



# Multi-level association rules for MP3P marketing strategies based on extensive marketing survey data

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## ABSTRACT

This study analyzes the purchase patterns of MPEG Audio Layer-3 Players (MP3) customers in Korea. Factor analysis, clustering, and association rules are used to find the purchase patterns of segmented groups. From our analysis, 7 major factors were identified: technique, business, stylishness, rationale, late adaptor, pragmatic propensity, and music. Based on these factors and demographic data, six types of user groups are identified. Subsequently, we identify the chain of purchase processes of each cluster of customers. Finally, we propose target marketing strategies for segmented groups. We expect that our study results can provide direction for marketing and public relations strategies for MP3P manufacturers.

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## 1. Introduction

MPEG Audio Layer-3 Players (MP3Ps) have become a cultural icon for youth and their popularity has spread all over the world based on attractive designs and various functions such as wireless Local Area Network [Wi-Fi] (LAN), Digital Multimedia Broadcasting (DMB), video players, etc.

According to IDC research, the worldwide MP3P market was no more than 26,000 in 2001, but it reached 1,500,000 by an annual growth rate of 176% until 2005. With the recent extension of the MP3P market – dominated by the leading company, Apple – other large global enterprises such as Microsoft, Samsung, Nokia and Matsushita are advancing or announcing plans to pursue a greater proportion of the MP3P market. Therefore, distinguishable marketing strategies are required to successfully take and/or hold a dominant position while participating in a fiercely competitive global market.

Many studies have used data mining techniques to increase the efficiency of marketing. Sohn and Kim (2008) identified patterns of use for additional services of mobile telecommunication subscribers in Korea by using quantitative association rules. Chang, Hung, and Ho (2007) proposed a forecasting model for potential customers' purchasing behavior based on clustering and association rules. Huang, Chuang, Ke, and Sandnes (2008) used back-propagation neural network with association rules to predict what customers will buy next and from what categories. In multiple relations, multi-level association rule analysis is encouraged. Therefore, multi-level association rule analysis is suitable for our paper, which

includes various information resources, such as purchase locations, prices, and satisfaction levels.

The main purpose of this study is to identify characteristics of target customers based on lifestyle variables (Lawrence & Giles, 2000), which include usage and various opinions about MP3Ps. We use factor analysis for clustering customers. Next, we employ association rules to understand preferences and purchase patterns of each cluster. Finally, we propose target marketing strategies for segmented groups.

The construction of this paper is arranged as follows: Section 2 describes the proposed research methodology. In Section 3, we conduct the empirical analysis using data mining methods and present marketing strategy for each cluster. Finally, Section 4 summarizes the study results and describes the potential for further study.

## 2. Research methodology

Various data mining methods (Wesphal & Blaxton, 1998) have been developed, and mining association rules in transactional or relational databases (DBs) have recently attracted a lot of attention in database communities. Typically, a marketing DB (Chye & Gerry, 2002) for an innovative product would include many variables regarding potential customers' lifestyles along with product preference information.

Before the analysis, we need to define the purchasing process of a customer. In the majority of cases, a customer would proceed as presented in Fig. 1.

Fig. 1 can be explained in more detail: customers first acquire information about a product from the internet, sales clerks, internet malls, or acquaintances before purchasing. Secondly, they prioritize considerations such as function/performance, brand,

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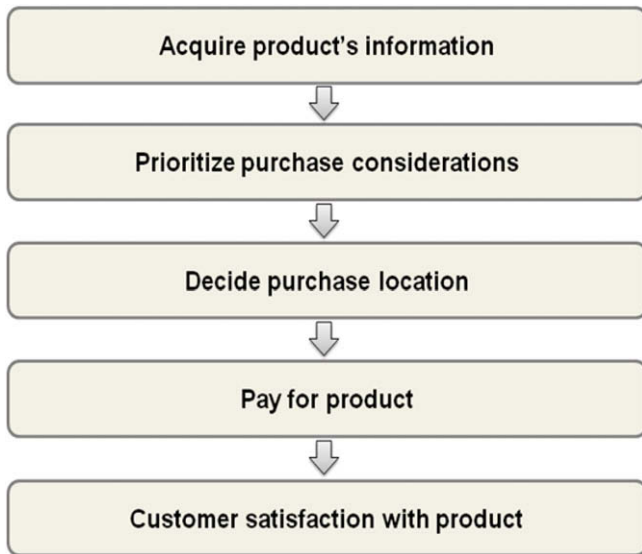


Fig. 1. Purchase process of customer.

price, design, and post-purchase services. Next, they decide on a purchase location: for example a retail store, internet mall, wholesale market, or department store. If they decide that the price is reasonable, they then buy the product. Finally, they feel some level of satisfaction about the product as they use it.

