
8	students anonymous 8	1	2
9	students anonymous 9	2	2
10	students anonymous 10	2	1
11	students anonymous 11	1	1

Figure 8. Group Findings on Information on RapidMiner

In RapidMiner, the data cluster procedure yields statistics with four attributes: name with ID, cluster with cluster, choice 1, and choice 2 distances with integers. View the accompanying image for clarification:

Name	Type	Missing	Statistics	Filter (4 / 4 attributes):	Search for Attributes
Id Nama	Polynomial	0	Least ZULKIFLI (1)	Most SHERLY (2)	Values SHERLY (2),
Cluster cluster	Nominal	0	Least cluster_3 (161)	Most cluster_2 (266)	Values cluster_2 (26
Jarak Pilihan 1	Integer	0	Min 1	Max 4	Average 1.551
Jarak Pilihan 2	Integer	0	Min 1	Max 4	Average 1.563

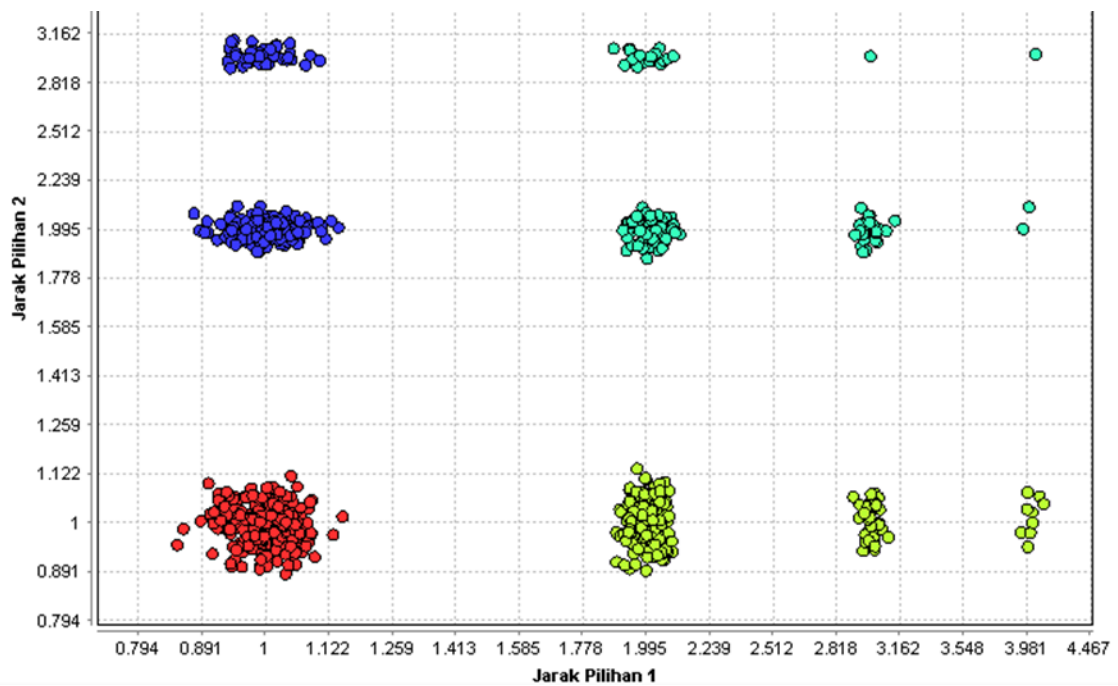
Figure 9. Results of Statistic on RapidMiner

A category that is within reach, far away, not within reach, and not likely to be within reach to be accepted is constructed in order to get the categories of students who complete PPDB. The specifics of this category are shown in the following table :

Table 3. Category of Distance

Category	Information	Distance
1	In the distance	<5000
2	Mid Range Entry	<9000
3	Not in the distance	<10000
4	Impossible	>10000

The Result of cluster data with K=4 is generated using the aforesaid data processing findings, as seen in the graphic below :

**Figure 10.** Results of Cluster Data on RapidMiner

The red cluster is the closest distance between option 1 and choice 2 schools in category 1, according to the results of the cluster data above. Students who complete PPDB for this cluster using the zoning method will be approved by the school. Because category 1 is still unfulfilled, PPDB students may still be admitted for yellow and blue with long-distance entry if there are still unfulfilled allocations. The green hue belongs to category 4, which is excluded from options 1 and 2 due to the student's extreme distance from home or the inability to be approved by the two schools in question.

D. Conclusion

This result demonstrates that the PPDB's zoning system can be a significant first step toward attaining equal access to education, but it also emphasizes the necessity of ongoing policy review and modification to meet needs and uphold educational equity.

And emphasize the following crucial points:

1. The Zoning System's Effect : The distribution of students in schools is significantly impacted by the zoning system. This results in variations in the regional distribution of student enrollment patterns, which may have an impact on the variety and proportion of students in each school.
2. Perception and Assessment of Policies : There are differences of opinion on how equitable and successful the zoning system is. While some may view it as a step in the right direction toward achieving equitable access to education, others may think it is unfair or still needs improvement.
3. Determined Difficulties : Numerous obstacles to zoning system implementation have been identified by research, including discrepancies between student distribution based on geographic zones and educational demands. This highlights the need to tailor regulations to actual demands in the industry.

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