DEVELOPMENT OF DATA MINING APPLICATION FOR DETERMINING THE PRODUCTION AT PT. CONTIN MOTOSPORT USING ASSOCIATION RULE METHOD

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ABSTRACT

Data mining is the process of extracting large amounts of data in which the process is aimed to obtain information and new knowledge useful. One method of data mining that can be used is the Association Rule. This method begins with finding frequent itemset and produce a rule that can be used as reference for the production of goods on the company.

Data mining approaches can be used as a solution offered to PT. Contin Motosport to overcome the obstacles being faced in minimizing buildup kinds of production by providing recommendations proper production of the type of goods.

The test results showed that the method of association rule algorithm CT-Pro has been successfully implemented to determine the rule or rules relating to prduksi recommendation on PT. Contin Motosport. From the research that has been conducted, it was found also that of the transaction data in the can and piloted by a combination of parameters minimum support and minimum confidence so it can be concluded that the selection of the combined value of minimum support and the minimum confidence affect the amount of rule or frequent item-set is generated.

Keyword: Data Mining, Production Recomendation, Association Rule, CT-Pro.

1. INTRODUCTION

PT. Contin Motosport is a company engaged in the production of gear drive (ridingware), the company was founded in 2006. The company has developed enough although not yet to the marketing of their products abroad, but its products are already quite spread in Indonesia. PT. Contin Motosport has served production orders transaction that involves a lot of different products, especially jackets, because the jacket is the flagship product of this company

The problems that occurred in this company is frequently made mistakes that resulted in the accumulated production of products that are not the result of production according to the needs of consumers it is caused by the production rules based only on estimates of Head of Production and booking directly.

Over time, sales activities and transactions that occur generate a lot of data and will continue to grow. However, the data is not used by the company to the maximum, only a report and then saved as an archive. By using data mining, data may be dug up to get a value-added form of knowledge that had been unknown to manually [2].

One method of data mining is the association rule [3]. Association rule aims to demonstrate the value of associative between the types of products purchased by consumers so that they could see a pattern of what products are often purchased together in a sales transaction, so it can be used as a reference for decision making in determining production types of products.

As a solution for solving problems in the company of PT. Contin Motosport author will try to apply data mining to sales transaction data in the company's products using the Association Rules in the form of software as a tool to determine the associative value between the kinds of products. Expected by this software can help the company, especially the production to determine the purchasing patterns of consumers, which is where the information can be utilized by the company as a basis for consideration and recommendations in determining the type of product to be manufactured.

1.1 Data Mining

Data mining is a process that uses statistical techniques, mathematics, artificial intelligence, and machine learning to extract and identify useful information and relevant knowledge of various large databases [4].

According to Pramudiono [2], “Data mining is a series of processes for adding additional value in the form of knowledge that had been unknown manually from a data set”.

According to Larose [5], remarkable progress continues in the field of data mining is driven by several factors, among others:

1. The rapid growth in the data set.
2. Storage of data in the data warehouse, so that the entire company has access to a reliable database.

3. An increase in data access through web and intranet navigation.
4. Pressure business competencies to increase market share in the economic globalization.
5. The development of software technology for data mining (availability of technology).
6. Developments great in computing capability and capacity of storage media.

1.1.1 Concept of Data Mining

Data mining is needed, especially in managing extremely large data sets to facilitate the activities of recording a transaction and to process data warehousing in order to provide accurate information for the user data mining. The main reason of data mining is needed in the information industry due to the unavailability of data in large numbers and a greater need to transform data into information and knowledge that is useful for the appropriate focus of these disciplines are conducting extracting or mining knowledge from data-size or large numbers, This information is very useful for development later.

1.1.2 Cross-Industry Standard Process for Data Mining (CRISP-DM)

Cross-Industry Standard Process for Data Mining (CRISP-DM), which was developed in 1996 by analysts from several industries such as Daimler Chrysler, SPSS and NCR. CRISP-DM provides a standard data mining process as a general problem-solving strategies of the business or research units.

