The Retail Industry Offers New Experiences for Consumers

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Abstract

The retail industry is entering an era of major reforms. This is due to circumstances that include demographic changes brought about by the recent low birth rates and a trend toward increased longevity, changes in lifestyle and taste and rapid changes in the ICT environment.
This paper introduces perspectives for reforming the procedures adopted in actual shops by using AI. These include loss reduction by visualization of persons and things in the shops, improvement of the efficiency of shop procedures by real-time identification of purchasing behaviors, support for shop management by AI and improved shop standards by IoT.

Keywords
auto recognition AI, mathematical optimization AI, logical thinking AI, chance loss, unknown loss, disposal loss, behavior analysis, sight detection, omni-channel

1. Introduction

Advanced AI technology is about to commence use in the retail shops that are familiar to general consumers, including in convenience stores, drugstores and clothing shops.

At NEC, we believe that the retail industry of the future will be led by consumers who will reform it into "consumer-centric retailing". This will be a reform in the retail industry that will be chosen by consumers by taking real-time measures for diversifying consumer needs. In this paper, we will consider the diversity of shopping procedures reforms, particularly that in the retail industry of the near future that will be based on the application of AI.

(1) Reduction of chance losses and unknown losses based on real-time, precise identification of persons and things in shops using visualization AI technology.
(2) Data of customer purchasing behavior in the actual shop has not previously been available to collect and utilize as data. Significant efficiency improvement, however, can be achieved by adding these data to the already accumulated data such as POS data.
(3) Shop management based on AI consulting.
(4) Shop value improvements utilizing IoT to connect actual shops and customers locally.

2. Auto Recognition AI for Improving the Eye of the Leading Salespersons

Personalization in the retail industry means execution of optimum promotional activities aimed at each individual customer. In the case of online shopping, the entire field of purchase behaviors is performed online. So it is easy to identify the goods browsed by each customer and the information (websites) via which he or she came to purchase a specific item. It is already easy via online shopping to analyse customer tastes by using such information and by enforcing various promotion strategies accordingly. Future progress in image recognition technology is expected to allow the stores that are currently operating offline to obtain detailed customer purchasing information.

NEC's "auto recognition AI" technology recognizes a

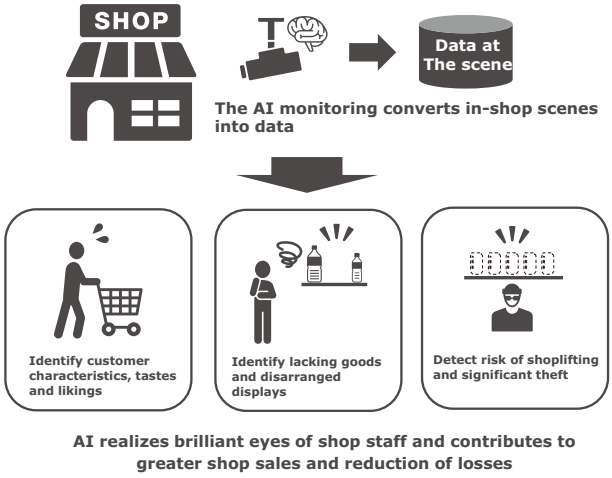

Fig. 1 Application of AI technology in retail shop.

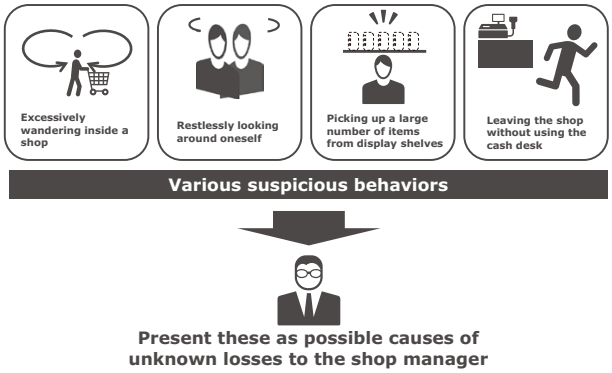

Fig. 2 Detection of suspicious behavior with auto recognition AI.

wide range of currently-occurring events instantaneously in order to support quick decision making. Specifically, it is the progress of technology for the recognition of persons and things that prompts real-time understanding of what is occurring in the shops (**Fig. 1**). It is said that leading salespersons in retail shops achieve several times the sales compared to ordinary salespersons. Outstanding salespersons serve each customer by observing the kinds of goods he or she is interested in, or even if he or she is a first-time visitor, by guessing customer tastes and likings based on observation. The auto recognition AI will provide the observation ability equivalent to those of such outstanding salespersons.

