



Design of Web-Based Point Of Sales (POS) With FP-Growth Algorithm at Toko Buku Mandiri

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Abstract: From this problem the author conducted research to design a point of sales information system that can be used to facilitate business processes plus the market basket analysis feature with the FP-Growth algorithm to provide knowledge that is expected to make it easier for owners to make sales strategies and arrange items that must be restocked so that Goods turnover is always smooth.

The results of the design show that the system made is able to carry out transaction processes, goods management, report generation and market basket analysis processes well based on black-box testing. The results of the market basket analysis process from 200 transactions were obtained as many as 29 association rules with a minimum support requirement of 5% and a minimum confidence of 75%. The combination of the three highest variables is 'If Octavo Books are 100 OK, then ABD Notes Books' with support of 8%, confidence of 100% and lift ratio of 11.11.

Keywords: Point of Sales, Market Basket Analysis, Website, Algorithm, FP-Growth.

I. INTRODUCTION

Mandiri Bookstore is a store that sells various kinds of office stationery (ATK) and school supplies that serve wholesale and retail purchases. Currently, Berdikari Stationery has 3 employees. This shop is located at Pasar Baru Bekasi Shopping Mall block J1. In carrying out its operations, this shop is still quite traditional in running its business. An example is the absence of recording of incoming and outgoing stock of goods, this makes stock control more difficult because it is only done visually with irregular time intervals. Then the process of making proof of transaction is done by hand in the form of a note, this makes the transaction process ineffective in terms of time.

This example is only one of the processes that make store operations less effective, there are still many processes that can be completed using information technology so that business processes become more effective. Judging from these problems, point of sales is a solution for Toko Buku Mandiri to improve the quality of service for consumers and facilitate the implementation of store operations.

Point of sales can help business actors to control stock and improve customer experience by speeding up the transaction process and can provide reports for store owners. Point of sales is expected to increase customer loyalty and provide convenience in carrying out store operations.

Frequent Pattern Growth Algorithm (FP-Growth) is an alternative algorithm that can be used to determine the most frequently occurring data set (frequent itemset) in a data set. The characteristic of the FP-Growth algorithm is that the data structure used is a tree called FP-Tree. By using FP-Tree, FP-Growth algorithm can directly extract frequent Itemset from FP-Tree. Excavation of frequent itemsets using the FP-Growth algorithm will be carried out by generating a tree data structure or called FP-Tree[1][2], [3].

II. RELATED WORKS

A. Point of Sales

Point Of Sales (POS) is a sales-oriented activity and a system that helps process transactions. Each POS consists of hardware in the form of a terminal/PC, receipt printer, cash drawer, payment terminal, barcode scanner and software in the form of inventory management, reporting, purchasing, customer management, transaction security standards, return processing where both components are used for each transaction process. Point of sales (POS) can be in the form of a checkout counter in a store or place of business where a sales transaction occurs[4].



B. Market Based Analysis (MBA)

MBA is a methodology for analyzing consumer buying habits by finding associations between several different types of goods, which are placed by consumers in the shopping basket purchased in a particular transaction[5]. The aim of the MBA is to find out which products are likely to be purchased together. Analysis of transaction data can result in frequent product purchase patterns[6]. This technique has been widely used by wholesale and retail stores.

1. Declaration of minimum support and minimum confidence

The initial step before carrying out the calculation is to declare the minimum support and minimum confidence in the form of a percentage[7]. This declaration aims to filter transactions whose items do not meet the minimum support and minimum confidence. Selection of minimum support and minimum confidence is done by trial-and-error method. In this case the author uses a minimum support of 5% and a minimum confidence of 75%.

2. Calculation of the Support Count of the entire transaction

At this stage the items from all transactions are calculated for their support[8]. The formula used to calculate the itemset support is:

$$\text{Support}(S) = \frac{\text{Count}(S)}{n}$$

The results of these calculations produce a support value of 120 items. For this example the author provides a minimum support value of 5%. After screening the minimum support, the items that successfully passed totaled 23 items as shown in table 1.

