A Study on the Information Management of O2O Service Through Artificial Intelligence

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Abstract: Various technologies are developed in the era of the 4th Industrial Revolution. Among these technologies, artificial intelligence technology is a very important technology. In addition, as the IT industry developed, online commerce developed. Currently, many companies use O2O services that allow customers to use offline stores through online services. Artificial intelligence technology can be a key technology for O2O services. Therefore, in this paper, the use of artificial intelligence in the O2O service platform was studied. As for the research method, case studies were conducted based on literature research. Case studies were conducted focusing on companies that provide existing O2O services. And field studies were conducted based on case studies. Through these field studies, the use of artificial intelligence in the O2O service platform was analyzed. In the O2O service, artificial intelligence can recognize the logo or mark of a product through an algorithm. Customers can receive information and services on their products by scanning the logo of the products with their smartphones. In addition, artificial intelligence can analyze the image and logo of the customer's preferred product and recommend products that the customer may prefer. Such a function may increase satisfaction when a customer purchases a product. As artificial intelligence's image recognition technology develops in the future, it is expected that accurate products can be recommended to customers. In addition, on the O2O service platform, customers communicate with stores through mobile. So UI should be designed in a customer-friendly way. The UI of mobile should be designed from the customer's point of view so that customers can use the O2O service platform well. These research results can be used as basic theoretical data when developing an O2O service platform using artificial intelligence.

Keywords: O2O service; platform; artificial intelligence; omni-channel system

1 INTRODUCTION

1.1 Purpose and Significance

With the recent development of artificial intelligence technology, artificial intelligence technology is used in various industrial fields. These artificial intelligence technologies can bring innovation to various fields. In addition, as the IT industry developed, online commerce was activated. In particular, as mobile technology develops, customers and companies are connected in various ways by using mobile. In addition, many companies are activating O2O services that allow customers to use offline stores directly through online services. When

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artificial intelligence technology develops, artificial intelligence technology is used in various mobile service platforms. The artificial intelligence technology will increase the convenience of customers. As such, artificial intelligence technology can be a major technology for O2O services. Despite the importance of artificial intelligence technology, artificial intelligence technology has not yet been applied to the O2O service platform. Therefore, in this paper, a study on the role of artificial intelligence in the O2O service platform was conducted. In addition, this study aims to analyze the purchase stage through the O2O service platform of producers and consumers through artificial intelligence and present a new method of distribution channels. Moreover, in order to maximize the convenience of consumers, a UI design plan for the O2O service platform is also proposed. These research results can be used as basic theoretical data when developing an O2O service platform using artificial intelligence.

1.2 Literature Review

With the recent introduction of smart-phones, interest in the O2O service platform is increasing. The O2O service platform connects online and offline through a smart-phone or personal computer. In addition, with the development of artificial intelligence technology, many companies try to use artificial intelligence technology on the O2O service platform. So companies invest a lot of money for technological advancement in these fields. Therefore, the research on the use of the O2O service platform so far is as follows. Sung Jae Kyung et al. (2017) proposed a new service design which is deep learning-based image retrieval system for product search on O2O shopping mall platform [1]. Song Jae Min et al. (2020) can look at the use cases of domestic and overseas image recognition technology, as well as see which methods are being applied to the industry [2]. Yu Aram (2019) examined the O2O service cases of domestic and foreign companies from the point of view of consumers' purchasing behavior [3]. Choi Tae Ho et al. (2020) examined the relationship between the impact of O2O quality of service on trust and the intent of continuous use [4]. Kim Jae Young et al. (2020) analyzed from a comprehensive perspective the quality factors (systems, services, interfaces, information) for mobile real estate brokerage services that are well known and used in the domestic market [5]. Lee Sang Shik (2017) Focused on the Customer Experience Story of Bandi&Luni's Centum City branch which Offers the Different Service Concept on the Competitive Book Selling Market [6]. Kim Chul Jin (2016) proposed a Mobile Service Architecture, which can provide an Omni channel, for activating O2O(Online to Offline) business to induce customers to visit offline stores through online services [7]. Shin Hee Hwang et al. (2019) examined the usability of the AI search service on the Naver App 8.9.3 beta version by comparing it with the search services of the current Naver App and targets 30 people in their 20s and 30s, who have experience using Naver apps [8]. Most of the existing studies were studies on the operation of the O2O service platform. However, there is a lack of research on the use of artificial intelligence in the O2O service platform. In addition, there is a lack of research on UI design in the O2O service platform. Therefore, in this study, the use of artificial intelligence and UI design in the O2O service platform were studied. These research results can be theoretical basic data when establishing an O2O service platform.

