CHAPTER 4
ANALYSIS AND DESIGN

4.1 Analysis

It is not easy calculating the sum of each items in the sales transaction record when data is large. Therefore, this project using FP-Growth algorithm to solve the problem.

Before started, Minimum Support is entered to limit items that enter the system. Minimum support is a standard that is chosen by user, how many minimal item that processed by system. Then, click *Masuk Program*. Minimum support value has been saved with system.

Illustration 4.1: Inserting Minimum Support

1. Menghitung Jumlah Transaksi Tiap Data

No	Kode Barang	Nama Barang	Jumlah Transaksi
1	25505	SAFCO Mobile Desk Side File, Wire Frame	7
2	25506	SAFCO Commercial Wire Shelving, Black	2
3	25507	Xerox 198	4
4	25508	Xerox 1980	6
5	25509	Advantus Map Pennant Flags and Round Head Tacks	4
6	25510	Holmes HEPA Air Purifier	4
7	25511	DS/HD IBM Formatted Diskettes, 200/Pack - Staples	3
8	25512	Wilson Jones 1" Hanging DublLock	10
9	25513	Ultra Commercial Grade Dual Valve Door Closer	5
10	25514	#10-4 1/8" x 9 1/2" Premium Diagonal Seam Envelopes	2
11	25515	Hon 4-Shelf Metal Bookcases	5
12	25516	Lesro Sheffield Collection Coffee Table, End Table, Center Table, Corner Table	8
13	25517	Huawei Ascend G520	8
14	25518	Swiss LX 788	4
15	25519	Avery 52	3
16	25520	Plymouth Boxed Rubber Bands by Plymouth	2
17	25521	GBC Pre-Punched Binding Paper, Plastic, White, 8-1/2" x 11"	6
18	25522	Maxell 3.5" DS/HD IBM-Formatted Diskettes, 10/Pack	5
19	25523	Newell 335	7
20	25524	SANFORD Liquid Accent Tank-Style Highlighters	4

Transferring data from localhost...

Illustration 4.2: First Step - Count Each Item

First, Calculating the sum of each items in the sales transaction records. In this project, items is in “tblBarang” table. After items have been calculated, items are sorted from the most purchased items to few purchased items. After that, items that below minimum support are eliminated.

_ _ _ _ _ _ _ _ _ _ Minimum Support : 2 dan Sudah diurutkan dari besar ke kecil _ _ _ _ _ _ _ _ _ _

No	Kode Barang	Nama Barang	Jumlah Transaksi
1	25512	Wilson Jones 1" Hanging DublLock	10
2	25516	Lesro Sheffield Collection Coffee Table, End Table, Center Table, Corner Table	8
3	25517	Huawei Ascend G520	8
4	25523	Newell 335	7
5	25505	SAFCO Mobile Desk Side File, Wire Frame	7
6	25508	Xerox 1980	6
7	25521	GBC Pre-Punched Binding Paper, Plastic, White, 8-1/2" x 11"	6
8	25515	Hon 4-Shelf Metal Bookcases	5
9	25522	Maxell 3.5" DS/HD IBM-Formatted Diskettes, 10/Pack	5
10	25513	Ultra Commercial Grade Dual Valve Door Closer	5
11	25509	Advantus Map Pennant Flags and Round Head Tacks	4
12	25510	Holmes HEPA Air Purifier	4
13	25524	SANFORD Liquid Accent Tank-Style Highlighters	4
14	25518	Swiss LX 788	4
15	25507	Xerox 198	4
16	25511	DS/HD IBM Formatted Diskettes, 200/Pack - Staples	3
17	25519	Avery 52	3
18	25506	SAFCO Commercial Wire Shelving, Black	2
19	25520	Plymouth Boxed Rubber Bands by Plymouth	2
20	25514	#10-4 1/8" x 9 1/2" Premium Diagonal Seam Envelopes	2

Illustration 4.3: First Step - Ordering and Eliminating Data

The result of first iteration is order of data items.

Second, data transaction which is in “tblRincian” table, is sorted according order of data items.

