



**APLIKASI PREDIKSI RATING PENJUALAN MINUMAN BERBASIS
WEBSITE MENGGUNAKAN METODE ASOSIASI FP-GROWTH**

TUGAS AKHIR

TIGOR NOVANDA PURBA
41516110157

**PROGRAM STUDI TEKNIK INFORMATIKA
FAKULTAS ILMU KOMPUTER
UNIVERSITAS MERCU BUANA
JAKARTA
2020**



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Tugas Akhir

Diajukan Untuk Melengkapi Salah Satu Syarat
Memperoleh Gelar Sarjana Komputer

Oleh:
TIGOR NOVANDA PURBA
41516110157

PROGRAM STUDI TEKNIK INFORMATIKA
FAKULTAS ILMU KOMPUTER
UNIVERSITAS MERCU BUANA
JAKARTA
2020

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NIM : 41516110157

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Nama : Tigor Novanda Purba
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Dosen Pembimbing

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KATA PENGANTAR

Puji syukur kita panjatkan kehadirat Allah SWT atas rahmat dan karuniaNya yang senantiasa dilimpahkan kepada penulis, sehingga bisa menyelesaikan skripsi dengan judul “Aplikasi Prediksi Rating Penjualan Minuman Berbasis Website Menggunakan Metode Asosiasi Fp-Growth” sebagai syarat untuk menyelesaikan Program Sarjana (S1) pada Program Studi Ilmu Komputer Jurusan Teknik Informatika.

Penulis menyadari bahwa tanpa bantuan dan bimbingan dari berbagai pihak baik secara moral maupun spiritual tidak dapat terselesaikan dengan baik karena dalam penulisan skripsi ini banyak hambatan dan rintangan yang penulis hadapi. Oleh karena itu, penulis mengucapkan terima kasih kepada:

1. Bapak Prof. Dr. Ngadino Surip, MS selaku Rektor Universitas Mercu Buana.
2. Bapak Dr. Mujiono Sadikin, M.T selaku Dekan Fakultas Ilmu Komputer Universitas Mercu Buana.
3. Ibu Desi Ramayanti, S.Kom, M.T selaku Ketua Program Studi Teknik Informatika Universitas Mercu Buana.
4. Bapak Diky Firdaus, S.Kom, MM selaku Koordinator Tugas Akhir Teknik Informatika Universitas Mercu Buana.
5. Bapak Anis Cherid SE, MTI selaku Dosen Pembimbing Akademik yang telah memberikan ilmu dan solusi untuk lanjut ke tahap Tugas Akhir.
6. Diky Firdaus, S.Kom, MM, selaku Dosen Pembimbing Tugas Akhir yang telah berkenan memberikan waktu dalam membimbing penyelesaian Tugas Akhir dari awal sampai akhir dan selalu memperhatikan progress mahasiswa/i bimbingnya untuk menyelesaikan setiap permasalahan atas kesulitan yang dihadapi.
7. Seluruh Bapak/Ibu dosen Program Studi Teknik Informatika yang telah memberikan pengetahuan yang sangat bermanfaat selama masa perkuliahan.

8. Kedua orang tua yang telah memberikan dukungan baik moril maupun materil serta do'a yang tiada henti kepada penulis.
9. Seluruh staf dan karyawan Universitas Mercu Buana yang telah memberikan dukungan dan bantuan kepada penulis.
10. Seluruh teman-teman seangkatan terutama grup COS Squad yang telah memberikan semangat baik dalam proses perkuliahan maupun pembuatan tugas akhir.
11. Siti Hadijah, yang telah memberikan semangat setiap hari tanpa henti, selalu memberikan motivasi, menemani proses kuliah dari awal semester sampai dengan penyelesaian skripsi, dan bisa menjadi teman sharing dalam proses penulisan tugas akhir.
12. Semua pihak yang telah membantu penulis yang tidak dapat disebutkan namanya satu persatu oleh penulis.

