

The Relationship Between (4ps) & Market Basket Analysis. A Case Study Of Grocery Retail Shops In Gweru Zimbabwe.

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Abstract— The purpose of this study was to investigate the relationship between Product, Place, Promotion and Price (4Ps) in Market Basket Analysis (MBA) and establish how the 4Ps can be applied as a tool for competitive advantage in the small scale retail sector in Zimbabwe. Market basket analysis is a technique that discovers relationships between pairs of products purchased together. The technique can be used to uncover interesting cross-sells and related products. To conduct this study the researchers carried out observations, and examined transactions of customers for grocery retail shops in Gweru and used a survey questionnaire to elicit data. The researchers then evaluated the empirical data and compared with literature evidence. The results revealed interesting relationships.

Index Terms— Cross selling , Data analysis, Data mining, Market basket analysis, Up selling, 4Ps

1 INTRODUCTION

THIS paper is a follow up to our proposal paper published in [1]. Retailing is increasingly becoming a high performance sport, and like athletes, retailers are seeking a competitive edge through technology [21].

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Market Basket Analysis (MBA) promises to be the next step in the progression of retail merchandising and promotion. The practice identifies links involving items or connecting categories of items that regulars have a propensity to procure jointly (complements) or between items customers rarely purchase together (substitutes) [2]. The main goal of MBA is to identify relationships that is association rules between groups of products, items or categories [3]. For example, if you are in a Zimbabwe supermarket and you buy a packet of 2kg sugar and don't buy bread, you are more likely to buy flour at the same time than somebody who didn't buy sugar. The set of items a customer buys is referred to as an **item set**, and market basket analysis seeks to find relationships between purchases. Typically the relationship will be in the form of a rule: IF {sugar, no bread} THEN {flour}. The probability that a customer will buy sugar without a loaf of bread (that the antecedent is true) is referred to as the **support** for the rule. The conditional probability that a customer will purchase flour is referred to as the **confidence**. **Lift** being a third metric in the MBA approach is a measure of how much more likely the customer is to purchase item B now that he or she intends to purchase item A as compared to a customer not purchasing item A. In retailing, most purchases are bought on impulse. MBA gives clues as to what a customer might have bought if the idea had occurred to them. The objective of this study was to find out why customers buy particular products together and find whether the 4Ps influence the decisions they make on the retail outlets they choose to buy from.

2 LITERATURE REVIEW

2.1 Association Rule Mining

Association rule mining is a data mining technique used to find interesting associations or relationships between a large set of data items [4]. It identifies the association or relationship between a large set of data items and forms the base for MBA [5]. A typical application of association rule mining is market-basket analysis. In market-basket analysis, buying habits of customers are analyzed to find associations between the different items that customers place in their "shopping baskets". The discovery of such associations can help retailers develop marketing and placement strategies as well as plan on logistics for inventory management. Items that are frequently purchased together by customers can be identified.

An attempt is made to associate a product "A" with another product "B" so as to infer "whenever A is bought, B is also bought", with high confidence (the number of times B occurs when A occurs).

2.2 Market Basket Analysis

Market basket analysis is a technique that discovers relationships between pairs of products purchased together. The technique can be used to uncover interesting cross-sells and related products. The idea behind market basket analysis is simple. Simply examine your orders for products that have been purchased together. For example using market basket analysis you might uncover the fact that customers tend to buy hot dogs and buns together. Using this information you might organize the store so that hot dogs and buns are next to each other. Market Basket Analysis (MBA) is also an exploratory technique which identifies the strength of association between pairs of products purchased from an individual retailer. Such analysis is usually applied to data on shopping behavior, such as that collected at the point of sale. If applied to grocery shopping for example, the results of a MBA could inform a supermarket's pricing strategy. If the supermarket knows that bread and fruit juice tend to be purchased together, it can avoid offering price discounts on both at the same time. Almost all available literature have attempted to address the what, and how part of Market Basket Analysis. Aguinis et al [3] researched on how MBA can be used in management research and concluded that the adoption of MBA can help bridge the much lamented micro-macro and science-practice divides. They also argued that the use of MBA can lead to insights in substantive management domains such as human resources, organizational behavior, entrepreneurship and strategic management. Hoanca and Mock [2] research was on how MBA can be used to estimate potential revenue increases for a small university bookstore and concluded that depending on the customers' price sensitivity and on the saturation level of the affinities uncovered revenue can increase by as much as \$10 000 for the bookstore. Another research was done by FactPoint Group in on how retailers are using MBA to win margin and market share. Results obtained reveal that retailers are using MBA to develop more profitable advertising and promotions target that can attract into the stores and increase the size and value of the basket of purchases among other things.

