Proceeding Book

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THEME : *" Unlocking New Marketing Strategies on ASEAN After Covid-19 Pandemic "*

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# Proceeding Book of
# The 3rd International Conference on Business and Banking Innovations (ICOBBI) 2021
# "Unlocking New Marketing Strategies on ASEAN After Covid-19 Pandemic"

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## FOREWORD

Alhamdulillah, praise be to Allah Subhanahu Wa Ta'ala for granting us the opportunity to organize and publish the proceedings of the 3nd International Conference on Business and Banking Innovations (ICOBBI) with the topic "*Unlocking New Marketing Strategies on ASEAN After Covid-19 Pandemic*". This proceeding contains several researches articles from many fields in Business & Marketing, Banking & Sharia Banking, Accounting & Financial Management, Human Resources Management, Operations Management, Investasi, Insurance & Capital Market, Strategic Management, Technology Management, and Information System.

The 3nd International Conference on Business and Banking Innovations was held on 6th – 7th March 2021 by virtual (online) meeting and organized by the Master Management Study Program of STIE PERBANAS Surabaya in Collaboration with three Higher Education Institutions in Indonesia and two Universities from Asia countries. Keynote speakers in this conference were: Prof. Jessa Frida T Festijo (Lyceum of the Philippines University), Prof. Krisda Tanchaisak, Ph.D (Ramkhamhaeng University Thailand) and Burhanudin, Ph.D (Head of Undergraduate Program In Management of STIE Perbanas Surabaya, Indonesia).

I would like to give high appreciation to the Rector of STIE Perbanas Surabaya for his support at this event. Acknowledgments and thank you to all the steering and organizing committees of the ICOBBI for the extra ordinary effort during the conference until this proceeding published. Thank you very much to all presenter and delegates from various Universities. Beside it, I would like to express our gratitude to the three universities, namely Universitas 17 Agustus Surabaya, STIE 66 Kendari, Institut Institut Bisnis dan Keuangan Nitro Makassar which has been the co-host of this event.

Hopefully, the proceeding will become a reference for academics and practitioners, especially the business and banking industry to get benefit from the various results of the research field of Business and Banking associated with Information Technology. Proceedings also can be accessed online on the website https://pascasarjana.perbanas.ac.id.

Chair of the Master Management Study Program
STIE Perbanas Surabaya

**Prof. Dr. Tatik Suryani, M.M.**

# Tabel of Content

**Banking and Syar'i Banking**

**Accounting and Financial Management**



**Human Resources**

**Operating Management**

**Operating Management**

# Determination of Alternative Retail Layout usingMarket Basket Analysis
## A Case Study of Maga Swalayan

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**ABSTRACT**

Retail is a commercial activity that involves selling goods or offering services directly to end consumers. The comfortable atmosphere makes retail and minimarkets the leading choice for people to shop. Merchandiser must measure and regularly record so it can be place goods according to customer demand. Maga Swalayan deals with the disadvantages of excess stock that impact the high inventory holding cost. This research aims to reduce operating costs and reduce deadstock by proposing the relation of buying patterns by determining the alternative retail layout. This research was conducted using Market Basket Analysis with support value of 0.3, confidence level of 0.5, and lift ratio >1 that was considered valid with Rapid Miner software. This research analyzed 18,797 transaction data and Activity Relationship Chart to read the degree of closeness between departments. There are 4 association rules from ten product categories, department that has the strongest possibility of influence is the pair of department 8 (housecleaners) affecting department 7 (toiletries) with confidence level 75.4% to improve the layout and reduce the excessive stock. The re-layout store area's result will monitor the inventory faster and more accurately by using the consumer's buying pattern or relation of each department expected.

***Keywords:*** *Supermarket, Retail, Retail Layout, Market Basket Analysis, Activity Relationship Chart.*

## 1. INTRODUCTION

Retail is a commercial activity that involves selling goods or offering services directly to end consumers. Consumers will use goods purchased from retail businesses for personal consumption or family and household purposes, not resale. From Statistics Indonesia (BPS), Monthly Average of Food and Non-Food Expenditure per Capita in Urban and Rural Areas by Regency/Municipality in D.I. Yogyakarta Province (rupiahs), from 2015 – 2019 is increasing. In line with increasing number of monthly expenditures, the development of the number of modern markets in Yogyakarta is also relatively high. The comfortable atmosphere makes retail and minimarkets as the leading choice for Yogyakarta people to shop. Supermarkets were also built in the middle of residential areas so that they could meet various daily needs and those needed suddenly. Retailers satisfy consumer demand by balancing inventory without running out of stock or holding excess supply [1]. The excess supply can make the product placement scattered so the customer did not find the product needed. The recording must be appropriate so the merchandise can be placed according to customer demand. In practice, effective inventory management results in lower costs and a better understanding of sales patterns. Retail inventory management tools and methods give retailers more information with which to run their businesses, including product locations.

