



PROCEEDING

UG ECONOMICS FACULTY INTERNATIONAL CONFERENCE 2017

On Digital Economy Enhancement
for Accelerating Sustainable Development
Goals Achievement

July 25th, 2017

Campus L2, Gunadarma University
Mutiara Taman Palem Block C7 Cengkareng
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35.	Decision Support System Determination Of Lecturer Performance Assessment Based On Tri Dharma Higher Education Using Balanced Scorecard In Computer Science	365
	Prihastuti Harsani, Sugeng Santoso.....	
36.	Development Of Learning Maturity Model, As A Means Of Graduates Quality Assurance	376
	Eka Miranda , J.Sudirwan.....	
37.	Analysis And Design The Sales Accounting Information System (AIS) On Tb. Sinar Agung Jaya	387
	Eva Nor Octania , Sri Supadmini.....	
38.	An Analysis Of Consumer Behavior Using Frequent Pattern Growth Algorithm At UD Barokah	407
	Dewi Anggraini P.H, Septi Mariani T.R, Winda Widya Ariestya.....	
39.	Welfare Of The Farmers In Sukaraja Village, Tambelang Subdistrict, Bekasi Regency, Indonesia	413
	Dewi Anjani, Desi Novianti, Abdul Mufti.....	
40.	Succesfull Factor Of Implementation Electronic Customer Relationship Management (E-CRM) On E-Commerce Company	422
	Eka Vidiazuti, Dini Labibah.....	
41.	Effect Of Brand Equity And Family Factor On Honda Car Purchase Decision At PT. Megatama Mandiri Bekasi	432
	Hasna Insytha Shahlan,Ekaning Setyarini,Lana Sularto.....	
42.	The Impact of Customer Relationship Management on Company Performance in Three Segments	444
	Ismi Alawiyah, Putri Nadila Humairoh.....	
43.	Exploring The Success Factors Of E-CRM Implemntation On B2C E-Commerce: Satisfaction And Loyalty A Conceptual Framework	448
	Malicha Aulia, Trisna Nugraha Pamungkas.....	
44.	Effect Of E-Commerce Implementation On Small And Medium Enterprise (SMEs) Development In Palembang City	451
	Maulana.....	
45.	Impact Development Of Digital Marketing On Startup's. A Case Of New Entrepreneurs In Economic Faculty Of UNPGRI Kediri	460
	Sri Aliami, Ema Nurzainul Hakimah, Diah Ayu Septi.....	
46.	Use Of Digital Marketing As An Effort To Incrase Sales Volume Micro Small And Medium Enterprises Products In Kediri	468

An Analysis of Consumer Behavior Using Frequent Pattern Growth Algorithm at UD Barokah

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ABSTRACT

Utilization of consumer purchase data to increase the competitiveness of a company is a necessity. In determining consumer purchasing pattern at UD Barokah used RapidMiner Studio tool which apply Frequent Pattern Growth Algorithm (FP Growth). From the various experiments that have been done, the number of rules with minimum support 40% and minimum confidence 85% as many as 7 rule. Business strategies that can be applied next based on the pattern of consumer purchases are: increase inventory items, arrange a good layout with approaches on items that have high confidence value

Keyword: Association rules, Data Mining and FP Growth Algorithm

JEL Code: M31

INTRODUCTION

Utilization of Information Systems on every line of life is common, as has been done by UD Barokah located in the city of Bogor. By utilizing a computerized information system, it is expected to facilitate UD Barokah in collecting data and storing various sales data.

The data that has been collected and stored now is only used for the purpose of sales report and profit and loss statement. Though the data can be utilized to the maximum by doing further data processing so that obtained a new information in terms of decision making on the next business strategy.

Association Rule Mining is a data mining technique for finding associative rules between combinations of items. The association rule function is often called market basket analysis, which is used to find relationships or correlations between sets of items. Market Basket Analysis is an analysis of customer buying habits by finding associations and correlations between different items that customers place in their shopping carts. This function is most widely used to analyze data in terms of marketing strategy, catalog design, and business decision making process.

Association rules capture items or events in large transactional data. With advance technology, sales data can be stored in large numbers called data buckets. Association rules defined in data buckets, used for promotional purposes, catalog design, customer segmentation and marketing targets. Traditionally, association rules are used to find business trends by analyzing customer transactions.