2.3 Marketing Mix: The 4Ps

Many authors argue that understanding the customer attitude toward 4Ps (product, price, place and promotion) marketing mix is important. The issue of customer mind-set toward 4Ps of business particularly in the retail industry is crucial. There is need to understand the customer attitude toward the 4Ps marketing mix. According to [6] marketing mix is a framework of the dominant marketing management paradigm used to identify market development, environmental changes and trends. Several studies corroborate that the 4Ps are indeed the trusted abstract platform of practitioners dealing with operational marketing issues [7]. The ample recognition of the 4Ps among field marketers is the end result of their insightful disclosure to this notion, since identifying the 4Ps as the controllable parameters is likely to influence the consumer buying process and decisions [8], [9]. The marketing mix originated from the single P (price) of microeconomic theory [10]. Often referred to as the "4Ps", it is a means of translating

marketing planning into practice [11]. Marketing mix is not a systematic theory, but merely a conceptual framework that identifies the major decisions managers make in configuring their offerings to suit consumers' needs. The idea of the marketing mix is the same idea as when mixing a cake. A baker will alter the proportions of ingredients in a cake depending on the type of cake he or she wishes to bake. The proportions in the marketing mix can be altered in the same way and differ from product to product. Kent [12] refers to the 4Ps of the marketing mix as "the holy quadruple...of the marketing faith...written in tablets of stone". Marketing mix has been extremely influential in informing the development of both marketing theory and practice [13]. Consumers make many buying decisions every day. Most large companies research consumer buying decisions in great detail. They want to answer questions about what consumers buy, where they buy, how and how much they buy, when they buy, and why they buy. However learning about the whys of consumer buying behavior and the buying-decision process is not so easy the answers are often locked deep with the consumer's head. The central question is: How do consumers respond to various marketing stimuli the company might use? The company that really understands how consumers will respond to different product features, price, and advertising appeals has a great advantage over its competitors. Therefore, companies and academics have heavily researched the relationship between marketing stimuli and consumer response. Baidya and Basu [14]'s survey was aimed at studying the issues of customer satisfaction with respect to the 4Ps for a brand in India and the results indicate that the 4Ps have significantly positive effects on overall customer satisfaction. Purnomo et al [15]'s 2010 study was on why it is important to understand customer attitude towards the 4Ps marketing mix using a case study of the livestock input industry in Indonesia. The authors concluded that there is need to understand customer's needs, values and behavior associated with the product as this can help the marketers to develop segments around brand loyalty, price-sensitive and feature sensitive respondents. Research done by [16] was concerned with evaluating the Health Promoting Food Policies using the 4Ps marketing approach. Results obtained indicated that the 4Ps framework offered a potentially useful approach for categorizing the effectiveness evidence spanning a very wide range of healthy food policies. Kiprotich [17] came up with a proposal to conduct a survey which would look at the effects of the 4Ps marketing mix on sales performance of automotive fuels of selected service stations in Nakuru town. It is hoped that once the survey is completed the oil marketers' performance will be greatly influenced by the 4Ps.

3 METHODOLOGY

3.1 Defining the research focus

The observation method was used to identify and categorize the product relationships and customer profiles in order to further develop the questionnaires required for the survey phase. From the number of observations carried out the researchers established the general buying behavior of customers in the retail shops in question as well as the general composition and size of the market basket and the products to consider in the research.

3.2 Selecting the shops

When it came to choosing the retail shops for the study in question a specific criteria was used. Retail outlets were selected using the snowball technique from grocery retail shops in and around Gweru CBD. They were eligible to participate due to their optimum observable size. They are large enough and assorted with the candidate merchandise plus, and small enough to allow an observer to extract valuable data critical for this research. Since the researchers intended to carry out a comparison among the different retailers it was also considered critical to choose retail outlets with many attributes in common. The researchers also believed that having too many retail outlets and big retail outlets was going to make it difficult for the researchers as well as not being accomplishable within the time frame. Five retail outlets were chosen for the study and in order to keep the names of the participants anonymous, the pseudo-names Supermarket A, Supermarket B, Supermarket C, Supermarket D and Supermarket E are used.

