DATA MINING IMPLEMENTATION OF PRODUCT SALES IN AALIYAH USING ASSOCIATION RULE METHOD

Hadid Arifin

Informatics Engineering – Indonesian Computer University
Jl. Dipatiukur 112-114 Bandung
alhadidarifin@gmail.com

ABSTRACT

AALIYAH is a boutique owned by individual, engaged in sales of women's clothing products such as shirts, cufflinks, shirts, skirts, pants, coats, jackets, dresses, veils, accessories, bags, shoes and so forth. One of the marketing strategies adopted by a Aaliyah is the packaging on each event Muslims feast. However, in practice, the package provided by AALIYAH is less interested buyer, due to poor packaging that is considered only based on the tastes nice and trends without being based on calculations or processing of data sales. This decrease the chances of getting AALIYAH consumer purchase interest in that event.

One way to overcome the existing problems in AALIYAH is using data mining approach with the method of association rule. Data mining is the process of finding interesting knowledge from large amounts of data and association rule is one method to determine the pattern of an item is always selected from each event. In the development of its application, the algorithm is used is FP-Growth. FP-Growth algorithm is one alternative that is effective to finding data set that appears most frequently (frequent itemset) in a large data set. Overall association rule can help the consumer by AALIYAH produce patterns of sales transactions to be used as a package.

Based on the testing that was done with beta testing and functional, application built to help the parties AALIYAH to know the pattern of the purchase transaction data owned AALIYAH henceforth be used as a reference in determining the package that will be offered to consumers.

Keywords: AALIYAH, boutique, data mining, association rule, frequent itemset, generate rule, FP-Growth.

INTRODUCTION

1.1 Background

Aaliyah is a boutique founded in 2009 with a location in Jalan Gedung Merdeka Bandung Indah Plaza, 2nd Floor No. 63. Aaliyah engaged in product sales of women's clothing such as shirts, cufflinks, shirts, skirts, pants, coats, jackets, dresses, veils, accessories, bags, shoes and so forth. With the completion of the goods sold, Aaliyah became a shopping destination for women. It is one of the strategies of differentiation Aaliyah with other hijab shop.

Based on interviews with Ms. Finny Muktiany as the owner of Aaliyah, Aaliyah's other strategies are applied in marketing are giving discounts during the holidays of Muslims like Idul Fitri and Idul Adha. Each event Aaliyah issued 11 package consisting of three pieces (superiors, subordinates and hoods / syall), with a price range of $ 400,000 to $ 900,000. However, in practice, the package provided Aaliyah is less interested buyer, as seen from the sales data when the package is held. According to Mrs. Finny, the determination of the package is only based on the tastes that are considered good and is a trend without being based on calculations or processing of the data they hold. Aaliyah itself has a number of sales transaction data which is very much each month and just being alone archives. Hence the perceived need for a method that can utilize sales data to be used as a sales pattern information for Aaliyah in making the package. By using the techniques of data mining association rule is expected to provide solutions to the Aaliyah in determining the sales package in the next event.

Association rule is one of the methods of data mining to find patterns of an item is always selected from each event. The process of data compression with a model tree data structure to avoid repetition of scanning the database without the need for candidate generation, proceed with the FP-Growth algorithm to directly extract frequent itemset of FP-Tree that has been formed.

From the description that has been described above, the authors wanted to do research with the title "On the Application of Data Mining Product Sales in Aaliyah Using Association Rule" to get the pattern right goods to increase sales in the next event.

1.2 Objective and Significance

The purpose of this research is to build a data mining application on sales data in Aaliyah with association rules method. The purpose of this study is to help the parties Aaliyah determine what items

to be used as a package in order to increase sales in the next event.

1.3 *Data Mining*

Data mining is the process of finding interesting knowledge from large amounts of data stored in databases, data warehouses, or other information repositories [1].

Remarkable progress continues in the field of data mining is driven by several users, among others [1]:

a. The rapid growth in the data set.
b. Data storage in the data warehouse, so that the entire company has access to a reliable database.
c. An increase in data access through web and intranet navigation.
d. Pressure business competencies to increase market share in the economic globalization.
e. Development of software technology for data mining (availability of technology).
f. Great developments in computing capability and capacity of storage media.

From the definitions that have been submitted, key issues related to data mining are:

a. Data mining is an automated process of data that already exists.
b. The data will be processed in the form of very large data.
c. The purpose of data mining is gaining relationships or patterns that may provide a useful indication.

1.4 Cross-Industry Standart Process for Data Mining (CRISP-DM)

Cross-Industry Standard Process for Data Mining (DM CRISP-) which was developed in 1996 by analysts from several industry such as Daimler Chrysler, SPSS, and NCR. CRISP DM provides the standard data mining process as a general problem-solving strategies of the business or research units. In CRISP- DM, a data mining project has a life cycle that is divided into six phases. Overall sequential phases that there are adaptive. The next phase in the sequence depends on the output of the previous phase. Antarfase important relationship illustrated by arrows. For example, if the process is in the modeling phase. Based on the behavior and characteristics of the model, the process may have to go back to the data preparation phase untuku further improvement of the data or move forward to the evaluation phase [2].

1.5 *Association Rule*

Association rule is one way or the data mining process to determine all the associative rules that meet the minimum requirements to support (minsup) and confidence (minconf) on a database. Both of these conditions will be used for interesting association rules with dibandingkaan with the limits defined, namely minsup and minconf. [3]

Association Rule Mining is a procedure to look for relationships between items in a dataset. Starting with the search for frequent itemset, namely the combination that most often occurs in an itemset and must meet minsup. [3]

Analysis of the association defined a process to find all association rules that meet the minimum requirements to support (minimum support) and the minimum requirements for confidence (minimum confidence).