Maga Swalayan is one of the retail in Yogyakarta that used the understanding of consumer behavior to arrange store layouts to make it easier for consumers to make purchases and increase the likelihood of buying impulse buying [2]. The product placement need to be arrange on based on the relation of each department and expected to reducing the excessing stock. The process of grouping using transaction data carried out in supermarkets is known as AR-MBA (Association Rule – Market Basket Analysis) and ARC (Activity Relationship Diagram) with consumer behavior approach.

## 2. LITERATURE REVIEW

### *2.1. Conceptual Framework*

As described in Figure 1. below, the research starts with analyzing the business issues and the symptoms experienced by Maga Swalayan. After that, continue with literature study and do data collection to find related factors to the business issue. To do the root cause analysis, the author elaborate internal and external analysis first. Next step is to discuss the problem to get the solution using AR-MBA and finally determine the

proposed layout to reduce the level of deadstock in Maga Swalayan. The projection of result analysis will execute based on the solution.

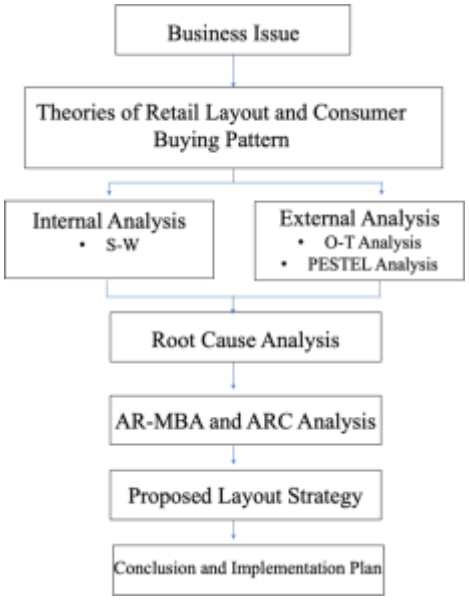


**Figure 1.** Conceptual Framework

### *2.2. Association Rule*

Association Rule is a technique of data mining to find associative rules between a mix of objects or a job to decide which attributes will be collectively acquired. The Association Rule is a form of "previous event" and "consequences" (IF antecedent, THEN consequent). Finding out how likely a customer is to buy bread and milk is an example of the Association Rule from a supermarket purchasing study. Supermarkets may coordinate the positioning of products or design marketing strategies with this information by using discount coupons for certain product combinations [3].

### *2.3. Market Basket Analysis*

Market basket analysis is defined as a set of products (itemset) purchased simultaneously by a customer in one visit to a store. Market basket analysis allows retailers to quickly see the consumer's basket's content and value when shopping to understand the pattern of products purchased together.

Two parameters can determine the importance of an associative rule in market basket analysis. The first is support value, namely the percentage of the item combination and confidence (certainty value), which is the strength of the relationship between items in the associativse rule. The associative rule is usually expressed in the form: {bread, butter} → {milk} (support = 40%, confidence = 50%). This means: "A consumer who buys bread and butter has a 50% chance of also buying milk. This rule is quite significant because it represents 40% of the transaction records so far.

Association analysis is defined as a process to find all associative rules that meet the minimum requirements for support (minimum support) and the minimum requirements for confidence based on [4].

$$Support = \text{p(A} \cap \text{B)} = \frac{\text{am\#\$n\& \#( \&)an*a+\&i\#n +\#n*i*\&* A and /}}{\text{am\#\$n\& \#( \&\#\&a0 \&)an*a+\&i\#n}} \quad (1)$$

($A \cap B$) = *Support* consists of A and B

P = amount of total transaction

$$Confidence = \text{P}(\frac{\text{B}}{\text{A}}) = \frac{\text{s\$\%\%\&r( A} \cap \text{B}}{\text{* (A)}} \quad (2)$$

A(A ∩ B) = Support consists of A and B

P = amount of total transaction

*Lift Ratio*

Lift ratio is an important parameter besides support and confidence in the association rule. Lift ratio is a value that shows the validity of the transaction process and provides information whether it is true that product A was purchased in conjunction with product B. Lift ratio can be calculated using the formula.

$$Lift\ Ratio = \frac{\text{s\$\%\%\&r( (A} \cap \text{B)}}{\text{S\$\%\%\&r( (A)} * Support\ B} \quad (3)$$

A transaction is said to be valid if it has a Lift value of more than 1, which means that in the transaction, products A and B are actually purchased simultaneously.

