

1  
*by* 1 1

---

**Submission date:** 02-Dec-2021 12:09PM (UTC+0700)

**Submission ID:** 1718138842

**File name:** HPAI\_consumer\_shopping\_analysis.pdf (569.76K)

**Word count:** 3289

**Character count:** 16386

PAPER · OPEN ACCESS

## HPAI consumer shopping analysis using Apriori algorithm

To cite this article: Y Findawati *et al* 2021 *IOP Conf. Ser.: Mater. Sci. Eng.* **1098** 032087

View the [article online](#) for updates and enhancements.

You may also like

5

- [K-Means and Apriori Algorithm for Pharmaceutical Care Medicine \(Case Study: Eye Hospital of South Sumatera Province\)](#)  
Luthfiah and Ken Ditha Tania

- [Looking for Transaction Data Pattern Using Apriori Algorithm with Association Rule Method](#)

Y Sutisnawati and M Reski

5

- [Analysis of Accuracy K-Means and Apriori Algorithms for Patient Data Clusters](#)  
N P Dharshinni, Fadhillah Azmi, I Fawwaz et al.

## HPAI consumer shopping analysis using Apriori algorithm

Y Findawati\*, I N Hikmah, S Sumarno and Y Rachmawati

Department of Informatics, Universitas Muhammadiyah Sidoarjo, East Java, Indonesia

\*yulianfindawati@umsida.ac.id

**Abstract.** PT Herba Penawar Alwahida sells a variety of herbal products. The process of buying and selling transactions occur every day, resulting in a pile of data pretty much. However, so far the transaction data has only been used as material to make monthly reports without further use of data these, even though from these data information can be extracted to support marketing. To utilize existing transaction data, the authors make a website-based data mining application. This application will be developed by method association (Association Rule) uses apriori algorithm. So that it can be seen the level of accuracy of this application. With the application of data mining, is expected to help the distributor to get information about which HPAI products are often purchased by consumers simultaneously, so as to improve the product marketing and maintaining process availability of stock of these products to remain.

### 1. Introduction

Traditional medicine is still in demand by the people of Indonesia, such as herbs and herbal products. Many companies produce herbal products, one of which is in Indonesia, namely PT. Indonesian Alwahida Penawar Herba or what people know as HPAI. The company is a network of Halal business companies in Indonesia and focuses on herbal products that are halal and of high quality and based on Thibbunnabawi. All HPAI products are distributed directly by the company to the Business Centres in each region and then distributed again to HPAI agents scattered around it. HPAI does not only sell herbal medicines, the products sold are also varied, such as supplements and beauty cosmetics. In the distribution of these HPAI products, the buying and selling process takes place. It also became a daily routine, weekly to annual. Can imagine how many transactions occur in one day and how much data has been stored in a month. However, the data set is not used, when in fact it can be processed into information that is useful for stock agents. To process the data, this is where the role of data mining is needed. Namely using the association method with apriori algorithm to determine the relationship of each product in sales, so that it can be known HPAI consumer spending patterns. The method often used to analyse consumer shopping behaviour patterns is shopping basket analysis or Market Basket Analysis (MBA). MBA is one of the most popular types of data analysis used in the marketing world [1]. This MBA is analysing consumer buying habits by finding associations between different products that consumers place in shopping basketball [2]. There have been many previous studies that use the association method with this apriori algorithm, there are Implementation of Apriori Algorithm for Analysis of Consumer Purchase Patterns [3], where this research has the aim of create an application that is used in determining consumer purchasing patterns by applying apriori algorithms and using Visual Basic 2010 as a tool for determining consumer purchase patterns. In this study, then Use of Apriori Algorithm on Building materials Sales Transaction Data of Building Materials [4] where this



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

research has the aim of to determine the pattern of dependency relationships between goods and other goods so that the probability of goods purchase based on other goods can be found, and Online Store Product Recommendation System Uses Apriori Method [5] this research will analyse the rules in a historical data of purchase from Online Store visitors to get recommendation of products to be displayed. the authors conducted a case study at a HPAI Distribution Center (DC) in the Sidoarjo area, namely DC Rahma Andriana. The method used is apriori algorithm. The apriori is first algorithm to generate all frequent item sets and confident association rules was the AIS algorithm by Agrawal [6-8] As a result, they have stored a lot of data but only a little information can be used to support marketing strategies. The author expects the information obtained from this study is information about HPAI consumer spending patterns in DC. Therefore, this thesis research the author has the idea of the title "HPAI Consumer Shopping Cart Analysis Using Apriori Algorithms (Case Study: DC Rahma Andriana)". It is expected that the results of this research can help DC Rahma Andriana in analysing sales transaction data to make better marketing policies and planning in the future.