Basic methodology association analysis is divided into two stages:

a. Generation Frequent Itemset

This stage looking for a combination of items that meet the minimum requirements of the value of the support in the database. Values support an item obtained by the following formula.

$$Support(A) = \frac{The\ number\ of\ transaction\ contains\ A}{Total\ Transactions}$$

Then, to get the support of two items of value can be obtained by the following formula:

$$Support\ (A,B) = \frac{The\ number\ of\ transaction\ contains\ A\ and\ B}{The\ number\ of\ transaction\ contains\ A}$$

b. Generate Rule

After frequent itemset raised, then look for an association rule fairly strong degree of interdependence among the items in the antecedent (precursor) and consequent (followers) and meets the minimum requirements for calculating the confidence with confidence Associative rule A → B. Suppose D is the set of transactions, where each transaction T in D represents the set of items that are in I. I is the set of items for sale. Suppose we choose the set of items A and B set other items, then the rules of the association will take the form:

if A, then B (A → B)

An antecedent and consequent wherein B is a subset of I, and A and B are mutually exclusive where rules:

If A, then B
Does not mean
If B, then A

An itemset is a set of items that exist in the I, and k-itemset is itemset that contains k items. Itemset frequency is the frequency of occurrence itemset has more than a predetermined minimum value (ϕ). Suppose ϕ = 2, then all itemset frequency of occurrence of more than or equal to 2 times called frequent. The set of frequent k-itemset denoted by Fk.

Confidence value of the rule A → B is obtained from the following formula.

$$Confidence = P(B \mid A) = \frac{Transactions\ contains\ A\ and\ B}{Transactions\ contains\ A}$$

1.6 *FP-Growth* Algorithm

FP-Growth algorithm is an extension of Apriori algorithm. Frequent Pattern Growth Algorithm is one of the alternative algorithm that can be used to specify the data set that appears most frequently (frequent itemset) in a data set. [4]

In the FP-Growth algorithm uses the concept of development tree, commonly called FP-Tree, in the search for frequent itemset not use the generated candidate as you would on Apriori algorithm. By using this concept, the FP-Growth algorithm is faster than Apriori algorithm. [5]

The FP-Tree is a tree with the following definition:

a. FP-Tree formed by a root labeled null, a tree consisting of a set of specific items, and a frequent table header.

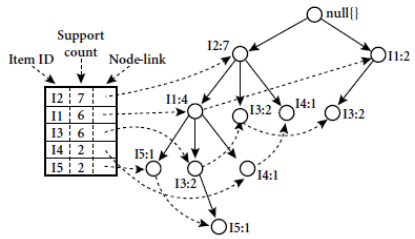
b. Each node in the FP-Tree contains three important information, namely label items, inform the types of items that are represented to the node, support count, representing the number of passes through the knot proficiency level transactions, and pointer link connecting the vertices with the same item label inter-track , marked by the dashed arrow lines.

FP-Growth method is divided into three stages, namely [4/2]:

a. Phase generation conditional pattern base.

b. Phase generation of conditional FP-Tree.

c. Finding stage frequent patterns generated.



Item	Conditional Pattern Base	Conditional FP-tree	Frequent Patterns Generated
I5	{{I2, I1: 1}, {I2, I1, I3: 1}}	⟨I2: 2, I1: 2⟩	{I2, I5: 2}, {I1, I5: 2}, {I2, I1, I5: 2}
I4	{{I2, I1: 1}, {I2: 1}}	⟨I2: 2⟩	{I2, I4: 2}
I3	{{I2, I1: 2}, {I2: 2}, {I1: 2}}	⟨I2: 4, I1: 2⟩, ⟨I1: 2⟩	{I2, I3: 4}, {I1, I3: 4}, {I2, I1, I3: 2}
I1	{{I2: 4}}	⟨I2: 4⟩	{I2, I1: 4}

Image 1 stage of formation FP-Tree

1. CONTENTS OF RESEARCH

2.1 Analysis Of Data Sources

The data used in this study that the sales transaction data in Aaliyah in June-July, 2015.
Here's a sample sale of goods in Aaliyah:

Table 1 Data Sample of Purchase Transactions

Date	Tranc Numb	Item Code	Item Name	Price
01 Juni 2015	BL-00348	A01A257-AAKK	KALUNG LEHER	75,000
01 Juni 2015	BL-00349	A04D001-ANNR	LONGDRESS LEHER RANTAI	290,000
01 Juni 2015	BL-00350	A04D001-ANNR	DRESS THAILAND	200,000
01 Juni 2015	BL-00351	A02B017-ANRK	SHIRT PRINT	215,000
01 Juni 2015	BL-00352	A02B017-ANRK	SHIRT PRINT	215,000
01 Juni 2015	BL-00353	A03J013-ADWR	CAVE HONSTUD	445,000
01 Juni 2015	BL-00354	A02B001-ANNR	BLOUSE	225,000
01 Juni 2015	BL-00354	A01D243-ANKR	DRESS SATIN CORAK	265,000
01 Juni 2015	BL-00354	A01A174-AAKR	KALUNG PANJANG	75,000

2.2 Data Preprocessing

Preprocessing of data is an important step in the data mining process, because not all data or data attributes in the data used in data mining. This process is carried out so that the data will be used according to need. As for the data preprocessing stages as follows:

a. Data Extraction

Data extraction can be defined as the process of collecting data from the data source in order to continue the process of data processing to the next level or to keep records of the extract. In this study, the data coming from the flat file is a Microsoft Excel (.xlsx) is extracted and stored in a database in order to facilitate the processing of data.

b. Data Cleaning

Data will be purged from the memorandum that has an item number less than 3. The cleaning is done to get the association of three items needed to be bosses, subordinates and hoods.

c. Selection of Attributes

On selecting attributes, the data will be selected attribute memo number, item code and item name. In the memo number is useful to distinguish between the consumer, the item code is useful to know the type of goods while the item name is the name goods such detail.

2.1 Modeling

Modeling is the creation phase models to be used in the data mining process. This phase is done by using association rule which will enter into two phases:

a. Frequent Itemset

In stage frequent itemset will be fed into the model algorithm. The algorithm used is FP-Growth algorithm. This algorithm uses knowledge about the frequent itemset previously known to process more information.

Here is an implementation of FP-Growth algorithm by using two months of transaction data taken from the pre-processing of data. Determined value of minimum support count is 3, and the minimum 80% confidence to see the large number of rule formed.

Phase 1: Scan the entire transaction and calculate the value of the frequency of occurrence for each item, in this case is KodeBarang, then sorted in

descending (descending) based on the amount of support count.

