



## A study on the deployment status and development plan of retail technology

Se-Jin KIM<sup>1</sup>, Sang-Youn LEE<sup>2</sup>

<sup>1</sup> *First Author* Researcher, Department of Convergency Industry, Seoul Venture University  
E-mail: arzo099@nate.com

<sup>2</sup> *Corresponding Author* Director, Korea Institute of Artificial Intelligence Industry  
E-mail: rmi21lee@daum.net

Received: January 15, 2021. Revised: January 15, 2021. Accepted: January 15, 2021.

---

### Abstract

**Purpose** – Faced with the great change of the 4th industrial revolution and the addition of the COVID-19 pandemic, great confusion and crises are occurring in the retail environment as well. The purpose of this study is to suggest the necessity of establishing a methodology for applying retail tech to offline distribution channels in crisis.

**Research design, data, and methodology** – After examining the recent developments of representative fields to which retail technology is applied, it is rearranged through consideration through previous studies.

**Result** – The retail industry must transform into digital commerce through digital transformation. According to the development of retail technology, the distribution industry is at a time of change from the stage of brokering product and service transactions to a structure that creates value based on information on production and consumption. The business model of the distribution industry must be converted to a platform business model in which both consumers and producers become users.

**Conclusion** – In-depth analysis of the cases has not been conducted, and there are limitations in that the development is somewhat insufficient due to insufficient prior research data. However, it is meaningful to suggest the necessity of finding a methodology for applying retail technology to overcome the crisis of offline retailers through quantitative research on the retail technology area.

**Keywords:** Retail Tech, High-tech retail store, Retail technology, Smart retailing, Shopper marketing

**JEL Classification Code:** M10, M31.

---

## **1. Introduction**

In recent years, the world has faced a major change called the 4th industrial revolution. A lot of discussion has been going on about this. In addition to this, the COVID-19 pandemic is causing great confusion and crisis in the retail environment. Due to the factors of the 4th industrial revolution and Corona 19, the daily life of consumers as well as the distribution industry are facing a new normal. Now, concerns about COVID-19 infection are protracted and there are even signs that it will become commonplace. Panic situations that they had never experienced made people avoid and stay away from people. Through this, the need for non-face-to-face and non-contact communication has naturally spread, and it is directly linked to the explosion of online consumption regardless of generation. According to the development of retail technology, the distribution industry is at a time of change from the stage of brokering product and service transactions to a structure that creates value based on information on production and consumption. The business model of the distribution industry must be converted to a platform business model in which both consumers and producers become users. Domestic distributors emphasize securing technology to increase overall SCM efficiency, and this is corporate competitiveness. In order to secure core technology, it is essential to link large companies with SMEs and venture companies. In retail technology, the link between members of the industrial ecosystem is very important.

There are still very few academic research materials related to retail technology in Korea. The purpose of this study is to promote research motivation for other researchers to conduct in-depth research in this field, where there have been few related studies, by introducing various examples of retail technology that has been rapidly introduced and spread. In addition, it was intended to suggest a direction for establishing a strategy for retail technology to those in the retail industry who are considering the introduction of retail technology. In the future, these authors plan to continue further research in this field through more specific and empirical considerations.

## **2. Growth of Untact Business**

Let's take a look at the untact, which has been talked about in the population recently. The term untact is mainly used in Korea. In academic research, only some domestic researchers tend to use it. In foreign countries, unmanned technologies and unmanned services such as drones and unmanned delivery robots are referred to as 'unmanned'. Recently, foreign media have mentioned 'zero contact', 'noncontact', and 'no-contact' to encompass non-face-to-face and unmanned. Using digital technology and online platforms to replace human work or human interaction is called untact service.