Akhir kata, penulis berharap segala bentuk saran serta masukan bahkan kritik yang membangun dari berbagai pihak. Penulis menyadari bahwa skripsi ini masih jauh dari sempurna dikarenakan terbatasnya pengalaman dan pengetahuan yang dimiliki penulis. Semoga skripsi ini dapat bermanfaat bagi para pembaca dan semua pihak yang terlibat khususnya dalam bidang teknik informatika.

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DAFTAR ISI

HALAMAN SAMPUL.....	i
HALAMAN JUDUL	i
ABSTRAK	ix
ABSTRACT	x
KATA PENGANTAR.....	xi
DAFTAR ISI.....	xiii
NASKAH JURNAL	1
KERTAS KERJA.....	10
BAB 1. LITERATUR REVIEW.....	11
BAB 2 ANALISIS DAN PERANCANGAN.....	15
BAB 3 SOURCE CODE	27
BAB 4 DATASET.....	108
BAB 5 TAHAPAN EKSPERIMEN.....	110
BAB 6 HASIL SEMUA EKSPERIMEN.....	112
DAFTAR PUSTAKA.....	116
LAMPIRAN.....	117

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NASKAH JURNAL

Full Paper

eISSN :

pISSN :

Website-Based Drink Sales Prediction Application Using the FP-Growth Algorithm

Tigor Novanda Purba¹, Diky Firdaus²

^{1,2}Department of Computer Science, Mercu Buana
University, Jakarta, Indonesia

^{1,2}Street Meruya Selatan No. 1 Meruya Selatan,
Jakarta, Indonesia

*Corresponding author

novandapurbatigor@gmail.com

dikyf354@gmail.com

Abstract

The culinary business is now increasingly developing and competition is increasing, so it requires a strategy to market the products to be sold. In the business sector, the results of the implementation of FP-Growth algorithm data mining can help business people find opportunities from consumption trends so that culinary business people can find out what types of products currently have the highest rating in the community so that managers can provide menu recommendations so they can increase sales turnover. The data required is a certain period of transaction data which is analyzed to produce product recommendations by the association rules. The design of this application uses HTML as the base system used in making websites, PHP as a means to develop websites, and SQL as a medium for data storage and processing. The testing process begins with the login process, then determines the support and confidence parameters, and determines the transaction time period. From the conclusion, managers can determine marketing strategies by increasing the stock of raw materials in beverage products that have the highest itemset value. Then the product with the lowest itemset value can provide promos or discounts on the purchase of goods to attract consumer buying interest.

Keywords: FP-Growth, Sales Prediction, Website

1.0 INTRODUCTION

The culinary business is always growing and will never stop. Every year there are always new culinary business opportunities created by entrepreneurs. Many people choose to go directly into this business because it has great advantages. Even so, competition in the culinary business realm is also high. Currently, the culinary business is also increasingly mushrooming in various parts of Indonesia. This means that competition is getting tougher and requires more effort to market the products to be sold. In a competitive business world, it is demanded to find the right strategy that can be used to optimize sales.

Large amounts of data can be a problem for companies if not managed properly. Therefore, researchers use the FP-Growth algorithm in solving problems that occur at PT. Kulo Group Indonesia. To look for sales patterns, management is currently looking only at sales results. The sales results are in the form of reports on the number of goods sold and how much their income can only be seen without any follow-up to determine future decisions [1]. In the

business sector, for example, the results of applying the FP-Growth algorithm data mining can help business people find opportunities from deep consumption trends so that business people can find out what types of products currently have the highest rating in society so that business people can provide menu recommendations to increase turnover and profits. sales for business people. From sales data, the product category is used as a parameter to identify product groups that tend to be sold together in a certain period using the FP-Growth algorithm[2]. From the sales data, it is necessary to search for goods using the FP-Growth algorithm with the FP-Tree formation process that generates rules from new sample data. Determination of data variables greatly determines the accuracy of FP-Growth which is made in determining support and confidence which is used to find items that often appear that are interrelated to determine strategies in sales promotion[3].

