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CUIRS Investment Research
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APAC Smart Retail Industry Outlook

Industry View	Geographic Coverage
Over-Weight	Asia Pacific

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Introduction

Background

As retail giants compete for business, the operation mode of players has always been ever-changing. When the world enters the new phase of 'Industry 4.0', the advent of smart retail hints at the hybridization between traditional retail methods and the usage of modern technologies, encompassing the "Internet of Things" (IoT), artificial intelligence (AI), and cloud computing.

Based on this definition, the first academic venture into an idea similar to smart retail was in 2014. Yet, it was only until March 2017 that the industrial application of the technology sprung to life with the first launch of augmented reality (AR) in an indoor mapping system by Lowe's in the US.

Future Prospect

Stimulated by the trend of smart cities, new technological advancements accelerated the technological transformations of retailing. The development of the smart retail industry was then put on full throttle when retailers were forced to learn, mimic and indoctrinate innovative retail tools more aggressively when COVID-19 terrorized the globe. The tech evolution is expected to go further beyond omnichannel capability exploration, layering workforce skill alteration, creative customer experiences, emerging acquisition channels, and more. Specifically, the market utilized more extensive usage of drones and robotics in retailer operations and presumes future maturation of big data techniques in customer segmentation.

Today, retailers are looking for cutting-edge innovation with the goal of stimulating growth in the smart retail sector. Given that the notion of data analytics and big data no longer come as surprises to customers, Japan and South Korea, for instance, have already begun preparation for the popularization of reception robots in unmanned or contactless shops and delivery drones and robots.

Challenges

Smart retail providers are challenged to understand both the needs of retail customers and their respective end-users to create the most suited solutions and products. In addition, the surging compliance cost of data privacy and fluctuating production costs brought about by geopolitical instability have also pressured the supply chain for market players.

Although the burgeoning of the smart retail market has been significant, players in the field have been taking actions to seize significant market share, further boosting the industry's boom through increasing research & development efforts, as well as education policy reforms.

(Source: Grand View Research, ViewSonic Library, Science Direct Assets, CUIRS)

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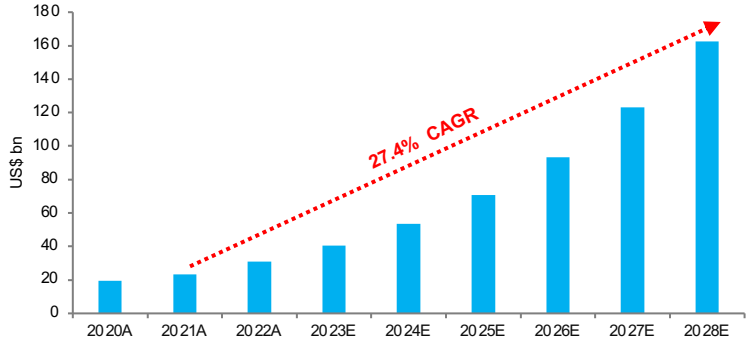
Top-Down Analysis

Total Addressable Market (TAM)

The smart retail industry has been, and is still, expanding. With their global market size standing at US$ 23.4 mn in 2021, according to Grand View Research, analysts predicted that the market would establish a CAGR of about 27.4% globally from 2021 to 2028 through estimating the growing penetration rate of AI, VR, AR, and IoT in retailing. Moreover, as Chinese and Japanese retailers invest larger budgets in "higher-tech" retail methods, the APAC market is forecasted to emerge as the fastest-growing region, holding up to 32% of the total market magnification.

Exhibit 1. 20A-28E Global Smart Retail Market Size (Polaris Market Research, 2021)

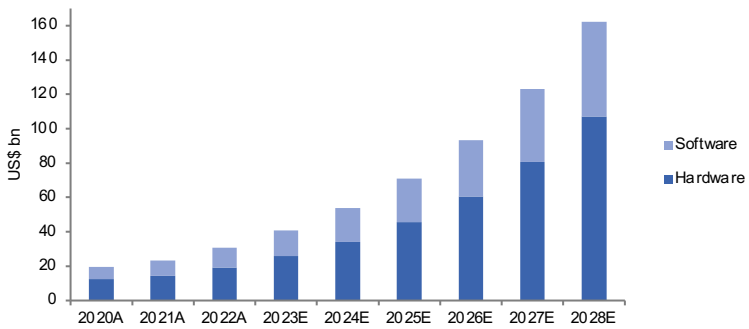


Market Segments

According to MarketsandMarkets Research, the smart retail market is segmented into hardware and software. The hardware segment includes the services of augmented reality and virtual reality (AR/VR) devices, point of sale (POS) systems, Bluetooth beacons, and radio-frequency identification (RFID) systems. In 2021, the hardware segment dominated the global market, accounting for 70% of the industry's global revenue.

On the other hand, the software segment is projected to burgeon at the highest CAGR of 29.9% from 2021 to 2028. With the increasing adoption of analytics software and the escalating availability of subscription-based platform services, retailers seek improvements in users' shopping experience and marketing success rate. Therefore, elevating the expansion capabilities of the software segment.

Exhibit 2. 20A-28E Total Market Size, segmented by Hardware and Software (Grand View Research, 2021)



(Source: Grandview Research, Polaris Market Research, MarketsandMarkets Research, CUIRS)

Industry Analysis

Business Model

Smart retail players manufacture the technological hardware that fulfills the retailers' and end users' demands, then sell to the retailers or offer the analytic platform or system to retail customers to generate subscription fees.

Market entry barrier

The smart retail industry players require talents and expertise in both customer-market analysis and top-notch technical skills. New entrants will have to overcome the high set-up costs budget-wise and human capital-wise. In certain jurisdictions, strict licensing regulations have been imposed, creating regulatory barriers for new players.