Untact business can be defined as 'an industry encompassing various non-face-to-face, contactless, and unmanned services that can use digital technology to minimize human contact and replace interaction'. The untact industry can be largely divided into 'non-face-to-face and contactless services' that minimize face-to-face activities and interactions, and 'unmanned services' that replace human work with digital technology. Among these, examples of non-face-to-face and contactless services include video conferencing, telemedicine, online education, Internet games, video streaming, smart factories, and online shopping. These untact services are services that have been converted so that economic activities, which were previously conducted in an analog manner offline, are combined with an online platform to be conducted online digitally. In other words, untact service basically means using digital technology or online platform to provide products or services to customers.

## **3. Advances in Retail Technology**

### **3.1. Retail Digital Transformation**

Retail's digital transformation is constantly changing based on digital technologies and platforms. For retailers, it is now possible to easily purchase products from kiosks and to sell more products easily from unmanned stores (Kwak & Cho, 2019). Due to digital transformation, some retailers with a long tradition are closing some or all of their stores, while others are reinventing store layouts and shopper engagement strategies. Interestingly, traditional offline retail is changing, with migration of specialized online retailers into the physical retail environment (Vishag & Enrique, 2018). In addition, many online retailers provide real-time inventory availability information, so consumer purchasing behavior is affected by availability information (Ruomeng, et al., 2018). In the future, the retail industry must

transform into digital commerce through digital transformation. The transition to an online focus is not unique to large retailers. Small and medium-sized retailers and retailers should also actively participate.

### 3.2. Retail Technology Applications

As the methods of delivering and communicating products to consumers have diversified, modern distribution has a more multi-layered structure. Retail Tech is undoubtedly the main driver of changes in the current distribution market. Retail Tech is a combination of Retail and Technology, meaning retail and retail stores. It refers to bringing about innovation by combining major technologies of the 4th industrial revolution, such as artificial intelligence, big data, advanced ICT, AR, VR, drones, and robots, with traditional offline retail stores such as large marts, convenience stores, and department stores. An example is unmanned stores, where advanced technology is taking over the role of store staff. Although retail tech may be unfamiliar, there is no one who has not experienced it. This is because it has already become a natural part of our lifestyle. In addition to simple payments such as SSG PAY, Samsung Pay, and Naver Pay, self-checkouts at large marts, kiosks at fast food restaurants, Amazon's unmanned store system 'Amazon Go' that automatically pays when you leave the store, and Alibaba's supermarkets 'Hermasenseng' and futuristic convenience stores introduced by domestic and foreign convenience store companies are typical examples of retail technology.

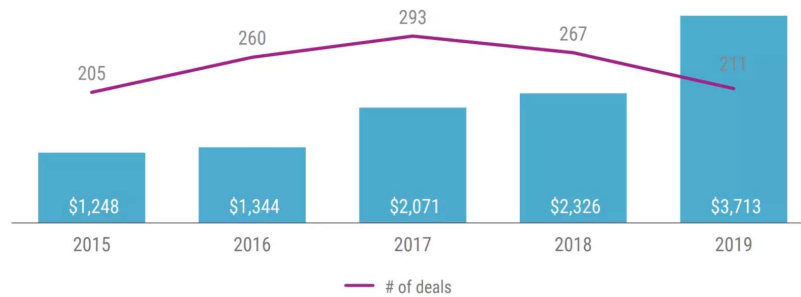
Now, consumption will further accelerate the growth of online, which is based on non-face-to-face and non-contact. The growth factor of the online distribution channel was the relatively low price and convenience compared to offline. Here, in conjunction with the offline avoidance phenomenon after Corona 19, a rapid transition to online has occurred. Kiosks, unmanned stores, self-stores, and live commerce and VR stores are emerging. The VR store, which appeared based on the evolution of digital technology, has created an environment that can provide a level of customer experience value similar to that of offline, and the position of offline distribution channels is getting smaller.

