Consumer Behavior DNA for Realizing Flexible Digital Marketing

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Traditionally, consumer behavior analysis, which is the core of digital marketing, has been based on customer journeys (processes from the recognition to the purchase of products and/or services by consumers) set by marketers, and evaluation based on similarity of customer behavior has been the main method. However, excessive focus on detailed descriptions of the types of customers has made this technique inadequate for deriving measures directly leading to specific business goals and results. Fujitsu thinks that the processes of digital marketing can be made more efficient. To this end, using existing knowledge of conventional consumer behavior analysis, we have developed "consumer behavior DNA," an algorithm for the identification of marketing measures directly linked to consumer engagement. This algorithm allows business-to-customer (BtoC) companies to automate analysis that identifies more effective sales promotion targets. This paper outlines consumer behavior DNA and presents examples of its application in marketing. As a future prospect, it also describes the application of consumer behavior DNA to different industries by leveraging the power of AI.

1. Introduction

The distribution and retail industry in Japan faces two major changes. The first is the structural change of society as the population ages and declines owing to the falling birthrate, and the other is the rise of major internet shopping companies in Japan and abroad. The size of the e-commerce (EC) market in particular has been growing at a high clip of about 10% annual growth as of 2016.[1] As a result, traditional retail has been suffering from sluggish or declining sales.

To overcome this situation, besides retaining existing customers, the development of new customers is becoming a very important theme for the retail industry. An example of efforts to this end is that of department stores, supermarkets, and specialty shops, many of which have begun providing EC sites and smartphone apps, and the competition for consumers is heating up.

To cope with such competition, retailers must develop more efficient marketing that uses multiple channels. Marketing automation tools that automate marketing work have appeared, but they are not the end-all be-all solutions. The marketing process of retailing is largely carried out in the following two steps.

1) Analysis based on consumer attribute information and purchase information, and consumer segmentation
2) Promotion to consumers belonging to the target segment by direct mail and other means

While 2) above can be achieved through automation with tools, attempts to realize 1) through automation at a level comparable to the acumen and intuition of marketers have failed so far. Segmentation is the essence of marketing, and outcomes are greatly influenced by the soundness of segmentation choices. Therefore, how to achieve effective segmentation is a challenge of major importance.

Fujitsu studied the development of supporting tools that enable effective marketing by retail marketers without the influence of individual analytical know-how. This led to the development of algorithms that we call "consumer behavior DNA," which are based on knowledge acquired from the consumer behavior analysis services that we have been providing.

This paper outlines consumer behavior DNA, presents examples of its application in marketing, and ends

with a discussion of future prospects. The term "marketing" as it is used here refers mainly to the process of promoting products for sale.

2. Prior data utilization modes

Traditionally, in the distribution and retail industry, marketers determine which marketing measures to use by analyzing numerical data yielded by business intelligence (BI) tools based on their knowledge and experience. However, the following two problems exist in carrying out this work.

1) The skills and know-how necessary for utilizing data become individual factors, making standardization within the organization difficult.
2) Analysis by drilling down conditions is very time consuming.

To overcome these issues, Fujitsu has been providing consumer behavior analysis services that support data utilization in the retail industry.[2] Through these services, we aim to establish a culture of data utilization at customers' organizations by conducting data analysis workshops with customers in the retail industry who wish to hone their analytical skills. For data analysis, AI developed by Fujitsu Laboratories is used. This analysis allows marketers to identify types of consumer purchasing behavior. Through these activities, we succeeded in efficiently segmenting consumers, understanding consumer categories, and making efficient use of this knowledge for shop design, product selection, product planning, and so on.

However, while this method makes it possible to grasp consumer tastes and preferences, it focuses solely on similarities in shopping habits, and therefore the light it sheds does not extend to the reasons why consumers go shopping. Without purchasing motives, consumers are much less likely to engage in consumption behavior, and if promotion measures are carried out uniformly for consumers who happen to be placed in the same group by clustering[note)] without consideration of motivation, the efficiency of such measures is bound to be poor.

Conversely, by stimulating purchasing motives of some kind later on, consumers can be made to purchase products they were not interested in originally (**Figure 1**). As concrete marketing measures cannot be determined based solely on such analysis, the marketer's knowledge and experience have to be relied upon. To automate this know-how, the visualization of purchasing motives is the next task.

note) A type of AI that creates groups with similar characteristics from data.