The first approach taken is the "visualization of a person". This makes it possible to judge whether a customer coming into the shop is a first-time or existing customer and, even when he or she is a first-time visitor to the shop, estimate the gender, age and body shape as well as health condition. This approach also tracks the behaviors of customers in the shop, detects their location in the shop, their time staying in the shop, sightings and postures and also recognizes the tastes and likings of customers automatically.

Next is the "visualization of things". An exceptional sales person has an overview of the shop, taking in various subjects such as the goods display status and lacking items etc. The recognition technology can also constantly identify the condition of the goods in the shop and check chance losses caused by disarranged displays and lacking items. In addition, "visualization of things" monitors the operations of various shop facilities in real time and detects signs of failure.

As seen in the above, Auto recognition AI is within the capability of the operations performed by leading salespersons and shop managers, from observation of customer purchasing behavior to the monitoring of the status of shop procedures, on all customers and all goods continuously throughout the day. The customers' purchase information that used to be available only to individual salespersons and to be inadequate compared to the online shopping data is now going to be available in deeply digitized forms as common knowledge.

The auto recognition AI is also effective in the detection of unknown losses including those due to in-shop dishonesty and shoplifting. It has been reported that the unknown losses for each Japanese retail shop may be as high as 600,000 yen per month, which means a significant loss for the retail industry. The auto recognition AI recognizes human actions and behaviors in real time by combining several recognition techniques and can preempt illegal actions before they occur (**Fig. 2**).

Usually, shop managers and leading salespersons monitor inside the shop and collect information. However, instead of those managers and salespersons, AI can be employed for such works, as described above. It observes all persons and things and converts the collected results effectively into accurate information data.

3. Mathematical Optimization AI Improving Shop Management Efficiency

Precise information on the customer purchase behavior in actual shops will become available via auto recognition AI. It will become possible to advance the traditional data usage such as analysis of existing data including POS data and then, it will become possible to realize the value improvement of each actual shop and personalized customer service and merchandising.

The AI analysis of purchase behavior using data from the in-shop flow line, staying time, detected sightings

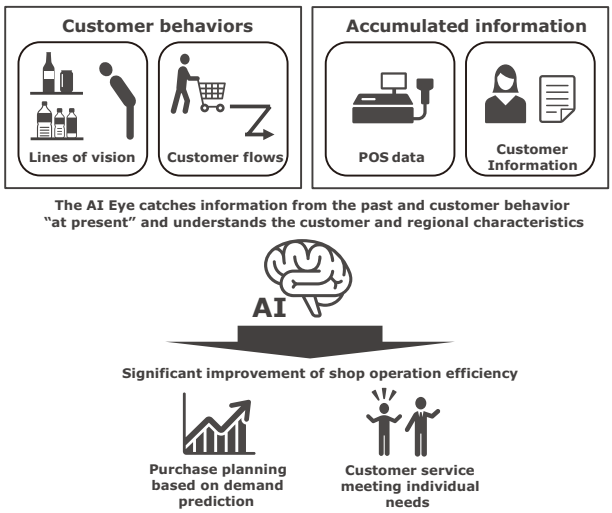

Fig. 3 Significant efficiency improvement of shop operations achieved using auto recognition AI and mathematical optimization AI.

and behavior analyses can elucidate facts that have not been clarified satisfactorily from the POS data, e.g. that a customer involuntarily selects an article because the truly needed article was lacking.

When such hidden customer behaviors that have not been observed by human eyes can be applied to the data in estimating goods demand, the goods demand prediction can become more finely tuned and precise than before. NEC's "mathematical optimization AI" not only deduces finely tuned and precise analysis results from existing data but it can also add the vast amount of feedback data obtained from the auto recognition AI that equips human perspective monitoring capability equivalent to that of leading salespersons and shop managers. This is the feature of "mathematical optimization AI" that can implement operations with remarkable efficiency by achieving predictions and optimizations that can exceed the human perception (**Fig. 3**).

4. Logical Thinking AI Enabling Concentration in Creative Work

Even when the purchasing trends of customers can be understood from their various characteristics and behavior patterns, it is still not possible to adopt optimum measures for the trading area of each shop without consulting expert knowledge regarding marketing methods. NEC's "logical thinking AI" can support solutions for such advanced issues by enabling a huge amount of knowledge and logical inferences. Thus, the process in which the shop manager interacts with AI as if consulting with a marketing expert in order to discover suitable measures for the shop management is enabled (**Fig. 4**). This means that even the management of an individual shop no longer has to resort to experience and intuition as before. Fine analysis, accurate prediction and appropriate decision making can be obtained by interacting with AI in simple language, even without an advanced knowledge of data science.

