

Available online @ [www.iaraindia.com](http://www.iaraindia.com)  
SELP Journal of Social Science - A Blind Review & Refereed Quarterly Journal  
ISSN: 0975-9999 (P) 2349-1655 (O)  
Impact Factor: 3.655(CIF), 2.78(IRJIF), 2.77(NAAS)  
Volume. X, Issue 42  
July - September 2019  
Formerly UGC Approved Journal (46622), © Author

## MARKET BASKET ANALYSIS: IDENTIFICATION OF CHANGING TRENDS THROUGH DATA MINING TECHNIQUES

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### *Abstract*

*Market Basket Analysis (MBA) is a data mining technique which is gaining popularity in various domains such as marketing, bioinformatics, education, nuclear science etc. The primary goal of Market basket analysis in marketing is to assist retailer in correct decision making by providing insights regarding the purchase behaviour of the customer. Market basket analysis employs on customer satisfaction in the retail firms/ organization through determining the placement of goods, designing sales promotion, improving the marketing strategies and so on. This in turn helps to maximize profits. Data mining enables to convert raw customer data into useful information. These information are used as input to data mining algorithms for predicting the future purchase patterns of the consumers. Various algorithms are available for performing Market basket analysis using data mining techniques. This paper is intended to study how MBA can be used as an effective strategy to examine the customer behaviour in retail marketing and assists for increase in sales.*

**Key Words:** Flood, Strategic Management, Losses, Stakeholders.

### **Introduction**

Every day, huge amount of data is being generated and maintained in various sectors like retail markets, social media, and online transactions. The question here is what percentage of that data is useful? Data mining plays a vital role in extracting useful information from these data. It is also known as Knowledge Discovery in Databases (KDD). Data mining can also be explained as the process to extract interesting patterns in customer behavior. The outcome of data mining process can include some implicit, non-trivial previously unknown potentially useful information derived out of huge database of previous transactions of customers.

The main idea is to utilize the available

technology and analyzing data from large repository of data sets. The ability to complete this task manually is unimaginable. The main purpose of data mining is to work with these large data sets and discover patterns. Today data mining is an essential part of business, as it helps to plan marketing strategies. With the help of data mining, marketing analyst can easily understand the customer behavior.

The significance of the problem lies in the importance to understand the customer behavior analysis and prediction to real world databases. Different data mining techniques are available for Market basket analysis.

Data collection due to electronic point of sale (EPOS) systems. With the advent of newer technologies, businesses these days are

keen on cost effectiveness and increased productivity & sales. Any retail outlets today look forward to have the quickest, best and the cost effective ways for their business. EPOS system is like a blessing as a complete solution comprising of reliability, efficiency and real time data accessing.

EPOS is an automated computer system visible in shops, restaurants and other retail outlets. It allows customers to make payment for their purchases electronically. Few advantages of EPOS systems include:

- Increasing the performance
- Secured storage of stocks and purchase information
- Up-to-the-minute retrieval of information for accounting, marketing and sales
- Check which are the hot selling products
- Print invoice and vouchers
- Can be connected to different terminals or websites through distributed computing technologies
- Ensures accurate pricing and sales reporting by reducing human errors
- Improves transaction speed and data integrity
- Easy updating options for stock details like reducing price on some special offer etc.

Essentially, EPOS systems can be modified according to different business requirements. Not just the in-house purchases, EPOS can also store vital information such as online purchases, telephone sales and multi-channel retailing.

**How Market Basket Analysis works?**

Market basket analysis is a technique which identifies how different products can be paired and how they are associated and identifying its probability of occurrence together. Market basket analysis applies if-then criteria on each product. Consider an example, if product A is purchased then product B is likely to be purchased. Market basket analysis works on probability theory or in simple terms Market basket analysis is a set of predictions based on the result of the analysis of previous purchase details of the products. Such predictions are also helpful in planning variety of marketing strategies like pricing, placement of products and different cross-selling strategies.

For the better understanding of the concept, let us consider an example of shopping

at a supermarket. Market basket analysis lists all the items purchased by a customer in a single purchase. Then the next step is to understanding the relationship of different products purchased together. These relationships works as basic building blocks in defining if-then conditions for different items. Rules can be defined as:

If {A} Then {B} {A}, which fall under the category of if condition is called antecedent and {B} which comes under Then condition is called consequent. The consequent can be stated as the result of the antecedent.

Considering an example of a purchase at the supermarket, the following is a table of nine transaction details with different combinations of milk, cheese, apple and bananas.