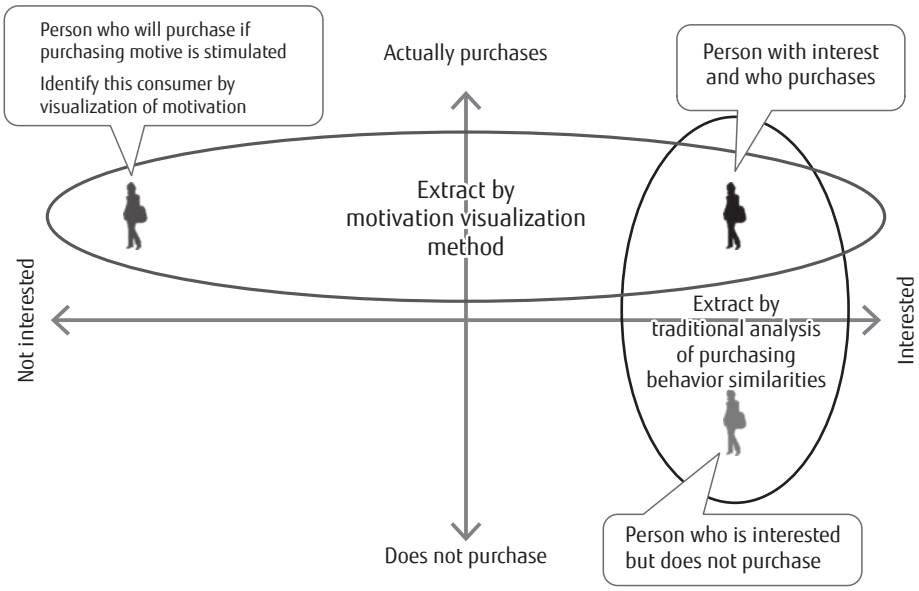


Figure 1
Consumer segmentation by purchasing similarities and motives.

3. Clarifying purchasing motives from consumer behavior DNA

Fujitsu therefore started developing an algorithm called "consumption behavior DNA" to visualize the purchasing motives of individual consumers. The purpose of visualizing why people buy is to facilitate the consideration of how to engage consumers in the retail industry. This serves also as the starting point for the formulation of marketing measures.

As regards consumer behavior DNA, the visualization of purchasing motives can be divided into two levels, namely actions that can be discerned from the data, and motives that can be interpreted from behavior. This incorporates the concept of factor analysis, which is often used as a method of interpreting results when conducting questionnaire surveys and the like. In consumer behavior DNA, the fragmented and concrete actions taken by consumers are tagged and are called "behavior tags," and the motives and attributes discerned therefrom are called "DNA." Multiple behavior tags are attached to each DNA. If the purchasing behavior of a consumer satisfies the conditions of multiple action tags, that consumer is regarded as having a certain DNA.

As data, in addition to information on the items that were purchased and the sales location, various quantitative data such as when the purchase was made, how many times the item in question has been purchased, and how much they spent, are used. These multidimensional data are combined to generate even more feature values, which are used to define behavior tags by logic programming. The key element here is the feature values used by the consumer behavior DNA. Far from being generated or selected at random, these feature values are based on the knowledge acquired from the consumer behavior analysis services Fujitsu has been providing customers over the last eight years. As of December 2017, about 150 feature values have been generated.

4. Utilization of consumer behavior DNA for marketing

There are two types of consumer behavior DNA, namely "nurturing type DNA," from which DNA-matching behavior can be expected depending on the approach, and "latent type DNA," which is strongly interest driven although consumer behavior is difficult to change. The method of utilizing consumer behavior DNA for marketing along these two axes is described below.

1) Nurturing customers

Focusing on nurturing type DNA, the approach is to engage consumers who are likely to be granted DNA. **Figure 2** shows an example of consumers responding to the use of points. Both consumers A and B have multiple behavior tags attached to DNA 1. Whereas Consumer A already meets all the granting conditions, Consumer B has been granted all behavior tags but one. In other words, Consumer B is highly likely to have the motivation indicated by DNA 1. Thus it is effective to encourage the behavior of behavior tags such as "visiting stores on days with extra points" that have not yet been granted to Consumer B.

2) Consumer targeting

Either of nurturing type DNA and latent type DNA

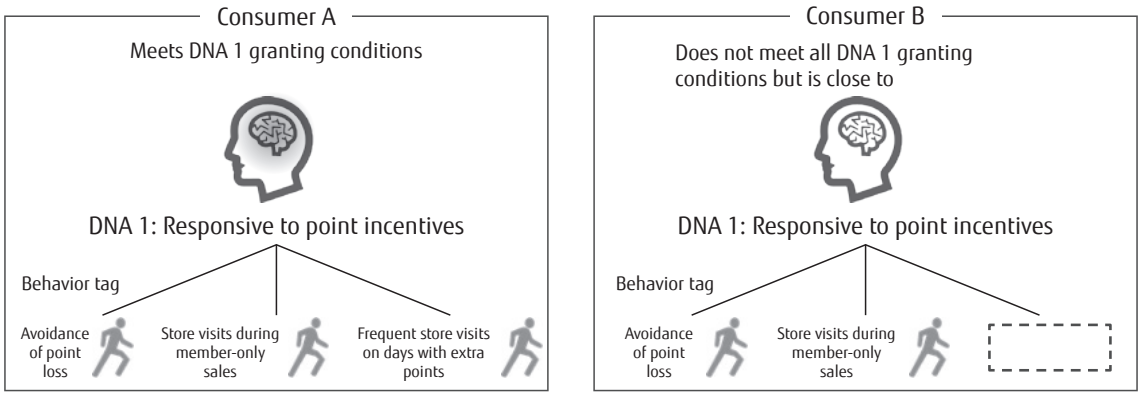


Figure 2
Specific example of nurturing type DNA.