Value Chain

From the value chain upstream, technology companies acquire raw materials such as capacitors, electrolytes, circuits, transistors, and semiconductors. (Exhibit 3) Tech companies develop hardware infrastructure and develop fee-based platforms as the next step. They mainly generate revenue from retailers, who look to raise their operation process efficiency, effectiveness, and accuracy by leveraging these tech companies' technological expertise and products.

Within the software segment, technology or platform-based companies focus on developing and providing business solutions to retailers. These companies function as platform owners, taking end-to-end responsibility to bring business, technology, governance, processes, and people management together on a platform. At the same time, retailers are allowed the freedom, to a certain extent, to customize the platform to maintain their operations.

In terms of the hardware segment, after being sold to retailers like any other products, they are often installed in smart stores and used in the logistics or delivery processes of the retailers' businesses.

In the last stage, retailers serve end customers based on their upgraded sets of service infrastructures.

Recent technological development

Thanks to the innovation of AI and the Internet of Things (IoT), self-checkout and AR-navigated shops have emerged and evolved. Take Amazon as an example; its Amazon Go Grocery model stores utilize computer vision, sensor fusion, and deep learning to detect when customers take items off the shelf and place them into their cart. After the guest leaves, the system settles the transactions through online payment channels.

Furthermore, robotic inventory management is one of the recent technological developments in the industry. Machines like SmartSight have been able to automate the process of identifying misplaced items on shelves and sales floor quantities, then alert workers when certain items are running low.

Moreover, indoor positioning systems (IPS), including Visual Markers, Bluetooth beacons, Wi-Fi RTT, and Ultra-wideband (UWB), have been launched at a higher level. For instance, Target chose to implement Bluetooth IoT lighting systems in its stores. When guests shop with the Target app, they can access a map to help them find their position in the store and find items they need.

(Source: Grandview Research, Polaris Market Research, EMERGEN RESEARCH, CUIRS)

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Industry Analysis

Exhibit 3. APAC Smart Retail Industry Value Chain (CIO & Leader, Huawei, 2021)

Tech Companies [Upstream]

HUAWEI · Alibaba.com · Data Storage · SAMSUNG ELECTRONICS · PAX

Retailers [Downstream]

Leverage on third-party technological platform

Software Segment

Smart Platform

Logistics	Strategy and Planning	Merchandizing	Store Operations	Marketing	Customer Experience
Supplier Performance Management Route Optimization Inventory Planning & Replenishment Shipment Tracking Analysis	Sale Planning & Forecasting Real Estate Planning Competitive Analysis & Cannibalization	Assortment Planning Competitive Intelligence Market Basket Analysis Cross Selling Analytics	Store Profitability Analysis Stock Out Analysis Layout Management & Optimization Loss Prevention	Customer Segmentation Marketing Effectiveness Promotion Effectiveness	Customer Insights Loyalty Program Management Customer Lifetime Value Customer Relationship Management

Omni-Channel Platform

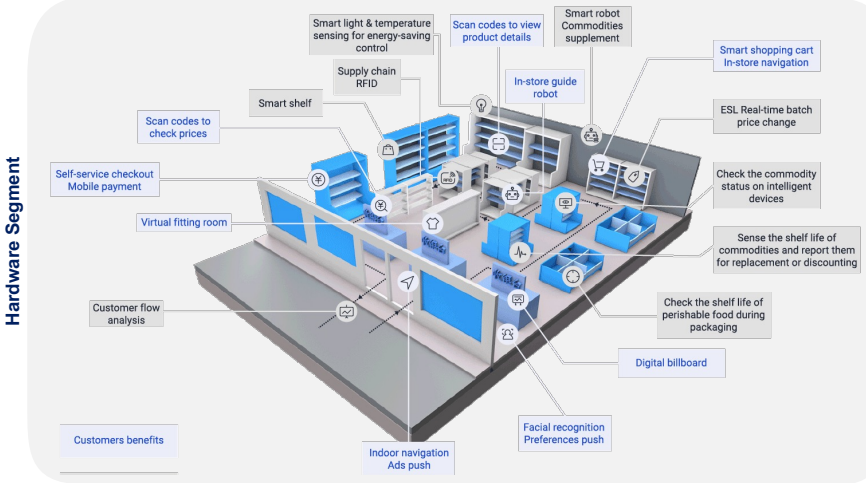
Front-end Layer: Platform e-commerce · Self-hosted mall · Micro-commerce · Marketing system · B2B dealer portal · Third-party service system · Store system · · ·

Middle Platform Layer: Omni-channel platform — Commodity center · Inventory center · Member center · Marketing center · Order center · Payment center · Settlement center · Channel center · Distribution center · Store center · Customer service center · · · ·

Big data platform — Data engine · Data warehousing

Back-end Layer: Purchasing management · Production management · Inventory management · Marketing management · Warehousing and logistics · Financial management · HR system · · · ·

Hardware Segment



Ultimate Service/Product Consumer

(Source: CIO & Leader, Company Reports, CUIRS)

Industry Analysis

Company Highlight and Competitive Landscape

Currently, the smart retail market of APAC is relatively dispersed. The industry is dominated by mature technology and solution companies. However, only some players specialize specifically in smart retail services.

Company Background

Huawei

Huawei owns an extensive product portfolio in terms of smart retail. For smart store solutions, Huawei's in-store management automatically controls air conditioning and lighting, manages the energy consumption of electrical equipment, and reduces operation. On top of that, Huawei offers a series of full-stack hybrid cloud services called HUAWEI CLOUD Stack for retailers, designed as a high-performance IT infrastructure by leveraging in-house chip design and hardware optimization tools. It is anticipated that the Company will make a consistent effort to manage its wide spectrum of product choices in the future with accelerated investments in R&D.