The FP-Growth algorithm can be implemented using a sales database to find trends in a combination of itemset patterns so that it can be used as valuable information in making decisions for the necessary marketing strategies in the future[4]. The application of the FP-Growth algorithm produces many informative association rules to determine the shopping patterns of PT. Kulo Group Indonesia. Also, customer association rules can be segmented separately to meet customer special needs cost-effectively by using several special promotions[5].

2.0 THEORETICAL

2.1. Data Mining

Data Mining is a new technology that has great potential in extracting hidden information. Data mining is also often defined as the process of extracting predictive information hidden from very large databases. Data mining can be applied in most fields, for example, to build trends, predict the future, and analyze the key factors needed for a complex problem[6].

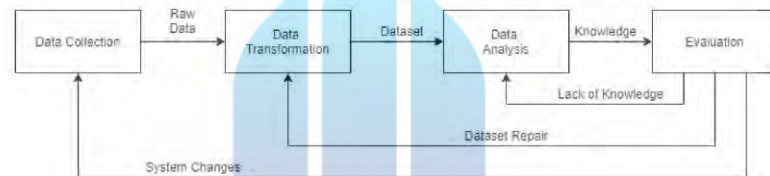


Image 1. Data Mining Process

The data mining process is carried out in three stages, namely data collection, data transformation, and data analysis. Before the three stages are carried out, the data mining process begins with preprocessing which consists of the process of collecting raw data needed by data mining, then continues with data transformation to convert raw data into a format that can be processed by data mining, for example through filtration or aggregation. The results of data transformation will be used by data analysis to generate knowledge using techniques such as statistical analysis, machine learning, and information visualization[7].

2.2. PHP Hypertext Preprocessor (PHP)

PHP is a server-side programming language used in creating websites along with CSS and HTML. PHP stands for Hypertext Preprocessor which is used as server-side script language in development of the Web inserted in the HTML document [8]. For web creation, PHP code is generally pasted in HTML documents. Because of this ability PHP is also often referred to as a script programming language or Scripting Language. In this case, the process of creating content on a page becomes more efficient. For example, to perform repetition more effectively, inputting databases, etc. PHP and HTML are almost the same in use to create websites, the difference is that PHP can be used to create dynamic websites, where the website can adjust the appearance of the content depending on the situation, whereas HTML is usually used to create a static website, where content and web pages are fixed.

2.3. MySQL

MySQL is one of the basic applications needed by programmers who are involved in website development that is used specifically for processing the language used to access line data relations. In general, MySQL has functions to create, manage and access databases in a structured and automatic manner.

2.4. Website

A website is a set of interconnected web pages that are generally located on the same server containing a collection of information provided by individuals, groups, or organizations in the form of web pages that are joined to each other in a domain or URL. The main benefit of a website is to spread information through the digital world. Through the website, people around the world can exchange the latest information so that they do not miss the development of technology, culture, and science that are developing in all parts of the world. Apart from being a medium for exchanging information, a website can also be a medium for promotion and business development.

3.0 METHODOLOGY

3.1. FP-Growth Algorithm

The FP-Growth algorithm is a development of the Apriori algorithm. So that the shortcomings of the Apriori algorithm are fixed by the FP-Growth algorithm. Frequent Pattern Growth (FP-Growth) is an alternative algorithm that can be used to determine the most frequent itemset in a data set. The Apriori algorithm requires generating candidates to get frequent itemsets. However, the FP-Growth algorithm does not generate candidates because FP-Growth uses the concept of building a tree in searching for frequent itemsets.

Association rules are a process in data mining to determine all associative rules that meet the minimum requirements for support and confidence in a database. These two conditions will be used for interesting association rules compared to the predefined limits[9]. The characteristic of the FP-Growth algorithm is that the data structure used is a tree called the FP-Tree. By using the FP-Tree, the FP-Growth algorithm can directly extract frequent itemset from the FP-Tree. Frequent itemset excavation using the FP-Growth algorithm will be carried out by generating a data tree structure or called the FP-Tree.