In CRISP-DM, a data mining project has a life cycle that is divided into six phases. Overall sequential phases that there are adaptive. The next phase in the sequence depends on the output of the previous phase. The relationship between the phases illustrated by arrows. For example, if the process is in the modeling phase. Based on the behavior and characteristics of the model, the process may have to go back to the data preparation phase for further improvement of the data or move forward to the evaluation phase.

Six phases in the CRISP-DM method can be seen in the following figure:

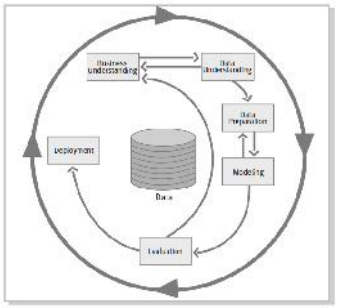


Figure 1 Fase metode CRISP-DM

The phases of CRISP-DM [5]:

1. Business Understanding
   a. Determination of business objectives undertaken by the company and the business success criteria is the reference companies in conducting business success.
   b. Describe the purpose of the use of data mining methods in a business that is run and the success criteria for data mining method.
   c. Assessing the situation of the resources owned by the company that can support the data mining process.
2. Data Understanding
   a. Collecting data.
   b. Describe the data have been obtained.
   c. Evaluating the quality of data.
   d. If desired, select a small portion of data groups that may contain a pattern of problems.
3. Data Preparation
   a. Set up of the preliminary data, the data set to be used for the entire next phase. This phase is hard work that needs to be carried out intensively.
   b. Select cases and variables that you want to analyze and which according to the analysis to be performed.
   c. Make changes to multiple variables if needed.
   d. Prepare initial data so it is ready for device modeling.
4. Modelling
   a. Selection and apply appropriate modeling techniques.
   b. Calibration model rules to optimize the results.
   c. It should be noted that some of the techniques likely to be used on the same data mining problem.
   d. If necessary, the process can return to the processing phase of data to make the data into a form that is in accordance with the specification requirements specific data mining techniques.
5. Evaluation
   a. Evaluating one or more models used in the modeling phase to get the quality and effectiveness before being disseminated to use.
   b. Establish whether there are models that meet the objectives in the initial phase.
   c. Determine whether there are important issues of business or research that is not handled properly.
   d. Take decisions relating to the use of data mining results.
6. Deployment
   a. Using the resulting model. The formation of the model does not signify that the completion of the project.
   b. A simple example deployment: report generation.

c. Examples of complex deployment: application of data mining process in parallel with other departments.

1.2 Association Rule

Association rule is one of the main techniques or procedures in market basket analysis to find the relationship between items in a set of data and display the form association rule [6]. Association rule will find a certain pattern to associate the data with other data.

To search for association rule from a data set, the first phase should be done is to find frequent itemset. Frequent itemset is a set of items that frequently appear simultaneously. After all frequent patterns item is found, then look for a rule or rules associative linkages eligible predetermined.

For example, consumers typically buy coffee and milk will be shown as follows:

Coffee → milk [support = 2%, confidence = 60%]

Association rule required a variable size specified by the user to determine the limits of the extent to which or how much output the desired user. Support and confidence is a measure of confidence and usefulness of a pattern that has been found, support value 2% indicates that the overall total consumer transaction to buy coffee and milk simultaneously as many as 2%. While the confidence of 60%, which indicates that if consumers buy coffee and definitely buy milk by 60%..

In determining an association rule, there is an interestingness measure (measure of confidence) is obtained from the processing of data with a particular calculation. Generally there are two sizes, namely:

a. Support, a measure which indicates the extent of the dominance of an item / itemset of the overall transaction. This size determines whether an item / itemset worth seeking his confidence (eg, of the total transactions that exist, the extent of the dominance of an item indicating that the item A and B items purchased together).
b. Confidence, a measure that shows the relationship between two items in a conditional (eg, calculated the odds and how often items purchased by the consumer if the consumer is buying an item A).

The two measures will be useful in determining the strength of a pattern by comparing the pattern with a minimum value of both parameters specified by the user. When a pattern meets both the minimum value of predefined parameters, then the pattern can be termed as interesting rule or strong rule.