2. Melihat Rincian Transaksi dengan Jumlah Pembelian Tiap barang

No	Kode Transaksi	Kode Barang	Jumlah Dibeli
1	1	25512	10
2	1	25516	8
3	1	25508	6
4	1	25515	5
5	1	25518	4
6	1	25524	4
7	1	25509	4
8	1	25514	2
9	2	25512	10
10	2	25516	8
11	2	25523	7
12	2	25505	7
13	2	25508	6
14	2	25521	6
15	2	25513	5
16	2	25506	2
17	3	25512	10
18	3	25523	7

Illustration 4.4: Second Step - Ordering Data

For example, take a closer look on transaction number 9 before be ordered.

9	25505
9	25507
9	25510
9	25515
9	25522

Illustration 4.5: Second Step - Data before Sorted

Then, this is transaction number 9 after its items have been ordered by most purchasable item..

9	25505	7
9	25515	5
9	25522	5
9	25507	4
9	25510	4

Illustration 4.6: Second Step - Data after Sorted

Items in data transaction that are below minimum support are also eliminated.

_ _ _ _ _ _ _ _ _ Minimum Support : 2 _ _ _ _ _ _ _ _ _

No	Kode Transaksi	Kode Barang	Jumlah Dibeli
1	1	25512	10
2	1	25516	8
3	1	25508	6
4	1	25515	5
5	1	25524	4
6	1	25509	4
7	1	25518	4
8	1	25514	2
9	2	25512	10
10	2	25516	8
11	2	25505	7
12	2	25523	7

Illustration 4.7: Second Step - Eliminating Data Below Minimum Support

The result of second iteration is sorted data transaction where its item same or more than Minimum Support. This result is called FP-List. FP-List is a final data transaction which is used for next process.

Third, FP-List is processed to become Conditional Pattern Base. The process began when FP-List is turned into an array string.

a. Memasukkan data Transasksi kedalam Array

Array ([0] => [1] => 25512,25516,25508,25515,25509,25518,25524,25514 [2] =>
25512,25516,25505,25523,25521,25508,25513,25506 [3] => 25512,25523,25505,25521,25522,25519,25506 [4]
=> 25516,25517,25505,25515,25510,25511,25520 [5] =>
25512,25517,25516,25523,25505,25508,25521,25507,25509,25524 [6] =>
25512,25517,25523,25508,25522,25524,25518,25509,25520,25514 [7] =>
25512,25517,25505,25523,25521,25522,25507 [8] =>
25512,25516,25517,25523,25513,25522,25515,25518,25511 [9] => 25505,25515,25522,25510,25507 [10] =>
25512,25516,25517,25505,25508,25515,25513,25509,25510,25518,25519 [11] =>
25512,25516,25517,25523,25521,25508,25513,25507,25524,25510,25511,25519 [12] =>
25512,25516,25517,25521,25513)

Illustration 4.8: Third Step - FP-List Changed into Array

So array's length as many as FP-List data. Then, data items also is changed to array string but from few purchased items to most purchased items.

b. Kode Barang diurutkan dari frekuensi Kecil menuju Besar

No	Kode Barang	Nama Barang	Jumlah Transaksi
1	25506	SAFCO Commercial Wire Shelving, Black	2
2	25520	Plymouth Boxed Rubber Bands by Plymouth	2
3	25514	#10-4 1/8" x 9 1/2" Premium Diagonal Seam Envelopes	2
4	25511	DS/HD IBM Formatted Diskettes, 200/Pack - Staples	3
5	25519	Avery 52	3
6	25509	Advantus Map Pennant Flags and Round Head Tacks	4
7	25510	Holmes HEPA Air Purifier	4
8	25524	SANFORD Liquid Accent Tank-Style Highlighters	4
9	25518	Swiss LX 788	4
10	25507	Xerox 198	4
11	25515	Hon 4-Shelf Metal Bookcases	5
12	25522	Maxell 3.5" DS/HD IBM-Formatted Diskettes, 10/Pack	5
13	25513	Ultra Commercial Grade Dual Valve Door Closer	5
14	25508	Xerox 1980	6
15	25521	GBC Pre-Punched Binding Paper, Plastic, White, 8-1/2" x 11"	6
16	25523	Newell 335	7