can be utilized, and they can be used selectively to best effect by targeting consumers selected for marketing measures. Specifically, DNA is selected according to the theme of the marketing measures, and sales promotion is carried out targeting customers who have been granted that DNA. For example, for customers who have been granted the DNA of "sensitive to fashion," one could consider sending direct mail at the early stage of the change of merchandise at the boundary of two seasons to boost purchasing motivation.

3) Finding consumers

Another possible approach might be to find customers who may move over to a higher loyalty segment, by focusing on consumers who share DNA across segments. Specifically, the first step would be to carry out segmentation of consumers by a method such as clustering in order to group together consumers who share similar shopping habits.

Let us suppose, for example, that Cluster A in **Figure 3 (a)** is a cluster with very high loyalty, and that Cluster B in that figure is a cluster of average loyalty. A relationship wherein Cluster B consumers switch to Cluster A as they mature would be ideal. Furthermore, the group with upmarket preferences in Cluster A in **Figure 3 (b)** is larger than that in Cluster B. In such a case, the group with upmarket preferences belonging to Cluster B would be identified, and measures to promote the purchase of high-quality products would be taken.

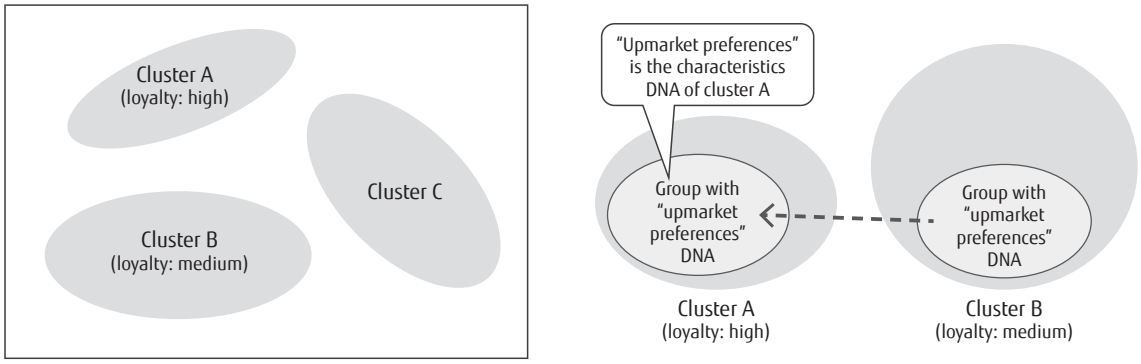
As described above, the use of DNA that allows the visualization of purchasing motives makes it possible to perform analysis more directly linked to marketing measures than traditional segmentation that focuses on purchased items.

5. Conclusion

This paper described the "consumer behavior DNA" algorithm developed using Fujitsu's proprietary consumer behavior analysis know-how, and its application to marketing. This DNA algorithm was shown to have potential for realizing automation of analysis in addition to already established marketing automation technology that mainly focuses on promotional activities such as mailings.

While this technology was stated to have been developed for the retail industry, consumer behavior DNA is considered to have broader potential. At present, companies in various industries accumulate all kinds of data including unstructured data and the like in data lakes, and increasingly they are seeking ways to generate revenue based on those data. Yet the data in data lakes are usually stored in the various formats in which they are collected, and this makes it difficult for companies in other sectors to find value in such data.

However, by creating unique DNA for various specific industries and deleting information that identifies individuals, data utilization across companies with DNA as a common language can be promoted. This makes it possible to assign behavior tags to data in companies' data lakes, and thereby provide a platform (CTP: Customer Tagging Platform) that can be used by other industries as well.



(a) Consumer segmentation

(b) Inter-segment comparison

Figure 3
Finding consumers through the use of DNA.

Further, when constructing DNA specific to a particular industry, it is necessary to extract characteristic patterns from vast amounts of data and create tags. Pattern mining technology, a type of AI, holds promise for such processing.

Going forward, we will utilize the comprehensive capabilities of Fujitsu, which has knowledge of many industries, to develop DNA for various industries by combining AI and industry know-how, as we aim to build an ecosystem for data utilization between different industries.

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