1.2.1 Base Methodology of Association Rule

Association Rule basic methodology is divided into two phases: [6]:

1. Analysis of high frequency pattern
   Stage This stage looks for patterns of eligible items from the minimum support value in the database. According to Larose, we are free to determine the value of the minimum support (minsup) and minimum confidence (mincof) as needed [5]. For example, if you want to find data that has a strong association relationship, minsup and mincof it can be rated high. Conversely, if you want to see the many variations of strong data without really care whether or not the association relationship between his items, the value of its mincof minsup and can be charged lower [7]. Values support an item obtained by the following formula

$$\text{Support}(A) = \frac{\text{Jumlah transaksi yang mengandung A}}{\text{Jumlah total transaksi}} \text{x}100\% \quad (1)$$

   Equation 1 explains that the support is obtained by dividing the number of transactions that contain item A (one item) with the total amount of all transactions. Meanwhile, the support of two items obtained from the following formula

$$\text{Support}(A,B) = P(A \cap B)$$

$$\text{Support}(A,B) = \frac{\text{The number of transactions containing A and B}}{\text{Total of transactions}} \text{x}100\% \quad (2)$$

   Equation 2 explains that the item set support is obtained by dividing the number of transactions that contain item A and item B (first item in conjunction with other items) with the total amount of all transactions.
2. Establishment of association rules
   In the antecedent and consequent and meets the minimum requirements for confidence associative rule A → B.
   Suppose D is the set of transactions, where each transaction T in D represents the set of items that are in I. I is the set of items for sale. Suppose we choose the set of items A and B set other items, then the rules of the association will take the form:

   If A, Then B (A→B)

   Antecedent A and consequent B are a subset of I, and A and B where the rules:

   If A, Then B

   Does not mean

   If B, Then A

   An item set is the set of items in the first, and i item sets. Frequency item set is itemset has a frequency of occurrence of more than a predetermined minimum value.
   Confidence value of the rule A → B is obtained from the following formula.

$$\text{Confidence} = \frac{\text{The number of transactions containing A and B}}{\text{The number of transactions containing A}} \quad (3)$$

1.3 CT-Pro Algorithm

This algorithm is one algorithm development of FP-Growth. The difference is in which FP-Growth makes FP-Tree while CT-Pro makes Compressed FP-Tree (CFP-Tree) [8]. At this stage of mining algorithm CT-PRO also uses a bottom-up approach where the item in the item table and CFP-Tree is scanned from the smallest number to largest.

CT-Pro algorithm has three stages: [8]:

1. Finding Frequent Item, at this stage occur the following processes:
   a. Of existing databases, be selected based on the specified minimum support resulting in frequent item.
   b. Of frequent items that have been formed, in calculating the frequency of occurrence of each item so as to produce the Global Item table.
2. Build CFP-Tree, at this stage occur the following processes:
   a. Frequent items that have been found, sorted by Global item existing table in descending order (ordered from largest to smallest frequency item).
   b. With frequent item that has been ordered is formed Global CFP-Tree, here are the rules of the establishment of the Global CFP-Tree:
      1) CFP-Tree consists of a tree that has a root that represents the index of the item with the highest level of appearance and collection subtree as a child of the root.
      2) If I = {i1, i2, ..., ik} is a collection of frequent item in the transaction, the items in the transaction will be incorporated into the CFP-tree starting from the root subtree is i1 in the item table.
      3) Root of CFP-Tree is a level-0 from the tree.
      4) Each node in the CFP-Tree has four field main business of item-id, parent-id, Count which is the number of items on that node, and the level that shows the data structure tree on that node starts of the items contained in the item table with level contained in CFP-Tree.
3. Mining, at this stage occur the following processes:
   a. At this stage of mining, CT-Pro algorithm works by performing a bottom-up mining so that Global table items are sorted from smallest to largest item frequency.
   b. For each item listed on the Global item table that has been sorted, do a search node associated with the item on the Global CFP-Tree. Of all the nodes are found for each item is called the Local frequent item and is used to create Local item table.
   c. Local manufacture items on this table is also made based on the minimum amount of support that has been determined.
   d. Thereafter, Local made CFP-Tree based Local item table is formed. Rules establishment of Local CFP-Tree together with the formation of the Global CFP-Tree, the difference is in the Global CFP-Tree is used in the formation of tree-it is Global item table formed of Global item data table while the Local CFP-Tree is used in the formation of his tree is a table formed Local item of Local frequent item.
   e. Local CFP-Tree of frequent pattern formed in accordance with the items in mining.
   f. From frequent pattern is calculated each item that meets its calculated confidence. If it meets the minimum confidence then each item in question serve as knowledge.