Alibaba

Alibaba announced its newest smart retail solution in Alibaba Cloud Summit 2022-IoT Product and Application Innovation Forum, focusing on two links of antitheft and AI measurement of smart retail stores. The solution will be able to detect the risk of theft and damage and identify wrong scanning in the settlement process in real time. The announcement signifies the Company's ambition to expand into the hardware segment of smart retail, providing other solutions on top of Alibaba's smart retail cloud suite services.

Hitachi LG Data Storage Inc.

Safe Pass Plus, a facial recognition innovative signage system that ensures convenient customer management, won the iF Design Award in April 2022 and the "Good Design Award" in Japan. The technology is designed with a built-in camera and infrared heat sensor, which collaboratively recognize people's faces, allowing the device to approve entries and check the employee's attendance. It marks a breakthrough in AI interactive display in enhanced customer experience.

Samsung Electronics

In 2H21, the Company announced upgrades in the Samsung Kiosk series, providing customers with more accessible install options. Powered by Samsung's System on Chip (SoC) technology, the new model could be installed without additional construction, offering a more time-, cost- and space-saving option for corporate clients. In addition, with the new model's introduction of the MagicINFO Remote Management feature, Samsung is determined to upgrade its retail options consistently.

PAX Global Technology

The Company exhibited rapid business growth in its smart retail line in India in recent years. The Android miniPOS PAX A50, primarily adopted in pharmacy stores at first, enhances the user-friendliness of POS tools. As a result, it received massive praise in India, shipping around 100K devices to customers in 2021 alone; the technology has been an increasingly popular choice among pop stores. PAX established itself as the leading brand for electronic payment terminals, cooperating with mom-and-pop stores, pharmacies, and other retailers. Investors may look ahead to rapid regional development in the coming years.

(Source: Company Reports, CUIRS)

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Industry Analysis

Latest Development and Research Motivation

With progress continually being made within the smart retail market, developments involving Bluetooth low-energy (BLE) beacons, in particular, have gained popularity; they are placed in retail stores and send out radio signals to smart devices within range. In addition, universally Unique Identifier number (UUID) infrastructures are used to control shop displays and provide each customer with a unique shopping experience. Other industry highlights include the incorporation of AR-enabled mirrors in fitting rooms in China, which enables customers to "try on" different outfits and styles just by standing in front of them. Not to mention the utilization of reception robotics in physical stores in Japan and South Korea.

However, how the popularization of smart retail infrastructure will play out is being shaped by today's actions - by general demand and supply, governments, and global industry shortly.

Exhibit 4. Peer Comparison (Huawei, Alibaba, Hitachi LG Data Storage Inc., Samsung, PAX Global)

Company	Huawei	Alibaba	Hitachi LG Data Storage Inc.	Samsung Electronics	PAX Global Technology
Region	China	China	Japan	South Korea	China
Ticker	Private Company	9988.HK	Private Company	5930.KS	0327.HK
Founding Year	1987	1999	2000	1969	2000
Main Business	ICT infrastructure Smart devices	Digital marketplace Cloud and entertainment	Optical drive disks Smart data storage solutions	Consumer and industry electronics	Electronic payment terminals Point of sale (POS) infrastructures
Key Developments in Smart Retail	In-Store Management HUAWEI CLOUD Stack	Alibaba Cloud suite	AI Interactive Display Safe Pass Plus	Samsung Kiosk Samsung + Scandit	PAX Android payment terminal solutions
Strengths	Competitive pricing in China Extensive product portfolio	Wide business diversity	Strong in the optical drive Extensive global distribution network	Strong patent portfolio Strong global brand	Strong in smart payment terminals Wide geographical presence
Weaknesses	Limited funding source, stripped for cash	Limited international exposure	High staff turnover at managerial level	Dependence on the US market Product failures	High turnover of employees
Company Prospects	Expects increased R&D effort and management of product offerings	Anticipate product diversification in the future	Making progress in utilizing AI in customers' experience	Samsung shows determination in constant product innovation	PAX may gain meaningful market share in the digital payment field in India

(Source: Company Reports, CUIRS)

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Growth Factors – Demand Side

Demand Analysis

In terms of the demand-side analysis, the smart retail industry had gained traction, largely due to COVID-related digitalization on a global scale. Driven by COVID-19, an increasing number of retail customers start to expect personalized services that are achievable through smart retail adoption, boosting the sector's growth. This impact had been especially noticeable in China, where strict social distancing policies and disease control had been implemented. For Japan and South Korea, the sector's growth was chiefly attributable to manpower shortage and escalating downstream demands, respectively.

Global Scale:

Digitalization of the retail market improves the cost efficiency

In the early stages of the pandemic, during the period of a stagnant business environment, retailers responded with aggressive cost-containment strategies in the immediate aftermath, thus boosting the usage of retail AI and robotics. Research from the Institute for Robotic Process Automation & Artificial Intelligence (IRPAAI) indicated that deploying effective retail AI, namely, robotic process automation could save up to 25-50% of costs for individual businesses, around US$ 340 bn globally in 2022; the pandemic outbreak triggered a flurry of investments in technological integration.

Specifically, Daisy Intelligence Research pointed out that 83% of global executives had "substantial plans" to leverage AI and relative technologies within the next two years, considering pandemic restrictions in early 2020. As a result, the global retail market is predicted to displace banks as the number one investors in AI, reaching US$ 7.3 bn by 2022 year-end and representing a nearly fourfold investment compared to the pre-pandemic era data. Moreover, according to the International Data Corporation, the market is still counting on consistent demands for smart retail to sustain a compound growth rate of 25.5% until 2025.