**Table 1:** Retail Tech Applications <Source> eBest Investment & Securities Research Center, 2018.4.

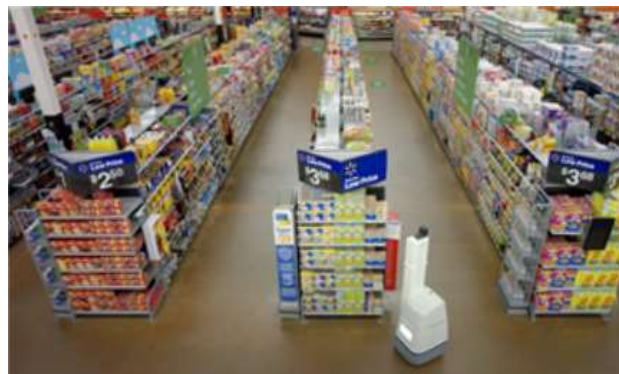
Technology	Contents
augmented reality	You can place and use products without going to the store by adding a virtual image
virtual reality	Fitting service available without going to the store
big data	Service advancement through understanding consumer purchasing patterns and preferences
drone	Last Mile unmanned delivery, inventory management system through RFID reader drone
autonomous driving	Last Mile Delivery via Self-Driving Vehicles, In-Store Autonomous Driving Kits
Internet of Things	Effortless shopping: devices or consumer goods shop directly before customer awareness Smart home: shopping for daily necessities through the control of home appliances
A.I	Voice Shopping: Shopping through Voice Recognition AI Curation Commerce: Combining big data and AI to recommend suitable products and increase purchase conversion rate
robot	Logistics center automation robot, serving robot, porter robot
RFID	Payment: Self-checkout through RFID tag, inventory management system in warehouse
machine learning	Smart robot cart, chatbot
face recognition	Facial recognition payment, security technology
3D printing	Personalization through custom product creation

Recently, retail companies are actively introducing Retail Tech using technologies such as AR, VR, AI, and unmanned stores. As a result of analyzing domestic and foreign retail tech cases using the Case Study Method, it was found that most cases emphasized cognitive control and ability control, and interactive communication and vitality were found to be intermediate. In addition, except for retail tech using AI, the sense of human social presence or automated social presence was still low (Kim & Song, 2019).

**Table 2:** Annual in-store retail tech company deals and financing (\$M), 2015~2019 <source> CB Insights



Retail technology is being adopted by many retailers regardless of the distribution format. Looking at some of the various cases, first, there is Cloud POS. It is a new concept solution that allows customers to select the services they want and apply them immediately to affiliates by configuring various business logic such as sales, events, payment, mobile, and smart solutions by distribution type on the cloud server. Second, self-checkout counters are becoming more and more popular recently. It is a checkout device that allows customers to purchase products by themselves by scanning the product and proceeding with payment. An evolutionary model that can use not only credit cards, but also simple payments, cash, and paper gift certificates has been released. Third, it is a smart bending machine. Beyond the existing beverage vending machines, it sells a variety of products such as fresh food, cosmetics, home appliances, and clothing. A bending machine that can provide product and event information, as well as customized recommendation service through the control unit display located in the center of the device was introduced. Fourth, stand-up scanning robots are also in the spotlight. Based on computer vision technology, data analysis, and autonomous driving, more and more robots are identifying the current inventory and shortage status of products on the shelf.



**Figure 1:** 'Auto-S', a shelf management robot introduced by Wal-Mart

### 3.3. Augmented Reality (AR) and Virtual Reality (VR)

Virtual and augmented reality are a major new trend that is gaining widespread attention around the world. In retail, in particular, the use of virtual reality technology in stores can reinvent the customer experience and optimize prices. Augmented reality stores can be combined to improve customer shopping, including enabling display and price tag adjustments with customer loyalty programs (Megan, et al., 2017). Augmented reality (AR) and virtual reality (VR) are rapidly advancing technologies used by both online and offline retailers to enhance the sales experience and shopping experience. However, academic research and practical applications of AR and VR in retail are still fragmented (Bonetti, et al., 2018). User skills have a profound impact on consumer decisions. However, little is known about how such an effect occurs, and recent studies examining the effect of augmented reality (AR) on the consumer experience have been conducted (Atieh & Arturo, 2017).

