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"Strategizing IR4.0 in Conquering Covid-19 and Beyond"

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Preface

This e-book describes the research papers presented at the International Conference on Emerging Computational Technologies (ICECoT 2021), organised by Faculty of Computer and Mathematical Sciences (FSKM), UiTM Cawangan Melaka. The main discussions of the conference is on the technological advances that help shape the skills that are required to cope with the Fourth Industrial Revolution (IR 4.0). Considering that this is our first attempt at organising a conference, we are therefore greatly honoured that the Universitas Negeri Semarang (UNNES), Indonesia, Mahasarakham University (MSU), Thailand and University of Hail (UoH), Saudi Arabia have all agreed to become our partners by contributing several reseach papers as well as providing reviewers to assess the quality of the papers.

Out of the numerous research works that had been submitted and reviewed, the Editorial Board have selected 22 papers to be published in the e-book. The discussions of these papers pertain to the use of technologies within the broad spectrum of Computer Science, Computer Networking, Multimedia, Information Systems Engineering, Mathematical Sciences and Educational Technology. It is hoped that the research findings that are shared in this e-book can benefit those who are interested in the various areas of computational technologies; such as graduate students, researchers, academicians and the industrial players, to name a few.

As the Project Manager, I would like to thank all of the committee members from the bottom of my heart for their tireless efforts in ensuring the success of ICECoT 2021. Without their continual support and excellent teamwork, this conference would not have come to fruition. In fact, holding this major event has been a good learning experience for us all, and I sincerely believe that our future conferences will become more outstanding if the same spirit is maintained.

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Enhanced Kiosks Mapping on Traditional Market using Apriori Algorithm

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***Abstract*— Traditional market requires realignment of the existing problems so that the market is more comfortable to visit. In this study the author experimenting with buyer transactional data using market analysis method to see association rules between numbers of attributes of a kiosk. The algorithm used here is a priori algorithm, the data used are questionnaire data from 250 respondents, from the data taken 120 data used as training data, for the process of making data models. In this market there are 288 kiosks that grouped into 14 categories. The results in the F1 process with the 30 thresholds, obtained 6 categories, up to the F3 process with the determination of the 20 threshold, obtained 3 categories. Based on the results of research in accelerate the process of forming item-set combinations of transactions. Also, this research can help in giving recommendations and considerations to traditional market developers in determining kiosk layout.**

Keywords—apriori algorithm, association rules, kiosks, market

I. INTRODUCTION

Today's traditional markets have problems or shortcomings that make buyers less comfortable, one of which is the location of traders who are less organized and there are merchandise that is not selling well. In this research, an experiment on the business place which is traditional market with a market analysis method to see the rule associated between numbers of business place attributes. Many association rule mining algorithms have been well-established, such as Apriori, Eclat, FP-Growth, or LCM algorithms [1]. Association Mining is one of the most important data mining's functionalities and it is the most popular technique has been studied by researchers [2], Since apriori algorithm is the basis for most association rule mining algorithms [3], it can be used to find association rules for detection of interesting association relationships between large quantities of business transaction data can assist in catalog design, cross-marketing, and various business decision making processes [4].

Research in the field of data mining that discuss the layout of items from customer transaction using apriori algorithm [5], [6], [7], [8], [9], but there are also those who use FP-Growth [10], [11], [12]. In other methods in discussing office layout, Simple Additive Weighting (SAW) can also be used [13].

This research focuses on the problem of determining the location of existing kiosk in traditional market which aims to make a decision support analysis that will later be used to give consideration to market developers if they want to make changes.

II. RELATED PAPERS

According to Wulandari and Rahayu in 2014, research using Apriori Algorithm can be used to analyze patterns consumer shopping (market basket analysis) at Muslim women fashion stores. High consumer demand makes shops Muslim clothing develops quickly, both physical stores also an online shop. To optimize revenue, every Stores must improve services, including ease of access in-store items, related to market trends, structuring modern goods can be done by utilizing history of previous sales transaction data. The results of the study consisted of a system-based web that produces participation rules makes rearrangement can be done dynamically.

