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Determination Of Budi Darma University Ordering Patterns Needs With Apriory Algorithm

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Abstract

In a university, office stationery is needed to support the teaching and learning process, one of which is paper, markers, ink and so on. In determining the right strategy in terms of purchasing stationery, an effective analysis is needed, to reduce excessive spending. One way that can be done to order stationery is to use data mining techniques. The data mining technique used in this case is to use the Apriori algorithm. The a priori algorithm is one of the classical data mining algorithms. The a priori algorithm is used so that computers can learn association rules, look for patterns of relationships between one or more items in a dataset. This research was conducted by observing several research variables that are often considered by universities in ordering office stationery. (ATK).

Keywords : Data Mining, ATK, Apriori Algorithm

1. INTRODUCTION

Information technology has developed very rapidly and has had a considerable effect on the in human life. This influence cannot be separated from information technology, such as in aspects of the economy, health, education, business, and others. In the business aspect, especially in the field of sales, a businessman will collect various information to obtain maximum profits and minimize losses.[1]

In a university, office stationery is needed so that the teaching and learning process runs smoothly. Every campus needs to pay attention to this, because ATK is a trivial thing that is often neglected in its procurement so that it can have an impact on the process of running smoothly or not. Universities often still use the manual method in ordering office stationery only based on estimates. Such a mechanism results in untargeted and wasted costs. The method that will be used in this research is the association rules method using an a priori algorithm, which is an algorithm to find high-frequency patterns. The association rule in question is carried out through a mechanism for calculating support and confidence from an item relationship. The Apriori algorithm has been used in several previous studies, but no one has used it to determine the rules for ordering ATK. This a priori algorithm will be suitable to be applied when there are several item relationships to be analyzed. One of them that can be applied is in the ATK order[2]

Apriori algorithm is one of the algorithms in the field of data mining for extracting association rules or better known as association rule mining (ARM). Apriori algorithm is an iterative approach where k-itemset is used to explore (k + 1)-itemset[3]. Utilization of existing data in the information system to support decision-making activities, it is not enough to just rely on operational data, a data analysis is needed to explore the potential of existing information. Decision makers try to take advantage of existing data warehouses to explore useful information to help make decisions, this encourages the emergence of new branches of science to overcome the problem of extracting important or interesting information or patterns from large amounts of data, which is called data mining. The use of data mining techniques is expected to provide knowledge that was previously hidden in the data warehouse so that it becomes valuable information*[4]*

2. METHOD

Data mining is a process of mining or extracting meaning from such a large amount of data, by extracting the data to find certain patterns and analyzing it to determine*get some knowledge or information[5]. A method used to* extracting patterns from data or commonly referred to as Knowledge Discovery in Database (KDD) consists of the following steps:

1. Data cleaning
2. Data integration
3. data selection
4. Data transformation
5. Data mining
6. Pattern evaluation
7. Knowledge presentation

Data mining is the process of extracting interesting information from large amounts of data so as to obtain useful patterns and knowledge. The extracted information cannot be considered trivial, implicit, previously unknown and potentially useful[6]. The pattern found must contain benefits that can be obtained, such as: for economic affairs. The patterns found help us to make good predictions are not trivial. The pattern found can be called structural, because it has a form that can be examined, considered, and used for future information. In other words, it helps explain the data. The beginning of the presence of data mining, because of the need for a scientific discipline to process very large amounts of data. One can call this large amount of data an abundance of data. The abundance of unprocessed data led to the emergence of the statement "data graveyard". Decision makers have not been able to use the data because it is still raw data.

A priori algorithm is a type of association rule in data mining. Association analysis is a data mining technique to find associative rules between a combination of items/attributes. An example of an associative rule from purchasing analysis in a mini market is to know how likely it is that a customer buys a cold drink at the same time as buying a snack. With this knowledge, the mini market owner can arrange the placement of the shelves of the two products close together.