### *2.4. Activity Relationship Chart (ARC)*

Activity Relationship Chart is a map of activities between each part that describes the importance or not the proximity of the room. This technique was proposed by Richard Muthe (1997), who said that "The relationship between activities is indicated by the level of importance of the relationship between activities." This relationship is represented by letters and numbers. There must be a bound relationship between one activity to other activities that are considered essential and always close together in a factory organization. Therefore, a map of activity relationships is made. It will be known how the relationships occur and must be fulfilled following the tasks and relationships that support them.

This map is similar to the distance table of a map the distance is replaced with a qualitative code letter. The number indicates the relationship between one activity and another and how dominant each relationship is. The letters (A, E, I, O, U, and X) are placed at the top of the box, and sometimes colors are also used to show the reasons that support each close relationship. The symbols used are:

**Table 1.** Closeness Rating

| Degree of Relationship | Annotation |
|---|---|
| A | Absolutely necessary |
| E | Especially important |
| I | Important |
| O | Ordinary closeness |
| U | Unnecessary |
| X | Avoid closeness |

The most important thing is that the reasons must match the level of the activity relationship described. The benefits of ARC are:

a. Shows the relationship of activity with others and the reasons
b. Obtaining a basis for further layout development.

## 3. EXPERIMENT AND RESULT

The data collected is the receipt of consumer spending with a minimum transaction of two product categories as many as 18,979 transactions. In collecting data, the products are grouped first. This is done because the number of variations of supermarket products is enormous.

The next step is the transformation data. Transformation is a continuous process of grouping categories that have been converted into binary numbers. This transformation process determines the processing of Association Rule data using RapidMiner. The finished data can be seen and become a reference for making the proposed layout at Maga Swalayan.

The support value in Table 2 shows the percentage of each department has bought by the consumer. It is expected that product departments above the minimum support value can impact the layout improvements. In this study, the minimum support is set at 30%. For support calculations, Rapid Miner software is used to make it easier and save time and effort. From the support value calculation above, not all of the calculation results were processed to calculate confidence. There are six departments which have a value of more than 30%. Department below the minimum support value is not included in the calculation of confidence. Data trimming is used for filter data. Only data or product departments have strong dominance in all transactions entering the next calculation process [5].

**Table 2.** Calculation of Support Value

| Dept | Category | Number of Purchased | Total Transaction | Support |
|---|---|---|---|---|
| 1 | Snacks/ biscuit | 11,611 | 18,979 | 61.2% |
| 2 | Dairy | 3,819 | 18,979 | 20.1% |
| 3 | Cosmetics/ pharmacy | 5,619 | 18,979 | 30% |
| 4 | Groceries | 10,264 | 18,979 | 54.1% |
| 5 | Canned drink/ syrup | 11,031 | 18,979 | 58.1% |
| 6 | Baby needs | 755 | 18,979 | 4% |
| 7 | Toiletries | 11,225 | 18,979 | 59.1% |
| 8 | House cleaners | 7,618 | 18,979 | 40.1% |
| 9 | Bakery/ fresh food | 3,459 | 18,979 | 18.2% |
| 10 | Household ware | 112 | 18,979 | 0.6% |

In calculating the confidence value, minimum confidence is also set to filter out departments that have strong relationships. The minimum confidence value is set at 50%. Department pairs with strong relationships are a set of departments with a great confidence value. The next step is to find the lift ratio to see whether one department affects other departments. Lift shows the strength of association rule during random occurrence between the influencing department and the affected department by looking at the support value [6]. A transaction is declared valid if it has a Lift value of more than 1, which means that products A and B are purchased simultaneously in the transaction.

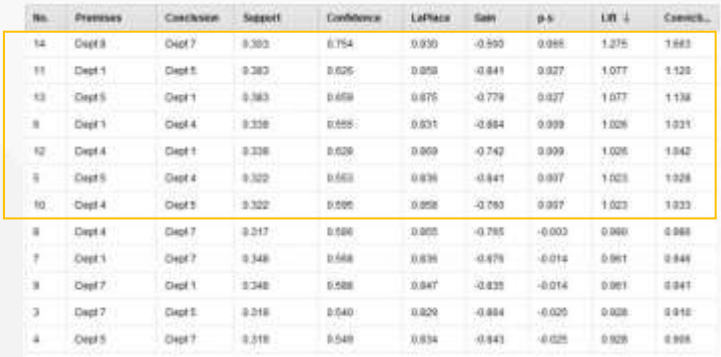

**Figure 2.** Valid Rule if score of Lift Ratio > 1

Next is the calculation of the improvement ratio, which shows that 4 out of 12 pairs of product groups meet the minimum improvement ratio value. Of the 12 product groups, only four product groups will be taken into consideration in making the layout because the results of

the support factor value are more than 30% and a confidence value of more than 50%.