According to Agarwal, Yadav, and Anand in 2013, among the many mining algorithms of association rules, Apriori Algorithm is a classical algorithm that has caused the most discussions; it can effectively carry out the mining association rules. The proposed algorithm reduces the storage room, improves the competency of performance with negligible error of the algorithm. And, the improved Apriori algorithm can solve the problem of traditional Apriori algorithm. This algorithm has been broadly used for Grocery rooms in customer consumer knowledge mining. However, another uses of algorithm could be apply, which is FP-Growth Algorithm.

According to Sumangkut, Lumenta, and Tulenan in 2016, the use of a lot of transaction data can provide interesting knowledge in making policies and strategies for the placement of goods racks. The rise of modern shopping and business competitors like that cannot be separated from the shifting mindset of consumers who had been looking for cheap prices, are now paying attention to aspects of security, cleanliness, comfort, friendliness in service and the completeness of types of goods and the placement of goods racks. In their study, the authors raised the problem of the Daily Mart Self-Service Shopping Pattern Analysis to Determine the Layout of Goods Using the FP-Growth Algorithm, in the service that often occurs at the Daily Mart supermarket, and to realize that the writer applies the KDD (Knowledge Discovery methodology) in Database.

III. METHODOLOGY

A. Knowledge Data Discovery

Knowledge discovery as a process consists of an iterative sequence of the following steps: i) Data Cleansing (to remove noise and inconsistent data). ii) Data integration (where multiple data sources may be combined). iii) Data Selection

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(Where data relevant to analysis task are retrieved from the database) [14], [15].

B. Data Collection Techniques

To obtain the information needed in order to achieve the research objectives, the authors collect data as follows:

- Observation, by directly observing the object of research, noting important things related to the proposed title, so that complete and accurate data is obtained.
- Interview, getting information by asking respondents directly. This method is done by the author to obtain data.
- Study of literature, facilitate the research, looked at several articles journal and books as research material that would facilitate research.
- Questionnaire, one way to collect data, namely by distributing questionnaires to market visitors.

C. Algorithm Flowchart

The first stage is collecting data sourced from the research location in the traditional market by interviewing one of the Head of Operational. Then, distributes questionnaires to market consumers. The algorithm flowchart that process the data in this study, can be seen in Fig. 1. The Flowchart started after the data have been preprocessed, then look for each item in an existing transaction. If so, then the next step is to determine the threshold value (∅)> = 30, if the item set <= 30 will be discarded and if> = 30 it will be processed in the form of a frequency set of item-set 1 (F1). After F1 is found it will be combined for each pair of item-set so as to get K = 2 (2 elements). If it has been combined then determine the threshold value (∅)> = 20, if the item set <= 20 will be discarded and if> = 20 it will be processed in the form of a frequency set of item-set 2 (F2). Then recombine for each pair of item-set so that it will get K = 3 (3 elements). After that 3 rules will appear for the association rules which will later become the association model.

IV. RESULTS AND DISCUSSIONS

A. Preprocessing

As an initial step, as many as 120 transactions are grouped as training data, where the kiosks categorized as seen in Table I that represents merchandises purchased by visitors/consumers.

TABLE I. KIOSKS LIST CATEGORY

No	Kiosks Category	Initial
1	Basic food	A
2	Pastry	B
3	Dried/Salted fish/Egg	C
4	Food/Drink	D
5	Spices	E
6	Cellphone	F
7	Vegetables	G
8	Fruits	H
9	Tofu-Tempe	I
10	Fresh Fish	J
11	Coconut	K
12	Beef	L
13	Chicken cut	M
14	Chicken	N