2. RESEARCH CONTENT

2.1 Process of Data Mining

1. Data Extraction

Data extraction is the process of collecting data from the data source to continue the process of data processing to the next level or to keep records of the extract. Data coming from .xlsx file format extracted into sql format, then stored in a database in order to facilitate the processing of data.

2. Attributes Selection

This process is done to eliminate some unnecessary attributes that mining process becomes faster. The following are the attributes that have been selected and will be used in the mining process.

Table 1 Selection of Transaction Data Attributes

Attributes	Selected	Reasons
No. Faktur	Yes	As a reference products purchased in a transaction
Tanggal	No	Not required
Customer	No	Not requied
Status	No	Not required
Kode Type	No	Not required
Type	Yes	To find the relationship between the type of product in order to obtain the rule for determining production by type
Size	No	Not required
QTY	No	Not required

3. Data Cleaning

Data cleaning is performed to remove noise and eliminate irrelevant data. The rules used in the cleaning process in a single transaction that is if there is only one type of product, the transaction will

be cleared from the data-set. Data cleaning process include:

a. Scans every transaction in the data-set after the selection of attributes.
b. If a transaction are the same type of product it is taken only one whose occurrence earlier.
c. If a transaction more than one type of product, the transaction will go through the next process, so that transactions that contain only one type of product is negligible.

Table 2 Dataset Before Cleaning

No. Invoice	Type
140102-1	Rompi Blaster
140102-1	Centour Pants
140102-1	Rompi Cavalier
140102-2	Speedtrap
140102-3	Corble Man
140102-3	Speedtrap
140102-3	Rompi Cavalier
140102-4	Kamerad 11 jeans man
140102-5	Rompi Blaster
140103-6	Neo Lunatic
140103-6	Centour Pants

Table 3 Dataset After Cleaning

No. Invoice	Type
140102-1	Rompi Blaster
140102-1	Centour Pants
140102-1	Rompi Cavalier
140102-3	Corble Man
140102-3	Speedtrap
140102-3	Rompi Cavalier
140103-6	Neo Lunatic
140103-6	Centour Pants

4. Modelling

It is the stage to create a model or design a system that will be built by implementing the algorithm CT-PRO by applying CFP-Tree data structures on the test data.

A. Count each occurrence frequency Each Product Type

To find the frequency stages following items:

1. Scan every type of product in Table sales transactions that have made the selection of attributes and cleaning, then grouped based on product type.
2. Calculate the number of products based on the group, and then inserted into Table Frequency of products.

Table 4 The Frequency of Appearance of Each Product Type

Type	Support Count
Speedtrap	26
Tank Bag Skipper	21
Hip Bag Flanker	21
Neo Lunatic	21
Centour Pants	20
Kamerad 11 jeans man	18
Rompi Cavalier	16
Corble Man	15
Hip Bag Baru 2 (sidewinder)	10
Kamerad 12 Jeans Woman	8
Rompi Blaster	7
Corble Women	7
Kamerad 21 Camo Man	6
Rain Cover Tankbag	6
Rompi Reign	6
Rompi Reign Denim	5
Magnet	4
Vivere Bella	4
Zirkon	3

B. Build Global Item Table

The steps in making the Global item table is as follows:

a. Specifies the minimum support to limit the emergence of products in a single transaction. In this case the minimum support used is 10 and the minimum confidence = 60% which will be used as a reference generation rule. It is intended that the candidate rule gained quite a lot so it can be seen what kind of products are often purchased together in order to be used on production. Therefore, the frequency range of products that appear to be as much as ≥ 10, if there is a product whose occurrence <10 will be eliminated. Below is the product that has been done the scan result can be seen in the following table.

