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Analysis of the Influence of Training on Civil Servant Competency Using Apriori Algorithm

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Abstract

Improving the competence of the State Civil Apparatus (ASN) is one of the important factors in supporting the effectiveness of the performance of government organizations and improving the quality of public services to the community. Good ASN competencies can help achieve organizational goals optimally. One of the efforts made to improve the competence of ASN is through the implementation of various training programs that are tailored to job needs and technological developments. However, not all training programs implemented are able to have an optimal impact on improving the competence of ASN. Therefore, an analysis is needed to find out the relationship between the training followed and the competencies produced. This study aims to analyze the influence of training on ASN competencies and apply an A priori algorithm in finding patterns of relationships between the type of training, the field of training, the level of relevance, and the competence of ASN in the Binjai City BKPSDM. The method used in this study is data mining with the association rule technique using an A priori algorithm. The ASN training data used comes from the Binjai City BKPSDM and is processed using the RapidMiner application. The analysis process was carried out based on support, confidence, and lift ratio values to produce association rules that show the relationship between research variables. The results showed that the best association rule obtained was "If the Relevance Level is Very Relevant, the Competence is Very Good" with a support value of 54%, confidence of 100%, and a lift ratio of 1.54. These results show a strong relationship between the level of relevance of training and the improvement of ASN competence. The more relevant the training provided to the ASN field of duties, the higher the competence that can be achieved. Thus, the A priori algorithm can be used effectively to analyze the influence of training on ASN competencies and assist the Binjai City BKPSDM in developing a training program that is more targeted, effective, and in accordance with the needs of ASN competency development.

Keywords: *Data Mining, Apriori Algorithm, Training, ASN Competencies*

1. Introduction

The State Civil Apparatus (ASN) has an important role in the implementation of government and public services. To support the implementation of duties professionally, ASN needs to have competencies that are in accordance with their field of work. One of the efforts made by the government to improve the competence of civil servants is through various training programs and human resource development. The training provided to ASN is expected to be able to improve knowledge, skills, and work abilities. However, not all training has an optimal impact on improving the competence of ASN. Differences in the level of relevance of training to job needs can affect the results of competencies obtained. Therefore, an analysis is needed to determine the relationship between the training followed and the ASN competencies produced. The development of information technology allows the use of data mining techniques in the data analysis process. One of the methods that is often used is the A priori algorithm which is able to find patterns of relationships between data through association rules. This algorithm can be used to identify the relationship between the type of training, the field of training, the level of relevance, and the competence of ASN based on the value of support and confidence produced. This study aims to analyze the effect of training on ASN competencies using an A priori algorithm on ASN training data at the Binjai City Personnel and Human Resources Development Agency (BKPSDM). The results of the study are expected to provide information on the pattern of the relationship between training and ASN competencies and become a consideration in the preparation of a more effective and targeted training program [1].

2. Literature Review

2.1. Data Mining

Data Mining is the process of finding important patterns, relationships, and information hidden in large and complex data sets to support better decision-making. Data mining is not just an ordinary statistical analysis, but the use of statistical techniques, machine learning, and algorithms to extract new previously unknown knowledge from big data. Data mining is often associated with the Knowledge Discovery

in Databases (KDD) process even though the two are different; KDD is the entire process of discovering knowledge from data, while data mining is one of the core stages in the process [2].

2.2. Apriori Algorithm

Apriori algorithm is an algorithm in data mining that is used to find patterns of relationships between items in a transaction data through association rules. This algorithm works by calculating support and confidence values to find out the likelihood that an item will be purchased at the same time as another item [3].
At this point, the combination of items that meet the minimum support criteria is determined by the product combination in each transaction. The support value of an item is determined. The explanation of Support, Confidence, and Lift [4]

a. Support
Support is the percentage of occurrence of items or combinations of items in the data. Before looking for a support value, determine the minimum support value. The right minimum level of support can select combinations of items that rarely appear and maintain a more meaningful pattern. A minimum value that is too low will cause too many items and combinations of items in the search rules, on the other hand, a minimum value that is too high will cause a lot of information to be lost. Support is calculated based on the formula:

$$Support\ (A)\ = \frac{\sum Transaction\ contains\ A\ and\ B}{\sum Total\ \ transaction\ amount} \times 100\%$$

b. Confidence
Confidance is a measure of the probability between the item ancedents and the item consequents. The confidence value gives an idea of how often the combination of items appears at the same time rather than appearing separately. A minimum confidence value is also required to filter out data that does not have a strong relationship. The confidence value is obtained by the formula:

$$Confidence\ (A \rightarrow B) = \frac{Support\ (A \cup B)}{Support\ (A)} \times 100\%$$

c. Lift
Of course, it produces good rules. The elevator value is between 0 – 2 where the elevator value has interpretation rules:
1. The value of the resulting < 1 Rules Elevator is weak and not used
2. Lift value = 1 Item has no relationship then no rules are formed
3. The resulting > 1 Rules Elevator value is strong and wearable
The formula for finding the elevator value is

$$Lift\ (A \rightarrow B) = \frac{Confidence\ (A \rightarrow B)}{Support\ (B)} \times 100\%$$

2.3. ASN Training

Training is a learning process that is systematically designed by the organization to improve the knowledge, skills, and attitudes of employees to be able to carry out tasks and responsibilities effectively and efficiently. The training focuses on improving current job performance and aims to improve the gap between the competencies of employees and the competencies needed by the organization [5].
ASN training aims to improve the technical abilities and professional skills of employees so that they are able to carry out their duties and responsibilities effectively. In addition, training also plays a role in reducing the skill gap between the competencies possessed by employees and the demands of the positions held. Through proper training, the quality and productivity of public services can be improved so that they can support the realization of good governance. In addition, ASN training is also a means to encourage bureaucratic reform and improve the ability of ASN to adapt to technological developments and digital transformation that continues to develop [6].

2.4. ASN Competence

Competency is a basic characteristic possessed by individuals related to the ability to carry out work effectively. Competencies include a combination of knowledge, skills, attitudes, and work behaviors that can be measured and developed according to the demands of the position [7].

3. Research Methods

3.1. Research Data

The data used in this study came from the Personnel and Human Resources Development Agency (BKPSDM) in Binjai City. Data obtained indirectly by researchers not from documents or archives available at the relevant agency is referred to as secondary data. This study uses data from the State Civil Apparatus (ASN) about their training and competence. A priori method is used to analyze this data to determine the relationship between ASN training and competency improvement. Furthermore, the data collected from BKPSDM was processed and analyzed to find a relationship or pattern between the type of training and the competence of ASN.

Table 1: Data Training ASN

No	Jenis Pelatihan	Bidang	Tingkat Relevansi	Kompetensi
1	Bimtek Sosialisasi Peraturan UU	Regulasi	Sangat Relevan	Sangat Baik
2	Bimtek Peraturan Pemerintah	Regulasi	Sangat Relevan	Baik

3	Bimtek Sosialisasi peraturan UU	Regulasi	Sangat Relevan	Sangat Baik
4	Bimtek Sosialisasi peraturan UU	Regulasi	Sangat Relevan	Sangat Baik
5	Bimtek jabatan fungsional	Fungsional	Sangat Relevan	Baik
6	Bimtek jabatan fungsional	Fungsional	Sangat Relevan	Baik
7	Bimtek jabatan fungsional	Fungsional	Sangat Relevan	Baik
8	Bimtek jabatan fungsional	Fungsional	Sangat Relevan	Baik
9	Bimtek Admisistrasi Kepegawaian	Kepegawaian	Sangat Relevan	Sangat Baik
10	Bimtek Admisistrasi Kepegawaian	Kepegawaian	Sangat Relevan	Sangat Baik
11	Bimtek Admisistrasi Kepegawaian	Kepegawaian	Sangat Relevan	Sangat Baik
12	Bimtek Admisistrasi Kepegawaian	Kepegawaian	Sangat Relevan	Sangat Baik
13	Bimtek jabatan fungsional	Fungsional	Sangat Relevan	Baik
14	Bimtek Admisistrasi Kepegawaian	Kepegawaian	Sangat Relevan	Sangat Baik
15	Bimtek Admisistrasi Kepegawaian	Kepegawaian	Sangat Relevan	Sangat Baik
16	Bimtek jabatan fungsional	Fungsional	Sangat Relevan	Baik
17	Bimtek jabatan fungsional	Fungsional	Sangat Relevan	Baik
18	Bimtek Laporan SOP	Manajerial	Sangat Relevan	Baik
19	Bimtek Laporan SOP	Manajerial	Relevan	Baik
20	Bimtek Laporan SOP	Manajerial	Relevan	Baik