## 2. Experimental method

Apriori Algorithms include association learning in data mining that looks for patterns of relationships of several items in a dataset. The association rule between some of these attributes is often called affinity analysis or market basket analysis so it is widely used in transaction data. For example, in a supermarket. who has a basketball market, with apriori algorithm, the supermarket owner can find out the pattern of consumer spending, if a consumer buys items A, B have a 60% chance he will buy item C, this pattern can be known from the transaction data so far. While the association analysis is a process to get all the associative rules of all transactions that meet the minimum support and minimum confidence requirements. Minimal Support is a value determined by the researcher to cut the combination of set items into fewer. Minimal Confidence is a value that is also determined by the researcher to cut the combination of each k-item set (the result of minimal support trimming) to form association rules. The basic methodology of association analysis is divided into two stages:

- Support: Support from an association rule is the presentation of the combination of items in the database, where if have item A and item B then the support is the proportion of transactions in the database containing A and B. The support value of an item is obtained by the formula [9].

$$\text{Support (A)} = \frac{\text{(the number of transactions containing A)}}{\text{transaction total}}$$

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

$$\text{Support (A,B)} = P(A \cap B)$$

- Confidence: Confidence of association rule is a measure of the accuracy of a rule, which is the presentation of a transaction in a database containing A and containing B [10]

$$\text{Confidence} = P(B|A) = \frac{\sum \text{Transaction contain A and B}}{\sum \text{Transaction contain A}}$$

## 3. Results and discussion

### 3.1. Manual calculation

The data used to obtain associative rules for products purchased by HPAI consumers are from January 2017 to December 2018. The total amount of initial data (data warehouse) is 50 data, with 3 attributes namely date, member name, and name product. Apriori algorithm manual calculations for now the relationship between HPAI products that are often bought by consumers.

**Table 1.** Transaction data for each item.

Product	Amount	Product	Amount	Product	Amount
Andrographis centella	5	6 gagan HS	2	Honey Premium	3
Bilberry	9	Procumin Rich Vit. E	1	Bitter Honey	1
Biosir	2	Procumin Propolis	3	Honey SJ	1
Carnocap	5	Rosella HS	1	Zaitun	13
Deep Squa	6	Siena	1	Sari Kurma	12
Diabextrac	2	Spirulina	12	6 imfibre	1
Gamat	6	Truson	3	Day Cream	7
Ginextrac	2	6 entella Teh Sinergi	2	Night Cream	7
Habbassauda HPAI	8	Deep Olive	2	Deep Beauty	2
Harumi	8	Etta Goat Milk	12	Green Wash	2
Langsingin	3	Extra Food	14	Hibis	4
Laurik	4	Hpai Coffe	9	Herbal HPAI toothpaste	20
Magafit	3	Jannatea Cold	1	Promol 12	1
Mengkudu	4	Jannatea Hot	1	Kolagen Soap	14
Synergy Herb Oil	21	Coffe 7 Elemen	9	Honey Soap	14
Mustika Dara	3	Honey Multiflora	2	Propolis Soap	14
N-Green	3				

Specify the minimum value ( $\phi$ ) = 14, then specify frequent itemset. Then  $F1 = \{\text{Synergy Herb Oil, Extra Food, HPAI Herbal Toothpaste, Collagen Soap, Honey Soap, Propolis Soap}\}$ . From the  $F1$  candidate will get 2-itemset of existing transaction data as in the table below.