Phase 2: Next, check the value of minimum support, if support count value> = minimum support value, then enter the item into a table of items that meet the minimum support.

Table 2 Minimum *Support*

Item Code	Item Name	Support Count
A23J014-ANKK	BLAZER MACAN	20
A02K027-ANSK	KERUDUNG PASMINA POLOS	19
A01K225-AAHD	SYALL	16
A23C015-AAEK	FASHION LEGGING	14
A01K224-AAKK	SYALL	11
A03B004-ANOK	LEOPARD SHIRT	10
A08B001-AAKA	MANSET TANGAN PEPLUM	10
A01K008-AAWK	SYAL PANJANG GOLD	9
A02B046-AAED	MANSET GAMIS	9
A03J054-ADRO	BLAZER GOLD	9
A01D238-ANNR	DRESS HITAM KULIT	8
A02B045-AANK	MANSET BALON	8
A02K054-ADSK	KERUDUNG PASHMINA	8
A22B046-ANKK	BLOUSE POLOS PANJANG	8
A07C002-AAOO	LEGGING MOTIF	7
A21B015-AASK	KAOS ZARA/GUESS	7
A22B049-AAWW	SWEATER	7
A22R003-AAHO	ROK RAYON POLOS	7
A02B036-AAEK	BLOUSE 902	6
A22D002-AAKE	DRESS SPANDEX 304	6
A24J015-AAKK	CARDI MAYONES	6
A25C019-AAWD	CELANA BIG CHERRY	6
A03D041-AEKE	DRESS UMBRELLA GLITTER	5
A03R020-ANSK	ROK SMA 1	5
A07C001-AAOO	LEGGING MOTIF	5
A08B002-AAKD	MANSET TANGAN BIASA 4 WARNA	5
A11K040-AAWK	SYALL CH 155A470	5
A22B001-AAAD	KAOS SLETING	5
A22B033-AAHK	BLOUSE 161	5
A22R001-AAWK	ROK BANGKOK	5
A23B031-AAKR	KAOS PANJANG POLOS GE	5
A24C026-AAAD	CELANA SILKI	5
A25B040-AAWK	KAOS B S	5
A02C050-AAWR	CELANA SOBEK2 WISKER	4
A03A030-AAHK	INNER NINJA (CIPUT)	4
A03C019-ANSK	CELANA KULOT SMA	4
A21B016-AAKK	SWEATER RAJUT SALUR	4
A22B014-AAOK	BLOUSE IM	4
A22B016-AAEA	KAOS 51	4
A22B048-AAOO	BLOUSE TM	4
A22D003-ANEW	MAXI JUMSUIT	4
A22R002-AAKN	ROK RAYON POLOS + GESPER	4
A23B023-AOSK	BAJU KALONG	4
A23B036-AAEW	KAOS FESTIVE	4
A24B001-AASH	BLOUSE MACHIKO N333	4
A24D009-AAWE	MAXI DRESS SUCCESS	4
A24J031-ANEK	BLAZER EMAS	4
A25B013-AAHO	BLOUSE ESTINA A109	4
A25B035-AAOK	KAOS FTV 148	4
A01B272-AAOR	ATASAN TANGAN PANJANG	3
A01C136-AAAR	CELANA PANJANG BUNGA	3
A01K007-AAKR	SYAL PURING PANJANG PITA HTM	3
A03C052-ANAD	CELANA KULOT SMA 1	3
A03D049-AEDK	DILEGO DRESS	3
A03R025-ADKK	KRAKAL CREAMY SKIRT	3
A03R058-ADKK	ROK	3
A03R059-ADAS	ROK	3
A11K041-AAHK	SYALL CH 155A477	3
A21B021-AASK	BLOUSE 8858	3
A21B023-AAOR	BLOUSE 07	3
A22B018-AAES	BLOUSE 51	3
A22B027-AAHW	BLOUSE 399	3
A22B050-AASH	BLOUSE BULU SISIR	3
A23B030-AAHW	KAOS PANJANG POLOS GE	3
A23J011-ANEK	BLAZER CHANEL	3
A23R038-AASK	PRETTY KNIT ROK C2027	3
A24B016-AAHO	BLOUSE ESTINA A109	3
A24D027-ANDK	DRESS 3006	3
A24D028-AAWA	STELAN ROLE 7/8	3
A24J034-ANEW	BLAZER POLOS	3
A25B034-AAEO	BLOUSE FTV 84	3
A25R027-AAWE	ROK SCS	3