4. Analysis and Planning

4.1. Discussion

Using an A priori algorithm, this study analyzed data to determine the influence of training on the competence of the State Civil Apparatus (ASN). The data used comes from the Binjai City Personnel and Human Resources Development Agency (BKPSDM), and includes the type of training, training field, level of relevance, and competence of ASN.
The A priori method is used to identify the association rule between the training that ASN participates in and the level of competence created. Data processing is done through the RapidMiner application, which helps to find association patterns quickly and accurately. It is hoped that the results of this analysis process will help agencies choose a more efficient training program to improve the capabilities of ASN.

4.2. Program Interface Discussion

This study used the RapidMiner application version 5.3 to build the interface. It consists of a priori data processing process and the display of the main page of RapidMiner. The following are part of the program's interface:

4.3. Discussion Of Input Data

System input data in the form of data obtained from the Binjai City BKPSDM for the last 5 years. The system input data has been stored in Ms.Office Excel as a data container, so that the data used in the system can be seen as follows:

4.4. Implementation Of Apriori Algorithm Using RapidMiner

a. The RapidMiner Homepage

he RapidMiner homepage is the main view of the app that consists of several menus such as File, Edit, Process, Tools, View, and Help. These menus have their own functions to support the data mining processing process. On this page, users can create a new process (New Process), open an existing project (Open Process), and use the available templates. In addition, there is a toolbar and initial work area that will be used to compile process designs, import data, add operators, and run data mining algorithms such as a priori in the next stage.

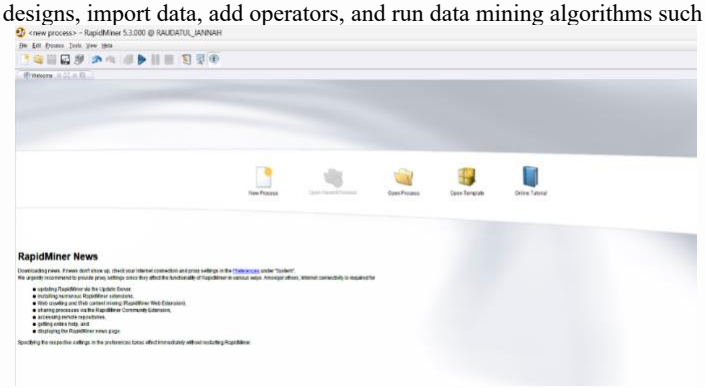


Fig. 1: RapidMiner homepage

b. Data Import Process

The following is a view of the data import process performed in RapidMiner. At this stage, the user selects the File menu, then selects Import Data and continues by selecting Import Excel Sheet because the data that has been prepared is stored in .xlsx format or Excel worksheet. The display also shows the Process Design area used to compile the data processing process, the Repositories panel to store data and projects, and the Parameters panel which functions to set the process parameters used.