4 FINDINGS AND RESULTS

4.1 Market Basket Analysis Data

4.1.1 Stage One

In order to better record information during the observation, observations were structured into two hour periods where the researchers would visit the retail shops in question and observe taking note of key events happening within the retail shop. At supermarket A the researchers made a total of eight two hour observations. Out of these observations a total of 386 transactions were observed and out of these 132 transactions qualified for analysis. In MBA, the quantity of each item that the customers bought is usually not considered. Whether a customer buys a carton of sugar or 2 kg of sugar would be considered as the same set of sugar. Not all recorded transactions are used. Only transactions of purchase of more than one item are considered as data. Transactions of single item are not used for the analysis. 132 transactions recorded contained cooking oil, of these 115 contained sugar, 93 contained rice, 72 contained flour, 59 contained milk, 129 contained bread, 61 contained soft drinks, 17 had kitchenware, 16 contained toiletries'. From the observations recorded it shows that there is a strong correlation on products such as cooking oil, rice, sugar, flour, bread and to some extent milk. Although there were other products bought together with these products there were insignificant and of no value.

Table 1 Supermarket A Market Basket Analysis Data

Antecedent	Antecedent Support 386	Consequent	Consequent Support	Confidence
Cooking oil	132	Sugar	115	87%
Cooking oil	132	Rice	93	71%
Cooking oil	132	Bread	129	98%
Cooking oil	132	Flour	72	55%
Cooking oil	132	Milk	59	45%
Cooking oil	132	Kitchen ware	17	13%

Cooking oil	132	Soft Drinks	61	46%
Cooking oil	132	Plastic ware	16	12%
Cooking oil	132	Toiletries	16	12%

At Supermarket B the same numbers of observations were made, eight two hour observation sessions with data being recorded onto a survey instrument. A total of 351 transactions were observed within the time intervals. Out of these 106 qualified for the Market basket analysis. The 106 transactions recorded contained rice, of these 93 contained cooking oil, 89 contained sugar, 37 contained flour, 69 contained milk, 42 contained bread, 63 contained soft drinks, 49 contained washing soap, 41 contained sanitary pads, 27 contained toiletries'. From the observations recorded it shows that there is a strong correlation on products such as rice, cooking oil, sugar, milk and soft drinks and to an extend flour. Although there were other products bought together with these products there were insignificant and of no value.

Table 2 Supermarket B Market Basket Analysis data

Antecedent	Antecedent Support 351	Consequent	Consequent Support	Confidence
Rice	106	Cooking oil	93	88%
Rice	106	Sugar	89	84%
Rice	106	Milk	69	65.1%
Rice	106	Flour	51	48.11%
Rice	106	Bread	42	40%
Rice	106	W/soap	49	46.22%
Rice	106	Soft Drinks	63	59.43%
Rice	106	Sanitary pads	41	39%
Rice	106	Toiletries	27	25.5%

At Supermarket C the same numbers of observations were made, eight two hour observation sessions with data being recorded onto a survey instrument. A total of 311 transactions were observed within the time intervals. Out of these 79 qualified for the Market basket analysis. The 79 transactions recorded contained sugar, of these 76 contained cooking oil, 71 contained rice, 51 contained flour, 43 contained milk, 77 contained bread, 49 contained soft drinks, 33 contained washing soap, 27 contained sanitary pads, 16 contained toiletries'. From the observations recorded it shows that there is a strong correlation on products such as cooking oil, rice, sugar, flour, bread and to some extent milk. Although there were other products bought together with these products there were insignificant and of no value.

Table 3 Supermarket C Market Basket Analysis data

Antecedent	Antecedent Support 311	Consequent	Consequent Support	Confidence
Sugar	79	Cooking oil	76	96%
Sugar	79	Rice	71	90%
Sugar	79	Bread	69	87%
Sugar	79	Flour	51	65%
Sugar	79	Milk	43	54%
Sugar	79	W/soap	33	42%
Sugar	79	Soft Drinks	49	62%
Sugar	79	Sanitary pads	27	34%
Sugar	79	Toiletries	16	20%

At Supermarket D the same numbers of observations were made, eight two hour observation sessions with data being recorded onto a survey instrument. A total of 362 transactions were observed within the time intervals. Out of these 127 qualified for the Market basket analysis. The 127 transactions recorded contained milk, of these 115 contained cooking oil, 121 contained rice, 86 contained flour, 109 contained sugar, 123 contained bread, 91 contained soft drinks, 103 contained washing soap, 56 contained sanitary pads, 61 contained toiletries', 119 contained margarine, 69 contained energy drinks, 17 contained cigarettes', 125 contained salt while 97 contained meat. From the observations recorded it shows that there is a strong correlation on products such as milk, cooking oil, rice, sugar, flour, bread, washing soap, soft drinks, meat, salt, margarine and energy drinks and to some extent sanitary pads and toiletries. Although there were other products bought together with these products there were insignificant and of no value. Supermarket D was also found to be unique in the sense that almost all the commodities that qualified for market basket analysis had higher confidence percentages than any other supermarket in this research and there were also more products that qualified for market basket analysis.