The basic methodology of association analysis is divided into two stages[7] :

a. High frequency pattern analysis

This stage is looking for a combination of items that meet the minimum requirements of the support value in databases. The support value of an item is obtained by the following formula:

$$\text{Support (A)} = \frac{\text{Jumlah Transaksi mengandung A}}{\text{total transaksi}} \text{ x } 100\% \quad \text{.....(1)}$$

While the support value of 2 items is obtained from the following formula:

$$\text{Support (A n B)} = \frac{\text{Jumlah Transaksi mengandung A dan B}}{\text{total transaksi}} \text{ x } 100\%$$

b. Associative rule formation

After all high-frequency patterns are found, then look for associative rules that meet the minimum requirements for confidence by calculating the confidence of the associative rule A_B

$$\text{Confidence} = P(B \mid A) = \frac{\text{Jumlah Transaksi mengandung A dan B}}{\text{Jumlah transaksi yang mengandung A}} \times 100\% \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

3. RESULT AND DISCUSSION

a. Data Needs

The data used in designing the application for determining the pattern of ordering stationery needs by collecting transactions for 60 days from April to May, with the following transaction data:

Table 1. ATK Orders for the April-May Period

No.	Date	ATK Login
1	01/04/2021	1 Box of Pens, 1 Ream of HVS Folio Paper, 3 Reams of A4 HVS Paper
2	02/04/2021	Plain Envelopes 2 Boxes, 10 Pcs Receipt Books, 2 Pcs Stop Map
3	03/04/2021	1 box of pencils, 3 boxes of marker ink, 30 erasers, 2 black tires lack
4	04/04/2021	1 piece iron ruler, 2 stapler, 40pcs marker, 1 box of paper glue
5	05/04/2021	Contents of 1 box of stapler, 2 Pcs of Pencil Sharpener, 1 Box of Tip-Ex, 5 Pcs of Stamp Ink
6	06/04/2021	5 pieces of paper punch, 4 squares of Ink Markers, 5 Pcs of Plastic Ruler
7	07/04/2021	2 Pcs Large Paper Clips, 2 Pcs Small Paper Clips, 5 Scissors, 5 Pieces of Large Tape
8	08/04/2021	5 pieces of small tape, 10 pieces of Cutter knife, 10 small batteries
9	09/04/2021	Lack of Clear Tires 5 Pieces, Lack of Brown Tires 10 Pieces, Small Envelopes 2 Boxes
10	10/04/2021	10 Pcs Plastic Stop Map, 2 Pcs Double Tip, 10 Pcs Printer Machine Ribbons
11	11/04/2021	L120 Printer Ink 4 PCs, L220 Printer Ink 4 PCs, Epson L210 Printer Ink 4 PCs
12	12/04/2021	LX-300 Printer Ribbons 10 Pcs, Flashdisk 2 Pcs, CD-RW 10 Pcs, CD-R 10 Pcs
13	13/04/2021	Air freshener 20 PCs, Mops 5 pieces, plastic buckets 10 pieces
14	14/04/2021	4 doormats, 5 dusters, 10 flower brooms
15	15/04/2021	10 pieces of porcelain, 4 pieces of toilet brush, 5 pieces of tissue paper
16	16/04/2021	Hand Soap 10 pieces, cloth 10 pieces,
17	17/04/2021	2 Boxes of Pens, 2 Reams of Folio HVS Paper, 3 Reams of A4 HVS Papers
18	18/04/2021	Plain Envelopes 1 Box, 15 Pcs Receipt Books, 3 Pcs Stop Map
19	19/04/2021	2 boxes of pencil, 5 boxes of marker ink, 20 erasers, 5 black tires lack
20	20/04/2021	2 pieces of iron ruler, 3 pieces of stapler, 40 pcs of markers, 2 boxes of paper glue
21	21/04/2021	Contents of 1 box of stapler, 2 Pcs of Pencil Sharpener, 1 Box of Tip-Ex, 5 Pcs of Stamp Ink
22	22/04/2021	5 pieces of paper punch, 4 squares of Ink Markers, 5 Pcs of Plastic Ruler