In order to discover the purchase patterns of customers, we first conduct factor analysis to extract the factors among lifestyle variables and product preference variables (price, brand, design, function, attitude of purchase, and trends) in a reduced dimension. Next, based on these factors, we divide target customers into several segments using *K*-means clustering in order to identify the characteristics of each cluster. Finally, we use association rules to identify each cluster's preference and purchase pattern in terms of price, satisfaction, purchase location, and information resources of MP3Ps. In marketing, purchase patterns are very important information because they can be used to target potential customers and to build a marketing strategy.

In summary, our research framework to analyze customer patterns of the MP3P market (Chen, Park, & Yu, 1998) is presented as shown in Fig. 2.

### 3. Case study

We use survey data from a company which plans to pursue more of the MP3P market. This survey was designed to target customers who have purchased and used MP3Ps. The survey was conducted in 2007 during 3 months with 1200 customers ranging in age from 13 to 39 years old. The survey questionnaire inquired about willingness to purchase, satisfaction, location of purchase, individual demographics, and lifestyle variables such as brand, price, usage, trends, function, attitude of purchase, and so on.

We applied three analytical procedures: factor analysis, clustering, and association rules.

#### 3.1. Factor analysis

We conduct Exploratory Factor Analysis (EFA) of 35 lifestyle variables based on survey data. These 35 lifestyle variables are determined through a survey participant's agreement with various questions about MP3Ps such as brand, function, design, price, trends, and rational purchase. Factor analysis is a statistical method that is used to examine relationships or patterns between several variables. Also, it can summarize the variables' information with a small number of latent constructs. Therefore, a factor that is extracted through factor analysis is the best concept that represents characteristics of many observed variables, and it can efficiently explain a phenomenon simply and clearly (Bryman & Cramer, 1994).

This study calculated principal components in order to explain 35 lifestyle variables, and then we used Varimax, a vertical rotation method based on principal component analysis (PCA) that uses partial correlation. We have extracted factors with eigenvalues greater than 1. The results of factor analysis are presented in Table 1, while we present variable identification in A.

From the EFA, we extract 7 factors out of 35 lifestyle variables based on their eigenvalues. Accordingly, we define the characteristics of each factor as shown in Table 2.

#### 3.2. Clustering

Cluster analysis divides related objects into groups to examine the similarities of objects within their corresponding groups and the heterogeneity of objects in other groups (Chen, Han, & Yu,

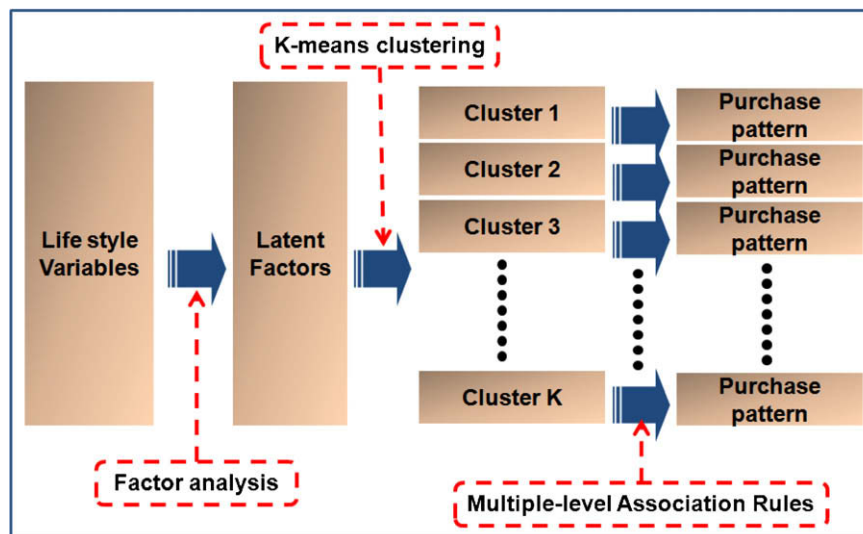


Fig. 2. Proposed research framework.

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