**Table 3.** Relation between Department

| No | Department Pairs | |
|---|---|---|
| 1 | Housecleaners | Toiletries |
| 2 | Snacks/biscuit | Canned drink/syrup |
| 3 | Snacks/biscuit | Groceries |
| 4 | Canned drink/syrup | Groceries |

The ARC is considered the degree of relationship determined by the symbols (A, E, I, O, U, and X). The ARC making can be beneficial for making layout because the results clearly illustrate which products should be brought near and far away. To remain consistent, it is necessary to create a category for the purchase frequency of the product. The annotation of the symbol can be seen in Figure 3 below.

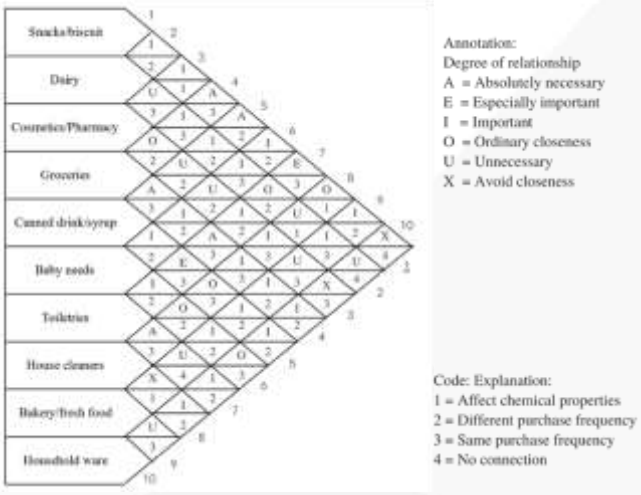


**Figure 3.** Activity Relationship Chart

The strategy that used by Maga Swalayan to arrangement of layout are:

1. Differentiate the product category between food and non-food. Food area located in front of the store, because it became one of the costumer considerations' to come.
2. Convey the mission of supermarket by carefully choosing the lead-off department's location.The department which is the destination of buyers who do not need to choose for a long time, such as groceries. On the other hand, the Dairy department is placed at the front, not only because choosing milk usually requires accuracy to make consumers stand longer. From outside, Maga Swalayan shop will look busier.

Alternative layouts are made by considering the proximity of the product/department (confidence) and support. Relevant departments will be brought near to stimulate impulse buying. Examples of these departments are department 1 (snacks) and 5 (canned drink/syrup). Layout 1 also separates departments with strong chemical properties, which are not acceptable if they are connected with several types of departments. Example: department 4 (groceries) and department 8 (housecleaners).

The advantage of this alternative layout is the proximity of departments with high confidence and support so that it is possible to increase impulse buying from customers. Also, the removal of chemical departments from several departments impacts the safety of the products being sold. The alternative layout above already fulfills the AR-MBA and ARC calculations because the department's quantitative and qualitative characteristics have been included.