China:

Accelerating adoption of smart retail due to strict COVID-19 curbs

While production and supply chains were challenged by strict containment and social distancing policies, consumer consumption patterns had also transitioned to digital retail channels. To cater to the shift in end-customer demand, retailers transferred substantial parts of their businesses online, seeking support from providers of smart retail solutions to transmute their services and sales online. Moreover, since the start of the pandemic, Chinese consumers of all ages have become more comfortable shopping across an array of e-commerce channels, leveraging digital payment platforms. In light of this trend, around 75.3% of interviewed retailers were currently adopting or planning to adopt smart retail and relevant technologies in the next two years.

(Source: FBIC Group Research, IRPAAI Research, Daisy Intelligence Research, Company Reports, CUIRS)

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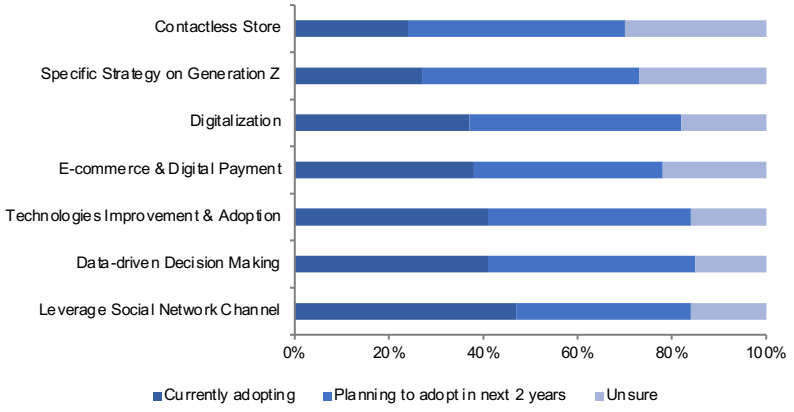
Growth Factors – Demand Side

Demand Analysis (cont.)

For instance, Helian Home (HLA), a Chinese fast fashion brand, sought aid in customer identification and supply chain optimization from smart retail services during disrupted supply chains. As a result, retail giants and department stores achieved a high smart retail penetration rate of up to 85.4%. Clearly, the policies in COVID-19 had prompted retailers to think of future possibilities of innovative retail, and they displayed a demand for such services.

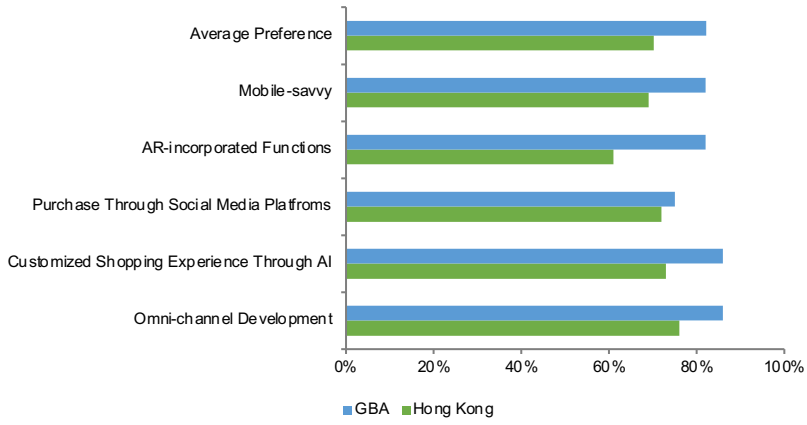
Exhibit 5. Growth Strategy Plans of Global Retailers (KPMG Link, 2021)



Generation Z's preference drives the digitalization of the retail market

Simultaneously, research shows that Chinese consumers, especially the younger generation in GBA, are more likely to demand forefront enhancements in customers' experience. In fact, 44% of China's generation Z have demonstrated an openness to drone deliveries versus 22% globally. Additionally, 67% of Chinese consumers have also called for personalized retail experiences built upon up-to-date data versus 42% globally. Correspondingly, business owners show high tendencies to alter their operation model according to the preference of Generation Z, hinting at a possible growth in demand for the smart retail software segment.

Exhibit 6. Key Characteristics of Generation Z in GBA (KPMG, 2021)



(Source: Company Report, KPMG Research, CUIRS)

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Growth Factors – Demand Side

Demand Analysis (cont.)
Japan:

Demographic gradation expedites the adoption of smart retail tools
Japan has been recording a low fertility rate, high life expectancy, and low immigration rate. As a result, Japan's National Institute of Population and Social Security Research estimates that the working-age population will drop by an average of 1.1% annually over the next 50 years. This degree of manpower shortage hints that the traditional way of retailing may be impacted to certain extents, which either more immigration or robotics needed to compensate for the labor shortage and unyielding demand for years to come. A case in point would be a demand for cashier-less technologies due to the need for lower-skilled workers.

Lawson, one of Japan's biggest convenience store chains, has looked to eliminate the conundrum of employee shortages by October 2022 with its new "Lawson Go" store model, allowing customers to skip cash registers through walk-through cashless payments altogether. The system only requires customers to download the Lawson Go app and register a credit card, as it generates a QR code to be displayed at the store's entrance. Within the store, cameras track shoppers' movements, and weight sensors installed on shelves determine the specific product that the shopper has taken. Afterward, Lawson would automatically bill the registered credit card and send a digital receipt to the customer via the app. The system is currently in the pilot phase as it opened a particular Lawson Go test store inside the Mitsubishi Shokuhin building of Tokyo's Bunkyo Ward.