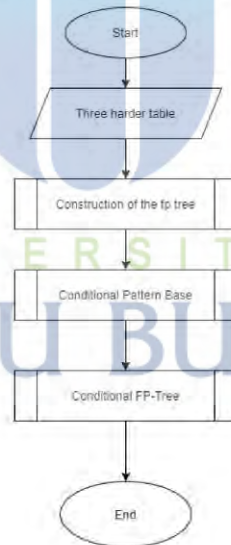


Image 2. Flowchart of FP-Growth Algorithm

3.2. Data Analysis

In this research, the input is the transaction time, receipt number, product id, product name, and amount. While the output is in the form of the value of support to determine the association of goods sold and the value of confidence to determine the value of the association of goods that has a correlates with between items.

3	Transaction Time	Receipt Number	Product ID	Product Name	Quantity
4	01/08/2020	HQE1MV0	BRG2011003	Salted Caramel Boba Fresh Milk	1
5	01/08/2020	HQE1MV1	BRG2011002	Brown Sugar Boba Milk Tea	1
6	01/08/2020	HQE1MV1	BRG2011001	Brown Sugar Boba Fresh Milk	1
7	01/08/2020	HQE1MV2	BRG2011013	Brown Sugar Dalgona Boba	1
8	01/08/2020	HQE1MV3	BRG2011013	Brown Sugar Dalgona Boba	1
9	01/08/2020	HQE1MV3	BRG2011001	Brown Sugar Boba Fresh Milk	4
10	01/08/2020	HQE1MV4	BRG2011013	Brown Sugar Dalgona Boba	1
11	01/08/2020	HQE1MV5	BRG2011015	Salted Caramel Dalgona Boba	1
12	01/08/2020	HQE1MV5	BRG2011001	Brown Sugar Boba Fresh Milk	1
13	01/08/2020	HQE1MV6	BRG2011001	Brown Sugar Boba Fresh Milk	1
14	01/08/2020	HQE1MV7	BRG2011001	Brown Sugar Boba Fresh Milk	1
15	01/08/2020	HQE1MV7	BRG2011006	Yuzu Sakura Macchiato	1
16	01/08/2020	HQE1MV8	BRG2011001	Brown Sugar Boba Fresh Milk	1
17	01/08/2020	HQE1MV9	BRG2011003	Salted Caramel Boba Fresh Milk	1
18	01/08/2020	HQE1MV9	BRG2011016	Brown Sugar Boba	1
19	01/08/2020	HQE1MVA	BRG2011014	Signature Dalgona Boba	1
20	01/08/2020	HQE1MVA	BRG2011001	Brown Sugar Boba Fresh Milk	2
21	01/08/2020	HQE1MVB	BRG2011003	Salted Caramel Boba Fresh Milk	1
22	01/08/2020	HQE1MVC	BRG2011003	Salted Caramel Boba Fresh Milk	2
23	01/08/2020	HQE1MVC	BRG2011015	Salted Caramel Dalgona Boba	1
24	01/08/2020	HQE1MVD	BRG2011001	Brown Sugar Boba Fresh Milk	1
25	01/08/2020	HQE1MVE	BRG2011001	Brown Sugar Boba Fresh Milk	1

Image 3. Transactoin data analysis

4.0 RESULTANTS AND DISCUSSION

4.1. System Design

The following is an application system flow design that will be used in this study.