Illustration 4.9: Third Step - Data Item Reverse Sorted

c. Kode Barang yg Sudah Urut dimasukkan kedalam Array

Print Array kodeBarang :
The value of $_SESSION['0'] is '25506'
The value of $_SESSION['1'] is '25520'
The value of $_SESSION['2'] is '25514'
The value of $_SESSION['3'] is '25511'
The value of $_SESSION['4'] is '25519'
The value of $_SESSION['5'] is '25509'
The value of $_SESSION['6'] is '25510'
The value of $_SESSION['7'] is '25524'
The value of $_SESSION['8'] is '25518'
The value of $_SESSION['9'] is '25507'
The value of $_SESSION['10'] is '25515'
The value of $_SESSION['11'] is '25522'
The value of $_SESSION['12'] is '25513'
The value of $_SESSION['13'] is '25508'
The value of $_SESSION['14'] is '25521'
The value of $_SESSION['15'] is '25523'
The value of $_SESSION['16'] is '25505'
The value of $_SESSION['17'] is '25516'
The value of $_SESSION['18'] is '25517'
The value of $_SESSION['19'] is '25512'

Illustration 4.10: Third Step - Data Item into Array

These two array string are modified and inputted into temporary table.

d.Membuat Temporary tabel untuk menjadikan Conditional Pattern Base

Suffix	Conditional Pattern Base	Jumlah
25524	25512,25516,25517,25523,25521,25508,25513,25507	1
25524	25512,25516,25508,25515,25518	1
25524	25512,25517,25516,25523,25505,25508,25521,25507	1
25524	25512,25517,25523,25508,25522,25518	1
25523	25512,25517,25516,25505	1
25523	25512,25517	1
25523	25512,25517,25505	1
25523	25512,25516,25505	1
25523	25512,25505	1
25522	25512,25523,25505,25521	1
25522	25512,25517,25523,25508	1
25522	25512,25517,25505,25523,25521	1
25522	25512,25516,25517,25523,25513	1
25522	25505	1
25521	25512,25517,25516,25523,25505	1
25521	25512,25517,25505,25523	1
25521	25512,25516,25517,25523	1
25521	25512,25516,25517	1
25521	25512,25516,25505,25523	1
25521	25512,25523,25505	1

Illustration 4.11: Third Step - Conditional Patern Base

This new temporary table is called Conditional Pattern Base. *Suffix* is from tblBarang and *Conditional Pattern Base* / CPB is from array of transaction data. Meanwhile, *Jumlah* is a counting total for each column CPB that putted into a row.

Fourth, Conditional Pattern Base is divided into each item. Each CPB no longer had more than one data item. After that, each suffix is counted. Then, each item is counted and inputted to other new temporary table and called Conditional FP-Tree. This process same as inputted Data into Conditional Pattern Base.

4. CONDITIONAL FP-TREE

Suffix	Conditional FP-Tree	Jumlah
25524	25521	2
25524	25518	2
25524	25507	2
25522	25521	2
25520	25517	2
25519	25517	2
25519	25513	2
25519	25510	2
25519	25508	2
25519	25521	2
25519	25523	2
25519	25505	2
25519	25516	2
25518	25523	2
25518	25522	2
25518	25513	2
25515	25522	2

Illustration 4.12: Conditional FP-Tree

Finally, FP-Tree joined with their data items, became two set item called Frequent Item Set.

5. FREQUENT ITEM SET

Suffix	Frequent Item Set	Jumlah
25524	25524,25521	2
25524	25524,25518	2
25524	25524,25507	2
25522	25522,25521	2
25520	25520,25517	2
25519	25519,25517	2
25519	25519,25513	2
25519	25519,25510	2
25519	25519,25508	2
25519	25519,25521	2
25519	25519,25523	2
25519	25519,25505	2
25519	25519,25516	2
25518	25518,25523	2
25518	25518,25522	2
25518	25518,25513	2
25515	25515,25522	2
25515	25515,25513	2
25515	25515,25508	2
25514	25514,25509	2
25514	25514,25524	2

Illustration 4.13: Frequent Item Set

When Frequent Item Set is found, a Frequent Pattern 2-Set can be found too. Because result of Frequent Item Set is a Frequent Pattern 2-Set.