Other than the shortage of in-store workers, retailers are also seeking technological solutions for delivery manpower shortages. In November 2021, 2 types of robots, developed by Kawasaki Heavy Industries Ltd., Sompo Japan Insurance Inc., and Nagoya-based Tier IV Inc., participated in testing an automated delivery system banked on to solve the caregiver and delivery shortage. In the experiment, two types of robots were sent traveling automatically along a straight road, delivering drugs and food for the elderly based on the pre-installed map information. By then, the robots still run into occasional errors when blocked by obstacles. This new technology resonates with Panasonic's unveiling of a new generation of autonomous delivery robots, Hospi, in March 2022. This model has been designed to reduce human labor by delivering medicines and medical equipment around hospitals or care homes. Furthermore, the usage of drones in delivering groceries and medication to the elderly has been gaining traction in the country. In May 2022, 5 municipalities in 4 prefectures, including Hokkaido, established a special council to promote the automation of such services. For instance, in the municipal government of Kosuge, about half of the population is elderly. It started drone-delivery tests in April 2021 with support from Aeronext to make it easier for residents to buy and receive goods.

These three projects not only highlighted the possibilities of pharmacies or clinics utilizing these medical-specific robots in their services and businesses but also proposed an alternative type of "manpower" for delivery.

(Source: Credit Suisse, Financial Times Research, Rakuten, Company Reports, CUIRS)

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Growth Factors – Demand Side

Demand Analysis (cont.)
South Korea:

Process digitalization boosted by the downstream demand

More and more Korean retailers have turned to smart retail in recent years, with most department stores and large-scale companies hoping to yield the advantages it may bring. For example, Lotte has launched its new smart shopping service, Smart Shopper, at its Bundang branch, replacing physical shopping carts and allowing customers to shop by simply scanning the barcodes of products with handheld scanner devices provided in the store. In addition, customers could complete payments at dedicated self-checkout terminals by tapping their handheld device against near-field communication (NFC) readers. Within the system, consumers may also choose to have their purchases delivered home. Furthermore, in March 2020, Lotte unveiled the industry's first "Smart Store" in Myeongdong, The Lotte Duty Free Smart Store. In Lotte's smart store, customers could scan a QR code installed at the store entrance with their smartphone and commence their shopping with access to a mobile cart dedicated to the "Smart Store". Lotte's system also encouraged brands of the store to introduce unique shopping services that customers could access via the system. Estee Lauder, for example, launched 'virtual makeup service' and 'digital shade finder' online services based on AR technology, thus convening customers' choice of lipsticks and other cosmetic products.

Another major Korean retailer, Hyundai Department Store, has also introduced a quick search service, "Smart Finder," enabling shoppers to find their desired products quickly through customized product recommendation functions. "Smart Finder" is designed to recommend similar products to customers by analyzing the designs of products in photos uploaded by shoppers. Research showed that Hyundai's system helped customers save up to 50% on browsing time. In June 2021, Hyundai Group teamed up with Amazon web services AWS to launch its unmanned convenience outlet, Uncommon Store, a doppelganger of Lawson's in Japan.

While the demand for "smarter" retail technologies from department stores has sustained, escalating demand from smaller-scaled retailers has still yet to come as the perks of smart retail become more noticeable.

Legislative plans pave the way for the application of smart retail

Although robots have been noticeable in the Korean restaurant industry since 2021, delivery robots are still defined as unmanned vehicles and are banned on sidewalks and crossings in Korea. As a result, the utilization of robots in retail and business operations has been restricted to stores or shops only. Looking forward, the South Korean government has planned to clarify the legal definition of delivery robots and establish proper safety regulations and other management standards by the end of 2022. Further legal revisions are also designed for 2023, paving the way for more extensive usage of, and thus demand for robots in commercial and retail settings.

(Source: The Japan News, Mordor Intelligence Research, TRBusiness Research, CUIRS)

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Growth Factors – Supply Side

Supply Analysis

In terms of the supply-side analysis, government policies have been the main driver for growth in the smart retail industry of most APAC markets. In addition to this factor, the Chinese finance sector has injected capital to support smart retail developers. Extra allocation of the public fund to national technological R&D and STEM education in Japan had benefited the development of the local smart retail market. Furthermore, foreign investment in tech infrastructures also fueled the maturation of smart retail in Japan. Simultaneously, favorable policies of South Korea are anticipated to sustain the boom in the smart retail industry.

China:

Government initiated supply-side reforms

In 2021, 28 Chinese government departments collectively intended to focus on retail, healthcare, culture and tourism, education, and sports. Authorities elaborated on plans to promote new technologies to transform traditional forms of retail and consumption in the coming five years. The document called for greater investment in supporting infrastructure such as 5G base stations and data centers. According to the Plan, the government announced expansion plans for express-delivery networks and warehousing in rural areas. It is expected that the maturation of technological hardware and expertise, as well as the increased accessibility of infrastructures, may lower manufacturing costs and benefit smart retail solution providers and retailers' in-house development.

Monetary support from the finance sector

The noticeable growth of the smart retail sector in 2021 has raised investors' interest in the market. For instance, Juice, a software-as-a-service smart retailer developer, has raised CN¥ 312 mn in a Series D round led by SoftBank Group's Vision Fund 2. The round attracted various alternative asset managers in China, including CITIC Private Equity. It is believed that the smart retail market would sustain its thriving with sufficient funding and resources from investors.

Japan:

Advancing digitalization through the policy support

The Japanese government has set aggressive goals in its envisionment of Society 5.0. The blueprint is described as the convergence between cyberspace and the physical world. At the same time, the government established a Digital Agency to accelerate initiatives and centralize decisions in relation to digital measures and their related transformations. This new blueprint for creating a super-smart society consists of 5 key themes, including FinTech initiatives and an ambition to sculpt a cashless society through actively deploying AI in various industries. Thanks to the efforts of the Japanese government, Society 5.0 has turned its corresponding Science, Technology, and Innovation (STI) policies into a mainstream political agenda in recent years.