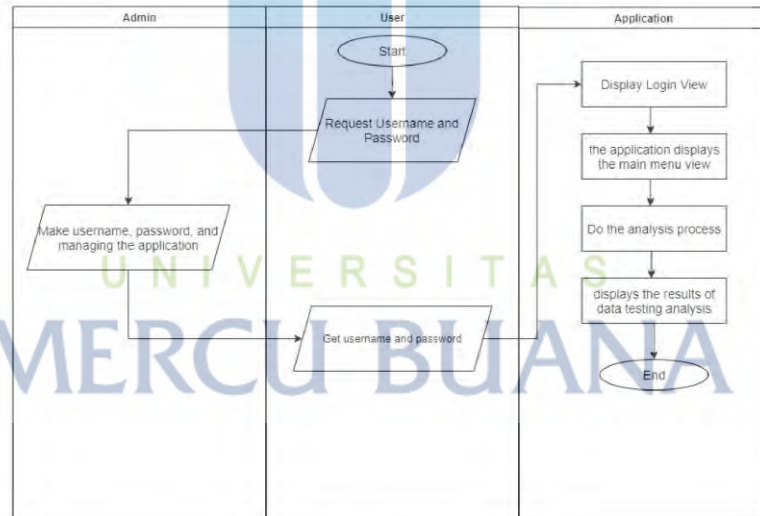


Image 4. System design flow map

In Figure 4 above, there are admin and user roles. In the first stage, the user asks the admin for a username and password. After that, the admin who acts as application management creates a password and username and gives it to the user. After the user enters the username and password, the application will automatically display the main menu display. In this application, the user can perform the data testing process and the application will automatically display the results of the data testing.

4.2. System Implementation

Interface design is a very important part of an application. The interface is a link for users to be able to communicate with the application. The design of the interface display is needed to facilitate the process of implementing the application[10]. Username and password are required to use this application to maintain data security and credibility. The login interface is shown in the image below:

Display Login Form

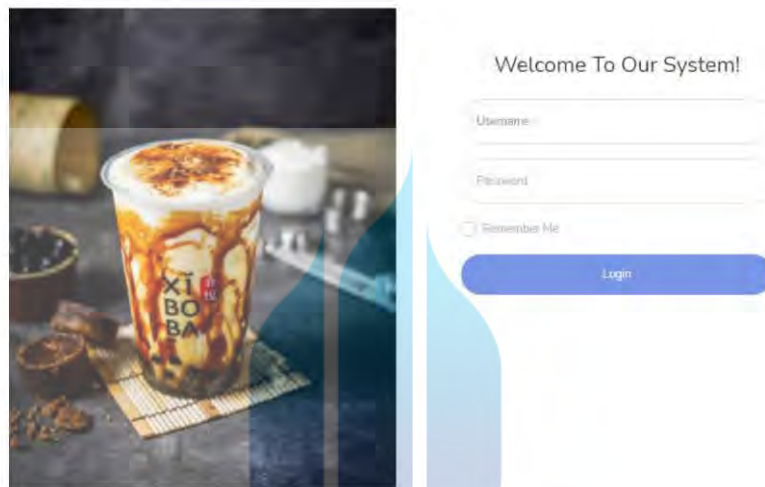


Image 5. Display Login Form

To use this application you need to input a username and password to maintain data security. Only users with active status can access the application.

Display Homepage

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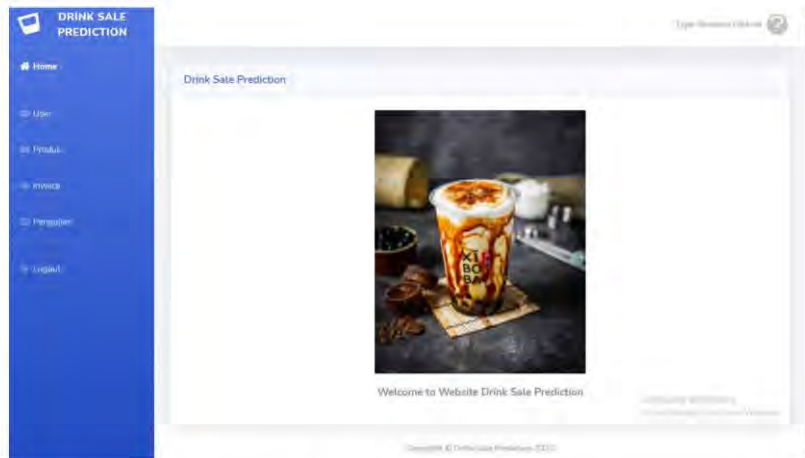