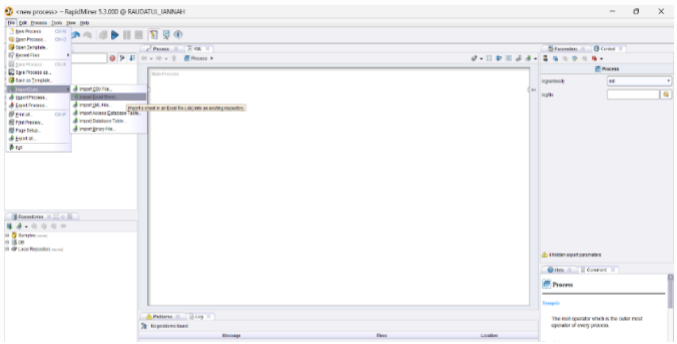


Fig. 2: Import Data and continues by selecting Import Excel Sheet

c. Data Pages in RapidMiner

The data was successfully imported into the RapidMiner application in the form of a binary representation using values of 0 and 1. The dataset consists of 537 data with attributes of training type, field, level of relevance, and ASN competence. A value of 1 indicates an attribute is possessed, while a value of 0 indicates an attribute is not possessed. This data representation is used to simplify the data processing process using a priori or FP-Growth algorithm in finding patterns of relationships between attributes.

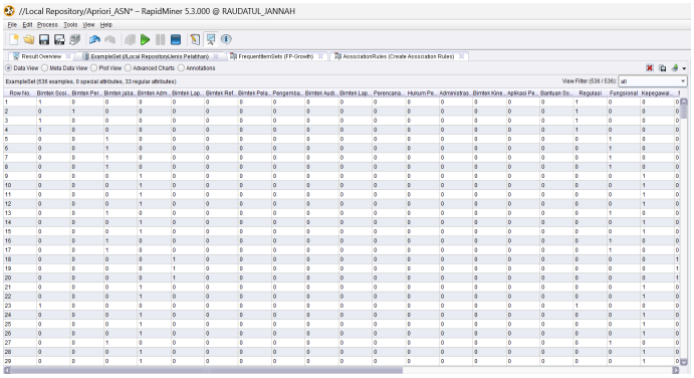


Fig. 3: The dataset consists of 537 data

d. RapidMiner Process View

The data processing process in RapidMiner begins by retrieving the dataset that has been stored in the repository using the Retrieve operator. Furthermore, the data is processed using the Discretize operator to adjust the data value before the transformation is performed. After that, the Numerical to Binominal operator is used to convert the data into binary form in the form of values of 0 and 1 so that it can be processed using an association algorithm. The next stage is to search for the frequent itemset pattern using the FP-Growth operator. The result of the pattern is then used in the Create Association Rules operator to form association rules between attributes. Once all operators are properly connected, the analysis process can be run on RapidMiner.

Fig. 4: Data Processing Stages for FP-Growth Algorithm in RapidMiner

e. Minimum Support Display

The minimum support value for FP-Growth operators is determined manually with a value of 0.1 (10%). In addition, a minimum number of itemsets is set as many as 500 to obtain frequent itemsets used in the formation of association rules.

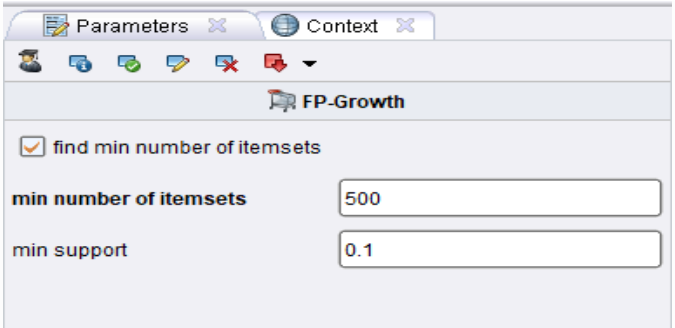


Fig. 5: Minimum Support and Itemset Settings in RapidMiner

f. Minimum Confidence Display

In the Create Association Rules operator, a minimum confidence value of 0.1 (10%) is used. This value serves as the minimum confidence limit so that only association rules that meet the minimum confidence value of 10% are produced.