Transaction	Product 1	Product 2	Product 3
1	Milk	Cheese	
2	Milk	Apple	Cheese
3	Apple	Banana	
4	Milk	Cheese	
5	Apple	Banana	
6	Milk	Cheese	Banana
7	Milk	Cheese	
8	Cheese	Banana	
9	Cheese	Milk	

Now we have to identify the relationship. The following table can be used to analyze the relationships and set rules.

Support can be defined as the number of transactions which include both {A} and {B} as a percentage of total number of transactions. It shows the frequency of occurrence of {A} and {B} together.

Support can be calculated by using the following formula:

Confidence can be defined as the ratio of the number of transactions that include all items in both {A} and {B} to the number of transactions that include all items in {A}. This calculates the frequency of occurrence of items in {B} in transactions that contains {A} only.

Lift, also called as lift ratio can be defined as the ratio of confidence to expected confidence. Expected confidence is the measure of confidence divided by how often {B} occurs. Lift value is directly proportional to the strength of the association. As the lift value increases, the association becomes stronger. That means, as the chances of

purchasing items in {A} becomes higher, so as the chances of purchasing items in {B}. Lift gives the confidence of prediction, which is a better solution than making assumptions. Prediction helps in planning marketing strategies in a better way.

#### **What is Data Mining?**

Data mining is the process of analyzing data in order to identify hidden patterns and understanding the pattern with various perspectives allows data to be classified into useful information. The extracted information can be collected and stored together in data warehouses. These stored information facilitates data analysis and decision support system for improving profits in the organization. Data mining process consists of the following phases.

- Data collection, transformation and storage of data in data warehouse
- Data storage and management in multidimensional database environment
- With the help of application software, facilitate business analysts by providing data access
- Present the outcome of analysis in some visual format like graphs, for better understanding

How Market Basket Analysis leverages effectiveness of sales and marketing Market basket analysis helps the retail store manager in deciding the location of goods and promotion of goods inside the store. Considering an example, it has been observed that the purchaser of Hot wheels are more likely to buy Kinder joy, then Kinder joy can be placed next to Hot wheels shelf. Then most of the purchases containing Hot wheels, include Kinder joy as well.

The above stated example is just the initial analysis. Differential Market basket analysis can identify more interesting facts such as comparison of customers of various demographic groups, comparing the transaction trends during different days of the week, different seasons of the year or during any particular occasion.

If the observation shows, the purchase of items in a particular section is more likely to be purchased, than any other section, then we can understand there must be something interesting about that section. Perhaps it is organized in a novel, attractive way. Investigating such observations may provide

useful insights to improve company sales and encourages to plan variety of marketing strategies.

#### **Who are the beneficiaries?**

The moment term 'Market Basket Analysis' is coined, one starts thinking about shopping mall and super market scenario. But as a matter of fact, there exists many more fields where we can find the applications of Market basket analysis. The perfect example of Market basket analysis which most of the internet users are well aware of is online shopping sites like Amazon and Flipkart. They suggest the users to buy certain items as those items relates to our previous purchase. They send notifications on items which are frequently brought together, the items which are on sale and having great discount or some exciting offer attached with the purchase. Not just this, following are certain areas where Market basket analysis can be beneficial:

- In Retail marketing, Market basket analysis helps to determine the frequently purchased items, items purchased together, and items purchased on a particular day of the week. This can help retailers to plan the location of products and to improve promotion strategies. For instance, it makes more sense to place soda with chips than placing soda with shampoo.
- In Telecommunications, Market basket analysis helps to track what services are being utilized and what packages attracts customers, thereby helping the company to plan strategy for their business.
- Banking sector is a financial sector, where Market basket analysis can be helpful in analyzing credit card purchases, transaction analysis to identify fraudulent transactions and so on.
- In Insurance sector, Market basket analysis is useful to keep track of the medical illness and fraudulent claims associated with it, and also to check if more than one claim belongs to the same person within a stipulated time period.
- In Medical or Healthcare, Market basket analysis can be used for analyzing symptoms and to check its association with the diseases to identify the illness. It also can helps in revealing biological associations between different genes or between environmental effect and gene expression.

### Conclusion

Market basket analysis works on the principle, 'If a customer purchases an item, he is more or less likely to purchase another item'. Market basket analysis looks forward to identify the relationships between purchases. These relationships will be in the form of a rule. While we summarize the process of Market basket analysis, understanding of how the process is done is also equally important. Data mining comes to our rescue here. It helps to predict the future outcomes by analyzing the patterns of items that are frequently purchased together. This also helps to reduce customer frustration at searching for items and also helps to increase sales for retailers.

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