Image 6. Display Homepage

The homepage display has 4 menus, namely user, product, invoice, and testing. The user menu is used to manage user data who will use this application, manage user data that is still active, and has an inactive status. From this menu, the admin can create a password and username for the user to log in to the application. The product menu is used to manage product data by inputting and changing the product name, product category, and product status whether it is still available or not. The invoice menu is used to input and classify sales data according to transaction time, transaction code, product name, and the number of products sold. And the test menu is used to view the results of the analysis process data that has been stored in the association application.

Testing Display



Image 7. Testing Display

The test menu is used to carry out a testing process that contains two parameters, namely the percentage of support and confidence. admin can change the value of these two parameters, while the user cannot change it. Apart from these two parameters, to carry out the testing process, it takes a transaction time period to be analyzed.

Display Analysis Process

No	Kode1-Kode2	Nama Item1-Nama Item2	Jumlah/Support	Confiden
1	BRG2011001	Brown Sugar Boba Milk Tea-Eppony Sugar	16.583464092288	0,27027027027027
2	BRG2011001	Brown Sugar Boba Milk Tea-Eppony Sugar	16.583464092288	0,27027027027027

No	Kode1-Kode2-Kode3	Nama Item1-Nama Item2-Nama Item3	Jumlah/Support	Confiden
1	BRG2011001-BRG2011002	Brown Sugar Boba Milk Tea-Fresh Milk	1.9011895424817	0,78
2	BRG2011001-BRG2011003	Brown Sugar Boba Milk Tea-Brown Sugar Dalgoná Boba-Salted Caramel Boba Fresh Milk	0.88359477124183	0,00
3	BRG2011001-BRG2011005	Brown Sugar Boba Milk Tea-Brown Sugar Dalgoná Boba-Honey Earl Sené Macchiato	0.88359477124183	0,00
4	BRG2011001-BRG2011015	Brown Sugar Boba Milk Tea-Salted Caramel Boba Fresh Milk-Salted Caramel Dalgoná Boba	0.88359477124183	0,00
5	BRG2011001-BRG2011014	Brown Sugar Boba Milk Tea-Salted Caramel Boba Fresh Milk-Signature Dalgoná Boba	1.3071898424093	0,00

Image 8. Display Analysis Process

After determining the minimum value of support, confidence, and transaction rules, the application will automatically display the itemset set and association rules from the transaction data.

Display of test results

DRINK SALE PREDICTION

Top 1 Item

Drink Sale Prediction

Parameter Pengujian

Pengujian: UUR201001

Data Pengujian: 1 | 1 | 1

No	Nama Pengujian	Menu
1	UUR201001	

Support: 0,25% Confidence: 50 %
Tanggal: 19 Januari 2021, 16:41:06
Perhitungan dari 150 Data Trans

Aturan FP Growth:

- Jika membeli Brown Sugar Boba Milk Tea (BRG2011002) dan Brown Sugar Dalgoná Boba (BRG2011013) maka akan membeli Salted Caramel Boba Fresh Milk (BRG2011002) = 100 %
- Jika membeli Brown Sugar Boba Milk Tea (BRG2011002) dan Brown Sugar Dalgoná Boba (BRG2011013) maka akan membeli Salted Caramel Grass Jelly Fresh Milk (BRG2011011) = 100 %
- Jika membeli Brown Sugar Boba Milk Tea (BRG2011002) dan Brown Sugar Dalgoná Boba (BRG2011013) maka akan membeli Honey Earl Grey Macchiato (BRG2011003) = 100 %
- Jika membeli Brown Sugar Boba Milk Tea (BRG2011002) dan Salted Caramel Boba Fresh Milk (BRG2011003) maka akan membeli Signature Dalgoná Boba (BRG2011014) = 100 %
- Jika membeli Brown Sugar Boba Milk Tea (BRG2011002) dan Salted Caramel Boba Fresh Milk (BRG2011003) maka akan membeli Signature Dalgoná Boba (BRG2011014) = 100 %
- Jika membeli Brown Sugar Boba Milk Tea (BRG2011002) dan Salted Caramel Boba Fresh Milk (BRG2011003) maka akan membeli Brown Sugar Grass Jelly Fresh Milk (BRG2011010) = 100 %
- Jika membeli Brown Sugar Boba Milk Tea (BRG2011002) dan Salted Caramel Dalgoná Boba (BRG2011015) maka akan membeli Signature Dalgoná Boba (BRG2011014) = 100 %
- Jika membeli Brown Sugar Boba Milk Tea (BRG2011002) dan Signature Dalgoná Boba (BRG2011014) maka akan membeli Brown Sugar Grass Jelly Fresh Milk (BRG2011010) = 100 %