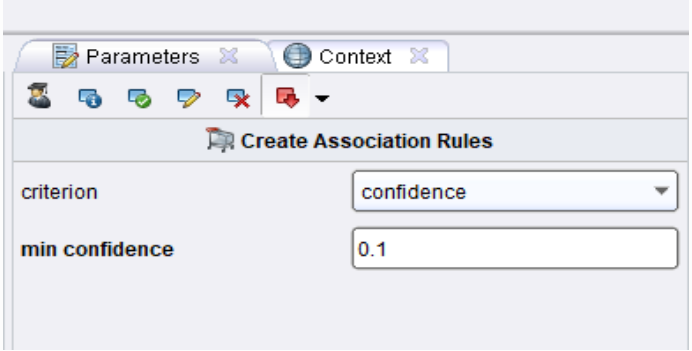


Fig. 6 : Minimum Confidence Threshold Setting in RapidMiner

g. Itemset Display

The results of the frequent itemset obtained from the data processing process using the FP-Growth algorithm in RapidMiner are displayed. The results show that there are 99 frequent itemsets that meet the minimum support values that have been determined, with itemset sizes ranging from 3 to 4 items. The highest support score obtained was 0.271 or 27.1% in the combination of Very Relevant, Very Good, Staffing, and Technical Administrative Guidance. The results of the frequent itemset show that there is a relationship between attributes that often appear simultaneously in ASN training data and is used as the basis for the formation of association rules.

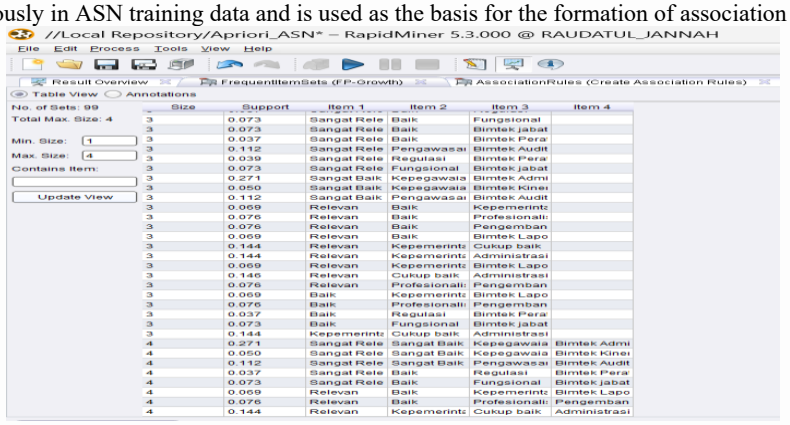
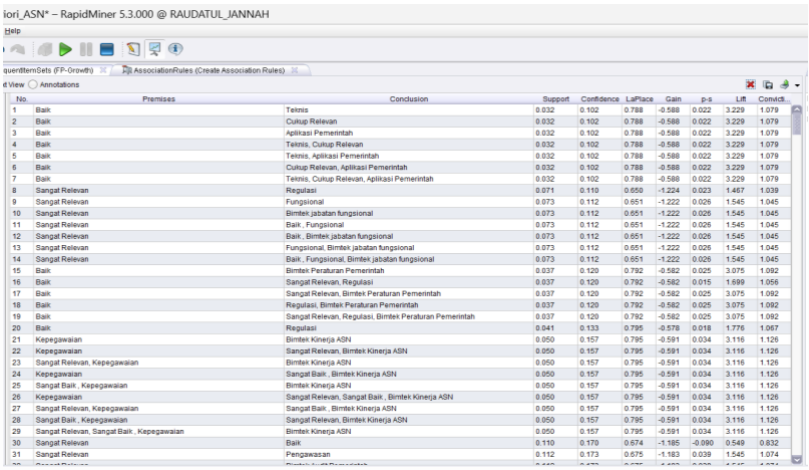


Fig.7: Output Display of Frequent Itemsets in RapidMiner

h. Association Display

Displays a table of association rules results obtained from the Create Association Rules process in RapidMiner. The table shows some of the association rules that have been formed along with the values of support and confidence. One of the rules produced is Personnel, Technical Guidance for ASN Performance with a confidence value of 0.157 or 15.7%. These results show that there is a relationship between attributes in ASN training data that can be used to determine the pattern of relationships between the training field, the level of relevance, and the competence of ASN.