(Source: FBIC Group Research, UNESCO Publication, Company Reports, CUIRS)

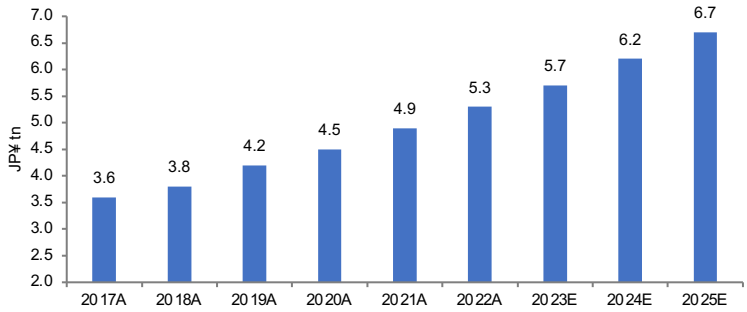
Industry Research | Smart Retail

Growth Factors – Supply Side

Supply Analysis (cont.)

As a result, the country's regular budget for science and technology, which had typically remained at around JP¥ 3.6 tn from 2002 to 2017, rose to JP¥ 3.8 tn in 2018 and shot up to JP¥ 4.2 tn in 2019, representing a compound increase rate of about 8.01% YoY on average for the three years. Japanese government showed determination and actual investment in the development and application of digital technologies, laying the groundwork for a favorable environment for smart retail to flourish.

Exhibit 7. Forecasted Yearly Budget for Science and Technology of Japan (UNESCO, 2022 Latest Updated Version)



Foreign investment subsidies to establish a domestic ecosystem

With aims to create a robust supply chain and construct reliable and stable domestic chip factories, the Japanese government supported technological advancements, including smart retail breakthroughs via subsidizing foreign direct investments. For example, in June 2022, Japan's Ministry of Economy, Trade, and Industry (METI) announced its offering of subsidies worth up to US$ 3.5 bn for a JV which involved Taiwan Semiconductor Manufacturing Company Limited, Sony group, and Denso with plans to build semiconductor plants in the Kumamoto Prefecture of southern Japan. The plants are expected to begin operations in December 2024 to produce 55,000 semiconductors with circuit line widths ranging from 10 to 20 nanometers per month. The level of support for this initiative was 40% of the estimated cost, which analysts found to be comparable to the subsidy provided by the German government that attracted Intel to build two wafer fabs in Magdeburg. Judging from their efforts, it is perceptible that Japan is determined to compete for a significant standing in the global smart retail market.

(Source: UNESCO Publication, Reuters Research, Nikkei Asia, Company Reports, CUIRS)

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Growth Factors – Supply Side

Supply Analysis (cont.)

The Increasing budget for technology-inclined education reform

To solve the general skill gap in technology-related industries, Japan has already started to implement IT educational programs, in which the study of programming and basic IT skills will be compulsory for children from an early age in their education. In 2021, the national budget for the expansion of mathematics, data science, and AI education accounted for about 1 billion yen, representing an increase of approximately 11.1% YoY. Among these changes, the Japanese Prime Minister also vowed in November to establish a university fund of US$ 88 bn to promote science and technology in the country. Furthermore, spurred on by the Society 5.0 initiative, the Global and Innovation Gateway for All (GIGA) School Program was front-loaded to the end of FY21. The initiative had budgeted up to US$ 4.4 bn and involved nearly 13 million school students in around 35,000 schools. Collectively, the efforts go in line to address the future demand for digital talents for the country and benefit the growth of the smart retail market.

South Korea:

The acceleration of retail digitalization powered by policy support

The Korean government showed great determination and support for the smart retail transitioning of the country by altering the allocation of its national resources. In March 2021, the South Korean Trade, Industry, and Energy Ministry announced plans to invest around USD267mn to accelerate retail digitalization. In addition, the budget plans to facilitate drone testing, with the end goal of actualizing complete-unmanned delivery services across the country. By July 2022, drone usage kicked off in corporate pilot programs, with the convenience store chain 7-Eleven partnering with Pablo Air, the first Korean company to participate in US drone delivery trials and commencing the pilot operation of its 3-minute drone delivery services in Gapyeong. Around 4000 logistic robots will be distributed for unmanned smart retail hardware by 2023. With the anticipated actualization, smart retail solutions will likely popularize in the future.

(Source: Japan MEXT, South Korea CFR Publication, TECHMONITOR, Company Reports, CUIRS)

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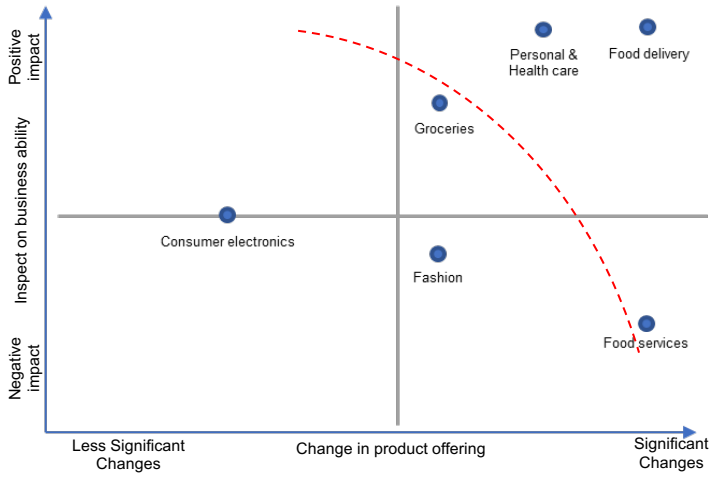
Catalysts & Risks

Catalysts

COVID-19 stimulates the alteration of retail and consumption patterns

Social distancing and pandemic containment measures had hampered the normal operation of brick-and-mortar businesses. The retail sector is among the most impacted industries in terms of their ability to offer products and businesses.