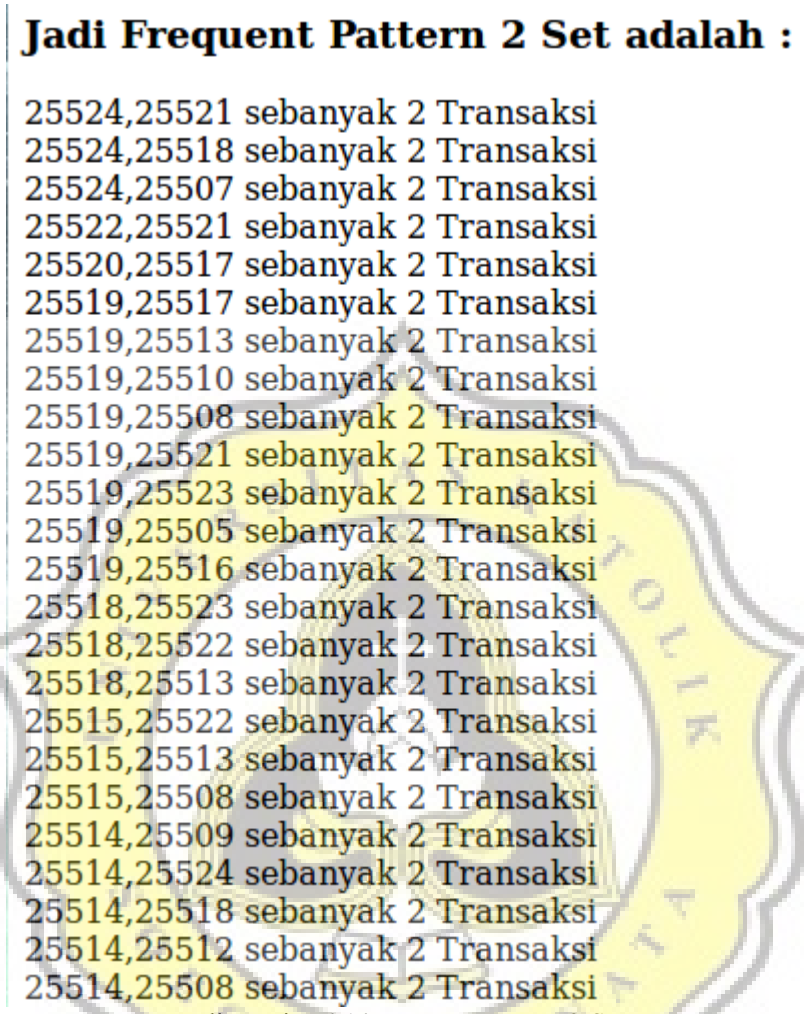

Illustration 4.14: Frequent Pattern 2-Set

Frequent Pattern 2-set can be analyzed again and made a Frequent Pattern 3-Set. The principal is If there is A,B as many transaction as A,C ; then FP 3-set which is A,B,C can be created. As can be ssen on table below, that item ID 25517, 25519, and 25513 bought together as much 2 transactions.