No.	Premises	Conclusion	Support	Confidence	LaPlace	Gain	p-s	Lift	Convict
1	Baik	Teknis	0.032	0.102	0.788	-0.588	0.022	3.229	1.079
2	Baik	Cukup Relevan	0.032	0.102	0.788	-0.588	0.022	3.229	1.079
3	Baik	Aplikasi Pemerintah	0.032	0.102	0.788	-0.588	0.022	3.229	1.079
4	Baik	Teknis, Cukup Relevan	0.032	0.102	0.788	-0.588	0.022	3.229	1.079
5	Baik	Teknis, Aplikasi Pemerintah	0.032	0.102	0.788	-0.588	0.022	3.229	1.079
6	Baik	Cukup Relevan, Aplikasi Pemerintah	0.032	0.102	0.788	-0.588	0.022	3.229	1.079
7	Baik	Teknis, Cukup Relevan, Aplikasi Pemerintah	0.032	0.102	0.788	-0.588	0.022	3.229	1.079
8	Sangat Relevan	Regulasi	0.071	0.110	0.650	-1.224	0.023	1.467	1.039
9	Sangat Relevan	Fungsional	0.073	0.112	0.651	-1.222	0.026	1.545	1.045
10	Sangat Relevan	Bimtek jabatan fungsional	0.073	0.112	0.651	-1.222	0.026	1.545	1.045
11	Sangat Relevan	Baik , Fungsional	0.073	0.112	0.651	-1.222	0.026	1.545	1.045
12	Sangat Relevan	Baik , Bimtek jabatan fungsional	0.073	0.112	0.651	-1.222	0.026	1.545	1.045
13	Sangat Relevan	Fungsional, Bimtek jabatan fungsional	0.073	0.112	0.651	-1.222	0.026	1.545	1.045
14	Sangat Relevan	Baik , Fungsional, Bimtek jabatan fungsional	0.073	0.112	0.651	-1.222	0.026	1.545	1.045
15	Baik	Bimtek Peraturan Pemerintah	0.037	0.120	0.792	-0.582	0.025	3.075	1.092
16	Baik	Sangat Relevan, Regulasi	0.037	0.120	0.792	-0.582	0.015	1.699	1.056
17	Baik	Sangat Relevan, Bimtek Peraturan Pemerintah	0.037	0.120	0.792	-0.582	0.025	3.075	1.092
18	Baik	Regulasi, Bimtek Peraturan Pemerintah	0.037	0.120	0.792	-0.582	0.025	3.075	1.092
19	Baik	Sangat Relevan, Regulasi, Bimtek Peraturan Pemerintah	0.037	0.120	0.792	-0.582	0.025	3.075	1.092
20	Baik	Regulasi	0.041	0.133	0.795	-0.578	0.018	1.776	1.067
21	Kepegawaian	Bimtek Kinerja ASN	0.050	0.157	0.795	-0.591	0.034	3.116	1.126
22	Kepegawaian	Sangat Relevan, Bimtek Kinerja ASN	0.050	0.157	0.795	-0.591	0.034	3.116	1.126
23	Sangat Relevan, Kepegawaian	Bimtek Kinerja ASN	0.050	0.157	0.795	-0.591	0.034	3.116	1.126
24	Kepegawaian	Sangat Baik , Bimtek Kinerja ASN	0.050	0.157	0.795	-0.591	0.034	3.116	1.126
25	Sangat Baik , Kepegawaian	Bimtek Kinerja ASN	0.050	0.157	0.795	-0.591	0.034	3.116	1.126
26	Kepegawaian	Sangat Relevan, Sangat Baik , Bimtek Kinerja ASN	0.050	0.157	0.795	-0.591	0.034	3.116	1.126
27	Sangat Relevan, Kepegawaian	Sangat Baik , Bimtek Kinerja ASN	0.050	0.157	0.795	-0.591	0.034	3.116	1.126
28	Sangat Baik , Kepegawaian	Sangat Relevan, Bimtek Kinerja ASN	0.050	0.157	0.795	-0.591	0.034	3.116	1.126
29	Sangat Relevan, Sangat Baik , Kepegawaian	Bimtek Kinerja ASN	0.050	0.157	0.795	-0.591	0.034	3.116	1.126
30	Sangat Relevan	Baik	0.110	0.170	0.574	-1.185	-0.090	0.549	0.832
31	Sangat Relevan	Pengawasan	0.112	0.173	0.575	-1.183	0.039	1.545	1.074