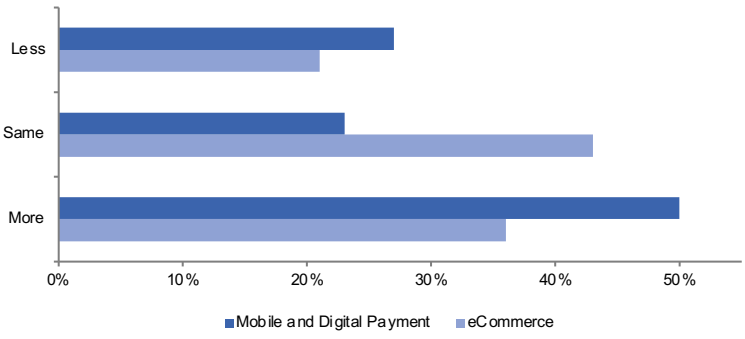
Exhibit 8. Impact of COVID-19 on Industries (Deloitte, 2020)



Demand for hand-free smart retail

The pandemic has accelerated the adoption of hand-free smart retail technologies. As a result, businesses plan to leverage the shift-to-digital trend in consumption patterns and expand their Capex on digitalization. According to research by Garner, 95% of global retail CEOs planned to increase their investment in digital capability. Furthermore, surveys show that 79% and 73% of the consumers displayed tendencies to increase or maintain their heightened demand for advanced eCommerce services, with demands for the availability of digital payment methods from retailers as compared to pre-pandemic times.

Exhibit 9. Willingness to adopt Smart Payment and Advanced e-Commerce Platforms after COVID-19 (Deloitte, 2020)



(Source: Deloitte Research, Company Reports, CUIRS)

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Catalysts & Risks

Catalysts (cont.)

With strict lockdown and zero-COVID policies during the early stages of the pandemic, the impact of COVID-19 on Chinese consumption and retailing had been especially obvious. As shown for this region, not only did customers demand 'smarter' shopping experiences, but companies have also been implementing data-analytics driven retailing tools, with plans to enhance its smart retail capabilities even beyond pandemic times.

Exhibit 10. Top Priorities of Corporates' Smart Retail Software Functions Enhancement (KPMG, 2022)

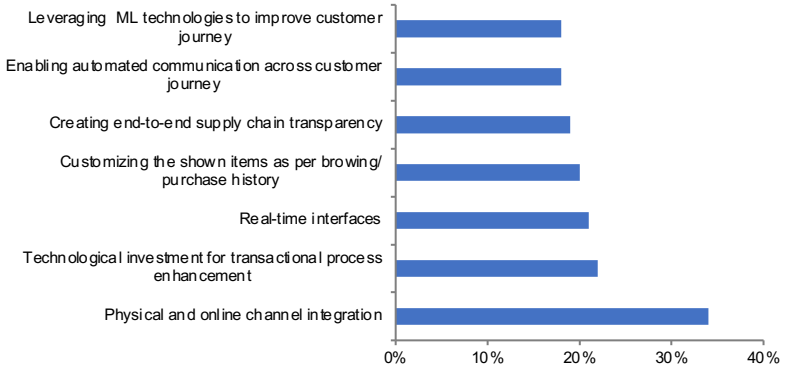
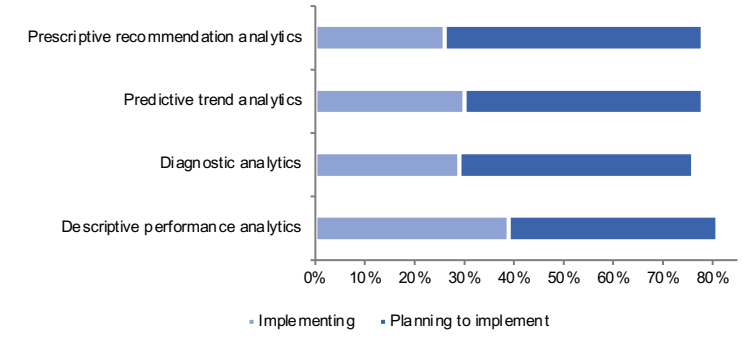


Exhibit 11. Corporates' Preferences Towards Data Analytics, Segmented by Function (KPMG, 2022)



(Source: KPMG Research, Company Reports, CUIRS)

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Catalyst & Risks

Risks

International rivalry in chip and semiconductor development

Global technology war, including the US Sales ban on computer chips and its manufacturing tool to China, may disrupt APAC's upstream and downstream ecosystem. Driven by accelerated international cooperation, the smart retail market of APAC may be susceptible to significant changes in market share and future growth patterns.

In October 2022, Washington announced bans and limits on hi-tech exports to China, including advanced computer chips, chip-making equipment, and prototypes of quantum computing and AI software.,

On the surface, these export bans hint at a negatively-inclined outlook of the Chinese smart retail market, indirectly boosting the market share held by other APAC regions.

By October 2022, China's purchases of chip-making machines fell by 27% YoY as a result. Nonetheless, the nation's demand for chips reflected a firm reliance on external imports, importing nearly USD 380-worth chips by 3Q22. The trend conveys a possible supply shortfall as opposed to an unyielding demand. Worse still, experts have estimated that China's equipment markers are currently lagging 4-5 years behind its overseas counterparts, turning them unsuitable as immediate substitutes for resources lost from US suppliers such as KLA Corp and Lam Research. Additionally, Boston Consulting Group estimated that at least USD1tn in incremental upfront investment is needed to build fully "self-sufficient" local chip supply chains for the nation. As a result, it may still be challenging for Beijing to support semiconductor factory constructions and R&D units establishments despite an injection plan of over US$ 150 bn into its domestic semiconductor industry by 2030.