Table 3 Data Ordering

Transc No	Item Code
BL-00434	A22B046-ANKK, A02C050-AAWR, A22B014-AAOK, A22B027-AAHW
BL-00457	A01K225-AAHD, A02K054-ADSK, A22B001-AAAD, A22R001-AAWK
BL-00484	A02B046-AAED, A02B045-AANK, A21B015-AASK, A22D003-ANEW
BL-00498	A21B015-AASK, A02B036-AAEK, A02C050-AAWR, A22R002-AAKN
BL-00579	A02K027-ANSK, A03B004-ANOK, A03C019-ANSK
BL-00609	A02K027-ANSK, A22D002-AAKE, A07C001-AAOO
BL-00659	A22B016-AAEA, A01C136-AAAR, A22B018-AAES
BL-00698	A02K027-ANSK, A03J054-ADRO, A03D041-AEKE
BL-00720	A07C002-AAOO, A22R003-AAHO, A22B048-AAOO, A01B272-AAOR
BL-00734	A23J014-ANKK, A02K027-ANSK, A01K225-AAHD, A01D238-ANNR, A23B023-AOSK, A21B021-AASK
BL-00769	A02K027-ANSK, A03B004-ANOK, A03C019-ANSK, A22B048-AAOO
BL-00801	A23C015-AAEK, A21B016-AAKK, A21B023-AAOR
BL-00802	A02B046-AAED, A07C002-AAOO, A22D002-AAKE, A22B033-AAHK
BL-00804	A01K225-AAHD, A22R002-AAKN, A23B023-AOSK
BL-00832	A01K225-AAHD, A03B004-ANOK, A01K008-AAWK, A03R020-ANSK
BL-00866	A01K008-AAWK, A03J054-ADRO, A01D238-ANNR, A22D003-ANEW
BL-00887	A03B004-ANOK, A03C052-ANAD, A23B030-AAHW
BL-00900	A02K027-ANSK, A03B004-ANOK, A03C019-ANSK, A21B023-AAOR, A23R038-AASK
BL-00934	A22B016-AAEA, A22B048-AAOO, A23J011-ANEK
BL-00940	A02K027-ANSK, A23C015-AAEK, A08B001-AAKA, A07C002-AAOO, A22B033-AAHK, A03A030-AAHK, A03R025-ADKK
BL-00962	A07C002-AAOO, A01C136-AAAR, A21B021-AASK
BL-00982	A01K225-AAHD, A07C002-AAOO, A24B016-AAHO, A24D027-ANDK, A24D028-AAWA
BL-01002	A02K027-ANSK, A02K054-ADSK, A22B001-AAAD, A22R001-AAWK, A23B036-AAEW, A23J011-ANEK
BL-01010	A23J014-ANKK, A02K027-ANSK, A01K224-AAKK, A03B004-ANOK, A03C019-ANSK
BL-01057	A22D002-AAKE, A24J015-AAKK, A23B031-AAKR, A24C026-AAAD, A22B014-AAOK, A24D028-AAWA
BL-01058	A01K008-AAWK, A03J054-ADRO, A01D238-ANNR, A23B030-AAHW
BL-01068	A01K225-AAHD, A01K224-AAKK, A22D002-AAKE
BL-01078	A23C015-AAEK, A24C026-AAAD, A03C052-ANAD, A03R025-ADKK
BL-01101	A22B016-AAEA, A24B001-AASH, A24D009-AAWE
BL-01119	A24J015-AAKK, A03R025-ADKK, A24D027-ANDK
BL-01138	A23C015-AAEK, A03B004-ANOK, A01K008-AAWK, A02B036-AAEK, A03R020-ANSK
BL-01148	A23J014-ANKK, A24J015-AAKK, A23B036-AAEW, A24B016-AAHO
BL-01183	A03B004-ANOK, A01K008-AAWK, A03R020-ANSK, A23B023-AOSK, A03C052-ANAD
BL-01186	A02K027-ANSK, A02C050-AAWR, A24B016-AAHO
BL-01191	A01K008-AAWK, A03J054-ADRO, A01D238-ANNR
BL-01268	A23C015-AAEK, A02B045-AANK, A24D028-AAWA
BL-01299	A03B004-ANOK, A01K008-AAWK, A03R020-ANSK
BL-01306	A02K027-ANSK, A03J054-ADRO, A03D041-AEKE, A11K040-AAWK, A22D003-ANEW
BL-01310	A24J015-AAKK, A23B031-AAKR, A24D009-AAWE
BL-01331	A23J014-ANKK, A03J054-ADRO, A03R059-ADAS
BL-01359	A01K008-AAWK, A03J054-ADRO, A01D238-ANNR, A22B049-AAWW, A24J034-ANEW
BL-01408	A23C015-AAEK, A02K054-ADSK, A21B015-AASK, A22B001-AAAD, A22R001-AAWK
BL-01441	A23C015-AAEK, A08B001-AAKA, A02B045-AANK
BL-01487	A08B001-AAKA, A02K054-ADSK, A22B049-AAWW, A08B002-AAKD, A24J031-ANEK, A25B035-AAOK, A01K007-AAKR, A22B050-AASH
BL-01505	A02K054-ADSK, A22B049-AAWW, A25C019-AAWD, A22B001-AAAD, A22R001-AAWK
BL-01523	A02B046-AAED, A25B040-AAWK, A25R027-AAWE
BL-01535	A23J014-ANKK, A02K027-ANSK, A01D238-ANNR, A02B045-AANK
BL-01537	A25B040-AAWK, A25B035-AAOK, A25B034-AAEO
BL-01553	A01K224-AAKK, A22B049-AAWW, A24J015-AAKK, A25B040-AAWK, A24B001-AASH, A25B013-AAHO, A25B034-AAEO
BL-01576	A22B049-AAWW, A24C026-AAAD, A23J011-ANEK
BL-01608	A22B049-AAWW, A25C019-AAWD, A23B030-AAHW
BL-01611	A23J014-ANKK, A02K027-ANSK, A03J054-ADRO, A03D041-AEKE

Transc No	Item Code
BL-01624	A23J014-ANKK, A03D041-AEKE, A11K041-AAHK
BL-01629	A23C015-AAEK, A08B001-AAKA, A02B036-AAEK
BL-01638	A23J014-ANKK, A02K027-ANSK, A01D238-ANNR, A11K040-AAWK
BL-01716	A23C015-AAEK, A03D049-AEDK, A11K041-AAHK
BL-01746	A08B001-AAKA, A08B002-AAKD, A25B040-AAWK
BL-01750	A08B001-AAKA, A02B046-AAED, A08B002-AAKD, A25B040-AAWK
BL-01765	A23J014-ANKK, A02B046-AAED, A11K040-AAWK, A11K041-AAHK, A24J034-ANEW
BL-01836	A11K040-AAWK, A03A030-AAHK, A24J031-ANEK
BL-01858	A23J014-ANKK, A02K027-ANSK, A01D238-ANNR, A02B045-AANK
BL-01908	A23C015-AAEK, A03B004-ANOK, A01K008-AAWK, A03R020-ANSK
BL-01929	A01K224-AAKK, A03R058-ADKK, A25R027-AAWE

After sorting on each transaction in accordance with item, the next entry on the formation of FP-Tree. Here are the stages in the manufacture of FP-Tree is:

a. Make reading the first data to be processed. See the data in Table 3.3 as a reference.

b. Make a check on the root, if root without children (child), then the data is read had become a child of the root. And support count of each node increases 1, except root.

c. If the data comes out next with the data first, then it is not the second child of the root, but keep children from previous root out, that change is the support count her be incremented by 1.

d. Make a check on the root, if root already have a child, or a data read out data differ from the data previously kelaur then it becomes the last child of the root and become a sibling of the first data node, and support from the node count increases 1.

e. Complete these steps until all the data out.