No.	Date	ATK Login
23	23/04/2021	3 Pcs Large Paper Clips, 4 Pcs Small Paper Clips, 5 Pcs Scissors, 3 Pcs Large Tapes
24	24/04/2021	5 pieces of small tape, 10 pieces of Cutter knife, 10 small batteries
25	04/25/2021	Lack of Clear Tires 5 Pieces, Lack of Brown Tires 10 Pieces, Small Envelopes 2 Boxes
26	26/04/2021	Plastic Stop Map 15 Pcs, Double Tip 12 Pcs, Printer Ribbon 20 Pcs
27	27/04/2021	L120 Printer Ink 4 PCs, L220 Printer Ink 4 PCs, Epson L210 Printer Ink 4 PCs
28	28/04/2021	LX-300 Printer Ribbons 10 Pcs, Flashdisk 2 Pcs, CD-RW 10 Pcs, CD-R 10 Pcs
29	29/04/2021	L120 Printer Ink 2 PCs, L220 Printer Ink 2 Pcs, Epson L210 Printer Ink 2 PCs
30	30/04/2021	LX-300 Printer Ribbons 10 Pcs, Flashdisk 2 Pcs, CD-RW 10 Pcs, CD-R 10 Pcs
31	01/05/2021	Plain Envelopes 1 Box, 15 Pcs Receipt Books, 3 Pcs Stop Map
32	02/05/2021	2 boxes of pencil, 5 boxes of marker ink, 20 erasers, 5 black tires lack
33	03/05/2021	2 pieces of iron ruler, 3 pieces of stapler, 40 pcs of markers, 2 boxes of paper glue
34	04/05/2021	Contents of 1 box of stapler, 2 Pcs of Pencil Sharpener, 1 Box of Tip-Ex, 5 Pcs of Stamp Ink
35	05/05/2021	5 pieces of paper punch, 4 squares of Ink Markers, 5 Pcs of Plastic Ruler
36	06/05/2021	3 Pcs Large Paper Clips, 4 Pcs Small Paper Clips, 5 Pcs Scissors, 3 Pcs Large Tapes
37	07/05/2021	5 pieces of small tape, 10 pieces of Cutter knife, 10 small batteries
38	08/05/2021	L120 Printer Ink 4 PCs, L220 Printer Ink 4 PCs, Epson L210 Printer Ink 4 PCs
39	09/05/2021	LX-300 Printer Ribbons 10 Pcs, Flashdisk 2 Pcs, CD-RW 10 Pcs, CD-R 10 Pcs
40	10/05/2021	Air freshener 20 PCs, Mops 5 pieces, plastic buckets 10 pieces
41	11/05/2021	1 Box of Pens, 1 Ream of HVS Folio Paper, 3 Reams of A4 HVS Paper
42	12/05/2021	Plain Envelopes 2 Boxes, 10 Pcs Receipt Books, 2 Pcs Stop Map
43	13/05/2021	1 box of pencils, 3 boxes of marker ink, 30 erasers, 2 black tires lack
44	14/05/2021	1 piece iron ruler, 2 stapler, 40 Pcs marker, 1 box of paper glue, 10 Pcs Alteco
45	15/05/2021	5 pieces of hole punch, 4 squares of Ink Markers, 5 Pcs of Plastic Ruler, 10 Rims of A4 Paper
46	16/05/2021	3 Pcs Large Paper Clips, 4 Pcs Small Paper Clips, 5 Pcs Scissors, 3 Pcs Large Tapes, 5 Pcs Double Tips
47	17/05/2021	5 pieces of small tape, 10 pieces of Cutter knife, 10 small batteries
48	18/05/2021	Plain Envelopes 1 Box, 15 Pcs Receipt Books, 3 Pcs Stop Map