Table 1. Items that Pass the Minimum Support Screening

No	Item	Count(S)	Support (Transaction : n=200)
1	Lakban Bening Daimaru	57	$\frac{57}{200} \times 100\% = 28.5\%$
2	Pen Standar AE-7 Hitam	36	$\frac{36}{200} \times 100\% = 18\%$
3	Nota Paperline K1	36	$\frac{36}{200} \times 100\% = 18\%$
4	Nota Paperline K2	28	$\frac{28}{200} \times 100\% = 14\%$
5	Isolasi Bening Daimaru Mini	24	$\frac{24}{200} \times 100\% = 12\%$
6	Kertas Kado Okey Batik	24	$\frac{24}{200} \times 100\% = 12\%$
7	Double Folio Garis Sinar Dunia 100	22	$\frac{22}{200} \times 100\% = 11\%$
8	Lem Fox 150gr	20	$\frac{20}{200} \times 100\% = 10\%$
9	Solasi Bening Daimaru 1/2 inch	20	$\frac{20}{200} \times 100\% = 10\%$

C. Association Rule

Association analysis or association rule mining is a data mining technique to find association rules between a combination of items. An example of an association rule from purchasing analysis in a supermarket is to know how likely a customer is to buy bread with milk. With this knowledge, supermarket owners can arrange the placement of their goods or design marketing campaigns by using discount coupons for certain combinations of goods. Association analysis became famous for its application to analyze the contents of shopping carts in supermarkets. (Astrina et al., 2019). Association Rule Mining is a procedure for finding relationships between items in a dataset. It starts by looking for frequent itemset, which is the combination that occurs most often in an itemset and must meet the minimum support.

D. Algorithm FP-Growth

Frequent Pattern Growth (FP-Growth) is an alternative algorithm that can be used to determine the most frequently occurring data set (frequent itemset) in a data set. The characteristic of the FP-Growth algorithm is that the data structure used is a tree called FP-Tree. By using FP-Tree, FP-Growth algorithm can directly extract frequent Itemset from FP-Tree. Excavation of frequent itemsets using the FP-Growth algorithm will be done by generating a tree data structure or called FP-Tree.



III. METHODOLOGY

1. Conditional Pattern Base Generation Stage Conditional Pattern Base is a subdatabase that contains path prefixes and suffix patterns. The conditional pattern base generation is obtained through the previously built FP-Tree.
2. FP-tree Conditional Generation Stage At this stage, the support count of each item in each conditional pattern base is summed, then each item that has a support count greater than the minimum support count will be generated with the conditional FP-Tree.
3. Frequent itemset search stage
If the Conditional FP-Tree is a single path, then the frequent itemset is obtained by combining items for each conditional FP-Tree. If it is not a single path, then FP-Growth is generated recursively.

Extreme Programming is a software development method that uses an 'object-oriented' approach as the desired development paradigm and includes a set of rules of practice that occur in the context of four framework activities: planning, designing, coding and testing.

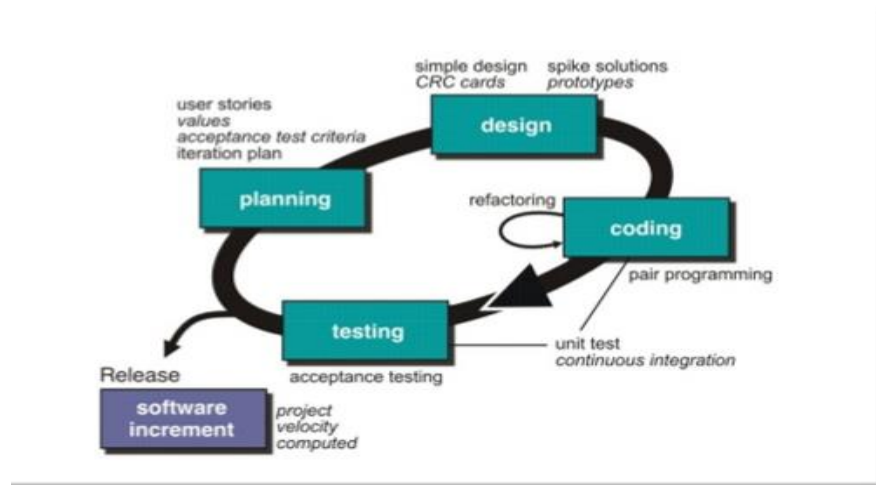


Figure 1. Extreme Programming Development Method Flow

The following is an explanation of the research flow chart:

1. Problem Identification At this stage the author defines the problems that occur in Toko Buku Mandiri
2. Data Collection This process The author collects the required data through interviews with shop owners, literature studies to obtain references related to the problems of this study and observations by making observations to find out the business processes of the shop.
3. Needs Analysis
This analysis is carried out to determine the minimum requirements both in terms of hardware and software so that the system to be made can run well.
4. System Design
In designing this system, the system design, coding and market basket analysis stages will be carried out with the FP-Growth algorithm.
5. Software testing
At this stage, the author will test the workflow of the system whether it is in accordance with the design or not. The author will also test the output of the application with various scenarios. This test aims to evaluate whether the system is running well or not, if errors are still encountered, then this research will be repeated to the data collection stage.
6. Results
As a result, the point of sales application can be used on Berdikari Stationery for its business needs which include transaction processing, goods management, stock taking and supplier management for employees and owners.
7. Implementation
At this stage the system that has been declared to be running well can be used.



IV. CONCLUSION

Berdikari Stationery still runs its store operations in a traditional way. Berdikari Stationery still relies on handwritten notes for making transaction evidence and stock management which is still done visually only without any data collection. In this case the author has designed a workflow system that can make shop business processes more effective, based on system design and what is built, it can be concluded that :

1. The point of sales system at Berdikari Stationery can be designed using the Extreme Programming software development method
2. The process of managing goods data, detailed information on goods will be managed by the system. It is expected that with the existence of a point of sales system, the process of managing goods will become more organized.
3. With the existence of an information system, transaction processing is expected to be faster and transaction data can be used as a backup or market basket analysis can be carried out

REFERENCES

- [1] G. Gintoro and E. H. Widjaja, "Perancangan Aplikasi Point of Sales Berbasis Customer Relationship Management Pada Toko Buku Notre-Dame," *CommIT (Communication Inf. Technol. J.*, vol. 2, no. 1, p. 39, 2008, doi: 10.21512/commit.v2i1.490.
- [2] D. Fitriana and S. Y. Zain, "Analysis of Consumer Purchase Patterns on Handphone Accessories Sales Using FP-Growth Algorithm," *Proc. Int. Conf. Eng. Technol. Soc. Sci. (ICONETOS 2020)*, vol. 529, no. Iconetos 2020, pp. 149–158, 2021, doi: 10.2991/assehr.k.210421.022.
- [3] C. E. Firman, "Penentuan Pola Yang Sering Muncul Untuk Penjualan Pupuk Menggunakan Algoritma Fp-Growth," *INFORMATIKA*, vol. 10, no. 1, p. 1, 2019, doi: 10.36723/juri.v9i2.97.
- [4] M. Kadafi, "Penerapan Algoritma FP-GROWTH untuk Menemukan Pola Peminjaman Buku Perpustakaan UIN Raden Fatah Palembang," *Matics*, vol. 10, no. 2, p. 52, 2019, doi: 10.18860/mat.v10i2.5628.
- [5] H. Aguinis, L. E. Forcum, and H. Joo, "Using Market Basket Analysis in Management Research," *J. Manage.*, vol. 39, no. 7, pp. 1799–1824, 2013, doi: 10.1177/0149206312466147.
- [6] E. Elisa, "Market Basket Analysis Pada Mini Market Ayu Dengan Algoritma Apriori," *J. RESTI (Rekayasa Sist. dan Teknol. Informasi)*, vol. 2, no. 2, pp. 472–478, 2018, doi: 10.29207/resti.v2i2.280.
- [7] A. Firmansyah, M. I. Wahyudin, and B. Rahman, "Penerapan Metode Data Mining Pada Point of Sale Berbasis Web Menggunakan Algoritma Apriori," *J. Media Inform. Budidarma*, vol. 5, no. 3, p. 1158, 2021, doi: 10.30865/mib.v5i3.3085.
- [8] M. P. Tana, F. Marisa, and I. D. Wijaya, "Penerapan Metode Data Mining Market Basket Analysis Terhadap Data Penjualan Produk Pada Toko Oase Menggunakan Algoritma Apriori," *JIMP - J. Inform. Merdeka Pasuruan*, vol. 3, no. 2, pp. 17–22, 2018, doi: 10.37438/jimp.v3i2.167.