If there is the same data after the reading, but a different path then the node on the other laintasan not increased its support count, only the data that is read only increasing its support count.



Image 2 Readings FP-Tree in Transaction Number BL-00434

Readings at transaction number BL-000 457 is A01K225-AAHD, A02K054-ADSK, A22B001-AAAD, A22R001-AAWK Because prefix A01K225-AAHD not been formed then created new paths.

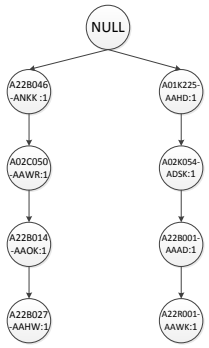


Image 3 Readings FP-Tree in Transaction Number BL-00457

Readings at transaction number BL-000 484 is A02B046-AAED, A02B045-Aank, A21B015-AASK, A22D003-ANEW. Because prefix A02B046-AAED not been formed then created new paths.

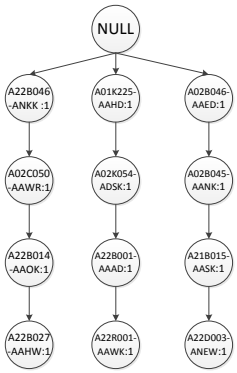


Image 4 Readings in NoNota BL-00484

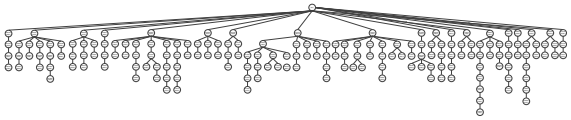


Image 5 Reading All Transactins

After the establishment phase of the FP-Tree of the data set of the transaction, it will be applied to FP-Growth algorithm for frequent itemset search process. Here are the main steps of FP-Growth algorithm, namely:

a. Phase Formation Conditional Pattern Base

Conditional Pattern Base formation obtained through the reading of the results of FP-Tree wholly into a table, looking for the smallest count support in accordance with the results of sequencing. Here are the results of a conditional pattern base table:

Table 4 *Conditional Pattern Base*

Item Code	Conditional Pattern Base
A23J014-ANKK	{NULL}
A02K027-ANSK	{A23J014-ANKK:1}
A01K225-AAHD	{A23J014-ANKK, A02K027-ANSK:1}
A23C015-AAEK	{A02K027-ANSK:1}
A01K224-AAKK	{A23J014-ANKK, A02K027-ANSK:1}, { A01K225-AAHD:1}
A03B004-ANOK	{A02K027-ANSK:3}
	{A01K225-AAHD:1}
	{ A23J014-ANKK, A02K027-ANSK, A01K224-AAKK :1}, { A23C015-AAEK:2}

Item Code	Conditional Pattern Base
A08B001-AAKA	{A02K027-ANSK, A23C015-AAEK:2}
	{A23C015-AAEK:2}
A01K008-AAWK	{A01K225-AAHD, A03B004-ANOK:1}
	{A23C015-AAEK, A03B004-ANOK:2}
	{A03B004-ANOK:2}
A02B046-AAED	{A08B001-AAKA:1}
	{A23J014-ANKK:1}
A03J054-ADRO	{A02K027-ANSK:2}
	{A01K008-AAWK:4}
	{A23J014-ANKK :1}
	{A01K008-AAWK :1}
	{A23J014-ANKK, A02K027-ANSK :1}
A01D238-ANNR	{A23J014-ANKK, A02K027-ANSK, A01K225-AAHD:1}
	{A01K008-AAWK, A03J054-ADRO:4}
	{A23J014-ANKK, A02K027-ANSK:3}
A02B045-AANK	{A02B046-AAED:1}
	{A23C015-AAEK:1}
	{A23C015-AAEK, A08B001-AAKA:1}
	{A23J014-ANKK, A02K027-ANSK, A01D238-ANNR:2}
A02K054-ADSK	{A01K225-AAHD:1}
	{A02K027-ANSK:1}
	{A23C015-AAEK:1}
	{A08B001-AAKA:1}
A22B046-ANKK	{NULL}
A07C002-AAOO	{A02B046-AAED:1}
	{A02K027-ANSK, A23C015-AAEK, A08B001-AAKA:1}
	{A01K225-AAHD:1}
A21B015-AASK	{A02B046-AAED, A02B045-AANK:1}
	{A23C015-AAEK, A02K054-ADSK:1}
A22B049-AAWW	{A01K008-AAWK, A03J054-ADRO, A01D238-ANNR:1}
	{A08B001-AAKA, A02K054-ADSK:1}
	{A02K054-ADSK:1}
	{A01K224-AAKK:1}
A22R003-AAHO	{A07C002-AAOO:1}
A24J015-AAKK	{A22D002-AAKE:1}
	{A23J014-ANKK:1}
	{A01K224-AAKK, A22B049-AAWW:1}
A25C019-AAWD	{A02K054-ADSK, A22B049-AAWW:1}
	{A22B049-AAWW:1}
A03D041-AEKE	{A02K027-ANSK, A03J054-ADRO:2}
	{A23J014-ANKK, A02K027-ANSK, A03J054-ADRO:1}
A03R020-ANSK	{A01K225-AAHD, A03B004-ANOK, A01K008-AAWK:1}
	{A23C015-AAEK, A03B004-ANOK, A01K008-AAWK, A02B036-AAEK:1}
	{A03B004-ANOK, A01K008-AAWK:2}
	{A23C015-AAEK, A03B004-ANOK, A01K008-AAWK:1}
A07C001-AAOO	{A02K027-ANSK, A22D002-AAKE:1}
A08B002-AAKD	{A08B001-AAKA, A02K054-ADSK, A22B049-AAWW:1}
	{A08B001-AAKA:1}
	{A08B001-AAKA, A02B046-AAED:1}
A11K040-AAWK	{A02K027-ANSK, A03J054-ADRO, A03D041-AEKE:1}
	{A23J014-ANKK, A02K027-ANSK, A01D238-ANNR:1}
	{A23J014-ANKK, A02B046-AAED:1}
A22B001-AAAD	{A01K225-AAHD, A02K054-ADSK:1}
	{A02K027-ANSK, A02K054-ADSK :1}
	{A23C015-AAEK, A02K054-ADSK, A21B015-AASK:1}
	{A02K054-ADSK, A22B049-AAWW, A25C019-AAWD:1}
A22B033-AAHK	{A02B046-AAED, A07C002-AAOO, A22D002-AAKE:1}
	{A02K027-ANSK, A23C015-AAEK, A08B001-AAKA, A07C002-AAOO:1}
A22R001-AAWK	{A01K225-AAHD, A02K054-ADSK, A22B001-AAAD :1}
	{A02K027-ANSK, A02K054-ADSK, A22B001-AAAD:1}
	{A23C015-AAEK, A02K054-ADSK, A21B015-AASK, A22B001-AAAD:1}
	{A02K054-ADSK, A22B049-AAWW, A25C019-AAWD, A22B001-AAAD:1}