Table 5 Not Frequent Data Deletion

Type	Support Count
Speedtrap	26
Tank Bag Skipper	21
Hip Bag Flanker	21
Neo Lunatic	21
Centour Pants	20
Kamerad 11 jeans man	18
Rompi Cavalier	16
Corble Man	15
Hip Bag Baru 2 (sidewinder)	10

b. After selection of products that meet the minimum frequency of occurrence of support, then formed the Global item table. Each type of product will be given in ascending Id corresponding frequency of largest to smallest. The result can be seen in the table below:

Table 6 Global Item Table

Type	Support Count	Id Global Item
Speedtrap	26	1
Tank Bag Skipper	21	2
Hip Bag Flanker	21	3
Neo Lunatic	21	4
Centour Pants	20	5
Kamerad 11 jeans man	18	6
Rompi Cavalier	16	7
Corble Man	15	8
Hip Bag Baru 2 (sidewinder)	10	9

Having determined the Global item table, it can be determined that frequent types of products. Product type of transaction data are then sorted on the global id smallest to the largest item on any No. Invoice. Here is an example of the sort of products are frequent.

Table 7 Data Transactions With Frequent Product Types

No. Invoice	Type
140102-1	Corble Man
140102-1	Kamerad 11 jeans man
140102-1	Hip Bag Baru 2 (sidewinder)
140102-1	Tank Bag Skipper
140102-1	Hip Bag Flanker
140102-1	Neo Lunatic
140102-1	Speedtrap
140102-1	Centour Pants
140102-1	Rompi Cavalier
140102-3	Corble Man
140102-3	Speedtrap
140102-3	Rompi Cavalier

C. Data Mapping

The process of mapping the data from the global item id, where the product name is replaced by the global item id. Here is an example of mapping transaction data:

Table 8 Data Mapping

No. Invoice	Type
140102-1	1
140102-1	2
140102-1	3
140102-1	4
140102-1	5
140102-1	6
140102-1	7
140102-1	8
140102-1	9
140102-3	1
140102-3	7
140102-3	8

D. Build CFP-Tree

CFP-Tree process to enter each transaction data into a tree. Stages build CFP-Tree are:

a. Starting from the product type, which first appeared on the first receipt codes in Table mapping, type the product will be currNode.
b. Add Count as many as 1 in the first product type appears according to the level.
c. If currNode already have children, and type the same products appearing with the child then add Count by 1 at the same level as currNode.
d. If currNode own children, but the data that appears different from the children of currNode, create new nodes and add Count as many as one in the same level with currNode, connect the new node on currNode through linkNode.

Here is the result of the formation of the Global CFP-Tree.

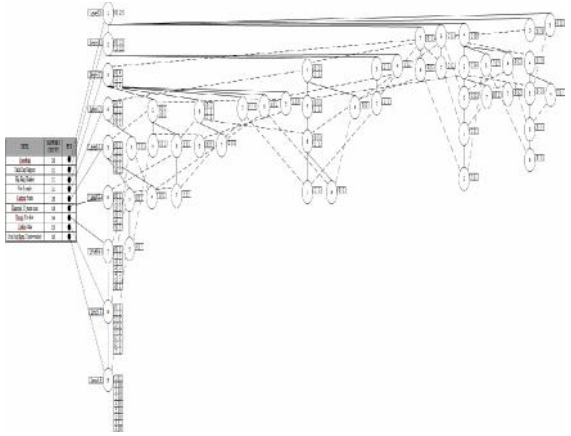


Figure 2 Global CFP-Tree

E. Looking For Frequent Pattern

Here are the steps to seek frequent Pattern:

a. Starting with the smallest index with the support count (x) from the Global table item.
b. Perform a search for the node associated with the index x by counting Count by 1 at each node visited ranging from Path to the root to find a node that meets the minimum support Count.
c. Put any kind of products that meet the minimum support to Local item table.
d. Give the new index on a node on the table in ascending Local item.
e. After Local items do mapping table formed a new index to the node that meets the minimum support corresponds to the index in the Local item table.
f. Once the mapping done Local establishment CFP-Tree by the same rules during the formation of the Global CFP-Tree

g. Local done CFP-Tree formation projection where x will be the root and the existing index in Local CFP-Tree be his child.
h. Do a search on Local CFP-Tree the bottom-up approach of node i by counting all of each Node Count, if the node meets the minimum support made k k being the son of the i-th node.