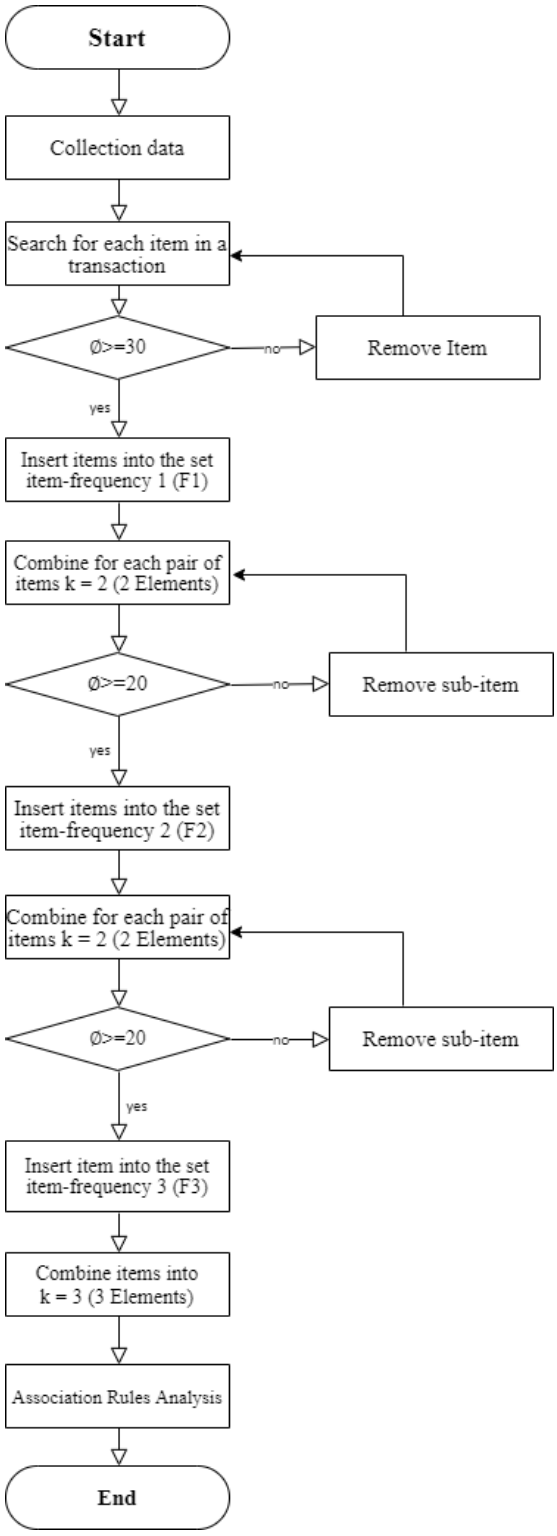

Fig. 1. Apriori algorithm flowchart.

B. Specify F1 with ∅ >=30

Specify ∅> = 30, for the item-set. After K1, eliminating F1 = {D, E, G, H, I, M}. Then pair for each of items so that K = 2 (2 elements) is obtained shown in Table II. The most likely groups are: {D, E}, {D, G}, {D, H}, {D, I}, {D, M}, {E, G}, {E, H}, {E, I}, {E, M}, {G, H}, {G, I}, {G, M}, {H, I}, {H, M}, {I, M}.

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TABLE II. K = 2 (2 ITEM-SET)

T	Itemset	Σ
1-120	D,E	11
1-120	D,G	11
1-120	D,H	12
1-120	D,I	8
1-120	D,M	12
1-120	E,G	25
1-120	E,H	15
1-120	E,I	21
1-120	E,M	22
1-120	G,H	23
1-120	G,I	28
1-120	G,M	30
1-120	H,I	20
1-120	H,M	20
1-120	I,M	28

C. *Specify F2 with ∅ >=20*

Specify again for F2 with ∅ = 20, then look for transactions that are greater than ∅, and those that do not meet the requirements are eliminated. Item-set obtained for F2 are {(E, G), (E, I), (E, M), (G, H), (G, I), (G, M), (H, I), (H, M), (I, M)}. Combine 3 item sets for further processing. Provided that the 3 item-set combined must have something in common with the first item. Then Table III for K = 3 (3 Elements) will be formed are: {E, G, I}, {E, I, M}, {E, G, M}, {G, H, I}, {G, H, M}, {G, I, M}, {H, I, M}.