No.	Date	ATK Login
49	19/05/2021	2 boxes of pencils, 5 boxes of marker ink, 20 erasers, 5 black tires lack, 10 small steppers
50	20/05/2021	2 pieces of iron ruler, 3 pieces of stapler, 40 pcs of markers, 2 boxes of paper glue
51	21/05/2021	Contents of 1 box of stapler, 2 Pcs of Pencil Sharpener, 1 Box of Tip-Ex, 5 Pcs of Stamp Ink
52	22/05/2021	5 pieces of paper punch, 4 squares of Ink Markers, 5 Pcs of Plastic Ruler
53	23/05/2021	3 Pcs Large Paper Clips, 4 Pcs Small Paper Clips, 5 Pcs Scissors, 3 Pcs Large Tapes
54	24/05/2021	5 pieces of small tape, 10 pieces of Cutter knife, 10 small batteries
55	25/05/2021	1 box of pencils, 3 boxes of marker ink, 30 erasers, 2 black tires lack
56	26/05/2021	Iron Ruler 4 Pieces, Stapler 2 Pieces, Markers 40 Pcs, Paper Glue 3 Boxes
57	27/05/2021	5 pieces of paper punch, 4 squares of Ink Markers, 5 Pcs of Plastic Ruler
58	28/05/2021	L120 Printer Ink 2 PCs, L220 Printer Ink 4 Pcs, Epson L210 Printer Ink 3 PCs
59	29/05/2021	LX-300 Printer Ribbons 10 Pcs, Flashdisk 2 Pcs, CD-RW 10 Pcs, CD-R 10 Pcs
60	30/05/2021	20 PCs air freshener, 5 pieces of Mops, 10 plastic buckets, 10 pieces of goods receipts

b. Data analysis

The available data is processed and separated from each unit of goods to facilitate the process of determining the pattern of ordering ATK needs at Budidarma University with the data in the following table:

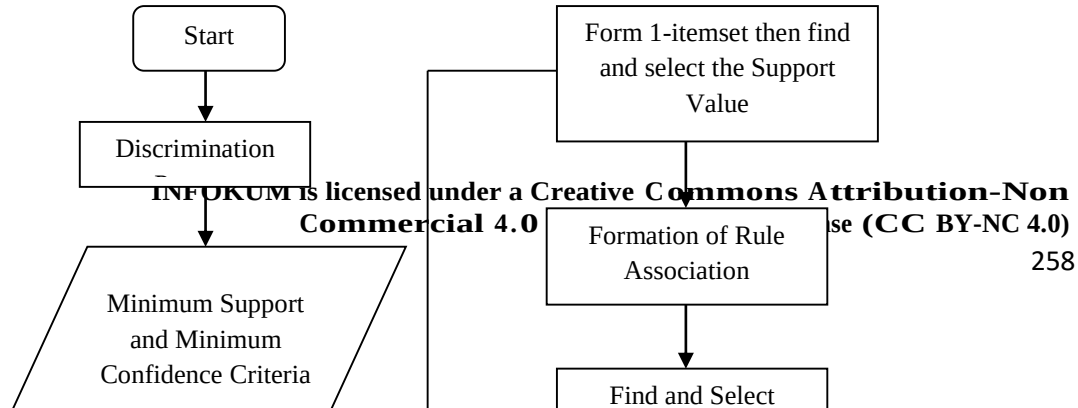
Table 2. ATK Code and Name

Code	ATK name
A1	A4 paper
A2	HVS Kertas paper
A3	Lack of Black Tires
A4	Lack of Brown Tires
A5	Envelope
A6	Iron ruler
A7	Printer ink
A8	Stapler
A9	Fountain pen
A10	Pencil
A11	CD-R
A12	CD-RW
A13	Paper Clip

Code	ATK name
A14	Paper Hole
A15	masking tape
A16	Knife Cutter
A17	Small Battery
A18	Eraser
A19	Ink Markers
A20	Scissors
A21	mop
A22	Air freshener
A23	Plastic Bucket
A24	Paper glue
A25	Pecil Sharpener
A26	Receipt Book
A27	Stop Map
A28	Blank Bon
A29	Flashdisk
A30	LX-300 . Printer Ribbon
A31	Plastic Ruler
A32	Ink stamp
A33	Whiteboard marker
A34	Type X
A35	Handsoap
A36	Duster
A37	Porstex
A38	Toilet brush
A39	Tissue Paper
A40	Lack of Clear Tires