**Table 2.** Candidate 2 items set.

Item	Amount
Synergy Herb Oil, Extra Food	7
Synergy Herb Oil, HPAI Herbal Toothpaste	10
Synergy Herb Oil, Collagen Soap	3
Synergy Herb Oil, Honey Soap	4
Synergy Herb Oil, Propolis Soap	6
Extra Food, HPAI Herbal Toothpaste	8
Extra Food, Collagen Soap	5
Extra Food, Honey Soap	6
Extra Food, Propolis Soap	7
HPAI Herbal Toothpaste, Collagen Soap	8
HPAI Herbal Toothpaste, Honey Soap	7
HPAI Herbal Toothpaste, Propolis Soap	7
Collagen Soap, Honey Soap	6
Collagen Soap, Propolis Soap	5
Honey Soap, Propolis Soap	7

The minimum value ( $\phi$ ) is changed to 7, then obtained  $F2 = \{\{\text{Herbal Oil Synergy, Extra Food}\}, \{\text{Synergy Herb Oil, HPAI Herbal Toothpaste}\}, \{\text{Extra Food, HPAI Herbal Toothpaste}\}, \{\text{Extra Food, Propolis Soap}\}, \{\text{Herbal Toothpaste HPAI, Collagen Soap}\}, \{\text{Herbal HPAI Toothpaste, Honey Soap}\}, \{\text{Toothpaste Herbal HPAI, Propolis Soap}\}, \{\text{Honey Soap, Propolis Soap}\}\}$ . Amount of candidate itemset as in the table below.

**Table 3.** Item set candidate.

Item	Amount
Synergy Herb Oil, Extra Food, HPAI Herbal Toothpaste	5
Synergy Herb Oil, Extra Food, Collagen Soap	1
Synergy Herb Oil, Extra Food, Honey Soap	3
Synergy Herb Oil, Extra Food, Propolis Soap	4
Synergy Herb Oil, HPAI Herbal Toothpaste, Collagen Soap	2
Synergy Herb Oil, HPAI Herbal Toothpaste, Honey Soap	5
Synergy Herb Oil, HPAI Herbal Toothpaste, Propolis Soap	5
Synergy Herb Oil, Collagen Soap, Honey Soap	2
Synergy Herb Oil, Collagen Soap, Propolis Soap	2
Synergy Herb Oil, Honey Soap, Propolis Soap	4
Extra Food, HPAI Herbal Toothpaste, Collagen Soap	4
Extra Food, HPAI Herbal Toothpaste, Honey Soap	6
Extra Food, HPAI Herbal Toothpaste, Propolis Soap	6
Extra Food, Collagen Soap, Honey Soap	3
Extra Food, Collagen Soap, Propolis Soap	3
Extra Food, Honey Soap, Propolis Soap	4
HPAI Herbal Toothpaste, Collagen Soap, Honey Soap	3
HPAI Herbal Toothpaste, Collagen Soap, Propolis Soap	3
HPAI Herbal Toothpaste, Honey Soap, Propolis Soap	4
Collagen Soap, Honey Soap, Propolis Soap	3

We specify the minimum value ( $\phi$ ) = 14, then we specify frequent itemset. Then  $F1 = \{\text{Minyak Herba Sinergi, Extra Food, Pasta Gigi Herbal HPAI, Sabun Kolagen, Sabun Madu, Sabun Propolis}\}$ . Then the minimum value ( $\phi$ ) is changed to 7, then  $F2$  can be obtained =  $\{\{\text{Minyak Herba Sinergi, Extra Food}\}, \{\text{Minyak Herba Sinergi, Pasta Gigi Herbal HPAI}\}, \{\text{Extra Food, Pasta Gigi Herbal HPAI}\}, \{\text{Extra Food, Sabun Propolis}\}, \{\text{Pasta Gigi Herbal HPAI, Sabun Kolagen}\}, \{\text{Pasta Gigi Herbal HPAI, Sabun Madu}\}, \{\text{Pasta Gigi Herbal HPAI, Sabun Propolis}\}, \{\text{Sabun Madu, Sabun Propolis}\}\}$ . With  $\phi = 7$ ,  $F3$  is obtained =  $\{\}$  because there is no 3-itemset whose frequency is  $\geq \phi$ . Because  $F3 = \{\}$ , then look for association rules, the frequent itemset used is  $F2$ . From the  $F2$  that has been found, we look for the value of support and value of confidence from the prospective association rules.