LITERATURE REVIEW

The FT-Growth algorithm is an alternative algorithm that can be used to determine the most common set of data in a dataset (Samuel, 2008) and the enhanced of apriori algorithm, so it is better than the previous one (Erwin, 2009).

Some researches on finding patterns that have been done, are:

- Raorane A.A, Kulkarni R.V. and Jitkar B.D, *Association Rule Extracting Knowledge Using Market Basket Analysis*. The objective of this paper is to analyze the huge amount of data thereby exploiting the consumer behavior and make the correct decision leading to competitive edge over rivals. Experimental analysis has been done employing association rules using Market Basket Analysis to prove its worth over the conventional methodologies.

- b. R-H Lin, *Potential use of FP-growth algorithm for identifying competitive suppliers in SCM*. This paper aims at contributing an effective method that combines an FP-growth algorithm with set theory to identify the primary and secondary suppliers. An example of the proposed method to find key suppliers is presented, and the results show the proposed method to be effective.
- c. Li-Juan Huang, *FP-Growth Apriori Algorithm's Application in the Design for Individualized Virtual Shop on the Internet*. This paper firstly points out there are two deficiencies of traditional apriori algorithm; Secondly it introduces an improved apriori algorithm so called FP-growth apriori algorithm that will help resolve two neck-bottle problems of traditional apriori algorithm and has more efficiency than original one. Lastly, based on huge consumers' data from a famous business website of book, this paper applies FP-growth apriori algorithm to design individualized virtual shop on the Internet. The individualized virtual shop can not only help to realize one-to-one marketing strategy, increase purchasing interest and loyalty of the consumer to virtual shop, but also make virtual shop gains more profit and more competitiveness. Designing an individualized virtual shop on the Internet is an interesting and tough international topic and applying FP-growth apriori algorithm to design individualized virtual shop on the Internet is novel ideal and method. As a result, the research result in this paper is just for reference.

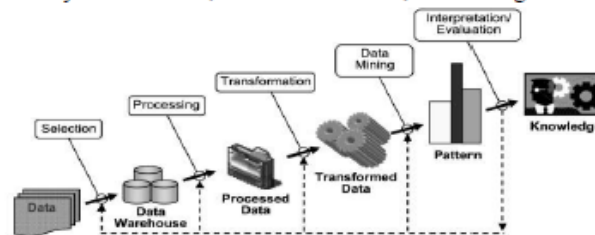
Based on the concept that has been described earlier, the purpose of this research is to analyze consumer behavior on UD Barokah by utilizing existing transaction data using Frequent Pattern Growth (FP Growth) algorithm assisted by RapidMiner Studio Tools.

THE METHODOLOGY AND MODEL

Object of research

The object of this research is transactional sales data at UD barokah on May 2017. The research method used is KDD (Knowledge Discovery in Database) process with FP Growth algorithm applied on RapidMiner Studio tools.

The Knowledge Discovery in Database process includes several stages, starting from the data collection stage, followed by data selection, data transformation, data mining and data evaluation.



Picture 1. KDD process's steps
[Kusrini, 2009]

THE FINDINGS

Stages of research using KDD process are:

a. Data collection

The main source data is transactional data of May 2017 at UD Barokah Bogor. The data collection is done by taking the analytical dataset. There are 24 attributes, 23 attributes are items of goods and 1 attribute is the transaction ID. The dataset used consists of 625 records. The example of the dataset can be seen in the table below.

Table 1. Sample Dataset

Customer Id	Cooking Oil	Rice	Flour	Egg	Peanut
Cus 01	TRUE	FALSE	FALSE	TRUE	FALSE
Cus 312	FALSE	FALSE	FALSE	FALSE	TRUE
Cus 623	TRUE	TRUE	TRUE	TRUE	TRUE
.....

b. Data selection

The transactional data then divided and selected using defined attributes. There are 23 attributes used in this analysis, they are : Cooking Oil, Rice, Flour, Egg, Peanut, Green Beans, Wafer, Biscuits, Instant Noodle, Snack, Coffee, Bread, Mineral Water, Soft Drink, The, Sugar Sand, Red Sugar , Bath Soap, Toothbrush, Washing Soap, Shampoo, Toothpaste, Fragrances Clothes.

c. Preprocessing / cleaning

In this stage, cleaning is focusing on categorized data that have been selected on stage 1. Cleaning process been done by entering the 23 categories of data into the tool, RapidMiner Studio.

d. Data Transformation

Transformation of data is done by changing the data type on each attribute from the form of integer to binominal form to facilitate the processing of data in accordance with the processing format in the tool RapidMiner Studio.

e. Data mining

This step is the main process to obtain the pattern of transactional data extraction that has been transformed by applying FP Growth algorithm.