Fig.8: Output Display of the Create Association Rules Operator in RapidMiner

i. RapidMiner Studio Display

The results of the formation of the Association rules from the testing process using the RapidMiner Studio application can be shown in the following image. The resulting association rules show the relationship between the field of training, the level of relevance, and the competence of ASN based on the predetermined confidence value. The confidence value produced ranges from 0.102 to 0.157, with the Personnel rule, ASN Performance Technical Guidance has the highest confidence value of 0.157 or 15.7%. These results show a relationship between attributes that can be used to determine the pattern of relationships in ASN training data.

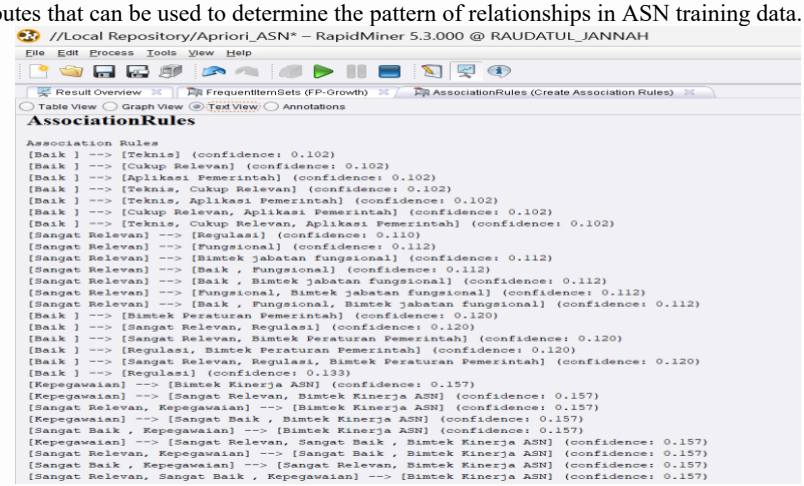


Fig. 9 : RapidMiner Studio Display Showing Final ASN Training Data Relations

4.5. Implementation

The application of a priori algorithm in this study was used to analyze the relationship between training and ASN competencies based on the data obtained. The data processing process is carried out using the RapidMiner Studio application to find the relationship between attributes and produce the best association rules based on the support and confidence values that have been determined.

4.6. Test Result Description

Based on the table of 537 training data on the competence of ASN that has been processed using RapidMiner, the results are obtained in the form of 10 association rules with the following details:

1. Rule 1: If the field is government, the competence is quite good, the type of training is government administration, then the level of relevance is relevant. Has 14% Support and 100% Confidence and 3.11 Lift
2. Rule 2: If the level of relevance is relevant, the field is professionalism, the type of training is ASN development, then the competence is good. Has Support of 8% and Confidence of 100% and Lift of 3.22
3. Rule 3: If the field is government, the type of training is the report of the minister of home affairs, then the level of relevance is relevant and the competence is good. Has 7% Support and 100% Confidence and Lift of 5.95
4. Rule 4: If the competence is good, the field is functional, the type of training is technical guidance for functional positions, then the level of relevance is very relevant. Has 7% Support and 100% Confidence and Lift of 1.54
5. Rule 5: If the type of training is government audit technical guidance, the field of supervision is very relevant and the competence is very good. Has 11% Support and 100% Confidence and 1.86 Lift
6. Rule 6: If the type of training is technical guidance in personnel administration, the field of personnel, the competence is very good, then the level of relevance is very relevant. Has Support of 27% and Confidence of 100% and Elevator of 1.54
7. Rule 7: If the level of relevance is very relevant, the field is personnel, then the competence is very good and the type of training is technical guidance for personnel administration. Has Support of 27% and Confidence of 100% and Lift of 3.11.