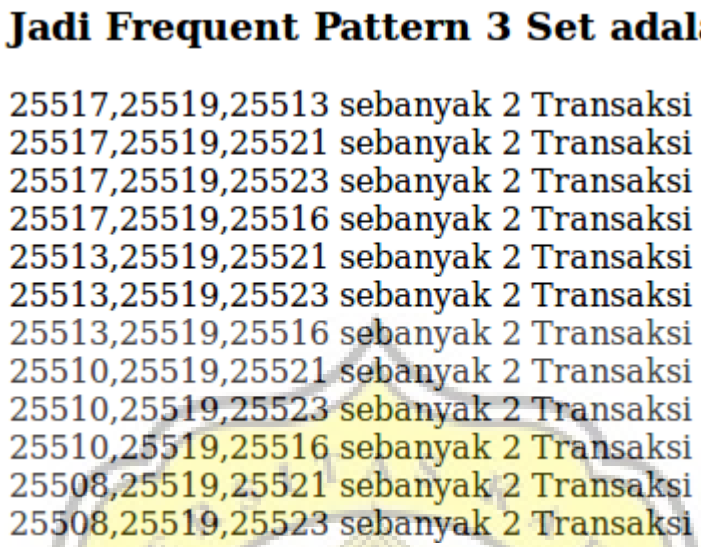

Illustration 4.15: Frequent Pattern 3-Set

When all Frequent Pattern Sets are displayed, process of system simulation has finished.

4.2 Desain

As can be seen below, that is a flowchart of Simulation System. Start from inputting data through SQL file. Then, before entering the system, minimum support must be inputted. If there is no Minimum support set, the system can not be continued. After minimum support is inputted, the each step of system process can be followed until Frequent Sets are found. If there is no Frequent Sets, it indicated that there is no Frequent Sets higher than minimum support

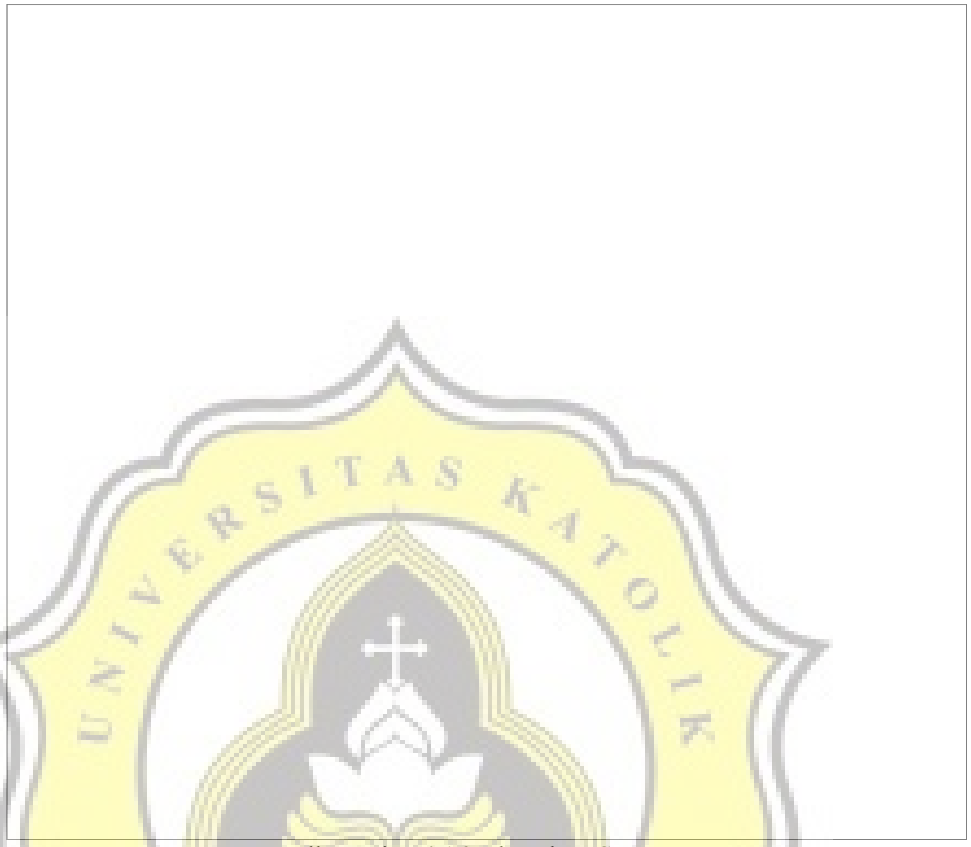

Illustration 4.16: Flowchart System