Table 4 Supermarket D Market Basket Analysis data

Antecedent	Antecedent Support 362	Consequent	Consequent Support	Confidence
Milk	127	Cooking oil	115	91%
Milk	127	Rice	121	95.3%
Milk	127	Bread	123	97%
Milk	127	Flour	86	68%
Milk	127	Sugar	109	86%
Milk	127	W/soap	103	81.1%
Milk	127	Soft Drinks	91	72%
Milk	127	Sanitary pads	56	44.1%
Milk	127	Toiletries	61	48.03%
Milk	127	Energy drinks	69	54.33%
Milk	127	Margarine	119	94%
Milk	127	Cigarettes	17	13.4%
Milk	127	Salt	125	98.43%
Milk	127	Meat	97	76.4%

At Supermarket E the same numbers of observations were made, eight two hour observation sessions with data being recorded onto a survey instrument. A total of 336 transactions were observed within the time intervals. Out of these 115 qualified for the Market basket analysis. The 115 transactions recorded contained sugar, of these 101 contained cooking oil, 95 contained rice, 97 contained flour, 72 contained milk, 68 contained bread, 74 contained soft drinks, 107 contained washing soap, 38 contained sanitary pads, 59 contained toiletries', 31 contained kitchenware, 91 contained greens while 63 contained salt. From the observations recorded it shows that there is a strong correlation on products such as cooking oil, and all other products save for kitchenware and sanitary pads. Although there were other products bought together with these products there were insignificant and of no value.

Table 5 Supermarket E Market Basket Analysis data

Antecedent	Antecedent Support 311	Consequent	Consequent Support	Confidence
Sugar	115	Cooking oil	101	88%
Sugar	115	Rice	95	83%
Sugar	115	Bread	68	59.13%
Sugar	115	Flour	97	84.4%
Sugar	115	Milk	72	63%
Sugar	115	W/soap	107	93.04%
Sugar	115	Soft Drinks	74	64.4%
Sugar	115	Sanitary pads	38	33.04%
Sugar	115	Toiletries	59	51.3%
Sugar	115	Kitchenware	31	27%
Sugar	115	Greens	91	79.13%
Sugar	115	Salt	63	55%

4.1.2 Stage Two: Survey

A survey is a powerful and effective instrument that can be used to collect information about human attitudes, behaviours, and characteristics. A questionnaire is simply a 'tool' for collecting and recording information about a particular issue of interest. It is mainly made up of a list of questions, but should also include clear instructions and space for answers or administrative details [18]. Questionnaires were distributed to customers who were actively buying from the supermarkets at the date and time that this survey was conducted. 125 questionnaires in total were handed out to participants not only actively involved in shopping in the supermarkets in question but those who had purchased trolleys full of goods. The questionnaires were distributed 25 per supermarket. All were returned but eleven (11) questionnaires were incomplete so they were discarded from further analysis. One hundred and fourteen (114) were complete and usable with a 91.2% response rate. Tables 6 provide demographic profiles of participants to the research for all Supermarkets in question.

Table 6 Demographic profiles for all Supermarkets

Variables		Frequency	Percentage	Categories	Individual
		Responses		Family	
Sex	Male	49	42.98%	38	11
	Female	65	57.02%	52	13
Age	<25	27	23.7%	10	17
	25-35	50	43.6%	47	3
	>35	37	32.5%	33	4
Shopping Frequency	Occasionally	20	20%	7	13
	Once/Months	34	28%	31	3
	Twice/Months	36	40%	30	6
	More than 2	24	12%	22	2
Reason	Place	12	10.53%	7	5

Doing Business with other Retail shops					
s of buying from this shop	Low Prices	50	44.74%	43	7
	Product	46	40.4%	37	5
	Promotion	6	5.3%	3	3
Doing Business with other Retail shops	1 Shop	14	12%	14	
	2 Shops	33	28%	29	4
	3 Shops	40	40%	32	8
More than 3	27	20%	15	12	