Item Code	Conditional Pattern Base
A23B031-AAKR	{A22D002-AAKE, A24J015-AAKK:1}
	{A24J015-AAKK:1}
A24C026-AAAD	{A22D002-AAKE, A24J015-AAKK, A23B031-AAKR:1}
	{A23C015-AAEK:1}
	{A22B049-AAWW:1}
A25B040-AAWK	{A02B046-AAED:1}
	{A01K224-AAKK, A22B049-AAWW, A24J015-AAKK:1}
	{A08B001-AAKA, A08B002-AAKD:1}
	{A08B001-AAKA, A02B046-AAED, A08B002-AAKD:1}
A02C050-AAWR	{A22B046-ANKK:1}
	{A21B015-AASK, A02B036-AAEK:1}
	{A02K027-ANSK:1}
A03A030-AAHK	{A02K027-ANSK, A23C015-AAEK, A08B001-AAKA, A07C002-AAOO, A22B033-AAHK:1}
	{A11K040-AAWK:1}
A03C019-ANSK	{A02K027-ANSK, A03B004-ANOK:3}
	{A23J014-ANKK, A02K027-ANSK, A01K224-AAKK, A03B004-ANOK:1}
A21B016-AAKK	{A23C015-AAEK:1}
A22B014-AAOK	{A22B046-ANKK, A02C050-AAWR:1}
	{A22D002-AAKE, A24J015-AAKK, A23B031-AAKR, A24C026-AAAD:1}
A22B016-AAEA	{NULL}
A22B048-AAOO	{A07C002-AAOO, A22R003-AAHO:1}
	{A02K027-ANSK, A03B004-ANOK, A03C019-ANSK:1}
	{A22B016-AAEA:1}
A22D003-ANEW	{A02B046-AAED, A02B045-AANK, A21B015-AASK:1}
	{A01K008-AAWK, A03J054-ADRO, A01D238-ANNR:1}
	{A02K027-ANSK, A03J054-ADRO, A03D041-AEKE, A11K040-AAWK:1}
A22R002-AAKN	{A21B015-AASK, A02B036-AAEK, A02C050-AAWR:1}
	{A01K225-AAHD:1}
A23B023-AOSK	{A23J014-ANKK, A02K027-ANSK, A01K225-AAHD, A01D238-ANNR:1}
	{A01K225-AAHD, A22R002-AAKN:1}
	{A03B004-ANOK, A01K008-AAWK, A03R020-ANSK:1}
A23B036-AAEW	{A02K027-ANSK, A02K054-ADSK, A22B001-AAAD, A22R001-AAWK:1}
	{A23J014-ANKK, A24J015-AAKK:1}
A24B001-AASH	{A22B016-AAEA:1}
	{A01K224-AAKK, A22B049-AAWW, A24J015-AAKK, A25B040-AAWK:1}
A24D009-AAWE	{A22B016-AAEA, A24B001-AASH:1}
	{A24J015-AAKK, A23B031-AAKR:1}
A24J031-ANEK	{A08B001-AAKA, A02K054-ADSK, A22B049-AAWW, A08B002-AAKD:1}
	{A11K040-AAWK, A03A030-AAHK:1}
A25B013-AAHO	{A01K224-AAKK, A22B049-AAWW, A24J015-AAKK, A25B040-AAWK, A24B001-AASH:1}
A25B035-AAOK	{A08B001-AAKA, A02K054-ADSK, A22B049-AAWW, A08B002-AAKD, A24J031-ANEK:1
	{A25B040-AAWK:1}
A01B272-AAOR	{A07C002-AAOO, A22R003-AAHO, A22B048-AAOO:1}
A01C136-AAAR	{A22B016-AAEA:1}
	{A07C002-AAOO:1}
A01K007-AAKR	{A08B001-AAKA, A02K054-ADSK, A22B049-AAWW, A08B002-AAKD, A24J031-ANEK, A25B035-AAOK:1}
A03C052-ANAD	{A03B004-ANOK:1}
	{A23C015-AAEK, A24C026-AAAD:1}
	{A03B004-ANOK, A01K008-AAWK, A03R020-ANSK, A23B023-AOSK:1}
A03D049-AEDK	{A23C015-AAEK:1}
A03R025-ADKK	{A02K027-ANSK, A23C015-AAEK, A08B001-AAKA, A07C002-AAOO, A22B033-AAHK, {A03A030-AAHK:1}
	{A23C015-AAEK, A24C026-AAAD, A03C052-ANAD:1}
	{A24J015-AAKK:1}
A03R058-ADKK	{A01K224-AAKK:1}
A03R059-ADAS	{A23J014-ANKK, A03J054-ADRO:1}
A11K041-AAHK	{A23J014-ANKK, A03D041-AEKE:1}