On the contrary, some Asian jurisdictions, including South Korea, Japan, and Taiwan, may achieve technological breakthroughs by engaging in international alliances, such as the US-led Chip 4 Coalition.

Provided that South Korea, Japan, and Taiwan, have sufficient domestic chip and semiconductor supply, they have been nurturing favorable soil for longer-term expansion of smart retail. Take South Korea as an example, its major technology company, Samsung, occupies the second-largest market share in contract chip manufacturing, and SK Hynix holds the third-largest market share in flash memory. As opposed to the case of China, these countries may not be adversely impacted by geopolitics. In Korea, for instance, tax breaks and incentives were offered for chip businesses in 2021. The nation also looked to keep pace with international rivals by investing USD 451 in local semiconductor production. These APAC regions have been on full throttle in supporting technological advancement in general. Sufficient specialized hardware available and mature expertise set solid foundations for future smart retail innovation.

(Source: CNBC Research, Bloomberg, SCMP, Company Reports, CUIRS)

Catalyst & Risks

Risks (cont.)

China imposed restrictions on online activities and data protection

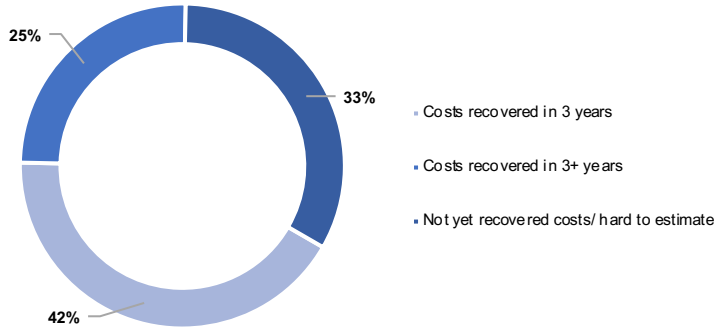
From the perspective of trading activities and app purchases, in order to strengthen supervision of online trading activities, a series of regulatory requirements were imposed on new forms of online trading in 2021, which restricted e-commerce activities on social networks and live streaming platforms to name a few. The Online Trading Measures, for instance, restrictions on e-commerce platform transactions, including the prohibition of unfair practices in search exposure areas and the removal or addition of products or services. Furthermore, these measures have also required innovative retail platform operators to regularly verify and update each merchant's profile by monitoring their market participant registration status. However, these constantly altering regulations create hurdles for smart retail providers, including the cost of compliance and relevant expenses of law observation.

Possible development slow-down in near-post-pandemic

As the world slots back to normal, the stimulating effect of COVID-19 on smart retail development may also stifle.

In the near-post-pandemic era, corporations still need to figure out how long-term consumption patterns will take shape after digitalization sped up in the course of the pandemic. While most researchers are in agreement that digitalization will eventually become the mainstream platform of retailing and consumption, the speed of transition from traditional brick-and-mortar businesses to smart retail operations remains under investigation. 45% of surveyed enterprises claimed that the toughest challenge in adopting smart retail is the highly uncertain return on investments. In contrast, a portion of business owners remained hesitant in venturing into the new mode of retailing based on uncertain breakeven estimations.

Exhibit 12. Expected Time for Digital Investment to Be Self-Sufficient (McKinsey, 2022)



(Source: KR Asia Research, McKinsey Research, Company Reports, CUIRS)

Conclusions

Key Summary

Despite the lowered consumption sentiments in COVID-19, the smart retail industry has shown a noticeable boom. Dated 2021, the smart retail market stood at a size of US$ 19.5 mn, representing a CAGR of about 27.4% from 2021 to 2028. Within the sector, the hardware segment dominates, while the software segment has demonstrated a higher potential for growth.

The smart retail landscape of the APAC region, chiefly including China, Japan, and South Korea, is surmised to be the most vibrant market in recent years, holding up to 32% of the global market magnification. On a global scale, it is understandable how downstream demands from retailers have surged since the outbreak of the pandemic in order to catch up with the general trend of digitalization over the past decade and cater to the stagnant business environment poisoned by pandemic control measures. Retail practice transformations in the APAC region, such as South Korea, resonate with these global trends. In addition, while the impact of the pandemic had been most evident in the upgrade of Chinese retailers' value chain, Japan's smart retail development had been mainly attributable to the adaptation to customer demographic shifts.

Precisely, the upstream supply of smart retail services has experienced a noticeable expansion in recent years. Active entrance to the Chinese market and favorable government policies for Japan and South Korea, such as budgetary planning and monetary support, has additionally added fuel to the industry's thriving fire. Furthermore, anticipating continuous technological maturation, various smart retail innovations are predicted to take shape and will outline new possibilities for retail methods of the future gradually.

Looking backward, the smart retail market has exhibited observable augmentation; looking ahead, the industry has shown signs of proliferation based on Japanese and South Korean education policy reforms. However positive the outlook may seem, the market is still vulnerable to risk factors encompassing the international tech rivalry, as well as the escalated compliance costs of smart retail industry players. Considering the profitability and outlook of the smart retail industry, experts suggested that the COVID-19 stimulus on the market's development may be transient in terms of business ROI and the transition speed of consumption patterns.

Nevertheless, with widespread policy support and maturing technology, coupled with the global trend of digitalization, we are optimistic in the long run. Therefore, we expect that the smart retail market will exhibit future growth possibilities and will eventually be the mainstream business model despite the risks and challenges.

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