TABLE III. K = 3 (3 ITEM SET)

T	Itemset	Σ
1-120	E,G,I	17
1-120	E,I,M	17
1-120	E,G,M	16
1-120	G,H,I	16
1-120	G,H,M	16
1-120	G,I,M	23
1-120	H,I,M	17

D. *Specify F3 with ∅ >=20*

From the Table III is known a total of K = 3. Then we determine for F3 with ∅ = 20, then it will look for transactions larger than ∅, and the eligibility will be eliminated. so that F3 = {(G, I, M)}.So setting ∅ = 20 of F3 will get 3 rules, shown in Table IV:

TABLE IV. ASSOCIATION RULES

Association Rules	Support	Confidence
If GI Then M	19,167%	62,162%
If GM Then I	19,167%	65,71%
If IM Then G	19,167%	50%

- Association Rules for G,I,M support

$$Support = \frac{numbers\ of\ transactions\ of\ G,I\ and\ M}{Transaction\ Total} = \frac{23}{120} = 19{,}167\%$$

`

- Confidence of Association rule “If GI then M”

$$Confidence = \frac{numbers\ of transaction\ of\ G,I\ and\ M}{Transaction\ Total\ of\ M} = \frac{23}{37} = 62{,}162\%$$

- Confidence of Association rule ”If GM then I”

$$Confidence = \frac{numbers\ of transaction\ of\ G,M\ and\ I}{Transaction\ Total\ of\ I} = \frac{23}{35} = 65{,}71\%$$

- Confidence of Association rule “If IM then G”

$$Confidence = \frac{numbers\ of transaction\ of\ I,M\ and\ G}{Transaction\ Total\ of\ G} = \frac{23}{46} = 50\%$$

E. *Kiosks Mapping*

After the results of the training data in the traditional market as many as 120 data, and also have done the calculation then we have obtained the association rule with the highest support and confidence with 65.71%, namely the rule "If GM then I" or GM-> I in explanation of G refers to “Vegetables”, M refers to “Chicken-cut” implies to I which is “Tofu-Tempe”. With this association, we can use it to manage the store layout in the market for posters, kiosks colors can be seen in Table V from original layout that shown in Fig. 2 enhanced using the association result that shown in Fig. 3.

TABLE V. KIOSKS COLORS

Initial	Kiosks Category	Colors
A	Basic food	
B	Pastry	
C	Dried/Salted fish/Egg	
D	Food/Drink	
E	Spices	
F	Cellphone	
G	Vegetables	
H	Fruits	
I	Tofu-Tempe	
J	Fresh Fish	
K	Coconut	
L	Beef	
M	Chicken cut	
N	Chicken	

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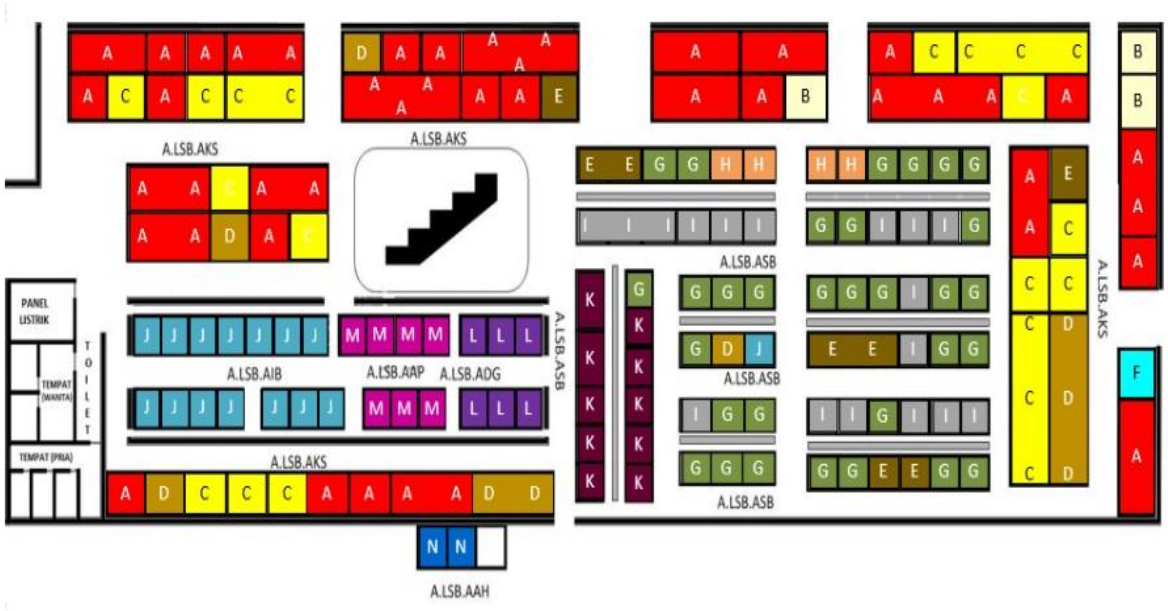