**Table 4.** Candidates for association rules from  $F2$ .

Item	Support	Confidence
If buy Synergy Herb Oil, it will buy Extra Food	14%	33%
If buy Extra Food, you will buy Synergy Herb Oil	14%	50%
If buy Synergy Herb Oil, it will buy HPAI Herbal Toothpaste	20%	48%
If buy HPAI Herbal Toothpaste, then will buy Synergy Herb Oil	20%	50%
If buy Synergy Herb Oil, it will buy Collagen Soap	6%	14%
If buy Collagen Soap, it will buy Synergy Herb Oil	6%	21%
If buy Synergy Herb Oil, it will buy Honey Soap	8%	19%
If buy Honey Soap, it will buy Synergy Herb Oil	8%	29%
If buy Synergy Herb Oil, it will buy Propolis Soap	12%	29%
If buy Propolis Soap, it will buy Synergy Herb Oil	12%	43%
If buy Extra Food, you will buy HPAI Herbal Toothpaste	16%	57%
If buy HPAI Herbal Toothpaste, then will buy Extra Food	16%	40%
If buy Extra Food, you will buy Collagen Soap	10%	36%
If buy Collagen Soap, it will buy Extra Food	10%	36%

Table 4. Cont.

If buy Extra Food, you will buy Honey Soap	12%	43%
If buy Honey Soap, it will buy Extra food	12%	43%
If buy Extra Food, you will buy Propolis soap	14%	50%
If Propolis Soap, it will buy Extra Food	14%	50%
If HPAI Herbal Toothpaste, then will buy Collagen Soap	16%	40%
If Collagen Soap, it will buy HPAI Herbal Toothpaste	16%	57%
If buy HPAI Herbal Toothpaste, then will buy Honey Soap	14%	35%
If buy Honey Soap, it will buy HPAI Herbal Toothpaste	14%	50%
If buy HPAI Herbal Toothpaste, then will buy Propolis Soap	14%	35%
If buy Propolis Soap, it will buy HPAI Herbal Toothpaste	14%	50%
If buy Collagen Soap, it will buy Honey Soap	12%	43%
If buy Honey Soap, it will buy Collagen Soap	12%	43%
If buy Collagen Soap, it will buy Propolis Soap	10%	36%
If buy Propolis Soap, it will buy Collagen Soap	10%	36%
If buy Honey Soap, it will buy Propolis soap	14%	50%
If buy Propolis Soap, it will buy Honey Soap	14%	50%

The minimum confidence value is 50%, then multiplied between support and confidence, the results of the final association rules are shown in the table below this.

Table 5. Final association rules.

Rule Item	Support	Confidence	Support x Confidence
If buy Extra Food, it will buy Synergy Herb Oil	14%	50%	7%
If buy HPAI Herbal Toothpaste, then you will buy Herb Oil Synergy	20%	50%	10%
If buy Extra Food, it will buy HPAI Herbal Toothpaste	16%	57%	9%
If buy Extra Food, it will buy Propolis Soap	14%	50%	7%
If buy Propolis Soap, then will buy Extra Food	14%	50%	7%
If buy Collagen Soap, then will buy HPAI Herbal Toothpaste	16%	57%	9%
If buy Honey Soap, it will buy HPAI Herbal Toothpaste	14%	50%	7%
If buy Propolis Soap, then will buy HPAI Herbal Toothpaste	14%	50%	7%
If buy Honey Soap, it will buy Propolis Soap	14%	50%	7%
If buy Propolis Soap, then will buy Honey Soap	14%	50%	7%

Based on the above calculation, the rule that has the highest support and confidence is 10% with rule If buy HPAI Herbal Toothpaste, then you will buy Herb Oil Synergy.

### 3.2. Testing result

For testing result data used to obtain associative rules for products purchased by HPAI consumers are from January 2017 to December 2018. The total amount of initial data (data warehouse) is 1633 data.

**Table 6.** Testing results.

Min Support	Min. Confidence	Rule	Support	Confidence	Support X Confidence
10%	50%	HPAI Herbal Toothpaste, Olive → Synergy Herb Oil	22.6%	89.13%	20.14%
		Synergy Herb Oil, Olive → Herbal HPAI Toothpaste	22.6%	100%	22.6%
		Synergy Herb Oil, HPAI Herbal Toothpaste → Olive	22.6%	92.95%	21%
15%	50%	HPAI Herbal Toothpaste, Olive → Synergy Herb Oil	22.6%	89.13%	20.14%
		Synergy Herb Oil, Olive → Herbal HPAI Toothpaste	22.6%	100%	22.6%
		Synergy Herb Oil, HPAI Herbal Toothpaste → Olive	22.6%	92.95%	21%
20%	50%	HPAI Herbal Toothpaste, Olive → Synergy Herb Oil	22.6%	89.13%	20.14%
		Synergy Herb Oil, Olive → Herbal HPAI Toothpaste	22.6%	100%	22.6%
		Synergy Herb Oil, HPAI Herbal Toothpaste → Olive	22.6%	92.95%	21%
20%	50%	HPAI Herbal Toothpaste → Olive	22.6%	89.13%	20.14%
		Olive → HPAI Herbal Toothpaste	25.35%	72.13%	18,28%
30%	50%	Found no association results			