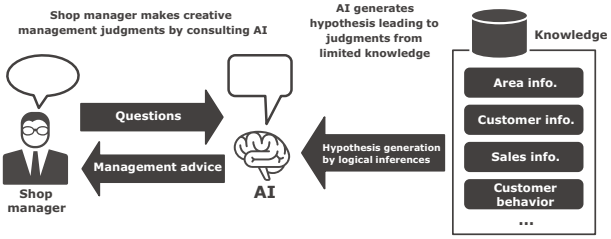

Fig. 4 Shop management advice by logical thinking AI.

5. Real Shop IoT Connecting Shop and Customers in Its Trading Area

The term "O2O" is a marketing technique with which purchase behavior is promoted from the network (Online) to real shops (Offline). The best known examples are the distribution of coupons on the network for guidance to real shops and the positive promotion of shop recognition and shop visits via an SNS, etc. The term "omni-channel" means that customer service is provided by crossing the barriers of devices and channels. However, in reality, it cannot fully use the value of real shops as the distribution channel and therefore in most cases "omni-channel" remains to be merely another way of EC (electronic commerce) that can be accessed from multiple devices.

The value of real shops consists of face-to-face communication, consultation based on expert knowledge of goods, an atmosphere specific to the shop, and the reality of articles that can be taken in hand, which are never available in the cyberspace. We at NEC believe that expanding the quality and quantity of these values through the use of networks and AI will be the ideal future orientation that must be followed (**Fig. 5**).

The customer information currently available online is just the history of purchase behaviors in the cyberspace. In the coming IoT era, it is expected that there will be significant expansion of the connection targets, such as wearable terminals, sensors and actuators installed in homes and offices, and of information terminals. The accessible customer information is also expected to increase synergistically. Let us consider an example in which a drugstore distributes wrist-band type activity

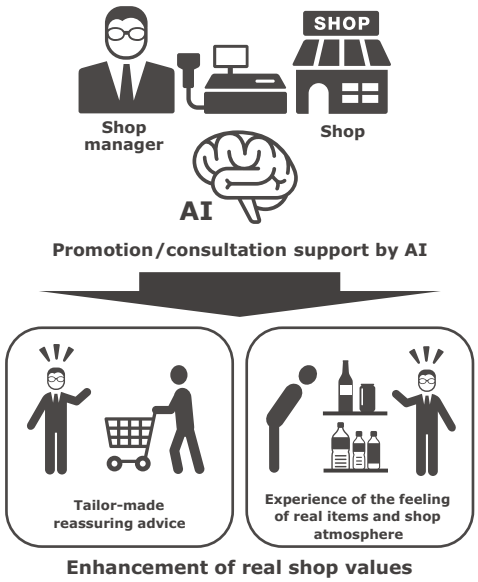

Fig. 5 AI consulting service for enhancing shop value.

meters to customers for a personalized health management service based on the monitored information on the number of steps taken, distance, consumed energy and heart rate. With this service, the AI gives a variety of customized health management advice to each customer based on the information monitored from the activity meter with the final goal of connecting the advices to business interests. The AI consulting service may recommend a certain supplement aiding fat combustion to a customer who is in a trouble of body fat increase on account of insufficient exercise, or it may provide a shop-front counselling campaign to customers based on data acquired from a sleep monitoring meter.

The key discussion here is that such advices are more than general health management advices. Interactions between the AI and customer can deepen the superficial information that has already been stored in the shop database. It becomes more profound information regarding what is really necessary for each customer and results in the possibility of providing customized information to be applied individually for each customer. Recommendations may be offered in the interactive format of optimum health supplements and materials for each customer, actual experience in the shop or as one-to-one consulting.

What is to be noted especially here is to connect the omni-channel type convenience with the actual experience in a local shop. Customers can acquire information on goods via omni-channel anytime and anywhere and then experience them in a local shop. AI supports those shops for promotion measures matching their trading areas, which makes possible a dynamic connection between customer and actual shops.

6. Conclusion

The retail industry will be reformed so that it can attract consumers by dealing dynamically with their diversifying needs. This will be essential for achieving further procedural efficiency improvements simultaneously under the trend of labour shortages and the creation of added value. Introduction of AI can reduce all kinds of shop losses including chance losses, waste losses and unknown losses. Furthermore, it will support attractive services and enhanced customer care by making full use of the location and characteristics of each shop.

At NEC, we are determined to create AI-applying solutions that can maximize the experience of customers based on the rich achievements, experience and technical skills that have been acquired through our retail industry solutions of the past.

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