Fig. 2. Old kiosk mapping

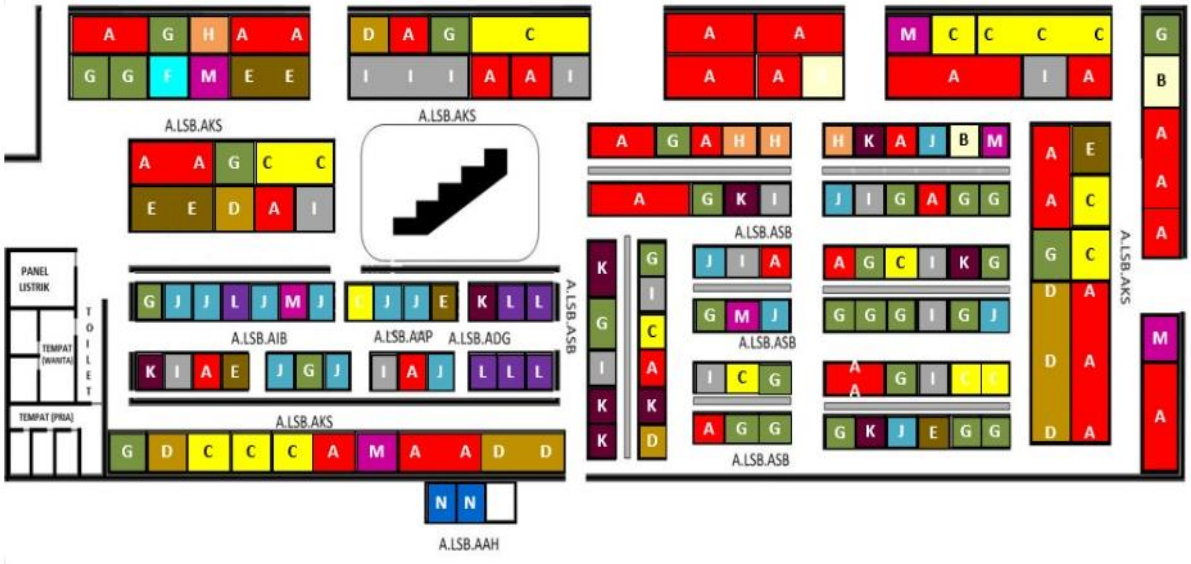

Fig. 3. New kiosk mapping

V. CONCLUSION

Based on the results, it can be concluded thatt his study can help in giving recommendations and considerations to traditional market developers in determining kiosk layout. The application of a priori algorithms to data mining techniques is very efficient, in forming trends in the pattern of combination of itemset transactions in the market so as to get an association rule with the highest support and confidence in the vegetable shop, chicken cut, and tofu tempe. The results of this study can also help determine the store layout of the traders so that they can increase their income and reduce competition among traders. By calculating the value of different weights, it will produce different values and a different decision.

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