Data mining process uses FP Growth algorithm by forming a frequent item set by determining the value of support and confidence value.

$$Support(A) = \frac{Jumlah\ Transaksi\ Mengandung\ A}{Total\ Transaksi}$$

$$Confidence = (A \rightarrow B) = \frac{Jumlah\ Transaksi\ Mengandung\ A\ dan\ B}{Jumlah\ Transaksi\ mengandung\ A}$$

f. Evaluation

Patterns that have been identified by the system are then translated into a simple form that is easier to understand.

From the various experiments in analyzing the consumer behavior uses FP Growth algorithm, there are 7 rules with minimum support 40% and minimum confidence 85%. In this analysis, there are 3 pattern on consumer behavior exposed with maximal frequencies to 3 item sets as follows:

1. Transaction pattern with 2 item sets

- Customer who buy tea, also buy shampoo. This pattern have value of support = 42.6% and the value of confidence = 85.3%
- Customer who buy fragrance clothes, also buy cooking oil. This pattern have the value of support = 39.7% and the value of confidence = 85.5%.
- Customer who buy toothpaste, also buy cooking oil with the value of support = 40.6% and the value of confidence = 85.8%

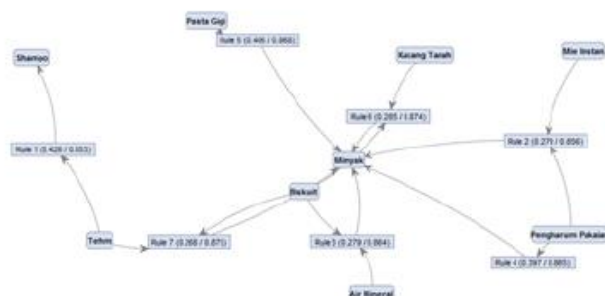
2. Transaction pattern with 3 item sets

- a. Customer who buy instant noodle, also buy fragrance clothes and cooking oil with the value of support = 27.9% and the value of confidence = 85.6%
- b. Customer who buy biscuit, also buy mineral water and cooking oil with the value of support = 27.9% and the value of confidence = 85.4%
- c. Customer who buy biscuit, also buy peanut and cooking oil with the value of support = 28.5% and the value of confidence = 87.4%
- d. Customer who buy biscuit, also buy tea and cooking oil with the value of support = 25.8% and the value of confidence = 87.5%

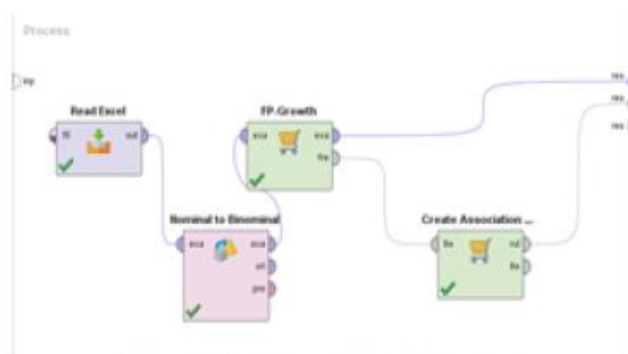
The seven rules observed in detail as below:

Table 2. Extracted Rules

No	Premises	Conclusion	Support	Confidence
1	Tea	Shampoo	42.6%	85.3%
2	Instant Noodle, Fragrance Clothes	Cooking Oil	27.9%	85.6%
3	Biscuit, Mineral Water	Cooking Oil	27.9%	85.4%
4	Fragrance Clothes	Cooking Oil	39.7%	85.5%
5	Toothpaste	Cooking Oil	40.6%	85.8%
6	Biscuit, Peanut	Cooking Oil	28.5%	87.4%
7	Biscuit, Tea	Cooking Oil	25.8%	87.5%