8. Rule 8: If the level of relevance is very relevant, the competence is very good, then the field of staffing and the type of training is technical guidance for personnel administration. Has Support of 27% and Confidence of 100% and Lift of 1.86
9. Rule 9: If the field is supervision, the type of training is government audit technical guidance, then the level of relevance is very relevant and the competence is very good. Has 11% Support and 100% Confidence and 1.86 Lift
10. Rule 10: If the competence is very good, the field is personnel, the type of training is technical guidance for ASN performance, then the level of relevance is very relevant. Has 5% Support and 100% Confidence and 1.54 Lift

Based on the results of the analysis, the best association rules obtained are:
If the type of training is technical guidance in personnel administration, the field of personnel, the competence is very good, then the level of relevance is very relevant. Has 27% Support and 100% Confidence and 1.54 Lift

5. Conclusion

Application Based on the results of the study on the analysis of the influence of training on the competence of the State Civil Apparatus (ASN) at the Binjai City Personnel and Human Resources Development Agency (BKPSDM) using an A priori algorithm, several conclusions can be drawn as follows:

1. Training affects the competence of ASN, especially if the training provided has a high level of relevance to the ASN's field of duties. The results of the analysis showed that the best association rule was "If the Relevance Level is Very Relevant, then the Competence is Very Good" with a support value of 54%, 100% confidence, and a lift ratio of 1.54. These results show that all data that meet the conditions of the level of relevance are very relevant to produce very good competence, so it can be concluded that the suitability of training with job needs has a strong relationship with the improvement of ASN competence.
2. A priori algorithm was successfully applied to analyze the influence of training on ASN competencies through the formation of association rules based on support, confidence, and lift ratio values. The best rule obtained in the 4 itemsets is "If the Type of Training is Technical Guidance for Personnel Administration, the Field of Personnel, and the Competence is Very Good, then the Relevance Level is Very Relevant" with a support score of 27%, confidence of 100%, and a lift ratio of 1.54. These results prove that the algorithm is a priori able to find a strong relationship pattern between the type of training, the field of training, the level of relevance, and the competence of ASN so that it can be used as a basis for decision-making in the preparation of a more targeted training program.

References

[1.] RUSMAWATI, R. (2025). *PENGARUH PELATIHAN DAN PENGEMBANGAN KARIR TERHADAP PENINGKATAN KINERJA PEGAWAI DI SEKRETARIAT DAERAH KABUPATEN KOTAWARINGIN BARAT* (Doctoral dissertation, Universitas Islam Sultan Agung Semarang).
[2.] Srirahayu, A., & Pribadie, L. S. (2023). Review Paper Data Mining Klasifikasi Data Mining. *Jurnal Ilmiah Informatika Global*, *14*(1).
[3.] Fernanda, K. D., Widodo, A. P., & Lemantara, J. (2023). Analysis and Implementation of the Apriori Algorithm for Strategies to Increase Sales at Sakinah Mart. *JUITA: Jurnal Informatika*, 203-211.
[4.] Wibowo, A., Ivanoti, V. I., & Sari, M. H. P. (2023). Employee Education and Training Recommendations using the Apriori Algorithm. *Jurnal RESTI (Rekayasa Sistem Dan Teknologi Informasi)*, *7*(5), 1118-1131.
[5.] Rahmaniyah, S., Aritmagitaningtias, L., & Handayani, N. (2024). Program Pendidikan dan Pelatihan di Lembaga Administrasi Negara: Mempersiapkan ASN Masa Depan. *Arus Jurnal Sosial Dan Humaniora*, *4*(3), 2329-2335.
[6.] Wibowo, A., Ivanoti, V. I., & Sari, M. H. P. (2023). Employee Education and Training Recommendations using the Apriori Algorithm. *Jurnal RESTI (Rekayasa Sistem Dan Teknologi Informasi)*, *7*(5), 1118-1131.
[7.] Karinda, K., & Nursin, E. (2018). Problem and Competence Development Design of State Civil Apparatus (ASN) in Banggai District through Education and Training Activities. *Jurnal Studi Pemerintahan*, 452-486.