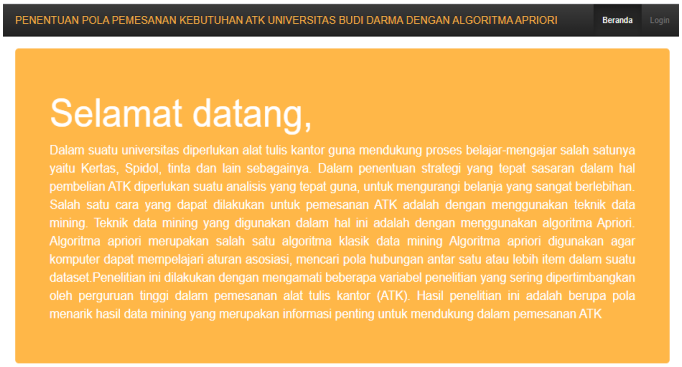
c. Algorithm Analysis

This section will describe the process of forming an analysis of stationery orders at Budidarma University with the determination of Support, Confidence, to the rules of association. In this study, the minimum support value used is 10% and the minimum confidence value is 50%, with the following diagram:



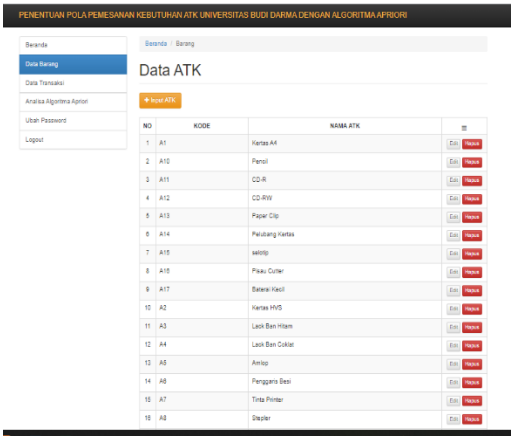
d. Implementation

1. Homepage

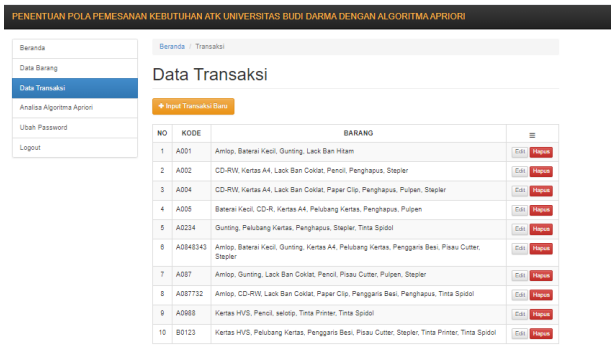


2. Main Menu

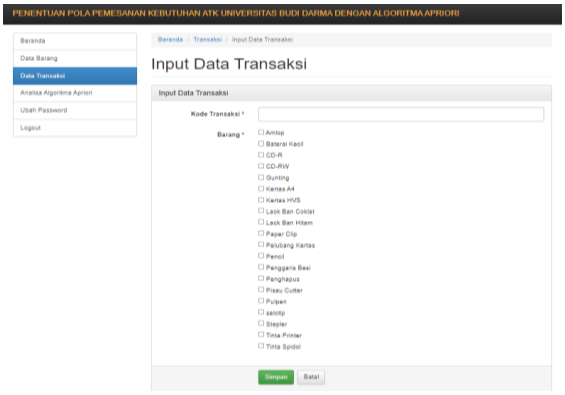
3. Sub Data Items



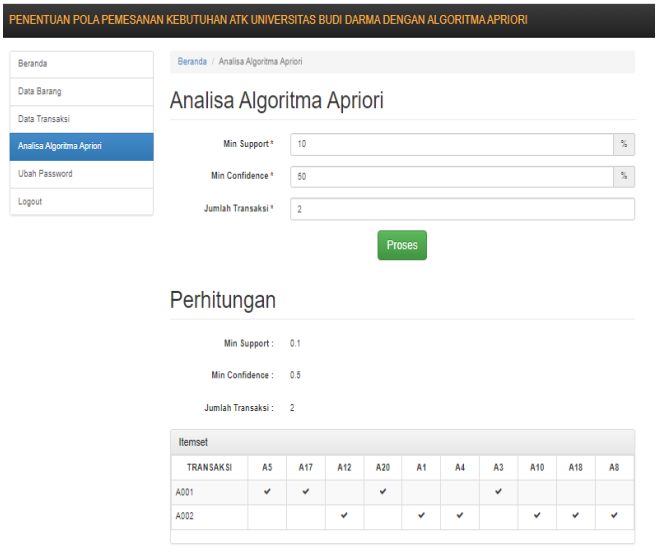
4. Sub Display of Transaction data



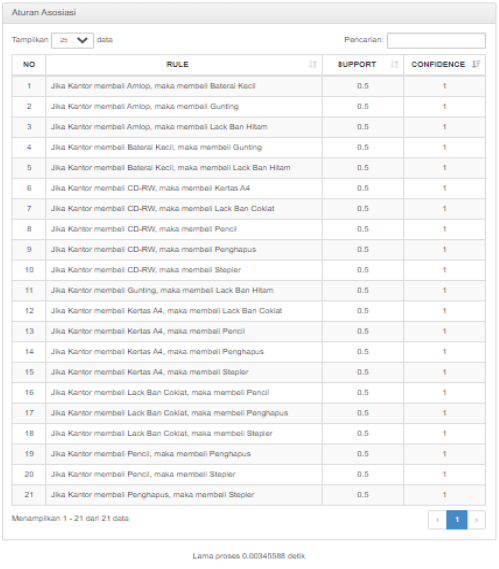
5. Transaction Data



6. Determining the Value of Support and Confidance



7. Association Rules



4. CONCLUSION

a. A priori algorithms can be implemented to obtain usable patterns from existing history
b. Can provide users to optimize the use of existing stock
c. Knowing what items are likely to be used a lot.

For further research, researchers can provide suggestions and input to get a pattern that can optimize the use of goods in one year. In addition, in the following year, you can predict what items must be ordered for the needs of Budi Darma.

Reference

[1] P. N. Harahap and S. Sulindawaty, "Implementasi Data Mining Dalam Memprediksi Transaksi Penjualan Menggunakan Algoritma Apriori (Studi Kasus PT.Arma Anugerah Abadi Cabang Sei Rampah)," *Matics*, vol. 11, no. 2, p. 46, 2020, doi: 10.18860/mat.v11i2.7821.