Item Code	Conditional Pattern Base
	{A23C015-AAEK, A03D049-AEDK:1}
	{A23J014-ANKK, A02B046-AAED, A11K040-AAWK:1}
A21B021-AASK	{A23J014-ANKK, A02K027-ANSK, A01K225-AAHD, A01D238-ANNR, A23B023-AOSK:1}
	A07C002-AAOO, A01C136-AAAR:1}
A21B023-AAOR	{A23C015-AAEK, A21B016-AAKK:1}
	{A02K027-ANSK, A03B004-ANOK, A03C019-ANSK:1}
A22B018-AAES	{A22B016-AAEA, A01C136-AAAR:1}
A22B027-AAHW	{A22B046-ANKK, A02C050-AAWR, A22B014-AAOK:1}
A22B050-AASH	{A08B001-AAKA, A02K054-ADSK, A22B049-AAWW, A08B002-AAKD, A24J031-ANEK, A25B035-AAOK, A01K007-AAKR:1}
A23B030-AAHW	{A03B004-ANOK, A03C052-ANAD:1}
	{A01K008-AAWK, A03J054-ADRO, A01D238-ANNR:1}
	{A22B049-AAWW, A25C019-AAWD:1}
A23J011-ANEK	{A22B016-AAEA, A22B048-AAOO:1}
	{A02K027-ANSK, A02K054-ADSK, A22B001-AAAD, A22R001-AAWK, A23B036-AAEW:1}
	{A22B049-AAWW, A24C026-AAAD:1}
A23R038-AASK	{A02K027-ANSK, A03B004-ANOK, A03C019-ANSK, A21B023-AAOR:1}
A24B016-AAHO	{A01K225-AAHD, A07C002-AAOO:1}
	{A23J014-ANKK, A24J015-AAKK, A23B036-AAEW:1}
	{A02K027-ANSK, A02C050-AAWR:1}
A24D027-ANDK	{A01K225-AAHD, A07C002-AAOO, A24B016-AAHO:1}
	{A24J015-AAKK, A03R025-ADKK:1}
A24D028-AAWA	{A01K225-AAHD, A07C002-AAOO, A24B016-AAHO, A24D027-ANDK:1}
	{A22D002-AAKE, A24J015-AAKK, A23B031-AAKR, A24C026-AAAD, A22B014-AAOK:1}
	{A23C015-AAEK, A02B045-AANK:1}
A24J034-ANEW	{A01K008-AAWK, A03J054-ADRO, A01D238-ANNR, A22B049-AAWW:1}
	{A23J014-ANKK, A02B046-AAED, A11K040-AAWK, A11K041-AAHK:1}
A25B034-AAEO	A25B040-AAWK, A25B035-AAOK:1}
	{A01K224-AAKK, A22B049-AAWW, A24J015-AAKK, A25B040-AAWK, A24B001-AASH, A25B013-AAHO:1}
A25R027-AAWE	{A02B046-AAED, A25B040-AAWK:1}
	{A01K224-AAKK, A03R058-ADKK:1}

b. Conditional formation stage FP-Tree

At this stage, the support count of each item on each conditional pattern base totaled, and every item has a number of support count is greater than or equal to the minimum support count will be raised with conditional FP-Tree. Here is a table of the results of conditional FP-Tree:

Table 5 *Conditional* FP-*Tree*

Kode Barang	Conditional FP-Tree
A03B004-ANOK	{A02K027-ANSK:4}
A08B001-AAKA	{A23C015-AAEK:4}
A01K008-AAWK	{A03B004-ANOK:5}
A03J054-ADRO	{A01K008-AAWK:5}
A01D238-ANNR	{A02K027-ANSK:4, A23J014-ANKK:4}
A01D238-ANNR	{A03J054-ADRO:4, A01K008-AAWK:4}
A03D041-AEKE	{A03J054-ADRO:3, A02K027-ANSK:3}
A03R020-ANSK	{A01K008-AAWK:5, A03B004-ANOK:5}
A22R001-AAWK	{A22B001-AAAD:4, A02K054-ADSK:4}
A08B002-AAKD	{A08B001-AAKA:3}
A22B001-AAAD	{A02K054-ADSK:4}
A03C019-ANSK	{A03B004-ANOK:4, A02K027-ANSK:4}

c. Frequent formation stage Generated Patterns

Formation of Frequent Patterns Generated for each item based on conditional FP-Tree obtained. Here is a table of the results of frequent patterns generated:

Table 6 *Frequent Patterns Generated*

Kode Barang	Conditional Pattern Generated
A01D238-ANNR	{A01D238-ANNR , A02K027-ANSK, A23J014-ANKK:4}
A01D238-ANNR	{A01D238-ANNR, A03J054-ADRO, A01K008-AAWK:4}
A03D041-AEKE	{A03D041-AEKE, A03J054-ADRO, A02K027-ANSK:3}
A03R020-ANSK	{A03R020-ANSK, A01K008-AAWK, A03B004-ANOK:5}
A22R001-AAWK	{A22R001-AAWK, A22B001-AAAD, A02K054-ADSK:4}
A03C019-ANSK	{A03C019-ANSK, A03B004-ANOK, A02K027-ANSK:4}

B. Generate Rule

Frequent Patterns Generated From the results above, then the next step is the establishment of the rule. Below is a table of the establishment of the rule generated:

Table 7 Pembentukan *Generated Rule*

Generate Rule	Confidence (%)
A01D238-ANNR → A02K027-ANSK, A23J014-ANKK	(4/8)*100 = 50
A01D238-ANNR → A03J054-ADRO, A01K008-AAWK	(4/8)*100 = 50
A03D041-AEKE → A03J054-ADRO, A02K027-ANSK	(3/5)*100 = 60
A03R020-ANSK → A01K008-AAWK, A03B004-ANOK	(5/5)*100 = 100
A22R001-AAWK → A22B001-AAAD, A02K054-ADSK	(4/5)*100 = 80
A03C019-ANSK → A03B004-ANOK, A02K027-ANSK	(4/4)*100 = 100

Having obtained the confidence value for each rule, then the next step is to determine the rule of frequent itemset. For every couple who are not eligible confidence score> = 80% then it will be removed. Results of the establishment of the rule can be seen in the following table:

Table 8 Rules Result

Generate Rule	Recomendation
A03R020-ANSK→A01K008-AAWK, A03B004-ANOK	ROK SMA 1→SYAL PANJANG GOLD, LEOPARD SHIRT }
A22R001-AAWK→A22B001-AAAD, A02K054-ADSK	ROK BANGKOK→KAOS SLETING, KERUDUNG PASHMINA
A03C019-ANSK→A03B004-ANOK, A02K027-ANSK	CELANA KULOT SMA→LEOPARD SHIRT, KERUDUNG PASMINA POLOS

The next stage is to determine the package are eligible:

- ✓ Restrictions price of Rp 400,000 - Rp 900,000
- ✓ consists of superiors, subordinates and hoods / syall.