Example looking frequent item for the product type 8.
Search path (Node) on Global CFP-Tree that ends in product types8 bottom-up search from Path to root, to detail can be seen in the following figure:

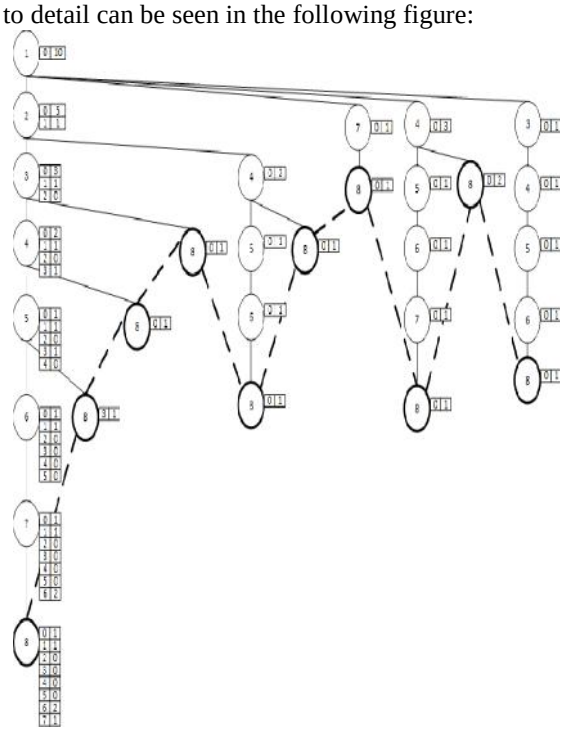


Figure 3 CFP-Tree ending Product Type 8

From the figures above, then do a search by looking for anything related index with the index 8 and put it in the Search Results table. Here are the search results for the index 8 on Global CFP-Tree which can be seen below:

Table 9 Search Result Index 8

No	Path
1	8
2	8, 7
3	8, 7
4	8, 7, 6, 5, 4, 3, 2
5	8, 7, 6, 5, 4, 3, 2, 1
6	8, 5, 4
7	8, 4, 3, 2, 1
8	8, 3, 2 ,1
9	8, 6, 5, 4, 2, 1
10	8, 4, 2, 1
11	8, 7, 1
12	8, 7, 6, 5, 4, 1
13	8, 4, 1
14	8, 4, 1
15	8, 6, 5, 4, 3, 1

From the above table amount of support obtained count of each node is 1 (10), 2 (6), 3 (5), 4 (10), 5 (6), 6 (5), and 7 (6). Due to its minimum support is 10 then for node 1 (10) and fourth (10) will be entered into the local table item. Furthermore, the node that meet the minimum support is put into the Local item table and given a new index on the table, namely the Local item numbering in ascending support count of the number of largest to smallest. Here is a table formed Local items:

Table 10 Local Item Table for Index 8

Indeks	Node	Type	Support Count
1	1	Speedtrap	10
2	4	Neo Lunatic	10

Next to the formation of Local CFP-Tree. Rules establishment of Local CFP-Tree together with the formation of the Global CFP-Tree, the difference is in the Global CFP-Tree is used in the formation of tree-it is Global item table formed of Global item data table while the Local CFP-Tree is used in the formation of his tree is a table formed Local item of Local frequent item. Here are Local CFP-Tree index 8:

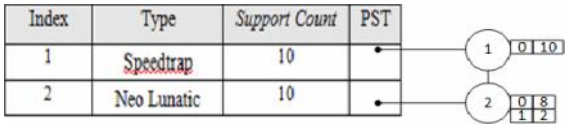


Figure 4 Local CFP-Tree for Index 8

After Local CFP-Tree index 8 is formed, the next step is the formation of Local CFP-Tree projection where the index 8 will be the root and every index in the Local item table will become a subsidiary of the index 8. To find Local frequent pattern tree, do a search on Local CFP -tree index 8 from Path to root through bottom-up, for more details can be seen in the following figure:

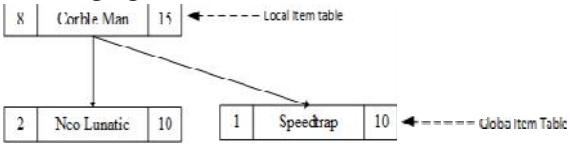


Figure 5 Local CFP-Tree Projection Index 8

From Local CFP-Tree projection then obtained a frequent item on the index 8 with the product type Corble Man is as follows: (8.2: 10) and (8,1: 10).