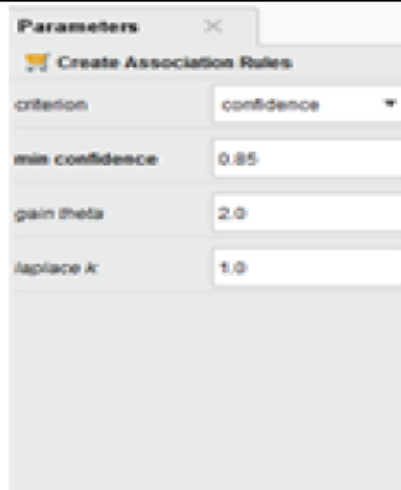


Picture 2. FP Tree obtained



Picture 3. Modelling with RapidMiner Tools

The confidence parameters used are:



Parameters

Create Association Rules

criterion confidence

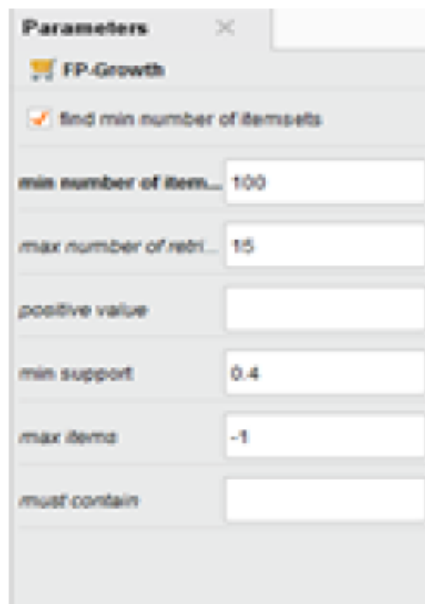
min confidence 0.85

gain theta 2.0

laplace k 1.0

Picture 4. Parameter confidence used

While the support parameters used are:



Parameters

FP-Growth

☒ find min number of itemsets

min number of item... 100

max number of retri... 15

positive value

min support 0.4

max items -1

must contain

Picture 5. Parameter support used

The results of data processing using RapidMiner Studio (Text View) obtained as shown on picture below.

Association Rules

```

Association Rules
[Tehm] --> [Shampo] (confidence: 0.853)
[Mie Instan, Pengharum Paksi] --> [Minyak] (confidence: 0.854)
[Biskuit, Air Mineral] --> [Minyak] (confidence: 0.864)
[Pengharum Paksi] --> [Minyak] (confidence: 0.865)
[Pasta Gigi] --> [Minyak] (confidence: 0.868)
[Biskuit, Kacang Tanah] --> [Minyak] (confidence: 0.874)
[Biskuit, Tehm] --> [Minyak] (confidence: 0.875)

```

Picture 6. Association Rules Result

SUMMARY AND CONCLUSIONS

The application of FT Growth algorithm can help to analyze the consumer behavior at UD.Barokah by producing 7 Rules with minimum support 40% and minimum confidence 85%. As follow up on these findings, adding inventory items based on the pattern of consumer purchases, arranging a good layout based on the pattern of purchasing items by placing items that have a high confidence value in a group.

REFERENCES

- David Samuel 2008, Penerapan Struktur FP-Tree dan Algoritma FP-Growth dalam Optimasi Penentuan Frequent Itemset, Institut Teknologi Bandung, vol. 1.
- Erwin 2009, Analisis Market Basket Dengan Algoritma Apriori dan FP-Growth. <http://www.scribd.com/doc/57563823/Jurnal-Generic-Vol-4-No-2-Juli-2009>. *Jurnal Generic*, vol 4 No. 2. ISSN 1907-4093. PP 26-30.
- Kusrini and Emha Taufiq Luthfi 2009, Algoritma Data Mining. 1st ed. Yogyakarta: ANDI.
- Li-Juan Huang 2007, FP-Growth Apriori Algorithm's Application in the Design for Individualized Virtual Shop on the Internet, IEEE Xplore Digital Library 29 Oct 2007, DOI: [10.1109/ICMLC.2007.4370808](https://doi.org/10.1109/ICMLC.2007.4370808).
- Raorane A.A, Kulkarni R.V. and Jitkar B.D *Association Rule-Extracting Knowledge Using Market Basket Analysis*, Research Journal of Recent Sciences Vol. 1(2), 19-27, Feb. (2012), ISSN 2277-2502.
- R-H Lin, *Potential use of FP-growth algorithm for identifying competitive suppliers in SCM*, Journal of Operational Research Society August 2009, Vol. 60, *Issue 8*, pp 1135–1141, DOI: [10.1057/jors.2008.157](https://doi.org/10.1057/jors.2008.157).