Combined respondents data for all supermarkets revealed that 57.02% of the shoppers were women while males accounted 42.98%. One possible explanation for more female respondents could be that females are more likely to be interested in shopping in general than males. Generally females are synonymous with shopping. This information could be vital for owners and management of retail shops. Respondents were also categorized by age groups, with the group 25 -35 years being dominant across all the supermarkets in question with an overall of 50% of respondents. Those above 35 years of age accounted for 32.5% across all shops in this study while those below the age of 25 constituted 23.7%. The statistics reveal that the occasional shopping group constitutes 32% of respondents, once a month's shoppers constitute 28%, twice a month's shoppers accounted for the biggest percentage across all shops with 40%, and those shoppers exceeding two times constituted 12%. Participants to the survey were also tested on loyalty and were asked about whether they do their shopping mainly where they were found shopping that. The respondents' statistics here shows that shoppers are heavily tilted towards shopping from multi-shops. 88% indicated that they do their shopping with at least two other shops other than where they were found shopping on the day the study was conducted. One participant actually said this statement "... when in Zimbabwe shop around don't say I only shop here only" The respondents were also asked as their shopping category whether they were family or single shoppers. The bulk of respondents were family shoppers with 78.9% while individual shoppers accounted for 21.05%. Participants were asked on the issue of the 4Ps. They were asked to list in order of priority the 4Ps and the outcome indicated that the 4Ps

family two (2) are more important than others. Price and product dominated the statistics on this one. Price obtained 44.74% of the respondents while product got 40.4% respectively. The other two members of the family place and promotion got 10.53% and 5.3% respectively. This shows that price is a vital cog in determining where and what to buy.

5 DISCUSSION

Results from the background information summarize the characteristics of the participants in this particular sample. Both males and females take into account the 4Ps seriously when they decide to visit a particular retail outlet to do business. However, overall, more females responded to this survey than males (57.02% females and 42.98% males), which means that the proportion of female shoppers is higher than that of male shoppers in this sample. People in the middle age group are more economically active and they accounted for the largest number of respondents with 50% in the 25-35 years age group. This suggests that generally Zimbabweans shopping behavior is highly influenced by the 4Ps family particularly price and product. The economically active are conservative in nature, they are aware of their money's value. When one goes through the rigorous process of working naturally one becomes aware of the value of their sweat and as a result it follows that they are highly inclined towards budgeting. When such people go for shopping they do real shopping. It's called real in the sense that they look at the value of what they are going to buy and how much it will cost them. Generally they are concerned with what constitutes their basket as well as how much they have to part with for their basket and at what convenience. This was further supported by the fact that everyone in this study is not loyal to any supermarket but they all buy specific grocery items from different shops because they look at the price and value of the product and then compare the shops before deciding to buy. Respondents were also asked to indicate their shopping frequency; on this part once a month's shoppers accounted for 28% of those who do business with the small scale retail shops. This percentage is made up of those customers who will always visit the retail shops in question regardless of the circumstances. Regular twice a month shoppers were the greatest group and weighed in with 40% of participants while those shoppers with at least more than twice regular shopping trips to these shops accounted for 12% of respondents. The low level of frequency of shoppers and the irregular nature of customers in question calls for more action from the small scale retail outlets. There is urgent need on the part of retailers to take a proactive role than reactive to try and tilt these statistics highly in favour of their business. In this research place and promotion did not receive much support as a paltry 10.53% and 5.3% of the participants take into account these 2Ps when deciding to do business with any retail outlet.

6 CONCLUSION

The purpose of this study was to investigate the role of 4Ps in market basket analysis and establish how the concept can be applied as a tool for competitive advantage in the retail sector in Zimbabwe. This research adopted observation and survey to achieve the objectives. There are two parts to the results comparisons. Firstly some results are found to be consistent with previous studies except promotion which was found to be important in the decision making process of customers in

previous studies while in this research it was found to be less important. Secondly, results of the other 2Ps that is price and product were found to be in line with the previous studies, while the other 2Ps, place and promotion were found to be less important in customer's decision making process. The utility bundle can change any time due to changes in political and economic climate. In this paper the authors have attempted to show the mathematical foundation and the reasoning for combining both behavioural and demographic information when applying MBA to small scale grocery retail shops. The authors deliberately used simple examples because they believe in the end computers will automate much of the work, but that this automation without human understanding of the fundamental theory is dangerous. The findings demonstrate that context specific factors such as product, price, place and promotion can influence customer perceptions about particular products that constitute a utility bundle and where they buy that valuable bundle.

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