2 PROCESS AND METHOD

This study is about the use of artificial intelligence in the O2O service platform. For this research, literature research was conducted. Papers, books, and magazines were used for data on literature research. And in this study, case studies were conducted based on literature research. Case studies were conducted focusing on companies that provide existing O2O services. In particular, the subjects of the case study are companies that provide mobile services. And field study was conducted based on case study. In the field study, participant observation and in-depth interviews were conducted. The targets of in-depth interviews are developers, entrepreneurs, and UI designers who understand O2O services. Through this in-depth interview, an analysis was conducted on the use of artificial intelligence in the O2O service platform. Then, artificial intelligence presented the role of the O2O service platform. The results of this study can be used as basic theoretical data for companies' use of artificial intelligence.

3 A THEORETICAL STUDY

3.1 Definition of O2O Service

The O2O service supports offline commerce through advertisements and coupons. In the future, the boundary between online and offline will be eliminated. This feature is also common in recent commercial transactions. For example, a customer checks the product offline and then buys it online. In addition, customers purchase products through coupons or advertisements through mobile devices. In particular, with the advent of smart-phones, O2O services through mobile will be activated. It is very important to increase customer loyalty to products through such systematic and continuous services. And recently, with the development of fin-tech, the mobile payment system is widely used. So the O2O service can be activated through this mobile payment system (figure. 1).

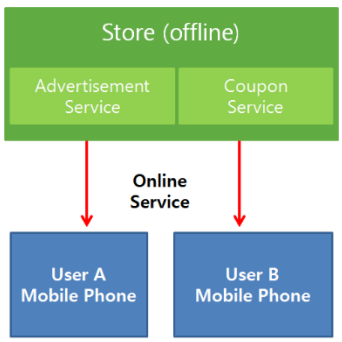

Figure. 1 O2O Service

3.2 Classification of O2O Service

O2O services can be classified into two main categories. These two types of services are platform type and business expansion type. First of all, the platform types include Uber and Airbnb. These companies connect customers and stores through online platform. Through this

platform, companies can connect more customers to stores and provide customers with a variety of information about the store's products. The following is a business expansion. Starbucks is a representative business expansion company that uses O2O services. Starbucks is originally a representative coffee shop franchise company based offline. However, with the development of mobile technology, Starbucks uses both online and offline. Starbucks allows customers to order and pay for coffee through a mobile app. Such online services have the advantage of shortening customer waiting times. Starbucks improves sales by introducing such O2O services. Starbucks also strives to provide services that maximize customer convenience from a customer perspective. In the future, the boundary between online and offline will disappear. Therefore, artificial intelligence technology that can analyze customers' tastes and predict customers' behavior will become more important.

4 RESULTS

4.1 Information Management of O2O Service through Artificial Intelligence

Various distribution methods are studied to pursue consumer convenience. Among these distribution methods, service design has recently become important. Service design is a method of providing a user's service in various ways. So service design is a field that provides services through marketing. This service design was generally a concept used to provide public services in public design. Recently, this concept of service design has used not only in public services but also in various fields. The O2O platform allows the user to receive services or products through offline after the user makes a reservation online. Recently, users check products through offline stores and analyze prices and characteristics of products through mobile platforms. As such, users purchase products and services by integrating online and offline. For example, after a customer orders food on a mobile phone, when the food is completed, the customer sends a text message from the store on the mobile phone. Then the customer picks up the food in the store. So it reduces the waiting time for customers to receive food. In this way, service design can increase customer satisfaction on the O2O platform (figure. 2).

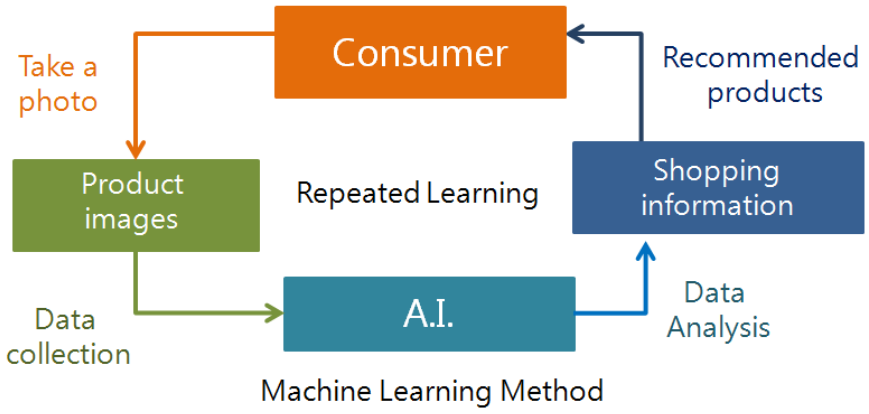

Figure. 2 O2O Platform through Artificial Intelligence

In particular, it is possible to provide individual customized services by analyzing the method desired by the user in big data using artificial intelligence. The representative service design of the O2O platform through artificial intelligence is as follows. Customers shoot offline products through their smart-phones. The customer can then use the captured image to find the same product or similar product online. And when artificial intelligence presents recommended products from customers, customers purchase products. By collecting such customer purchase information, artificial intelligence conducts deep learning. Therefore, artificial intelligence provides services to customers according to individual characteristics. Customers can receive product recommendations through artificial intelligence in consideration of purchase time and place through online. Artificial intelligence can provide appropriate services to customers as data on customers' purchasing tendencies increases. So artificial intelligence recommends products when customers need them. Artificial intelligence maximizes consumer purchase satisfaction by understanding customer consumption patterns. This function can also be used as a marketing strategy on the O2O platform.