This test stops here due to support values of 35%, 40%, and so on will not get the association rules. Based on the above test, with existing datasets, this system can perform apriori calculations with a minimum of  $\leq 25\%$  support. From the five tests with 5 minimum values of support used, it can be seen that the best association rule that is formed is if you buy Synergy Herb Oil, Olive then buy Herbal HPAI Toothpaste has 22.6% support and 100% confidence.

#### 4. Conclusion

Based on the results of the study in the previous chapter, the following conclusions can be drawn: From the five tests with 5 minimum values of support used, it can be seen that the best association rule that is formed is if you buy Synergy Herb Oil, Olive then buy Herbal HPAI Toothpaste has 22.6% support and 100% confidence. Thus, the three products must always be available at store.

#### Acknowledgements

We acknowledge to Universitas Muhammadiyah Sidoarjo.

#### References

- [1] Berry M J and Linoff G S 2004 *Data mining techniques: for marketing sales and customer relationship management* (John Wiley & Sons)
- [2] Deshmukh D and More A 2017 Applying Big Data in Higher Education *Int J Innov Res Comput Commun Eng* **5**
- [3] Panjaitan S, Amin M, Lindawati S, Watrianthos R, Sihotang H T and Sinaga B 2019 Implementation of Apriori Algorithm for Analysis of Consumer Purchase Patterns In *Journal of Physics: Conference Series* **1255**(1) 012057
- [4] Winanti M B and Handiansyah A 2018 Use of Apriori Algorithm on Building materials Sales Transaction Data In *Building Materials MS&E* **407**(1) 012107
- [5] Fatoni C S, Utami E and Wibowo F W 2018 Online Store Product Recommendation System Uses Apriori Method *International Conference on Electrical Electronic Informatics and Vocational Education (ICE-ELINVO)*
- [6] Al-Maolegi M and Arkok B 2014 An improved apriori algorithm for association rules *arXiv preprint arXiv:14033948*
- [7] Hunyadi D 2011 Performance comparison of Apriori and FP-Growth algorithms in generating association rules In *Proceedings of the European computing conference* pp 376-381
- [8] Agrawal R, Imielinski T and Swami A 1993 Sigmod93 Assoc Min Assoc Rules between Sets *tems Large Database* 1-10
- [9] Lingga D 2016 Application of Apriori Algorithms in Predicting Book Inventory at the Dwi



- Tunggal Tanjung Morawa High School Library *Information and scientific technology* **XI**(1)
- [10] Dutt S, Choudhary N and Singh D 2014 An improved apriori algorithm based on matrix data structure *Global Journal of Computer Science and Technology*

## ORIGINALITY REPORT

16%

SIMILARITY INDEX

10%

INTERNET SOURCES

16%

PUBLICATIONS

5%

STUDENT PAPERS

## PRIMARY SOURCES

- 1** Suprianto Panjaitan, Sulindawaty, Muhammad Amin, Sri Lindawati, Ronal Watrianthos, Hengki Tamando Sihotang, Bosker Sinaga. "Implementation of Apriori Algorithm for Analysis of Consumer Purchase Patterns", *Journal of Physics: Conference Series*, 2019  
Publication 5%
- 2** [e-journal.uajy.ac.id](http://e-journal.uajy.ac.id)  
Internet Source 4%
- 3** A A Hidayat, A Rahman, R M Wangi, R J Abidin, R S Fuadi, W Budiawan. "Implementation and comparison analysis of apriori and fp-growth algorithm performance to determine market basket analysis in Breiliant shop", *Journal of Physics: Conference Series*, 2019  
Publication 3%
- 4** [eprints.lancs.ac.uk](http://eprints.lancs.ac.uk)  
Internet Source 2%
- 5** Akash Saxena, Vikram Rajpoot. "A Comparative Analysis of Association Rule 2%

# Mining Algorithms", IOP Conference Series: Materials Science and Engineering, 2021

Publication

6

hpaibali.com  
Internet Source

2%

Exclude quotes On

Exclude matches < 2%

Exclude bibliography On