Then shown into a form that is easily understood, on the package can be seen in the following table.

Table 9 Package Recomendations

Paket	Nama Barang	Harga
Paket 1	ROK SMA 1, SYAL PANJANG GOLD, LEOPARD SHIRT	Rp 665000
Paket 2	ROK BANGKOK, KAOS SLETING, KERUDUNG PASHMINA	Rp 475000
Paket 3	CELANA KULOT SMA, LEOPARD SHIRT, KERUDUNG PASMINA POLOS	Rp 615000

2.3 Interface

a. Interface of Input Data Transaksi

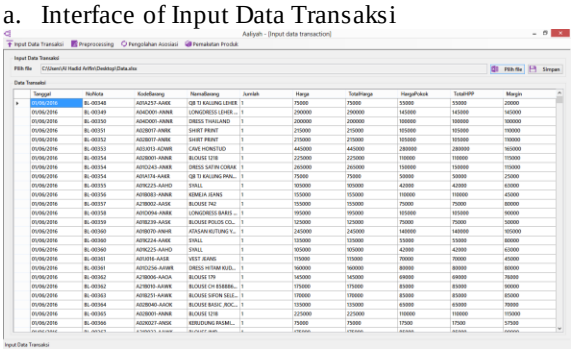


Image 6 Interface of Input Data Transaksi

b. Interface of Preprocessing

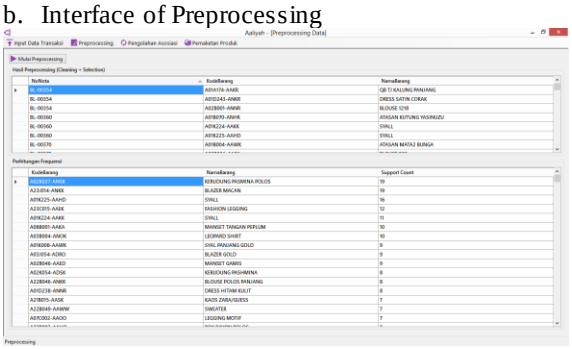


Image 7 Interface of *Preprocessing*

c. Interface of Association Process

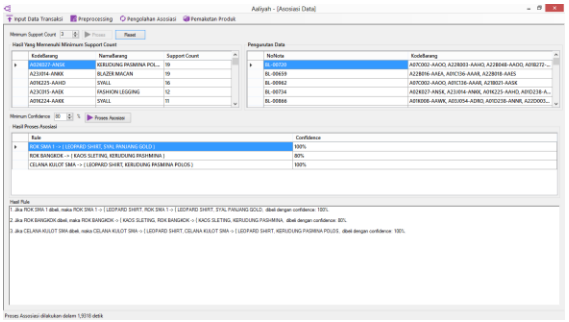


Image 8 Interface of Association Process

d. Interface of Package

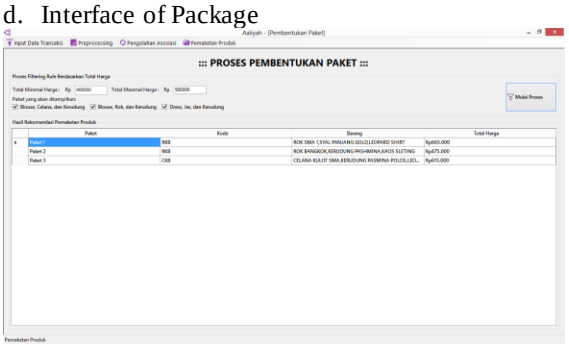


Image 9 Interface of Package

2. Research Result

The research results are tested by testing the software that has been built whether to produce valid data and in accordance with the results of applying the method of association rule algorithm FP-Growth.

Tests using the sales transaction data in June-July 2015 with a value of minimum support 3 and the minimum value of 80% confidence. The resulting association rules are:

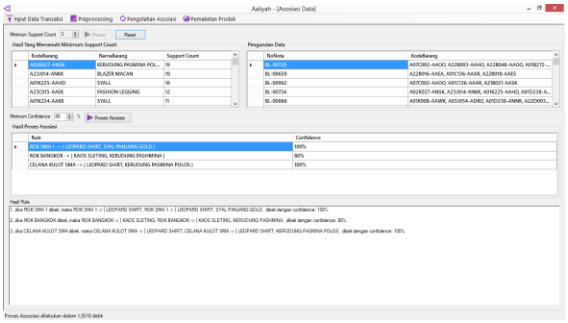


Image 8. Rules Result with Min. Support=3 and Confidence=80%

The determination of the combination of products that will be sold in packages, Aaliyah parties provide specific limits that the package consists of superiors, subordinates and hoods / syall at a price of Rp 400,000 - Rp 900,000.

In tests conducted using the minimum support and minimum confidence = 3 = 80% of the recommendations that formed the package are:

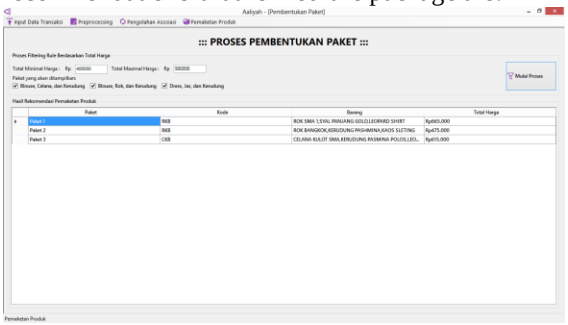


Image 9. Packaging

3. CLOSING

4.1 Conclutions

Based on the results of the implementation and testing has been done on the system by using the application of data mining association rule method, it can be concluded as follows:

a. Applications built to help the parties Aaliyah for using or managing existing sales data into information.

b. Applications built to help the parties Aaliyah know what combination of goods that could be used as optional in determining the sales package in the next event.

4.2 Suggestion

Suggestions for further development, as follows:
In determining the boundaries of goods at the stage of the packaging can be developed more dynamically, where users can define their own types of goods to be packaged as required.

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