4.2 Image recognition technology used in O2O service Information Management

As artificial intelligence technology develops, image recognition technology is also used in various fields. As deep learning develops, artificial intelligence can recognize even very small images. In the O2O service, artificial intelligence can recognize the logo or mark of a product through an algorithm. Customers can receive information and services on their products by scanning the logo of the products with their smart-phones. This function can also identify counterfeit goods. And the customer can recommend the product by analyzing the image and logo of the product by artificial intelligence. This function can increase satisfaction when customers purchase products. In the future, as artificial intelligence's image recognition technology develops, it will be able to recommend accurate products to customers. In addition, images taken by customers with smart-phones or downloaded from the Internet can be searched or recommended through artificial intelligence. This function can give customers convenience in finding products. Artificial intelligence not only recommends the same product based on images, but also recommends similar products. Therefore, customers can easily find similar products. Artificial intelligence learns the characteristics of products through deep learning. Then, on the O2O platform, artificial intelligence helps customers search for the best product considering not only the shape and color of the product but also the functionality. As such, the image recognition technology of artificial intelligence can be used in various parts of the O2O platform. In addition, the O2O platform of this technology can provide convenience not only for domestic customers but also for overseas customers when purchasing products (figure. 3).

Figure. 3 Image Recognition Technology of Artificial Intelligence [2]

4.3 Image recognition algorithm used in O2O service Information Management

Method of the image recognition algorithm mainly used in O2O service is as follows. Image recognition algorithms learn images with artificial neural networks. An artificial neural network is a system that solves problems through input and output by modeling the working appearance of the human brain. Therefore, the image recognition algorithm determines which image is through an artificial neural network and outputs an input image. If the image is wrong, the image is used for learning the artificial neural network again. Artificial neural networks can improve the performance of image recognition algorithms by repeatedly learning false discrimination (figure. 4).

Convolutional neural networks are mainly used in image recognition algorithms. A convolutional neural network (CNN) is a type of deep neural network (DNN). Image-based algorithms mainly utilize convolutional neural networks (CNN). CNN can recognize images through direct learning from various data such as images. Therefore, since the O2O platform mainly utilizes artificial intelligence technology through product images, CNN (Convolutional Neural Network) is mainly used. CNN recognizes the image by analyzing each pixel of the image (figure. 5).

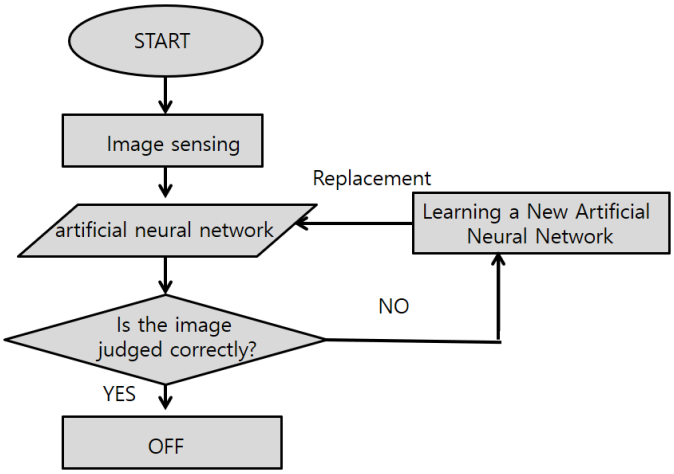

Figure. 4 Image recognition algorithm

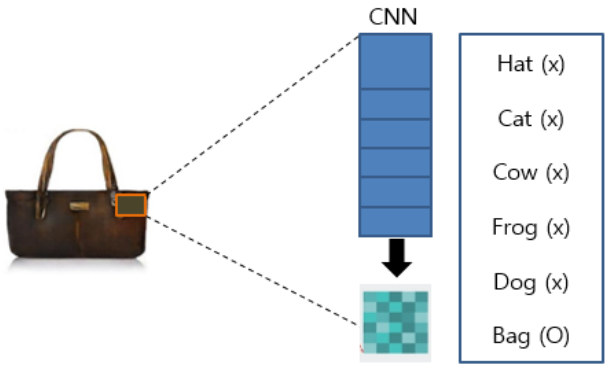

Figure. 5 Convolutional Neural Network

CNN consists of a convolution layer and a pooling layer. Convolution Layer has the function of filtering images. The output data of the convolution layer is obtained by multiplying the pixels by the convolution filter. The pooling layer receives output data and changes the size of the image. The output size of the convolution filter is as follows. H means the height of the input data. And FH is the filter height. FW is the width of the filter. S means the size of the strid. Finally, P is the padding size. The formula for the convolution filter output size is as follows.