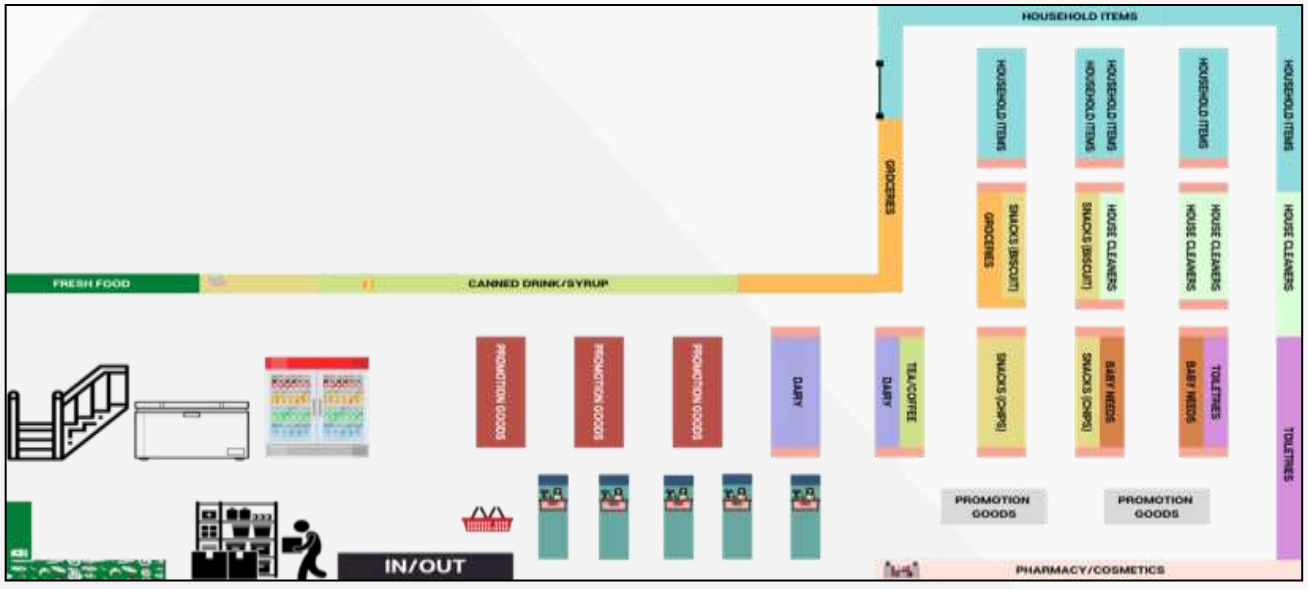


**Figure 4.** Current Layout

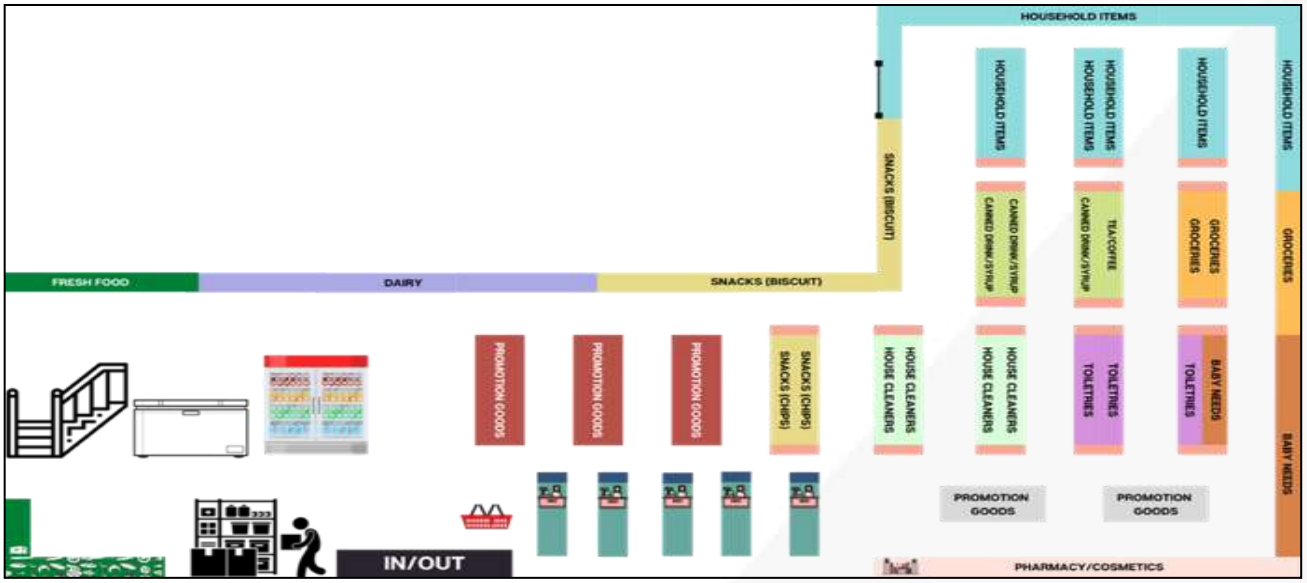


**Figure 5.** Proposed Layout Layout

## 4. CONCLUSION

New alternative retail layout has been made with various considerations and quantitative and qualitative research results that can be an option for Maga Swalayan in preparing the store layout. The result of the re-layout store area will monitor the inventory faster and more accurate by using the analysis of consumer's buying pattern or relation of each department expected to implement a directed and structured layout by needs of Maga Swalayan's customers. Experiments were performed on synthetic datasets, and the findings indicated that the proposed solution is successful for better product placement in supermarkets. Further research can be carried out to measure layout recommendations for increased sales.

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