[2] N. Hadinata and K. Kurniawan, "Analisis Pola Pembelian Produk Makanan Ringan Menggunakan Algoritma Apriori," *J. Sisfokom (Sistem Inf. dan Komputer)*, vol. 9, no. 1, pp. 1–7, 2020, doi: 10.32736/sisfokom.v9i1.623.

[3] E. Srikanti, R. F. Yansi, Norhavina, I. Permana, and F. N. Salisah, "Penerapan Algoritma Apriori untuk Mencari Aturan Asosiasi pada Data Peminjaman Buku di Perpustakaan," *J. Ilm. Rekayasa dan Manaj. Sist. Inf.*, 2018.

[4] I. Ismasari, M. Ramadhan, and W. Hadikristanto, "Analisis Tingkat Pembelian Konsumen dengan Algoritma Apriori," *J. Ilm. Intech Inf. Technol. J. UMUS*, vol. 2, no. 02, 2020, doi: 10.46772/intech.v2i02.292.

[5] I. P. Astuti, "ALGORITMA APRIORI UNTUK MENEMUKAN HUBUNGAN ANTARA JURUSAN SEKOLAH DENGAN TINGKAT KELULUSAN MAHASISWA," *J. Tek. Inform.*, 2019, doi: 10.15408/jti.v12i1.10525.

[6] D. Rusdianto *et al.*, "IMPLEMENTASI DATA MINING MENGGUNAKAN ALGORITMA APRIORI UNTUK MENGETAHUI POLA PEMINJAMAN BUKU DI PERPUSTAKAAN UNIVERSITAS Jurnal Sistem Informasi , J-SIKA Volume 02 Nomor 02 , Desember 202," *J. Sist. Inf.*, vol. 02, no. 02, pp. 1–10, 2020.

[7] E. D. Sikumbang, "Penerapan Data Mining Penjualan Sepatu Menggunakan Metode Algoritma Apriori," *J. Tek. Komput. AMIK BSI*, vol. Vol 4, No., no. September, pp. 1–4, 2018.