Convolution filter Formula of Output Size:

$$outputHeight = OH = (H+2P-FH)/S + 1$$
$$outputWeight = OW = (W+2P-FW)/S + 1$$

Shape of the pooling layer is generally square. Row and Column of input data are multiples of the Pooling size, so the Pooling Layer output size is the size of the rows and columns divided by the Pooling size. The formula for the Pooling Layer output size is as follows.

Formula for Pooling Layer Output Size:

$$outputRowSize = \text{InputRowSize/PoolingSize}$$
$$outputColumnSize = \text{Input}Column\text{Size/PoolingSize}$$

4.4 Information Management of O2O Platform through Omni-Channel System

Existing online commerce allows customers to purchase products through a single channel. Companies also advertise products to customers through a single channel. And as smart-phones became popular, customers and companies could communicate through multi-channels. And by using various Internet of Things as well as smart-phones, customers and companies can communicate through cross-channels. On the O2O platform, customers and companies communicate through omni-channel method. The omni-channel method is a system in which customers and companies communicate in various ways. In particular, the omni-channel method allows customers and companies to communicate without the boundary between online and offline. This omni-channel method not only increases the company's sales but also secures potential customers. Therefore, artificial intelligence technology is used for continuous communication between customers and companies through omni-channel method. Artificial intelligence can provide an optimized omni-channel method (figure. 6).

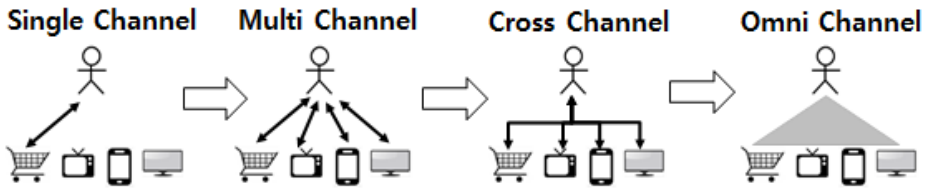

Figure. 6 O2O Platform through Omni-Channel System [7]

4.5 UI Design used in O2O service Information Management

On the O2O service platform, customers communicate with stores through mobile. So UI should be designed in a customer-friendly way. Therefore, the UI of mobile should be designed from the customer's point of view so that customers can use the O2O service platform well [9]. First, for UI design, designers must analyze scenarios that use the user's O2O service platform. Designers should also analyze user requirements. Through this analysis, UI designers must derive major UI design items [10]. Finally, based on these data, designers should present the most appropriate design for the customer. Recently, with the development of artificial intelligence, customers communicate through consultation robots. Then, the customer communicates with the consultation robot through voice and provides the most appropriate product. Therefore, when UI designers use robots, new UI design methods should be studied.

5 CONCLUSION

Artificial intelligence technology can be a key technology for O2O services. Despite the importance of artificial intelligence technology, artificial intelligence technology has not yet used much in the O2O service platform. Therefore, in this paper, a study on the use of artificial intelligence in the O2O service platform was conducted. When artificial intelligence technology develops, artificial intelligence technology will be used in various mobile service platforms. On the O2O platform, service design can increase customer satisfaction. In particular, artificial intelligence can provide individual customized services by analyzing the method desired by the user with big data. Moreover, artificial intelligence can provide appropriate services to customers as data on customers' purchasing tendencies increases. So artificial intelligence recommends products to customers when they need them. Artificial intelligence maximizes consumer purchase satisfaction by understanding customer consumption patterns. This function can also be used as a marketing strategy on the O2O platform. In addition, in the O2O service, artificial intelligence can recognize the logo or mark of a product through an algorithm. Customers can receive information and services on their products by scanning the logo of the products with their smart-phones. This function can also identify counterfeit goods. And artificial intelligence can analyze the image of the product and recommend the product to customers. In addition, recently, an interactive robot service based on artificial intelligence has been developed when customers purchase products. Such an interactive robot may be developed based on artificial intelligence technology. This technology is based on natural language processing ability. On the O2O platform, interactive robots accurately find products that customers want through artificial intelligence data. This technology can increase store profits by lowering the labor cost of the O2O platform. The results of this study can be used as basic theoretical data when developing an O2O service platform using artificial intelligence.

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