Do this in descending order from the type of products / index to 9 to the type of products / index to 1 for local CFP-Tree.

F. Generate Rule

Pattern of frequent obtained, will be generated to get a rule with minimum confidence = 60%. Calculated by the following equation:

$$Confidence = P(B \mid A) = \frac{Jumlah\ transaksi\ yang\ mengandung\ A\ dan\ B}{Jumlah\ transaksi\ yang\ mengandung\ A} X\ 100\% \quad (4)$$

Here are the results generated Rule which the minimum confidence > 60%:

Table 11 Rule Result

Rules	Rules Type	Confidence
8 → 1	Corble Man → Speedtrap	(10/15) * 100% = 66.67%
8 → 4	Corble Man → Neo Lunatic	(10/15) * 100% = 66.67%
6 → 1	Kamerad 11 Jeans Man → Speedtrap	(11/18) * 100% = 61.11%
6 → 4	Kamerad 11 Jeans Man → Neo Lunatic	(12/18) * 100% = 66.67%
5 → 4	Centour Pants → Neo Lunatic	(14/20) * 100% = 70%
5 → 1	Centour Pants → Speedtrap	(12/20) * 100% = 60%
4 → 1	Neo Lunatic → Speedtrap	(16/21) * 100% = 76.19%
3 → 2	Hip Bag Flanker → Tank Bag Skiper	(14/21) * 100% = 66.67%

Based on the information rules in table 11 above it can be clarified as a recommendation as to the production of products based on consumer buying patterns, for more details can be seen in the following table:

Table 12 Explanation of theRule Result

Rules	Rules Type	Rules Explanation
8 → 1	Corble Man → Speedtrap	Based on consumer buying habits type products "Corble Man", often in conjunction with the product type "Speedtrap". So as a recommendation if the company will manufacture the product type "Corble Man" then the product type "Speedtrap" better be produced as well.
8 → 4	Corble Man → Neo Lunatic	Based on consumer buying habits type products "Corble Man", often in conjunction with the product type "Neo Lunatic". So as a recommendation if the company will manufacture the product type "Corble Man" then type products "Neo Lunatic" better be produced as well.
6 → 1	Kamerad 11 Jeans Man → Speedtrap	Based on consumer buying habits type products "Kamerad 11 Jeans", often in conjunction with the product type "Speedtrap". So as a recommendation if the company will manufacture the product type "Kamerad 11 Jeans" then type products "Speedtrap" better be produced as well.
6 → 4	Kamerad 11 Jeans Man → Neo Lunatic	Based on consumer buying habits type products "Kamerad 11 Jeans Man", often in conjunction with the product type "Neo Lunatic". So as a recommendation if the company will manufacture the product type "Kamerad 11 Jeans Man" then type products "Neo Lunatic" better be produced as well.
5 → 4	Centour Pants → Neo Lunatic	Based on consumer buying habits type products "Centour Pants", often in conjunction with the product type "Neo Lunatic". So as a recommendation if the company will manufacture the product type "Centour Pants" then type products "Neo Lunatic" better be produced as well.
5 → 1	Centour Pants → Speedtrap	Based on consumer buying habits type products "Centour Pants", often in conjunction with the product type "Speedtrap". So as a recommendation if the company will manufacture the

		product type "Centour Pants" then type products "Speedtrap" better be produced as well.
Rules	**Rules Type**	**Rules Explanation**
4 → 1	Neo Lunatic → Speedtrap	Based on consumer buying habits type products "Neo Lunatic", often in conjunction with the product type "Speedtrap". So as a recommendation if the company will manufacture the product type "Neo Lunatic" then type products "Speedtrap" better be produced as well.
3 →2	Hip Bag Flanker → Tank Bag Skipper	Based on consumer buying habits type product "Tank Bag Skipper", often in conjunction with the product type "Speedtrap". So as a recommendation if the company will manufacture the product type "Tank Bag Skipper" then type products "Speedtrap" better be produced as well.