Technology is reshaping retail. France's leading luxury brands are also expanding digital investments in line with consumer changes and providing untact services in offline stores. In the case of Chanel, a fitting room with a smart mirror is installed so that customers can try on clothes and accessories through AR technology.



Figure 2: Chanel smart mirror

Beauty brand L'Oreal has partnered with startups and continues to invest heavily in digital technologies such as big data. By opening flagship stores for each brand it operates, it is strengthening the identity of each brand and providing customers with a new shopping experience. Lancome is providing online consultation services to customers using ModiFace, a makeup AR technology. Douglas, a German beauty store, has recently deployed and is operating an augmented reality mirror called 'Douglas Beauty Mirror'. Before purchasing cosmetics, customers can select products such as color makeup and test them with AR. By downloading Douglas' Beauty Mirror app, you can try out various virtual makeup looks with more than 1,000 products, including basic base, eye shadow, lipstick, and eyebrows. Millennials adapt quickly because they are open to AI and other shopping-related technologies. 28% of millennials receive personalized offers from retailers in digital channels such as email or mobile apps (J. King, 2020).

### 3.4. Robot

In foreign distribution sites, the use of robots is actively and universal. It is being used for various operations such as logistics automation as well as customer service in stores, and it is spreading rapidly because it meets the operational efficiency goals such as non-face-to-face and non-contact unmanned viewpoints and labor cost reduction. Among the various technological innovations introduced by Ocado for the first time in the industry, the most outstanding are the demand forecasting system using AI and the robot system for the shipment process. Okado is recognized to the extent that it is called Microsoft in food distribution, leading technology-based innovation in food distribution.



Figure 3: Okado Distribution Center

Since Japan's Nescafe introduced robots to its stores, sales have increased by 20%. The robot 'Pepper' equipped with artificial intelligence such as IBM Watson improved the accuracy of human emotion recognition through continuous self-learning. Retailers often introduce robots to increase operational efficiency, but Nescafé has had an impact on

actual sales growth by interacting directly with customers using robots. Best Buy in the US is running a service that allows customers to input music CDs, movie DVDs, games, etc. they want on the touch screen, and a robot called 'Chloe' finds them within 30 seconds.

Robots are expected to play a particularly useful role in labor-intensive retailers. It is highly likely to be active regardless of the store or the rear warehouse. Walmart introduced a shelf scanning robot and a cleaning robot to increase the productivity of its employees. The shelf scanning robot is operated in such a way that it detects the shelf stock, informs the staff, and the staff makes replenishment display. In particular, the use of robots in the field of logistics is increasing. A typical example is a robot that autonomously drives according to guidelines when picking at a distribution center.

### **3.5. Kiosk**

The most common application of untact is a kiosk. It has already been spreading around fast food stores, but the low cost and non-face-to-face properties of kiosks are causing an explosive increase due to COVID-19. It is expected that the store will receive more attention in the future as it can satisfy both safety and operational efficiency. Kiosks are improving customer convenience and eliminating complaints through the evolution of interfaces. Recently, chatbot kiosks that can use voice without having to touch the screen with a hand are also appearing. Kiosks are not limited to small stores and restaurants. Supermarkets are also building a multifaceted strategy. E-Mart introduced the unmanned pickup service 'PIXEL-Pick Cell' at the Cheonggyecheon branch. As a hybrid O2O model that orders online and picks up offline, unmanned and automated systems are implemented using baskets, conveyor belts, and robot cranes. In China, Walmart is installing a kiosk that can log in with facial recognition to check recommended products, download coupons, and even make payments. CSF Market, a famous supermarket chain in China, has also installed a kiosk to log in with facial recognition in the store. Through the kiosk, each individual can check recommended products, and all payment processes can be conducted non-face-to-face.