Image 8. Display of test results

The test results display shows the test results in the form of a percentage of the sales transaction pattern based on a predetermined transaction date period.

4.3. Black Box Testing

To get appropriate results, application testing is required to check directly on the application according to the application test plan. The application testing plan is carried out using the black-box testing method. Following are the plans and results of application testing using black-box testing.

1. Display Login Form

Table 1. Login Display Testing

Input	The Result	Conclusions
Correct Username and Password	Displays notification of success	Successful
Correct Username, Incorrect Password	Failed to display a notification	Successful
Incorrect Username, Correct Password	Failed to display a notification	Successful
Incorrect Username and Password	Failed to display a notification	Successful

1. Display Homepage

Table 2. Display Homepage

Input	The Result	Conclusions
Notification of Success from The Login Display	Display the home view	Successful

2. Analysis Test Display

Table 3. Analysis Test Display

Input	The Result	Conclusions
Input the value of support and confidence	Save the value of support and confidence	Successful
Click save test	Save testing	Successful
Klik tombol proses pengujian	Do the testing process	Successful
Click the test process button	Save the testing result	Successful
Select a test and press the print button	Print the testing result	Successful
Click Export Data	Export data testing	Successful

5.0 CONCLUSION

5.1. Conclusion

With this beverage sales prediction application, the manager or management can solve the problems that occur, besides that the application can also provide better information in a systematic and computerized manner. The results of research on a web-based beverage sales prediction application with a minimum support parameter of 0.2% and minimum confidence of 60% can provide information that sales of beverage products at PT KGI which have the highest itemset that consumers are often looking for is Brown Sugar Boba Fresh Milk product code (BRG2011001) and beverage products that have the lowest sales frequency that consumers rarely look for, namely Honey Earl Gray Macchiato with product code (BRG2011009), Black Tea Macchiato with product code (BRG2011007), and Earl Gray Grass Jelly Milk Tea with product code (BRG2011012). From these test results, managers can determine marketing strategies by increasing the stock of raw materials in beverage products that have the highest itemset value. Then with the lowest itemset value, the manager can provide promos or discounts on the purchase of goods to attract consumer buying interest.

5.2. Suggestion

Based on the above recommendations, the suggestions given to support the product recommendation system are that in designing this application there are still several deficiencies, especially from the interface display factor. So that the author's suggestion for further research is expected that the data input process can be developed so that the data processing process can be faster so that the application system can present more perfect product recommendations.

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KERTAS KERJA

Ringkasan

Kertas kerja ini merupakan material kelengkapan artikel jurnal dengan judul “Website-Based Drink Sales Prediction Application Using the FP-Growth Algorithm”. Kertas kerja berisi semua material hasil penelitian Tugas Akhir yang tidak dimuat/atau disertakan di artikel jurnal contohnya perancangan model, perancangan antarmuka, pengujian aplikasi, dataset yang digunakan, serta fungsi dari beberapa menu. Di dalam kertas kerja ini disajikan: literature review, dataset yang digunakan, source code, dan hasil eksperimen secara keseluruhan.