So based on the explanation of the final result of the rules in Table 12 above it can be concluded the types of products (type) as a recommendation to be produced is as follows:

Table 13 Recommendations type for Manufactured Products

Recommendations Type to be Manufactured
Corble Man
Speedtrap
Neo Lunatic
Kamerad 11 Jeans Man
Centour Pants
Hip Bag Flanker
Tank Bag Skiper

2.2 Testing Results

Testing is testing software that has been built whether to produce the desired data and in accordance with the result of applying the method of association rule algorithm CT-Pro in chapter 3. The testing will be done by comparing the rule of manual calculations with the results of the rule of data mining applications that have been built , The minimum value of support that will be tested is 10 and the minimum value of confidence that will be tested by 60%. Here are the results of the manual calculation method of association rule with CT-Pro algorithm approach.

Table 14 Test Results Calculation Manual

Rules Type	Confidence
Corble Man → Speedtrap	(10/15) * 100% = 66.67%
Corble Man → Neo Lunatic	(10/15) * 100% = 66.67%
Kamerad 11 Jeans Man → Speedtrap	(11/18) * 100% = 61.11%
Kamerad 11 Jeans Man → Neo Lunatic	(12/18) * 100% = 66.67%
Centour Pants → Neo Lunatic	(14/20) * 100% = 70%
Centour Pants → Speedtrap	(12/20) * 100% = 60%
Neo Lunatic → Speedtrap	(16/21) * 100% = 76.19%
Hip Bag Flanker → Tank Bag Skiper	(14/21) * 100% = 66.67%

From the test results obtained by manual calculation 8 rule generated. Here is a rule that is generated by data mining applications built with the support of a minimum value of 10 and a minimum score of 60% confidence.

Rule	Support	Confidence
Neo Lunatic -> {Speedtrap}	16	76.19%
Tank Bag Skipper -> {Hip Bag Fla...	14	66.67%
Centour Pants -> {Speedtrap}	12	60%
Centour Pants -> {Neo Lunatic}	14	70%
Kamerad 11 jeans man -> {Speed...	11	61.11%
Kamerad 11 jeans man -> {Neo L...	12	66.67%
Corble Man -> {Speedtrap}	10	66.67%
Corble Man -> {Neo Lunatic}	10	66.67%

Figure 6 Results Rule Data Mining Applications



Figure 7 Results Recommendations Manufactured Product Type

From the results of testing one using data mining applications that have been built to come by 8 rule generated.

If you look at the test results and the manual calculation software test results, it can be concluded that the calculation results of the applications that are built in accordance with the results of the calculations manually because the data generated by the application of rules and rule the data generated by manual calculations show the same value.

Based on test results, it can be concluded that data mining applications that have been built in accordance with the manual calculation for applications that have been built shows the results using the same rule manual calculation. Therefore the data mining applications can be used by the PT. Contin Motosport as a tool to determine the linkages between product and production on the type of product that may be appropriate.

3. CONCLUSION

Based on the results of the implementation and testing has been done on the application of data mining for the production of products using the recommendations association rule method and algorithm CT-Pro, it can be concluded as follows:

1. Applications are constructed to minimize the buildup of production of products for the information produced is accurate enough with the facts on the field.
2. Applications built to help the Head of Production in providing information and provide recommendations production of products that are good for the next production.

Thus the applications that are built in compliance and achieve the objectives of this study.

The suggestions for this production recommendation application development further, are:

1. Development of production in providing recommendations to output more innovative so much easier and enjoyable Head of Production.
2. Customize the application with technological developments in the PT. Contin Motosport, for example if Contin Motosport has been using the Database in the recap sales data, the application can be customized using data transaction previously through the process of importing data into the election data with the connected database company so that the Head of Production directly select sales data on how that will be used as reference in determining the next production.

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