## **4. Conclusion**

With the recent development of digital technology, companies are undergoing changes to streamline business processes, provide new products and services, expand new areas, and change business models (Babar & Yu, 2015). Domestic untact technology was introduced to differentiate offline stores in response to online growth and focused on self-service for quick shopping. However, as various solutions have been developed recently, the scope of application of untact technology has also been expanded. Business strategy, including technology and distribution infrastructure and customer service, was the most important factor in the success and growth of leading retailers including Amazon (Hahn, et al., 2018). This has great implications for domestic and international distribution companies that are benchmarking Amazon as a role model. Going forward, digital technology will be a game changer, and retailers must understand and capitalize on these trends (JayashreeRamanan., & Ramanakumar, 2014).

There are several factors behind the expansion of retail technology adoption, but three are representative. First, work efficiency. A company's concern is to improve productivity, and advanced technology helps employees work efficiently. Second, customers have changed. With the increase in one-to-two-person households, the number of customers who do not need bulk purchases and those who are uncomfortable with hospitality has increased. Third, the market situation of the COVID-19 pandemic. Corona 19 has created a non-contact trend beyond non-face-to-face and has raised the importance of cleanliness and hygiene. This became an important reason for lowering consumers' reluctance to adopt retail technology. The demand for contactless has expanded from customers to employees. In the future, the development and introduction of retail tech is expected to expand beyond the contact point with customers in the store to the minimization of contact between employees, such as rearward work efficiency and delivery. Untact retail is shaking up the online and offline landscapes of distribution and is becoming a lifestyle at the same time. We've seen too many companies failing because they hesitate to make decisions in times of major upheaval. If the application of retail tech is hesitant in the upheaval of untact retail, which has become steeper due to the COVID-19 pandemic, the future will be bleak. Through this study, the development pattern of the fields where retail technology is typically applied was examined. There is a limitation that the development of the case is somewhat insufficient due to the in-depth analysis of the case not being carried out and the quantitatively insufficient prior research data. However, in the future, I would like to note that this author and fellow researchers suggested the necessity of finding a methodology for applying retail technology to overcome the crisis of offline stores through quantitative research on the area of retail technology.

## References

- Atieh, P., & Arturo, Z. (2017). Discernible impact of augmented reality on retail customer's experience, satisfaction and willingness to buy, *Journal of Retailing and Consumer Services*, 34(1), 229–234.
- Babar Z., & Yu, E. (2015) Enterprise Architecture in the Age of Digital Transformation. In: Persson A., Stirna J. (eds) *Advanced Information Systems Engineering Workshops*. CAiSE 2015. Lecture Notes in Business Information Processing, 215(1). Springer, Cham.
- Bonetti, Francesca, Gary, W., & Lee, Q. (2018). Augmented Reality and Virtual Reality in Physical and Online Retailing: A Review, Synthesis and Research Agenda. In Jung, T. & Dieck, C. T, *Augmented Reality and Virtual Reality* (pp.119-132), Springer: Cham.
- Hahn, Y., Kim, D., & Youn, M., (2018). A Brief Analysis of Amazon and Distribution Strategy. *Journal of Distribution Science*, 16(4), 17-20
- JayashreeRamanan, K., & Ramanakumar, P.V (2014). Trends In Retail, *International Journal of Business and Management Invention*, 3(1), 31-34
- Jennifer, K. (2020). *Shoppers Are Warming Up to Retail Tech*. eMarketer.
- Kim, J., & Song, J. (2019). Exploring Key Factors Affecting the Success of High-Tech Retailers, *The Academy of Customer Satisfaction Management*, 21(3), 91-122
- Kwak, Y., & Cho, Y. (2019). Unmanned Store, Retailtech and Digital Divide in South Korea, *The Journal of Distrebution Science*, 17(9), 47-56
- Megan, D., Thilini, A., & Mark, F. (2017). The Influence of Augmented Reality on Retail Pricing, *Issues in Information Systems*, 18(4), 116-123
- Ruomeng, C., Dennis, J., & Achal, B. (2018). Learning from Inventory Availability Information: Evidence from Field Experiments on Amazon, *Management Science*, 65(3), 955-1453
- Vishag B., & Becerra, E. P. (2018). Shoppers' attachment with retail stores: Antecedents and impact on patronage intentions, *Journal of Retailing and Consumer Services*, 50. 371-378